FROM THE ANALYST'S COUCH

Demystifying industry–academia collaboration

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The past decade has seen intensified research collaboration between pharmaceutical companies and academic institutions. Although such partnerships are recognized as a source of innovation and a key pillar to advance science in drug discovery, they are replete with challenges. Despite much anecdotal evidence and debate, fact-based evidence on the nature of these challenges and how to manage them is scarce. Here, we present results from a systematic analysis of quantitative and qualitative data from the portfolio of academic collaborations at a major pharmaceutical company, Novartis, which illuminate the challenges associated with industry–academia collaborations. We also offer advice on how to make such collaborations more effective.

Analysis

We surveyed participants in 187 collaborative research projects in the field of drug discovery that Novartis conducted with different academic partners (excluding purely transactional activities such as in-licensing and out-licensing). Our study includes responses from 669 participants (416 from Novartis and 253 from the academic partners) and represents, to our knowledge, the most comprehensive study of its kind.

We employed two analytical approaches. First, a qualitative methodology provided a systematic account of the challenges of industry–academia collaboration as seen by both parties. To probe the challenges in an unbiased way, we asked open-ended questions that respondents could answer in a free text field. Using thematic content analysis, we decomposed the responses into lower-order and higher-order categories. We validated the resulting categorization scheme using two independent researchers (see Supplementary Box 1). FIG. 1 shows the resulting categories of challenges and the frequency at which they were mentioned. Second, we assessed the impact of one salient factor for each category on project success (FIG. 2; see Supplementary Box 2 for details).

Challenges in collaborative projects

Categories of challenges. Our results indicate seven categories of challenges in industry–academia collaborative projects (FIG. 1). First, resource constraints, the most frequently mentioned category, refers to the limited availability of human, monetary and organizational resources (for example, tools or instruments) for the project. Second, legal and administrative process complexity includes challenges due to 'paperwork', internal approval processes, ethical reviews, and contract negotiations that take time and often limit the partner's access to relevant knowledge. Third, coordination challenges relate to difficulties in teamwork, the frequency and quality of communication, the coordination of tasks and the exchange of goods and knowledge. Fourth, scientific challenges arise from negative results, issues with the scientific methodology and difficulties in interpreting data. These four categories together constitute 79% of all challenges mentioned by participants.

The fifth category, goal alignment challenges, relates to diverging expectations and goals among project members and insufficient priority of the project in the partnering organizations. Sixth, interpersonal challenges include issues related to differences in project members' individual attitudes, behaviours and interests, a lack of trust in the partner, a lack of commitment by single project members and interpersonal conflict. Last, technological challenges arise from scarce knowledge on new technologies and methods, uncertainty in the technical feasibility of methods and unreliable experimental techniques.

Prevalence of challenges. Counter to many anecdotal reports, we found that the most frequently mentioned challenges do not relate to conflicting goals or cultural differences between industry and academia, but rather to resource constraints, legal and administrative process complexity, coordination and scientific challenges. The good news is that, with the exception of scientific and technological challenges, challenges are mainly within the control of the collaboration team and can thus be mitigated through more effective teamwork and project management.

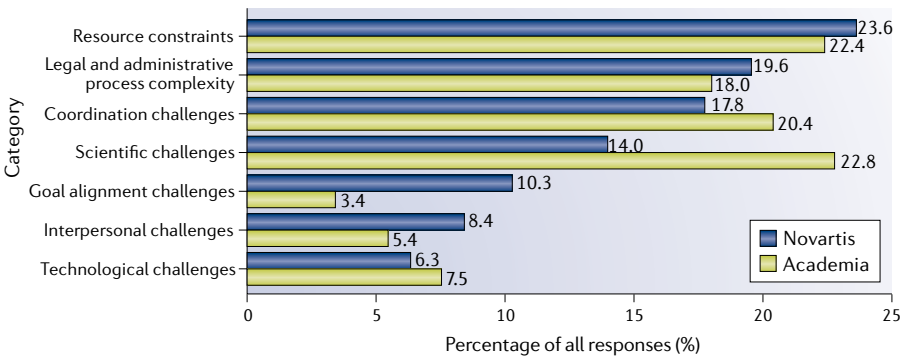

Fig. 1 | **Relative importance of different challenges in industry–academia collaborations by organization.** The figure shows the relative frequency at which the challenges within each category were reported by scientists in the 187 collaborations in our sample. The analysis is based on data from 722 responses to the question about the most pressing challenge in the project and was carried out separately for Novartis scientists (428 responses, blue bars) and academic scientists (294 responses, yellow bars). The categories are ordered by the total number of responses (from Novartis and academic scientists combined). See text and Supplementary Box 1 for details.

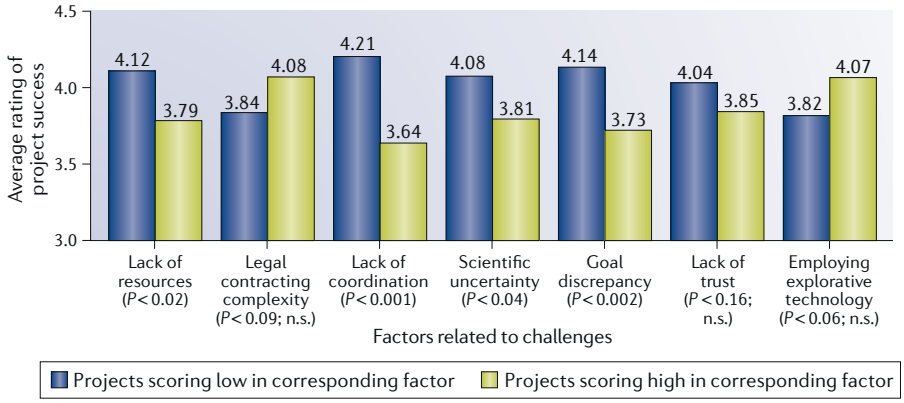

Fig. 2 | **The impact of factors related to challenges on project success.** The figure shows the average rating of project success for all the projects that scored low and high in factors related to the seven categories of challenges. The yellow bars represent the projects in which the specified factor was reported to be high (above the mean) and the blue bars represent projects in which the factor was reported to be low (below the mean). Project success corresponds to the evaluation of goal attainment in the collaboration after 6 months, rated by the project leaders from Novartis and the academic partners on a scale from 1 to 5. The *P* values indicate for each factor whether a difference in that factor also corresponds to a significant difference in the rating of project success. See Supplementary Box 2 for details on the methodology. n.s., not significant.

Novartis-based and academic scientists mentioned challenges in most categories with similar frequencies. However, we did find differences in how scientific challenges and goal alignment challenges are perceived: the former is mentioned significantly more often by academic scientists, and the latter more often by Novartis scientists.

Impact on project success

We analysed seven factors, each corresponding to one challenge category, and found that they showed different impacts on reported project success (FIG. 2). In most cases, a stronger presence of the factor was associated with a significantly lower project success half a year later (confirmed using an ANOVA statistical test; see Supplementary Box 2). The lack of coordination factor exhibited the strongest negative relationship with project success. Interestingly, projects in our sample on average turned out to be more successful if they involved a higher degree of explorative technology or methods (for example, projects that adopt an advanced technology for a scientific problem for which that technology has not yet been used). We also found that those projects involving more complex legal contracts (for example, collaboration agreements as opposed to material transfer agreements) reported higher levels of project success. Legal matters are often portrayed as a major challenge to industry–academia collaboration. Our data suggest, however, that while complex legal contracting may be a hurdle at the onset, it does not impede a project once it is running.

Conclusions

Our study suggests that 'conflicting incentives' or 'clashing cultures' are in fact not key roadblocks to industry–academia collaboration. Adequate resource commitments, however, are critical for collaborative project success. As many challenges we identified are under the control of scientists and managers, we conclude with four concrete suggestions for effectively managing industry–academia collaboration.

Evaluate and manage the collaboration portfolio. As collaborations demand ample resources and vigorous efforts to overcome legal and administrative hurdles, decisions are needed on the systematic allocation of resources across a project portfolio. Channelling resources to fewer projects, each with high potential, might be advantageous compared with handling a larger number of projects that divert scientists' attention and lower their engagement in any single project.

Ensure high-quality communication and coordination. As effective coordination provides the largest lever for project success, many collaborative projects will probably benefit from an intentional adoption of good practices of teamwork and project management. Adopting simple practices such as regular updates, frequent coordination of tasks, open discussions of disagreements and training conflict resolution methods is vital to successful collaboration.

Accommodate changing needs. Because early-stage scientific research entails substantial uncertainty, unforeseen results may require adapting the scientific approach and the project direction. Foreshadowing evolving needs for different types of expertise, human resources and other in-kind resources is important and should include some contingency reserves. When necessary, project leaders need to proactively re-organize a project; for example, by incorporating scientists with different expertise or replacing team members who leave their organization.

Foster commitment and enthusiasm. Successful inter-organizational collaboration requires a particularly good relationship between partners and a high level of intrinsic motivation for the project. To overcome barriers from differences in organizational goals and scientists' workstyles, attitudes and personal priorities, leaders in both firms and academic institutions should demonstrate a high personal commitment. Informal interactions, for example, spending some joint time outside of work, may increase familiarity with the partnering organization. Finally, leaders should make external collaboration a key priority of their organization and reward project progress and success.

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