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Innovation projects at the University–Pharmaceutical Industry interface: challenges and opportunities

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Abstract: COVID-19 pandemic accelerated the digital transformation of pharmaceutical R&D. This paper aimed to diagnose some key aspects of University–Pharmaceutical Industry (U–Pharma) partnerships in Brazil that should be addressed in digital platforms to enable the creation of innovative solutions to COVID-19. A qualitative research was applied through an online guiding questionnaire to identify the main points that are considered as opportunities or challenges by the parties involved in the University–Pharmaceutical Industry interface. The responses were processed using content analysis to raise common themes. Further, in-depth interviews were performed to evaluate the subjective perception of these themes. The results of the questionnaire showed the topics bureaucracy, partnership, and agility as the most relevant. The in-depth interviews showed the subjective perception of these themes. The joint analysis of the results showed that in addition to problems related to project management processes, issues that involve the human dimension, such as pro-executive behavior and communication skills, are also extremely relevant to the success of U–Pharma projects. The development of digital solutions for Knowledge Management of innovative projects of U–Pharma collaborations should take into consideration both the project and human dimensions. It is recommended that Project and People Management should be integrated into digital platforms.

Keywords: University–Pharma Industry Collaboration. Digital Solutions. Project and People Management. Pharmaceutical Innovation.

Introduction

The COVID-19 pandemic has considerably changed the work organization of the population worldwide [1]. The articulation of the University–Industry interface in innovative projects that aim to meet the urgent demands imposed by the crisis is of fundamental importance. Chemical and Pharmaceutical Research is one of the most important representative interactions that occur at the University–Industry interface. The so-called University–Pharmaceutical Industry (U–Pharma) collaboration has a great potential to develop innovative solutions to deal with the pandemic scenario, whether in terms of prevention, treatment, or diagnosis [2].

Although cooperative projects have been taking place for a long time, the full development of this interface still seems to be quite challenging, even in developed countries [3,4]. Because University and Industry have fundamentally different goals and are formed by researchers with different profiles, aligning strategic actions on both sides of the coin often run into problems that are difficult to resolve. Also, the current crisis requires increased attention by the bodies responsible for applied research to develop strategically, considering strong connections with fundamental research [5,6]. The areas of communication and project management are identified as important points of attention that directly interfere in the success or failure of these partnerships [7,8].

The so-called digital revolution, which has been present for decades with the creation of the internet, had its pace accelerated with the new reality imposed by the COVID-19 pandemic [9,10]. On the University side, the educational and work processes are being profoundly modified [11]. Most of the undergraduate and graduate courses are being transformed to meet the current scenario. Didactic and research activities are being changed to the online format, which is increasingly requiring teachers and students to adapt.

The Industry side is also rapidly changing as it consolidates the insertion of Industry 4.0 and the entire arsenal of concepts and new technologies related to information systems (eg "Big Data", "Machine Learning", Artificial Intelligence, among others). Particularly, the COVID-19 pandemic and the Industry 4.0 seems to influence each other. COVID-19 perturbed the supply chain outcomes (e.g. sales and market share losses, delivery delays, declines in service and customer satisfaction. At the same time, Big Data analytics have been pointed as a useful solution to improve supply chain resilience in comparison with other information technology tools [12]. The Pharmaceutical Industries, for example, have been showing great interest and capacity to absorb these new tools seeking to improve productivity

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and processes [13].

Concerning the University–Industry interface, digital transformation can contribute significantly through the automation and facilitation of processes that demand excessive time on the part of the members that compose the interface. The natural result of this is an improvement in the processes that make up the management of projects that occur in collaboration and, mainly, an advance in knowledge management by gaining agility and security in the flow of data and information that support the decision–making processes

The objective of this work is to establish a diagnosis of the main challenges and potential opportunities within innovation projects that occur at the U–Pharma interface. The following guiding questions were used for the development of the research:

Q1 – How is the U–Pharma interface in Brazil characterized at the moment of the COVID–19 pandemic?

Q2 – What is the perception about the challenges and opportunities of the parties involved in the Pharmaceutical Science and Innovation development loop?

Methods

In this paper, exploratory qualitative research was used to establish a diagnosis of the current situation of the U–Pharma interface. As it is a complex social nucleus and composed of individuals with very different profiles, it was decided to use a multimethod approach using quantitative and qualitative data. The combination of these two approaches is important to establish more clearly the objective and subjective points experienced by the actors that make up the collaborative interface [14]. Online questionnaire was used to explore the general points by means of quantitative data. In–depth interviews were used to focus on the subjective aspects of the points raised in the online questionnaires [15].

Questionnaire design

The online questionnaire was the first step in the work aimed at the parties involved in the innovation projects that take place at the U–Pharma interface: i. researchers inserted in the University (academics), ii. researchers in the Pharmaceutical Industry (raw material and/or finished product) and iii. Startup researchers working on this interface. The questionnaire was prepared on the "Google Forms" platform and disseminated on the internet via "e–mail" and social networks ("Linkedin" and "Facebook"). The questions were organized into three information axes: Axis 1 – Characterization of the personal and professional profiles of the stakeholders that make up the interface, Axis 2 – Identification of Challenges and Opportunities that occur in the collaborative interface and 3 – Evaluation of the perception of value about products and services resulted from collaborative projects.

Some open questions were also inserted in the online questionnaire to identify relevant topics to be dealt with in more direct interaction with each of the parties involved. The content analysis of the answers to these questions followed the methodology proposed by Laurence Bardin [16]. The coding of the responses was done by defining units of semantic and context registration using the qualitative analysis software ATLAS.ti. The themes emerging from this codification were then classified into the Challenges and Opportunities categories and were used as a basis for the construction of the in–depth interview script.

Interview design

The in–depth interviews were designed to clarify the subjective aspects inserted in the information axes 2 and 3 of the research. More specifically, it sought to understand how each of the parties involved perceives the situations of challenges and opportunities that are experienced in U–Pharma partnerships. A semi–structured questionnaire was used for this purpose. This stage of the work was aimed at participants previously selected from the responses to the online questionnaire. The interviews were recorded with the interviewees' permission and then later analyzed using the ATLAS.ti software. The online questionnaire and interview guide can be found in Supplementary Information.

Ethical issues

The information provided by the online questionnaire was treated anonymously to ensure confidentiality. The participant's responses were reported and analyzed using numerical codes to ensure that data cannot be linked to a specific individual. The interviews were conducted with the consent of the participants. All participants were aware of the anonymity and objectives of the research.

Results and Discussion

The U–Pharma interface has a great potential to generate innovations to deal with the current situation of the COVID–19 pandemic. However, it is necessary to recognize the perceptions of the main parties involved about the evolution of partnership projects. The results presented in this work seek to clarify how objective and subjective factors may be positively or negatively impacting the outputs of collaborative projects. These results were understood through a careful analysis of the perception of the parties involved. A total of 40 respondents were counted. These respondents comprise the three main nuclei involved in collaborative U–Pharma projects: i. University, ii. Pharmaceutical Industry and iii. "Startups".

Characterization of the stakeholders that make up the University–Industry interface

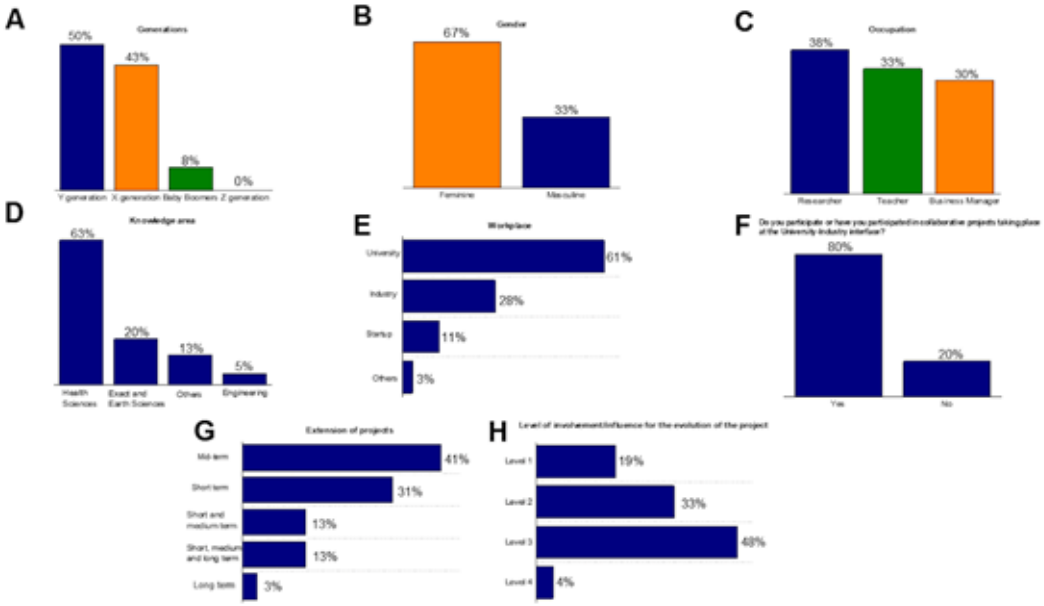
The socio–demographic characterization articulating the personal and professional profiles of the respondents

aims to raise "insights" about possible relationships between the perceptions of challenges and opportunities with characteristics such as sex, age, professional training, position, and level of influence in decision–making processes important for the evolution in collaborative projects of the U–Pharma interface. The characterization of the respondents' profile, presented in Fig. 1A–B, showed that most of them are female (67%) and are in the age group of 20 – 39 years (50%), belonging to the so–called Generation Y. Other participants are in the age group of 40 – 55 years (43%) and 56 – 74 years (7%), being classified within Generation X and "Baby Boomers", respectively. No respondent was representing Generation Z, which includes people under the age of 20. This classification of respondents following a generational approach is based on recent research that points out how the age group of workers can interfere with their perceptions and values [17].

The characterization of the professional profile is shown in Fig. 1C–H. Respondents have positions as business managers (30%), researchers (38%), and teachers (32%). Most respondents (63%) were classified as having training in the area of Health Sciences, being mainly pharmacists. Next are professionals with training in Exact and Earth Sciences (20%), formed mainly by chemists. Concerning the workplace, 61% of respondents are affiliated with a University, 28% with Industry, and 11% with a "startup" that interfaces between the academic and business sectors.

Most respondents (80%) have already participated in collaborative University–Pharmaceutical Industry projects. Most of these projects (41%) are medium–term, with a development period of 1–5 years, followed by short–term projects (31%), with a development period within one year. Long–term projects (over 5 years) total only 3%. This result may reflect a disarticulation of the University and Industry in disruptive innovation projects, which in general are long–term and involve the entire chain that unifies basic and applied research, from discovery, invention to innovation in the market. Regarding the level of influence on the decision–making processes that guarantee the evolution of the project, most respondents have some type of participation, directly (33%) or indirectly (48%). A still significant minority (19%) of the respondents is responsible as the sole decision–maker. This result can be evidence of the horizontalization of project dynamics within organizations [16]

Figure 1– Panels (A–B) Characterization of the respondents' profile. Panels (C–H) Characterization of the respondents' professional profile. Extension of projects defined according to the duration, being short (up to 1 year), medium (1–5 years), and long (over 5 years). For panel H, consider the following levels of participation in the decision–making processes: Level 1 (total participation), Level 2 (some direct participation), Level 3 (some indirect participation), and Level 4 (no participation)



Identification of challenges and opportunities from the point of view of different stakeholders

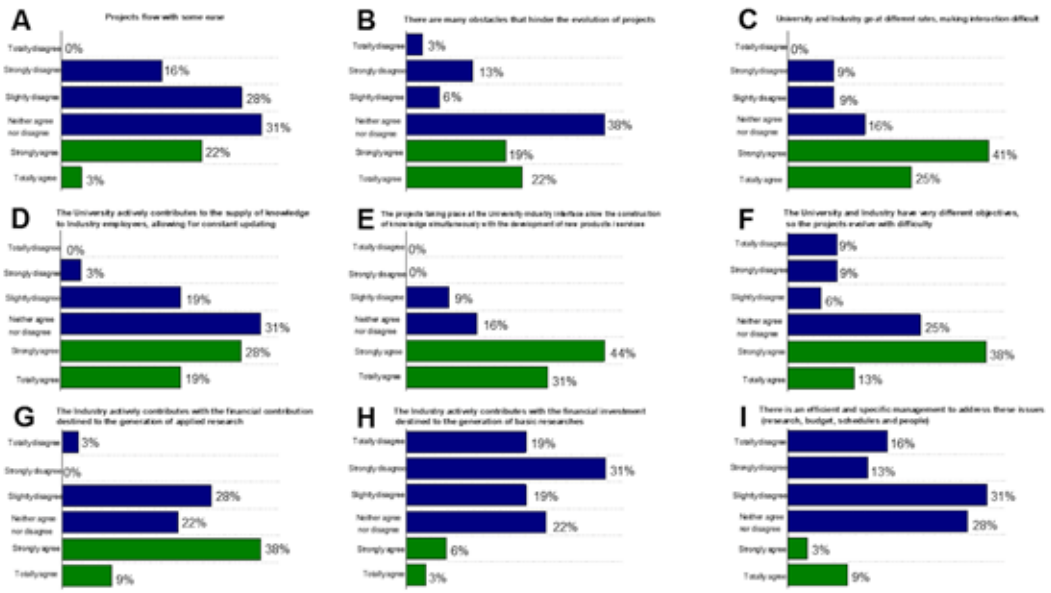
Challenges and opportunities are always realities that go together within an organization and can lead to the success or failure of projects. The differentiation between problem and opportunity must always be analyzed at an individual and collective level and, whenever possible, must be confronted with the potential risks for the evolution or stagnation of the project [19,20]. Fig. 2 presents the perspective of the different respondents about the perceptions of possible challenges and opportunities that occur during the development of collaborative projects. The results show that there are difficulties in the development of projects occurring in the collaborative interface between the University and the Pharmaceutical Industry, which can be demonstrated by numbers such as only 25% agree in some way that the projects flow easily and 41% agree in some way on the existence of obstacles (Fig. 2 AB).

The difficulties encountered in the evolution of such projects can be partly explained by the different mental models that comprise the parties involved belonging to the academic and business environment. The differences in work rhythm and purposes are shown in Fig. 2–C and F, which shows that 66% of respondents agree in some way about the University and Industry moving at different paces and 38% agree very much that they have very different objectives. Such factors are potential problems that hinder productive interaction during the development of collaborative projects and can be partially explained by the lack of active management at the interface (Fig. 2 – I). Here the results show that about 60% of the respondents disagree in some way that there is efficient and specific management to deal with research, budget, schedule, and people involved in collaborative projects.

Recognizing opportunities amidst countless challenges is not always easy, but it is essential, especially in times of crisis such as this that was triggered by the COVID–19 pandemic. In any partnership, opportunities, as well as challenges, need to be managed together. Fig. 2 establishes some points that can be seen as valuable opportunities in the U–Pharma collaborative process. The University is a nucleus of knowledge generation and, therefore, has the potential to offer an environment conducive to the development of projects that generate discoveries and inventions. However, this potential does not seem to be expressed in the current reality. When respondents were asked about the University to actively contribute to the knowledge input for the constant updating of Industry employees, about 22% disagreed in some way and 31% neither agreed nor disagreed (Fig. 2–D).

Possible discrepancies in the respondents' perception of the University's contribution to industry projects were also recorded. Some 75% of respondents agree in some way that University–Industry interface projects allow the construction of knowledge simultaneously with the development of new products (Fig. 2–E). The Industry's contribution to the research carried out at the University, especially applied research, divides opinions: 22% do not agree or disagree, 28% disagree a little, and 38% strongly agree (Fig. 2–G). On the other hand, about 69% of respondents disagree in some way that Industry contributes to basic research (Fig. 1–H). These results may show that the Industry has no interest in investing in this category of research since these are projects that aim to answer more fundamental scientific questions and, possibly, have a low potential to become a product in a short time.

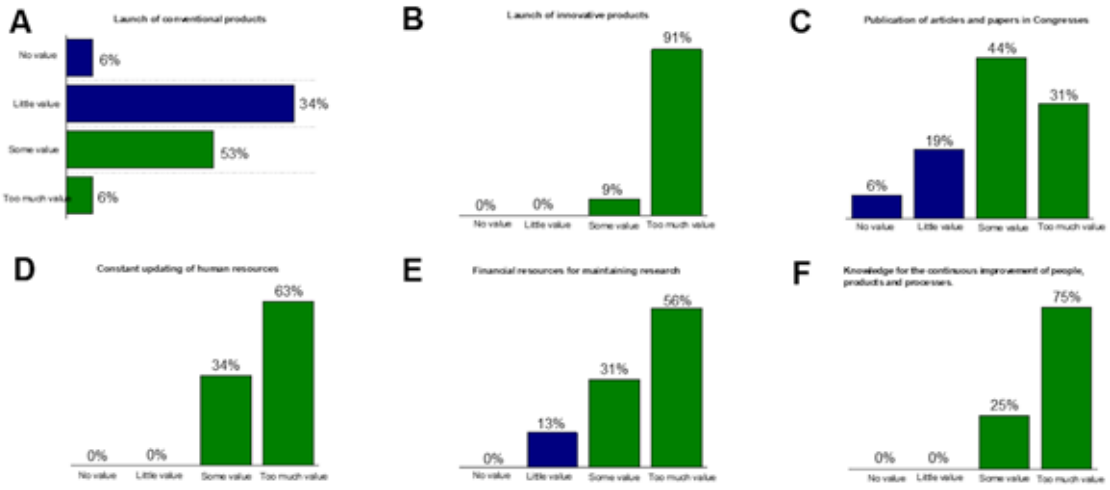
Figure 2– Diagnosis of the main topics that constitute challenges and/or opportunities in collaborative projects University – Pharmaceutical Industry. The statements were rated on a five–point scale: Totally agree – Strongly agree – Neither agree nor disagree – Strongly disagree – Totally disagree



Evaluation of the perceived value by the respondents about the collaborative interface outputs

The perceived value is a strategic element in any type of collaborative relationship. Needs and expectations must be negotiated between partners for effective collaboration. In the context of U–Pharma collaborations, we can analyze these values by analyzing the link between the generation and transfer of knowledge by the academic environment and the launch of products by Industry. Fig. 3 presents the respondents' opinion of some of the main outputs of the collaborative relationships that occur in the U–Pharma interface. Most respondents attach great value to the launch of innovative products (91%) while conventional products have some value (53%) (Fig. 3 – A and B). Regarding the publication of articles and papers in congresses, only 31% consider it to be a very valuable item (Fig. 3 – C). On the other hand, the majority of respondents attach great importance to the constant updating of human resources (63%), financial resources for maintaining research (56%), and knowledge for the continuous improvement of products, people, and processes (75%) (Fig. 3 – D, E, F).

Figure 3– Evaluation of perceived value by respondents in collaborative projects at University – Pharmaceutical Industry interface



Open questions

The open–ended questions at the end of the online questionnaire aimed to raise the main topics that respondents perceive as challenges or opportunities within collaborative U–Pharma projects. The emerging themes were coded from the responses and are shown within two categories (Challenges or Opportunities) in Table 1. The Challenges category accounted for seven emerging themes, of which "bureaucracy", "partnership", "agility" and "communication" were the most frequently cited: 12, 11, and 7 citations, respectively. The Opportunities category counted 9 emerging themes.

The issues within this category sought to cover mainly opportunities that can be used within Digital Platforms, which focuses on solutions based on Information Technology. The thematic codes "streamline the flow of information", "increase the efficiency of knowledge management" and "improve data analysis and management" were the most cited: 22, 16, and 16 citations, respectively. All of these emerging themes within Challenges and Opportunities comprise important dimensions of Project Management. Although it is not conclusive, these results may show the lack of adoption of some management techniques and good practices that can assist in the conduct of collaborative projects aimed at mitigating problems and maximizing opportunities.

In–depth interviews

In–depth interviews were conducted to improve understanding of emerging issues in the open–ended questions in the online questionnaire. Within this context, the more subjective factors that involve the perception of what constitutes a problem and a challenge and what an opportunity could be better understood through direct interaction with three interviewees, each representative of a nucleus participating in collaborative U–Pharma projects. The main excerpts of the interviews conducted are shown in Table 2 within each of the themes.

Table 1 – Codification of emerging themes in the open questions of the online questionnaire

Identification of Challenges and Opportunities	Thematic Codes	Frequency
Challenges	Communication	4
	Partnership	11
	Beaurocracy	12
	Agility	7
	Management	1
	Misaligned goals	3
	Legal issues	1
Opportunities	Knowledge generation	4
	Development of new products	4
	Innovation	2
	Entrepreneurial mindset	1
	Job creation	1
	Streamline the information flow	22
	Increase the efficiency of knowledge management	16
	Increase the efficiency of employee trai–ning	10
	Improve data analysis and management	16

Table 2 – In–depth interviews of respondents working at the University – Pharmaceutical Industry interface.

Guiding themes	*Main perceptions on emerging themes*		
	Interviewee 1 (Startup researcher working at the U–Pharma interface)	***Interviewee 2 (Academic researcher)***	***Interviewee 3 (Industry rsearcher)***
Partnership	Partnership is something both sides benefit from; and the gains are not necessarily financial; Industry can benefit from access to equipment and analyzes carried out in University laboratories; University can benefit from putting interns in direct contact with Industry. Difficulties in executing projects that connect multiple areas; Academics lack a corporate vision; Need to develop behavioral skills rather than techniques	Partnership happens when two people make an agreement to generate mutual benefit; The benefits need to be clear and are not necessarily financial; Gains related to knowledge and training of people serve as motivation. The "Job rotation" between researchers from University and Industry can be a healthy way to develop partnerships.	Partnership is risk sharing; For Industry, partnership is a business and for academics it is a funding opportunity; Partnerships happen when the Industry sees the potential to generate a product; Partnerships can help academic researchers advance their research towards new product launches. The focus of Industry and University are different; University must explore early–stage and proof–of–concepts while Industry must focus on manufacturing;
Agility	The industry is driven by profit; The academy has no incentive to move more quickly; The academy's pace is slower and the industry is faster; Agility is related to the extension of the project; Startups are also accelerated, but those that develop materials aimed at Health have a slower pace; Industries have processes that streamline work; University–Pharmaceutical Industry Interface can benefit from hybrid management models; Academics need to develop knowledge about management and planning models.	In short–term projects, agility is dependent on the level of knowledge of the research group on the subject in question; If the group needs to develop new knowledge, this can impact on agility. It is important to set expectations on both sides based on the objective, extent of the project, and the expertise of the academic research group on the specific problem that must be resolved.	Industry prefers to pay more for a university abroad; University needs to be more executive and know how to deal with task distribution and data management; The transfer of data from the University–Industry occurs in a disorganized manner; Industry values raw data; Pharmaceutical Industry is very regulated and is aligned with Anvisa. Hybrid models are suitable for interface projects: part of the regulation must be procedural and the development of ideas can be agile.

Table 2 – In–depth interviews of respondents working at the University – Pharmaceutical Industry interface (to be continued)

Communication	Too many meetings can cast off the partnership; The nature of the subject to be dealt with should dictate the best communication approach.	Openness is needed to understand what the partner wants. Industry problems sometimes arrive indefinitely or are very widespread. If knowledge management is not done, communication errors can persist throughout the development of new products.	Communication must be clear and the experimental steps pre–defined; There is a lot of difficulty for academic researchers in transforming experimental tests into deliverables; There is a lack of knowledge about the fundamentals of management / communication at the University; There is a need to build study groups at the University with a focus on developing teachers and students in relation to management / communication with the executive world; Lectures on entrepreneurship should be less vague and more objective.
Beaurocracy	Less bureaucratic alignments; Some institutions are already resolved; Need for people to resolve legal and intellectual property issues.	Intellectual property is the most sensitive issue to be discussed; Innovation offices must be agile and respond quickly to these questions;	Intellectual property is the most sensitive issue to be discussed; Contract establishment is very bureaucratic, which impacts on agility. There is confusion about understanding the difference between service delivery and partnerships. Royalty sharing is a sensitive topic and needs to be treated with caution. The Industry has the know–how that can direct the project to the most appropriate way to generate a new product. The Technological Innovation Centers (NIT) deal with legal issues, but the level of preparation depends on the University.
Digital Transformation	Too many online meetings can hurt; Assist in improving communication; Need for digital education;	Information Technology can facilitate University–Industry interaction through digital training; Experimental issues must be resolved in person. Computerization/ Automation of laboratory equipment.	The digital medium was already widely used by industry in the pre–pandemic period;
Conclusive points about Challenges and Opportunities	The opportunities are still very idealized; Bureaucratic and behavioral skills issues are the main barriers; Brazilian collaborative management model needs to be built; Complete horizontalization of working relationships is not ideal. Some degree of hierarchical structure is still needed; There is an excess of theoretical information on entrepreneurship. Practical training is required.	Challenges and Opportunities must be analyzed on a case–by–case basis; There are many academic demands upon the teacher that hinder the process.	The ideas that academic researchers propose for Industry are very vague; Challenges and opportunities coexist; There are many problems, but there are also many success stories; Product ideas are very difficult. In addition to the idea, it is necessary to have a promising market; The most difficult thing is to have the innovative idea.

The guiding theme "partnership", which had 11 citations in the online questionnaire, has the formal meaning of meeting people by common interest or objective, company, society. The exploration of this theme in in–depth interviews allowed us to identify that, in the interviewees' view, its most tangible meaning comes close to a division of gains and risks. Here, the highlighted gains and risks are not necessarily financial, but they must be very clear among stakeholders from the beginning. Besides, such gains and risks are different for the interviewed parties. While the academic side sees as gaining knowledge generation and training people, the Industry side needs to see the potential of research to become a product. This result is in line with what had already been exposed in the online questionnaires, where it became evident that the Industry's greatest interest in collaborative projects is centered on applied research.

Some other factors were also mentioned within the discussion of the partnership theme, as a way to understand why it sometimes becomes unviable. The lack of corporate vision and executive profile of academics was mentioned by two of the interviewees. As researchers located on the academic side do not always have this type of training, they may lack the most appropriate approach to deal with business issues, which makes it difficult to establish partnerships. Also, one of the interviewees highlighted the difficulties in establishing partnerships in projects that connect multiple areas. Such projects need to go beyond the technical–scientific knowledge of the people who make up each area and need to be developed mainly around solid behavioral skills.

The guiding theme "agility", which had 7 citations in the online questionnaire, has as its main meaning the speed of movement. The agile paradigm emerged in the 1990s in response to more traditional project management methods, which are heavier (eg "waterfall" method). Through the interviews, it was evident that all respondents perceive University and Industry walking at different paces. The industry is moving fast, driven by profit and the University is moving at a slower pace, driven by knowledge. This was also evidenced in the online questionnaires. However, it was also shown here that startups that operate at the University–Industry interface, despite being admittedly more accelerated, this will depend on the area of operation. The area of Health and Biotechnology is moving at a less accelerated pace when compared to the area of Information Technology, for example, since the first is subject to a series of steps and regulations. The regulation of the pharmaceutical industry by Anvisa, the Brazilian Government Agency of Pharma Regulation, was also mentioned by an interviewee as a way to clarify that not all departments are moving at an accelerated pace. Thus, the differences in rhythms occurring both internally and in the U–Pharma interface suggest that hybrid management models may be more appropriate than pure agile or traditional models.

The guiding theme "communication" had 4 citations in the online questionnaire and means "sharing", making it common, participating in something. It is through the act of communication that ideas can be shared and goals can be aligned. Respondents reported that although clear communication with pre–defined work steps is essential before development begins, this is not always possible. The interviewee on the academic side reported that the Industry side often brings ill–defined problems, which can hinder both communication and agility in proposing possible solutions. Besides, it was also highlighted once again the need for academics to develop a more executive posture to facilitate negotiations and the development of collaborative projects.

The guiding theme "bureaucracy", which had 12 citations in the online questionnaire, represents an organizational structure composed of rules, regulated processes, and an intense division of tasks and functions. Currently, the term has a negative connotation due to the intense value that is attributed to the number of rules instead of worrying about their meaning. The bureaucracy explored in the interviews was mainly related to legal issues involving the contractual and royalty division. This is considered to be the most sensitive topic and perhaps that is why it leads to delays in the process. Despite the existence of the Technological Innovation Centers (TICs), specific agencies to deal with these issues at Universities, not all of them have the same level of maturity that allows the accomplishment of tasks with the necessary agility. Also, it was evidenced by one of the interviewees that in many cases there is confusion about the nature of the projects that take place at the U–Pharma interface: partnership projects x service provision projects. These confusions can delay the progress of contracts since the question of "royalties" does not fit in the second category of projects.

The guiding theme "digital transformation", which encompassed codes referring to "streamlining the flow of information", "increasing the efficiency of knowledge management" and "improving data analysis and management" (total of 54 citations in the online questionnaire line), can be understood as a set of processes by which organizations seek to increase their performance both internally and externally. When analyzing the interviewees' perception on the topic, it became evident that the topic is more relevant mainly for the Industry side, which is very concerned with the issues of data agility and organization, since we are increasingly moving towards decisions based on evidence. Herein, automation, improved communication and the need for Digital Education were also raised on this theme.

Finally, the analysis of the conclusive points about the challenges and opportunities that occur in collaborative projects occurring at the University–Pharmaceutical Industry interface shows the need to decrease the level of idealization of the opportunities and move towards

more concrete management. It was also mentioned that the ideas must be treated less vaguely to facilitate the understanding of the parties involved. Furthermore, the need to train behavioral skills was again emphasized. These results are in line with the literature that explored the U–Pharma interface outside Brazil. As mentioned earlier, there is a strong perception among the main authors that the difficulties in taking advantage of opportunities are due to management and communication problems [21,22].

Answers to guiding research questions

Through the combined use of an online questionnaire with in–depth interviews, the following answers to the guiding questions of the research were obtained:

Q1 – How is the U–Pharma interface in Brazil characterized at the moment of the COVID–19 pandemic?

A. The characterization of the personal and professional profile: it has been shown that it is formed by people of different generations and different types of positions (teachers, researchers, and managers). Most of these people declared to have some degree of influence in the processes that involve the evolution of collaborative projects University–Pharmaceutical Industry, which can reflect the evolution of the work characteristics, being characterized by a progressive horizontalization of the relationships. This fact was also evidenced by one of the interviewees, although it was also emphasized that some hierarchical level must still be maintained in the relationships since the levels of maturity required for each type of decision are different.

Q2 – What is the perception about the challenges/opportunities of the parties involved in the Pharmaceutical Science and Innovation development loop?

A. The diagnosis of challenges and opportunities as well as the perception of the value assessed by the online questionnaire showed that these focuses are in both dimensions of processes and people. Concerning the challenges, the topics bureaucracy, partnership, and agility were the most frequently cited. The topic of bureaucracy was the most mentioned of all and was reported as one of the main obstacles to collaborative projects. Through in–depth interviews, it was realized that this theme is mainly related to legal and contractual issues in which specific points such as the nature of collaboration and the sharing of royalties can significantly delay or even make work unfeasible. The topic of partnership, the second most mentioned in the questionnaires, is perceived by the interviewees as a division of gains and risks. Agility, the third most cited, seems to be a highly dependent factor on the extent of the project and the level of knowledge around the demands of the project in question.

Conclusions and recommendations

The U–Pharma interface has been highlighted in the current times due to the demands generated by the COVID–19 pandemic. The need for innovative products and services capable of combating the pandemic is urgent, which makes it essential to better understand the main factors that dictate the interactions between the parties involved.

This work showed that the U–Pharma interface is creating increasingly complex social networks in which people of different ages and different mindsets must work together. In innovation projects, this is a reality for the group of respondents and interviewees. This mix of generations must be managed correctly so that natural conflicts can be translated into team learning. Through this research, it was realized that the focus of challenges and opportunities are not restricted only to the issues of processes that can be solved through information technology platforms, but also reach the dimension of people. Behavioral skills have been reported to be essential to the development of partnerships. These perceptions do not eliminate the importance of digital solutions, since one of the limitations of the research was the relatively low number of respondents (approximately 40 participants). Therefore, it is suggested that digital tools with a focus on improving project management processes also take into account the development and management of people. It is necessary to build digital businesses capable of connecting people and understanding issues involving human behavior is a central element to be considered. Future research in this line will be fundamental to deal with the new reality imposed by the COVID–19 pandemic. However, it will be necessary to evaluate a larger number of respondents to identify the perception of the groups that make up the U–Pharma interface at the national level and not only at the regional level.

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