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ORIGINAL ARTICLE

Using experimentation to boost university–industry collaboration

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ABSTRACT

The ATTRACT NEXT project examined the potential of experimentation – particularly the use of randomized controlled trials (RCTs) – to enhance university–industry collaboration, a policy field in which such methods have been underutilized to date. This project has led to the development of a Handbook on Experiments in University–Industry Collaboration, which identifies critical challenges in university–industry collaborations and proposes testable experimental ideas for interventions. A learning and support programme, the University–Industry Impact Accelerator, then facilitated the design and piloting of three experimental interventions addressing motivation, capacity-building, and relationship development between researchers and businesses. The results indicate that structured experimentation can yield actionable insights, improve engagement strategies, and optimize programme effectiveness. The NEXT initiative has demonstrated the feasibility and value of embedding experimentation within university–industry collaborations, aiming to foster more robust, evidence-based policymaking and programme implementation.

Keywords: Science commercialization; university–industry collaboration; randomized controlled trials, experimentation

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INTRODUCTION

Recent years have seen increasing interest in the use of experimentation to inform the design and implementation of public policies. We take 'experimentation' to refer to testing approaches in a structured way that is planned in advance and is intended to generate learning about how an intervention has worked. There are many ways of setting up an experiment, including using observational data to compare the outcomes of participants before and after the intervention, or using 'quasi-experimental' methods, in which the outcomes of the participants are assessed against a comparison group of similar individuals (Florio and Castelnovo, 2023). In this paper, we focus on the use of randomized experiments (often known as randomized controlled trials, RCTs), in which individuals or groups of participants are allocated at random to different forms of the intervention. The random allocation provides confidence (as long as the sample size is sufficiently large) that the members of the different experimental 'arms' are similar in all respects other than the intervention they are exposed to – implying that any differences between them in post-intervention outcomes can be attributed to the differences in the interventions they were exposed to. This allows organizations to generate particularly compelling evidence about the impact of their activities (Bravo-Biosca, 2020).

Randomized experiments can be used both to optimize programmes (for example, in comparing different approaches to delivering the programme) and to provide evidence about their effectiveness (by comparing those who have been given access to the programme with a control group who have not had access).

The field of university–industry collaboration has seen very little experimentation to date. Among the reasons for this are a lack of awareness of the potential benefits of experimentation and a lack of knowledge about how to design and implement experiments. Another barrier may be a perceived aversion to experimentation (Heck et al., 2020), even though other studies have found a high level of acceptance of the need for experimentation among the general public (Dur et al., 2023; Fuller, 2024; Mazar et al., 2023; Mislavsky et al., 2020). However, perhaps the most important factor is that evaluation has often not been prioritized within programmes or not planned for from the start. While the complications involved in carrying out randomized experiments are often exaggerated, one crucial factor is that the experiment is embedded into the programme design from the outset.

Just like other fields in innovation policy, however, university–industry collaboration is highly suitable for experimentation. The challenges faced in this space target numerous individuals (often researchers) and organizations (often companies) and include programmes that range from learning modules to business development support and funding allocation, all of which are executed through intermediaries like technology transfer officers and innovation agencies. All of these pre-conditions create a policy space ripe to systematically test what works, to learn, and to scale cost-effective

interventions that support the commercialization of early-stage technologies developed in research infrastructures.

In this paper, we discuss an initiative known as ATTRACT NEXT, which was implemented by the Innovation Growth Lab in partnership with researchers from the Barcelona School of Economics and Esade. This project sought to examine the potential for using experimentation to spur university–industry collaborations and to make such collaborations more effective. The project included both generating ideas for experimentation and piloting how this might happen.

THEORETICAL BACKGROUND

This research project sits at the intersection of a thriving research literature on university–industry collaboration and the application of a methodology that is underutilized in this field (Bravo-Biosca, 2020). The combination of the two has the potential to generate new insights, improve the evidence base, and provide actionable recommendations for the different actors in the university–industry ecosystem.

Much research has been undertaken by innovation scholars to improve our understanding of the different challenges and enablers of science commercialization and university–industry collaboration, typically using qualitative case studies or cross-sectional analysis of quantitative data. However, there is still very little evidence on the effectiveness of the different types of technology transfer activities undertaken by research institutions. This is in part due to the limite use of counterfactual evaluation methods, a gap that the project at hand addresses with the use of experimental approaches.

Experimentation has already been used to increase researchers' engagement around commercializing their discoveries (Sormani et al., 2022), to demonstrate the impact of peers in the creation of new ideas through informal conversation (Hasan & Koning, 2019) and to reduce search and matching costs through encouraging better communication (Boudreau et al., 2017). On the business side, getting small businesses to engage with universities has been a recurrent challenge, which governments have sought to overcome through various instruments, such as innovation vouchers. Several trials have explored the impact of vouchers in seeding new collaborations, showing strong impacts in the short term and mixed results in the medium and long term (Bakhshi et al., 2015; Balabay et al., 2019; Cornet et al., 2006; Kleine et al., 2020).

So, while some experimental work in the areas of researcher engagement and idea generation has been done, its scope remains limited and other areas remain underexplored. ATTRACT NEXT aimed to expand on the existing work, identify new areas for experimental intervention in the field of university–industry collaboration, create a repository of ideas for experiments, and to pilot some versions of them.

METHODOLOGY

Two key activities were carried out under the ATTRACT NEXT project: the development of a handbook on experiments in university–industry collaboration, and the design of some initial experiments to test interventions in this space.

The *handbook provides an overview of areas of intervention in university–industry collaboration*, detailing key challenges, opportunities, and testable ideas for support mechanisms, prioritizing those likely to provide impactful insights. The approach to developing the handbook began with a literature review to identify evidence gaps and gather initial ideas for potential experiments. This framework-developing process also included structured interviews and co-creation workshops with relevant stakeholders. This phase was followed by an idea-structuring and validation phase, and then by the development and validation of experimental ideas to target key issues.

Parallel to the development of the handbook, the project pursued the *testing of some projects in the field*, making sure that the ideas and recommendations of the handbook are also connected to the realities of running experiments in this space. This process began by developing partnerships with research institutions and stakeholders interested in experimenting with initiatives in university–industry collaboration. The selected partners participated in the University–Industry Impact Accelerator, a structured training and support programme over six months covering the foundations of experimentation and how to apply the learning to their own projects. In the course of the training, participants developed the essential elements of their experiments, including the problem definition, the theory of change, the details of the experimental design, data collection approaches and risk management strategies. The structured training offer was followed by one-to-one support to further specify different aspects of the studies, culminating in the teams piloting some of the processes involved in implementing their experiments.

RESULTS

Both elements of the project – the handbook and the Accelerator – have produced insightful outputs.

Handbook of Experimentation in University–Industry Collaboration

For the forthcoming Handbook of Experimentation in University–Industry Collaboration, a framework of key challenges in university–industry collaboration has been

developed (see Figure 1) along with a series of realistic yet adaptable experimental ideas to tackle these different challenges. The framework groups the interventions around the challenges they address – relating to motivation, capabilities, resources, or matching – or the actors that they target (researchers or businesses). Some of the experimental ideas proposed focus on interventions that target academic researchers and researchers at non-corporate labs (as corporate researchers operate according to company R&D goals and are well embedded within those processes). Other experimental ideas focus instead on interventions targeting small and medium-sized enterprises (SMEs), for which a lack of resources makes it harder to establish collaborations. And some experimental ideas target both sets of actors simultaneously.

Interventions regarding researchers' *motivation* target intrinsic motivations to engage in science commercialization (e.g. pursuit of social objectives) and extrinsic motivations (e.g. IP rights), as well as misunderstandings or misconceptions. On the business side, interventions target awareness and incentives.

Interventions addressing *capabilities* target researchers' non-scientific communication skills and business skills. For businesses, these capacity-building interventions tackle their ability to stay up to date on scientific discoveries and to identify their technological development and partnership needs.

Because capacity-building interventions such as training can take many forms (online vs. offline, intensive vs. spread out, one-to-one vs. group support) and target multiple actors, they lend themselves especially well to experimental initiatives. It is for this reason that, for each target, finding the right way to engage them in training is an area of discovery of its own.

When *resources* are being addressed, there are three dimensions that affect both actors: access to funding (for commercialization or business R&D), access to human resources (e.g., business expertise, IP lawyers) and access to infrastructure and other forms of non-financial support (e.g. research labs or urban labs).

Challenges around *matching* commonly target both actors simultaneously and include finding uses for technologies, developing technologies for pre-existing challenges, establishing and building trusting relationships between actors, and developing successful collaborations.

University–Industry Impact Accelerator

The Accelerator also yielded positive results, with the three participating projects targeting different key challenges in the university–industry collaboration space.

One project by a national innovation agency was centred on *increasing motivation for recent STEM graduates* to participate in a traineeship programme bringing together national companies and big science organizations. The overall programme also addressed relationship-building challenges in this space by matching local companies with organizations such as CERN and building working relationships through the traineeships. Because the traineeship was also intended to lead to future employment opportunities for trainees at the host companies, the increased recruitment numbers should also lead to more promising matches between trainees and companies.

The innovation agency used the opportunity of the University–Industry Impact Accelerator to test ways to reach out to students and encourage them to apply. Given that there were few existing links between big science organizations and students on the relevant graduate courses at universities, one of the key concerns was whether students would find out about the scheme and would be motivated to apply.

During the Accelerator, the innovation agency planned the experimental intervention that will take place ahead of the traineeship application window. The agency compiled a list of postgraduate programmes that will be producing graduates suitable for the traineeships and plans to ask the course coordinators to distribute information about the traineeships to final-year students. In randomly-selected courses, students will also be offered the opportunity to join a webinar to learn more about the traineeship scheme (including hearing from others about their experience of working within big science organizations) and how to apply. The office administering the traineeship process will provide data about how many applications were received from students in each course, allowing a clear assessment to be made of whether the webinars resulted in increased applications. To assess whether any such increase in the quantity of candidates comes at the expense of quality, the traineeship office will also provide data on how many students from each course passed the initial eligibility checks and were shortlisted.

Under a more traditional approach, the innovation agency would have decided whether or not to hold webinars, to which all students would have been invited. Although participants may have been asked to complete a feedback survey, this would have provided only weak evidence about the webinars' influence on students' decisions to submit applications. The experimental design will allow the agency to assess whether the benefits of holding the webinars outweigh the costs. The experiment is also acting as a proof-of-concept for experimentation, demonstrating within the implementing agency and to peer organizations that it is possible to generate useful insight from experiments over a relatively short time frame and at a modest cost. This also paves the way for more ambitious experiments in the future.

A second project addressed the *challenge of how to build researchers' capacity in knowledge exchange (KE)*, with the aim of enabling them to engage effectively with private-sector SMEs. The team of researchers had already developed a training programme to enhance KE skills among researchers. They joined the Accelerator seeking

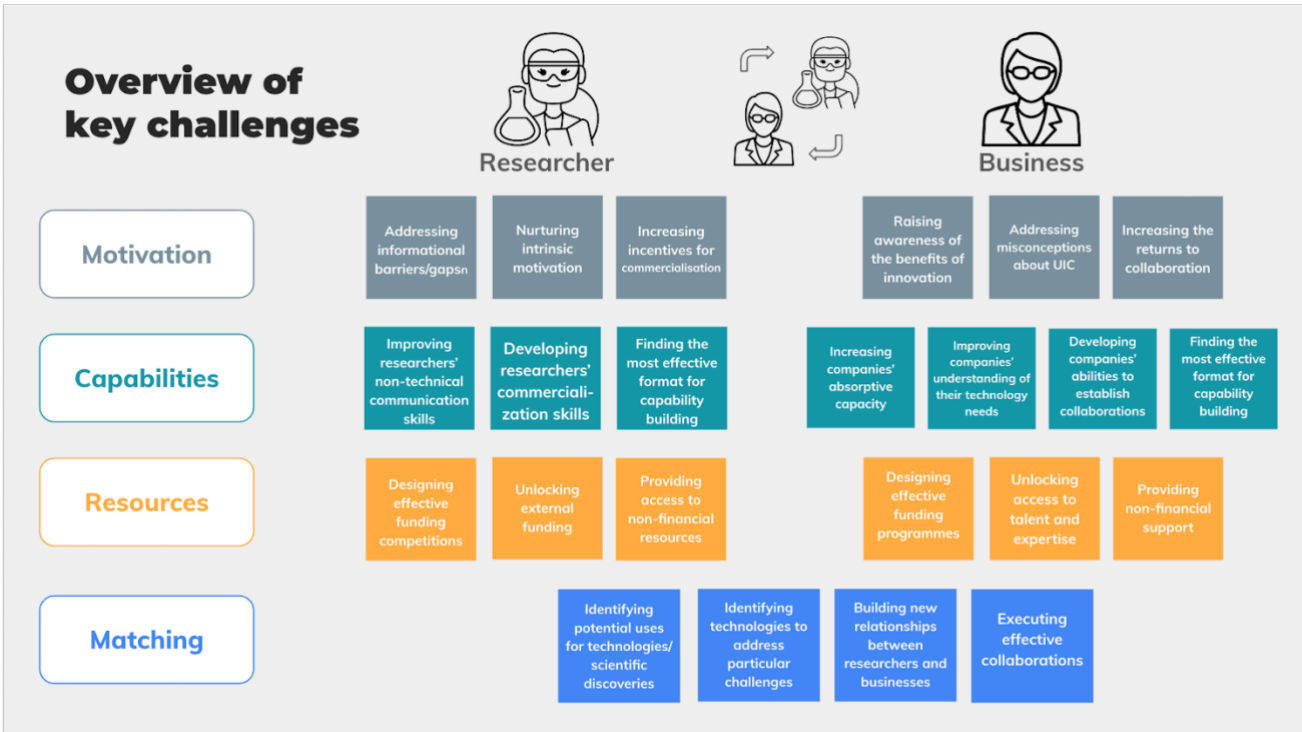

Fig. 1. Preliminary framework of key challenges in university–industry collaboration from the Handbook of Experimentation in University–Industry Collaboration. The framework groups the challenges in thematic areas and organizes them around the targets of the experimental intervention: researchers, businesses, or both. In the handbook, potential experimental interventions are included to target each challenge.

to improve the scalability of their programme, to develop metrics of success, and to test its impact experimentally.

As part of the Accelerator, the team worked with stakeholders to identify the optimal length of the KE programme (settling on two hours) and adapt the content accordingly. They also developed a training programme on an alternative topic (bid writing) to be delivered to the control group. Delivering this alternative training programme to the control group helps to increase acceptance of the process among participants (since nobody is denied access to training altogether), and also ensures that the participants are not aware that they are considered the control group for this experiment – something which could affect the way they respond to follow-up surveys. Ideally, those delivering the training would also be 'blinded' as to the objectives of the experiment, but for practical reasons that was not possible in this case.

The team also developed new output and outcome metrics for the interventions' piloting phase. They developed baseline and post-delivery questionnaires to record increases in participants' knowledge and their perceptions of the added value of the training, as well as to identify possible gaps to be addressed before scale-up. As a further metric of success, the team sought to organize 'speed-dating' (informal networking) events with local SMEs, where researchers who participated in both training programmes could test and refine their skills in engaging with businesses. The success of these efforts would be measured through feedback from participating SMEs and the number of follow-up contacts between researchers and SMEs.

During the Accelerator, the team identified three universities to pilot the training programme, gained buy-in for its implementation from administrators, and organized the training sessions. The 20 participants in these pilots were randomly allocated to take part either in the training on knowledge exchange or that on bid writing. While this number is too small for the team to expect to detect a quantitative impact of the KE training, the feedback received from the participants was highly positive, suggesting that scaling up the experiment to assess those impacts would be worthwhile. A full test would involve carrying out the training at additional universities and comparing the two groups in terms of their understanding of and readiness to participate in knowledge exchange after the training, as well as their successful engagement with SMEs (through the speed-dating events and beyond).

The third project, implemented by a research lab, focused on the challenge of *how to build new relationships between researchers and businesses*. Specifically, it focused on how research institutes with pre-existing technologies might best approach companies for potential partnerships in commercializing those technologies. The question was whether direct

contact by the researchers or a mediated approach with the involvement of technology transfer officers (TTOs) would yield better results. The former approach may increase engagement due to the superior knowledge and legitimacy of the researchers when discussing the technology, while the latter might be more successful because TTOs may be better able to act as translators between academic researchers and business needs and mindsets.

As part of the Accelerator, the project identified the specific research question, designed an experiment to address that question, and piloted some elements of the design. The experiment will be conducted in the context of a proof-of-concept programme supporting researchers in commercialization. For each of the research teams participating in the programme, a number of potential private-sector partners will be identified. The experiment will involve randomly allocating each of these businesses to be approached either by one of the researchers or by a TTO from their institution. A comparison of the number of businesses that respond and agree to a preliminary meeting about potential collaboration – as well as the number of follow-up meetings held – will reveal which outreach approach is most effective.

One consideration in designing this experiment is whether the behaviour of the researchers and TTOs could be affected by their awareness of the experiment. Might they put in more effort when reaching out to companies than they would if they were doing this routinely as part of their work? Or would they put in less effort, if they were not motivated by taking on this responsibility? These possibilities cannot be excluded, though they seem likely to affect researchers and TTOs in the same way, so will not compromise the comparison between them. Even in the worst-case situation that one of the two groups was motivated and the other unmotivated by this outreach work, the experiment would still provide valuable information in demonstrating this, through their relative performance in contacting businesses.

This experiment will provide the research lab with valuable information about the most effective approach when scaling up the programme, while also acting as a demonstration within the organization of the potential of learning from experimentation. During the Accelerator, the project team carried out a pilot to test the content of the informational package to be delivered in both treatment groups, as well as testing the ability to track the outcomes required to evaluate the intervention and the partner-identification strategies.

DISCUSSION AND CONCLUSIONS

The ATTRACT NEXT project has demonstrated that experimentation is possible across the field of university–industry collaboration. The development of the Handbook on Experimentation in University–Industry Collaboration and the University–Industry Impact Accelerator have engaged over 100 individual stakeholders – including policymakers and practitioners, researchers, technology transfer officers, and entrepreneurs, as well as 12 innovation agencies and numerous academics in the field. Their interest and positive feedback on the project activities signals that the policy space of university–industry collaboration is ripe for experimentation addressing its many challenges. Stakeholders are hungry for ideas, learning, and evidence-based insights (European Commission et al., 2024; National Centre for Universities and Business, 2024; Organisation for Economic Cooperation and Development, 2019; Perkmann et al., 2021; Royal Academy of Engineering, n.d.; Sormani et al., 2022). But they often lack direction and expertise to put in place the systems needed to achieve those goals. The Handbook and the University–Industry Impact Accelerator are thus important instruments contributing to a much-needed body of policy development and implementation knowledge in university–industry collaboration.

The Handbook provides policymakers and implementers with a framework of areas for intervention as well as experimental ideas. This helps policymakers understand when experimentation might be feasible and puts them in a better position to request that experiments be used to test, optimize or evaluate the programmes they fund – or some of the activities within them. To those working on the implementation of policies and programmes, it provides them with inspiration, direction and specificity about how to execute rigorous evaluation strategies.

The three Accelerator projects have demonstrated that experimentation is possible in different areas of university–industry collaboration, and that it can be done with limited support in a relatively short amount of time. While the projects are still at the piloting stage, each has the potential to provide delivery staff with valuable insights on how to make their collaboration efforts more effective. The evidence generated will be more robust and reliable than that typically generated through traditional evaluation processes, giving policymakers and programme implementers increased confidence when putting the evidence to use.

Experimental evaluation in university–industry collaboration is thus conceivable, possible, and necessary. But for this to happen, experimentation must be built into the design of programmes and policies from the outset. Unlike more traditional forms of programme evaluation, randomized experiments cannot be set up retrospectively. Although this implies an additional set of factors to consider at the programme design stage, those involved in implementation have often appreciated that this challenges them to think through the details of how their programme is designed and the results it is intended to have. This can result in more effective programmes being carried out, even before the experiment itself starts to generate learning.

By providing structure, ideas and demonstrators, this project aims to catalyse an increase in the use of experiments in science commercialization. As has happened in other areas of innovation policy (e.g., Bendiscioli et al., 2023; Cuello, 2019; Phipps, 2019; Research on Research Institute, 2024), funders can now begin to explore and demand randomized experiments or other forms of robust evaluation from new programmes in this field. Equally, as policymakers and implementing organizations become more comfortable with the notion of experimentation, they will increasingly identify opportunities to use experiments either to optimize or evaluate their activities. Over time such efforts will gradually build the evidence base for what works in university–business collaboration, increasing the effectiveness of the field as a whole.

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