



Guidelines

for integrity in research and business collaboration

GUIDELINES FOR INTEGRITY IN RESEARCH AND BUSINESS COLLABORATION


2023


**Bridging Integrity in Higher
Education, Business and Society**



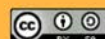
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Introduction

Relevance

Due to an increasing focus on the emerging and shifting functions of universities in the 21st century, universities are challenged to change and modernise their practices (Duderstadt, 2000) and address the development of the “21st century skills” that graduates need in order to participate in both the workplace and society (Lai & Viering, 2012; National Research Council, 2011; Suto, 2013). In addition to conducting research, disseminating findings, and providing higher education, universities are encouraged to seek various partnerships and enhance wider collaboration. There is great appeal to interaction between research and development (R&D, used interchangeably with the term “business”), enterprises, and higher education institutions (HEIs, used interchangeably with the term “universities”) through such activities as co-research (e.g., commissioned research) and internships (Ankrah & Al-Tabbaa, 2015). However, such collaborations raise ethical concerns (Lurie, 2016; Meslin et al., 2015) regarding aspects such as research data transfer, co-ownership of results, and subject-specific sponsorship in co-research. These issues should be carefully discussed in advance to avoid, among other problems, any conflicts of interest and other ethical and juridical infringements. Another example relates to collaboration in the development of a student’s thesis at various levels (i.e., bachelor’s, master’s, and doctoral) where competing interests may interfere. Given all these examples of research and business collaboration (RBC), partnerships require mutual understanding and respect, a certain amount of give-and-take, and a great deal of time, professionalism, and hard work (Ankrah & Al-Tabbaa, 2015) because R&D enterprises may have little knowledge of what to expect from university graduates, while, similarly, universities might lack knowledge of R&D enterprises’ needs. The institutional dimension should be addressed as well, since it provides the settings for individual interactions. It is stressed that a sound moral and ethical climate is necessary as a foundation to enhance RBC, for example, to elaborate on ethics infrastructure including the ethical climate as well as the communication, surveillance, and sanctioning components (Tenbrunsel et al., 2003).

To address all these matters mentioned above, this guiding document is intended to help higher education institutions properly address integrity in RBC.

Target groups

Both students and their supervisors might be involved in RBC. It is therefore paramount that they know how to address ethical concerns emerging in RBC. These guidelines are designated to help master's and doctoral students and their supervisors conduct various RBC-related activities in line with the ethical values and principles of academic and research integrity (ALLEA, 2017; ICAI, 2021). These guidelines provide guidance on how to embed integrity in RBC.

Outline of the guidelines

The *Guidelines for Integrity in Research and Business Collaboration* are structured in three sections: "Introduction", "Methodological approach", and "Guidelines". The "Introduction" section briefly introduces the reader to the relevance of RBC, while the "Methodological approach" section presents the steps that were used to distil key ethical concerns. At the end, the "Guidelines" section describes how these ethical RBC-related concerns should be addressed in practice. Guidelines are provided according to the most frequent research integrity topics in RBC (see "Methodological approach"). The ethical issues and related guidance are described in more detail for each specific topic.

The *Guidelines* have been developed as part of the Erasmus+ Strategic Partnership project "Bridging Integrity in Higher Education, Business and Society" (BRIDGE, 2020-1-SE01-KA203-077973). BRIDGE aims to create inter-sectoral integrity linkages by deepening our understanding of integrity in higher education, business, and society and by providing relevant skills needed in order to act in accordance with the values of academic integrity.

Contributors

Maryna Zharikova contributed to writing the Introduction. Julija Umbrasaitė contributed to developing the methodological approach. Each partner contributed to writing the following guidelines: Maryna Zharikova – authorship, William Bülow – contributorship, Sonja Bjelobaba – credit, Hajrulla Hajrullaji – fabrication, Sandra Krutuliene – falsification, Inga Gaizauskaite – plagiarism, Veli Kreci and Volodymyr Sherstjuk – conflict of interest, and Julija Umbrasaitė – bias.

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Disclaimer

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Methodological approach

To identify ethical concerns that arise in RBC, we used scientific evidence regarding what matters R&D enterprises consider crucial to address in their professional codes of ethics when collaborating with universities for various purposes. For this purpose, we selected the study by Komić et al. (2015), which concisely presents findings from 795 organisations. After perusing the research integrity/ethics statements in the professional codes of ethics of these organisations, Komić et al. (2015) listed multiple research integrity topics by the number of statements. The most frequently mentioned research integrity topics were categorised according to the following ethical concerns related to 1) *acknowledgement* (i.e., authorship, contributorship, and credit; $n = 258$); 2) *research conduct and reporting* (i.e., fabrication, falsification, and plagiarism; $n = 138$); and 3) *conflict of interest* (e.g., conflict of interest, bias, and competing interest; $n = 132$). Furthermore, each of these concerns is linked to a type of RBC at the individual level and, where relevant, referred to the institutional level, such as co-research, internship, mentorship, co-supervision, sponsorship (e.g., events and grants), and guest lecturing.

Limitations

Potential limitations of the *Guidelines* are that, first, they do not discuss research integrity/ethics statements mentioned less frequently in the ethics codes of professional organisations (Komić et al., 2015), for example, research integrity/ethics statements concerning misrepresentation and inaccuracy. Second, the *Guidelines* address general principles rather than providing ready-made solutions for how students and their supervisors should behave in certain situations; therefore, the *Guidelines* should be applied in the context of national/institutional and subject-based specificities.

Guidelines

All the guidelines presented below share the following structure: first, they provide a brief recommendation concerning good practice; second, they specify the types of RBC to which the specific guidelines are relevant; third, they specify to which of the three target groups the particular guidelines are relevant; and finally, the guidelines address the institutional level as needed.

Acknowledgement

Guideline #1

Credit should always be given where credit is due. The leading researcher should take the responsibility to ensure that the distribution of credit is appropriate.

RBC type: all types

Target groups: master's students, doctoral students, and supervisors

Guideline #2

Individuals whose contributions were not significant enough for them to be listed as authors should be properly acknowledged, usually in an acknowledgements section. Authors should obtain consent to be acknowledged from individuals who contributed to the research.

RBC type: co-research

Target groups: master's students, doctoral students, and supervisors

Guideline #3

The various roles of those involved in research and student training within RBC should be defined in advance. The roles of all the collaborators should be carefully weighted and the expectations discussed among them.

RBC type: co-research, internship, mentorship, and co-supervision

Target groups: master's students, doctoral students, and supervisors

Guideline #4

A contributor statement describing in detail who did what for all publications and research outcomes resulting from RBC should be included in the manuscript.

RBC type: co-research, internship, mentorship, and co-supervision

Target groups: master's students, doctoral students, and supervisors

Guideline #5

Intellectual property rights should be clearly defined in advance in collaborative research agreements.

RBC type: co-research

Target groups: institutions

Authorship

It is widely assumed that being an author of a research paper not only provides credit for having contributed to the research, but also carries responsibility for the publication (Carfagno et al., 2022; Moffatt, 2018; Perdigao, 2019; Tarkang et al., 2017). For this reason, it is important that only those who have made a substantial contribution to the research and to the writing of the research article should be listed as authors. In practice, collaborative efforts may often give rise to disputes about co-authorship (Rohwer et al., 2017; Smith & Master, 2017), including issues concerning ghost and gift (i.e., guest) authorship (Thandassery, 2022; see Box 1 for definitions). This issue also applies to RBC projects (Bozeman et al., 2013; Gøtzsche et al., 2007; Roper & Korenstein, 2015; Ross et al., 2008). This type of malpractice may be engaged in to attract or rule out certain reviewers (Tsudik, 2017). In RBC projects, the industrial partners, for instance, within the pharmaceutical sector, sometimes, in addition to providing funding, also engage in ghost-writing for their academic counterparts (Bosch & Ross, 2012; Sismondo, 2009).

Box 1. Definitions of ghost authorship and gift authorship

Ghost authorship refers to the “practice of using a non-named (merited, but not listed) author to write or prepare a text for publication” (Tauginienė et al., 2018, p. 23).

Gift or guest authorship (sometimes referred to as “honorary authorship”) is “the practice of naming an individual who made little or no contribution to a publication as an author” (Tauginienė et al., 2018, p. 23).

It is important that the contributions should be carefully weighted, and that authorship be acknowledged using standard criteria schemes, for example, that of the International Committee of Medical Journal Editors (Box 2). A key person in preventing ghost/guest/gift authorship is the corresponding author, who is typically responsible for communicating with journals during the publication process (COPE Council, n.d.; ICMJE, 2022). The corresponding author’s role may also include assigning contributors before and throughout the research (Brand et al., 2015) as well as transparently reporting authorship during the publishing process (COPE Council, n.d.; McNutt et al., 2018). However, in practice, as suggested by Helgesson (2021), the position of corresponding author may be considered equally important as or more important than that of the first or last author. The perceived “seniority” of corresponding authors might impede the evaluation and career advancement of researchers (Willems & Plume, 2021).

Box 2. Criteria of authorship (ICMJE, 2022, p. 2):

- “1. Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND
2. Drafting the work or revising it critically for important intellectual content; AND
3. Final approval of the version to be published; AND
4. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved”.

The early planning of co-authorship and adoption of international criteria in the event of publication could safeguard against the malpractice of improperly including contributors as co-authors in RBC. A discussion of authorship among the researchers and business representatives should be initiated by a scientific advisor from the university and a group leader from the enterprise before starting to work on the publication (Cooke et al., 2021). All co-authors should participate in this discussion. All contributions should be documented. Maintaining such documentation can help collaborators determine how their own ideas contributed to the group’s work (Cooke et al., 2021).

Contributorship

Collaborative research, including RBC, often involves a range of different types of collaborators (e.g., mentors, interns, educators, co-supervisors, research administrators, and/or co-researchers) (Carfagno et al., 2022; Hillerbrand & Werker, 2019). Given the multiple power relationships within RBC associated with hierarchical roles, expectations, and organisational culture (Wallace & Sheldon, 2015), it may be beneficial to clearly define in advance the various roles, responsibilities, and expectations of those involved. This may help prevent and resolve potential authorship disputes, prevent miscommunication (Carfagno et al., 2022; Smith & Master, 2017), and safeguard against the exploitation of students (Hillerbrand & Werker, 2019).

Although not all the aforementioned types of collaborators necessarily meet the criteria for authorship (ICMJE, 2022; see also Carfagno et al., 2022), it is advised that all relevant collaborators be properly acknowledged in research papers or other research outcomes that may result from a given RBC. Those collaborators who do not fulfil all the criteria for authorship but have made a substantial contribution to the research should be credited as contributors, in which case their role in the research should be specified in a contributor statement. A contributor statement should include a detailed description of the specific roles and respective contributions of authors or non-author contributors, for example, whether they served as scientific advisers, assisted in data collection, helped with research administration, or provided intellectual input on the project proposal (CRediT, n.d.; ICMJE, 2022). From the perspective of research integrity, including a contributor statement is important for reasons of transparency, accountability, and proper crediting (Carfagno et al., 2022; Shamoo & Resnik, 2009; Shukla & Supe, 2017).

Other types of credit

The business and educational sectors can have different expectations as to giving credit that might create tension between academic requirements for transparency and considerations regarding the commodification of science, on one hand (Jacob, 2009), and the business focus on profit and intellectual property (IP) rights, on the other. In academic settings, credit for research is usually given by authorship (i.e., authorship order), contributorship, or acknowledgement in a research publication. However, there are other types of credit as well. Not all roles that contribute to research, including research done in RBC, correspond to the traditional concepts of authorship and contributorship (Brand et al., 2015; Komić et al., 2015). Therefore, it is important to clarify mutual expectations and roles between academic and industry partners (D'Hooghe et al., 2019) and to give other types of credit for research where it is due. Such roles might entail crediting the intellectual contributions of the person or persons who contributed to inventions, designs, or other accomplishments. It is recommended that agreements be established as to

the responsibilities, credit, and acknowledgement for outcomes of research at the outset and that these agreements be revised as required, while steering clear of arrangements that unduly hinder the sharing of research data, results, and other outputs (WCRI, 2013).

Other types of credit include IP rights, such as patent rights, trademarks, copyrights, or industrial design rights, as well as financial rewards stated in contracts and agreements. Such credit could, for instance, be acknowledged in a separate acknowledgement section or provided for in contracts, agreements, patent grants, etc. Note that the regulations concerning IP ownership for university-generated knowledge vary between countries (Kelli et al., 2014; Perkmann et al., 2013) and that universities might have regulations on IP management. Therefore, it is advisable that the supervisor or leading researcher double-check the legislative requirements and contact the university entities responsible for the IP management.

IP is among the key factors and concerns in RBC in which knowledge and technology transfer is inherent (Ankrah & Al-Tabbaa, 2015; Awasthy et al., 2020; Evans & Packham, 2003; Sjöo & Hellström, 2019). Policies and agreements related to IP in RBC should therefore be discussed, agreed upon, and, to the extent needed, formalised by all partner institutions prior to collaboration (Ankrah & Al-Tabbaa, 2015). IP rights are a potential source of conflict in collaboration, so transparent but simultaneously not overly restrictive or ambiguous IP policies are beneficial for RBC (Awasthy et al., 2020; Sjöo & Hellström, 2019). Also, data sharing and open access, which are valued in research in academia, can be in tension with IP from the perspective of business (Stahl et al., 2019), so partner agreements on the possibility and boundaries of open access should be established.

Research conduct and reporting

Guideline #1

Collaborating institutions should discuss and define research misconduct early in the collaboration to align the views of involved collaborators.

RBC type: co-research, internship

Target groups: master's students, doctoral students, and supervisors

Guideline #2

Data management plans and procedures for data validation and verification should be used in collaborative research to prevent misconduct. The leading researcher should develop a data management plan, discuss it with co-researchers, and ensure that they follow the procedures.

RBC type: co-research and internship

Target groups: master's students, doctoral students, and supervisors

Guideline #3

Collaborating institutions should ensure the academic and research integrity training of all actors involved in co-creation activities in order to establish a common understanding of responsible research practices to prevent misconduct.

RBC type: co-research and internship

Target groups: institutions

Guideline #4

To avoid data fabrication/falsification, collaborating institutions could conduct data audits of randomly selected RBC projects.

RBC type: co-research and internship

Target groups: institutions

Guideline #5

Writing in RBC should follow the same requirements for referencing as in academic writing.

RBC type: co-research and internship

Target groups: master's students, doctoral students, and supervisors

Fabrication, falsification, and plagiarism (often referred to as FFP) are widely considered to be forms of deliberate misconduct in research (Steneck, 2006). For examples of research misconduct cases, see DeMatteis et al. (2020) on falsification/fabrication in surveys, George and Buyse (2015) on data fraud in clinical trials, Bik et al. (2018) on image manipulation, ORI (n.d.) on administrative actions imposed on research misconduct cases, and Retraction Watch (<https://retractionwatch.com/>) on retracted publications. Research misconduct can breach the trust between researchers, funding agencies, and society; it can damage the reputations of the employer and other external stakeholders and can have negative impact on financial costs (Kang & Hwang, 2020). Such research behaviours should be prevented and avoided in any research environment, including RBC.

Both universities and industry actors involved in collaboration recognise FFP as serious offences, although the understanding of the level of seriousness of research misconduct and the reporting of it may differ – for example, plagiarism may be seen as less serious misconduct from the industry perspective (Godecharle et al., 2018). Building awareness and shared understanding is therefore necessary for ethical collaboration. Universities should develop an institutional policy outlining the principles, rules, levels, and forms of collaboration with business. Furthermore, universities should ensure the preparation of transparent and clear agreements with partner institutions and/or co-researchers in collaboration. These agreements should cover the mutual settlement of co-creativity-related practices, for example, terms of shared work, terms of co-research data use, and IP rights. These policies and agreements should bear in mind the risks of misconduct and put in place appropriate safeguards to prevent it as well as procedures to address it in case misconduct is suspected in co-creativity-related practices.

Fabrication

As defined in the *Glossary for Academic Integrity*, “[i]n research, “the term ‘fabrication’ means making up data, experiments, or other significant information in proposing, conducting, or reporting research” (Tauginienė et al., 2018, p. 21). The associated reasons for engaging in the process of fabrication include “low funds and remuneration to the fieldworkers, lack of institutional moral support, or ... social and

political conditions within the research area limiting the fieldworkers from obtaining data” (Kang & Hwang, 2020, p. 8). Fabrication, if not detected, can be repeated and multiplied.

To avoid fabrication in RBC, all stakeholders should implement institutional policies that foster ethical collaboration. These should cover financial and other support to the staff performing activities related to RBC in addition to their daily work. For example, incentives might be embedded in the performance management system.

Fabrication may also have a personal dimension since people engage in such behaviour for personal benefit (Reza Khan et al., 2020) or may experience unethical pressure to commit misconduct (e.g., Hofmann & Holm, 2019). Such situations pose a potential threat to the validity and reliability of the data and can undermine the overall success of the collaborative project. Therefore, all stakeholders, prior to collaboration, should consider requesting a written agreement from all participants, stating their commitment to provide truthful, impartial, and reliable data. This agreement should also include fabrication as a potential violation.

Falsification

Falsification is understood as manipulating research data (Schuyt, 2019a). Falsification in practice can take various forms, such as “manipulating images, removal of outliers, changing of data, adding or removal of data points” (Kang & Hwang, 2020, pp. 8–9), adjusting measurement results, changing average values, and improper rounding of *p*-values (Schuyt, 2019b).

Falsification can have very serious negative consequences not only for the person who falsifies the data (e.g., if detected, the article containing the falsified data can be retracted and can seriously harm the reputation and career of the author) but also for society. For example, the falsification of data in health sciences and the misuse of statistical significance can disrupt the health of individuals by keeping bad treatments on the market (see Ziliak, 2016), or encourage the anti-vaccination movement (see Kang & Hwang, 2020, for the case of Andrew Wakefield).

In RBC, all stakeholders (e.g., institutions, researchers, students, and their supervisors) are expected to take responsibility to prevent falsification. To prevent research misconduct, students should be aware of falsification and of the harm it causes and should assume responsibility to act in good faith. Researchers and supervisors should act as good role models for internship students or co-researchers. HEIs are responsible for drafting effective academic and research integrity policies and for working in partnership with students, their supervisors, and their internship institutions. Research institutions have the duty to empower students and “researchers to act according to the standards of good” (Bouter, 2020, p. 2367).

Good research data management is one means to ensure data quality and prevent misconduct and questionable research practices. Prior to co-research, it is therefore recommended that a data management plan (DMP) be prepared that outlines the different steps of the research data lifecycle and how the plan can be updated during the research process (Lau et al., 2021, p. 2). Research institutions should establish institutional data management policies and DMP procedures, whereas co-research team leaders should ensure that the DMP is prepared for a co-research project and is adhered to by researchers during the project. Furthermore, to promote and ensure good data management practices, routine data auditing could be implemented at the institutional level (Lau et al., 2021; Nurunnabi & Hossain, 2019; Shamoo, 2013). Data audits can be carried out both to check whether the data have been manipulated (Shamoo, 2013) and to confirm that the research process and procedures have been followed (Jones et al., 2008; Shamoo, 2013). The audit should ideally be carried out by an independent audit institution; it could also be carried out by a university or research institution whose students are involved in RBC.

Plagiarism

Plagiarism happens when someone presents a work or idea(s) taken from another source and fails to properly acknowledge it (Tauginienė et al., 2018). More specifically, “[p]lagiarism occurs when someone: 1. Uses words, ideas, or work products | 2. Attributable to another identifiable person or source | 3. Without attributing the work to the source from which it was obtained | 4. In a situation in which there is a legitimate expectation of original authorship | 5. In order to obtain some benefit, credit, or gain which need not be monetary” (Fishman, 2009, p. 5). Many types of material can be plagiarised (e.g., text, code, images, multimedia content, or other work) in many ways (e.g., self-plagiarism, translation plagiarism, and patchwriting) (Tauginienė et al., 2019). The risk of plagiarism is thus relevant to various outputs of RBC, for example, product creation, technology development, and co-research publication.

Whether intentional or accidental, plagiarism should be avoided. As a consequence of plagiarism, personal, professional, and institutional reputations can be damaged. Plagiarism undermines trust in those involved (be it people or institutions) and in research in general. Therefore, in RBC, all actors involved in co-creation activities (e.g., students, supervisors, and researchers from research institutions and mentors, researchers, and staff from the business side) should be aware of the risk of plagiarism, and know how to recognise, avoid, and prevent it. Awareness and training are crucial for that. Depending on the context and act of plagiarism, it can be treated as an ethical or legal violation subject to appropriate sanctions and repercussions.

Writing in higher education/business collaboration should meet the same requirements as in other forms of academic writing regarding referencing. Therefore, those involved should be sure to properly cite and

list the sources of all used material, such as texts, figures, illustrations, charts, and tables. Both university and industry researchers should have equivalent knowledge and skills of ethical research conduct, including awareness of plagiarism, ethical writing, and publishing. Appropriate training of co-researchers helps prevent plagiarism as well as other types of misconduct. Co-research team leaders should assess whether there are any risks of plagiarism, discuss them with the team, and ensure appropriate training if needed.

Academic staff, student mentors, and co-supervisors in business should also be trained in guiding students and monitoring their progress in collaborative activities. Co-supervisors and mentors should guide students on how the various types of knowledge they acquire and sources they access during internship can be used in their research work. Supervisors should check whether students who will conduct internships in business companies or collaborate in preparing research work have prior academic integrity training (including the skills necessary for ethically writing academic texts). They should also inform students of university collaboration policies and agreements. If needed, supervisors should guide students about training possibilities or educational materials relevant to the collaborative work.

Finally, there must be agreement among partnering institutions on what to do or what procedures to follow if plagiarism occurs. In many cases, universities have such procedures established; however, it is important that they be shared among collaborating institutions as well.

Conflict of interest

Guideline #1

Expectations of collaborators and all potential competing interests should be clearly recognised and discussed before the research process starts. The leading researcher should initiate the consultations.

RBC type: co-research, internship, and mentorship

Target groups: master's students, doctoral students, and supervisors

Guideline #2

Students and researchers should transparently declare all potential or actual financial, intellectual, and professional interests related to their collaboration with business entities and funders that might have a bearing on the research process, doing so in a disclosure statement or declaration of interest form to alert the research community.

RBC type: co-research, internship, and mentorship

Target groups: master's students, doctoral students, and supervisors

Guideline #3

It is advisable that, where intellectual property rights are applicable, the researchers should thoroughly consider potential data sharing and publishing limitations before entering into collaborative agreements.

RBC type: co-research and co-publication

Target groups: master's students, doctoral students, and supervisors

Guideline #4

To prevent bias and to increase the transparency and credibility of research, it is advisable to openly provide research data, materials, methods, and other information related to research data collection, analysis, and reporting. The collaborators should discuss their expectations before entering into collaborative research agreements.

RBC type: co-research and co-publication

Target groups: master's students, doctoral students, and supervisors

Conflict of interest

Conflict of interest (used interchangeably with competing interest) represents the “[p]otential to compromise judgement or objectivity caused by financial or personal obligations or other considerations” (Tauginienė et al., 2018, p. 14). As the application of research drives technological advancement, the nature of collaboration between universities and industry is evolving (Carayol, 2003), bringing ethical concerns to the fore. In particular, at the individual level, the driving motivation of a researcher at the research institution in producing and disseminating knowledge might conflict with industry’s motivation

in the instrumental use of knowledge (Hillerbrand & Werker, 2019). Consequently, differences in goals put additional pressure on researchers' values in dealing with the new environment of RBC. As a result, the ethical values of "the traditional truth-seeking scientist" are firmly challenged by those of the "entrepreneurial scientist" who, by definition, is "able to interface science with innovation" (Etzkowitz & Viale, 2010, as cited by Hillerbrand & Werker, 2019, p. 1634).

Conflict of interest occurs when "professional judgments or actions regarding a primary interest" (e.g. integrity of research) are "influenced by a secondary interest" (e.g. financial, professional, or personal gain) (IOM, 2009, p. 6). There can be both financial and non-financial competing interests (see Box 3).

Box 3. Examples of competing interests

Financial relationships are the most prevalent source of competing interests (ICMJE, 2022). As entrenched in editorial policies, it includes any of the following (Springer, n.d.): funding (e.g. research grants and research support "including salaries, equipment, supplies, reimbursement for attending symposia, and other expenses"), employment, and financial interests (e.g. "stocks and shares in companies", "consultation fees", "patents or patent applications").

Non-financial competing interests ("private interests") reflect the researcher's "personal, political, academic, ideological, or religious" ties (The *PLoS Medicine* Editors, 2008, p. 1299).

Having such interests is not necessarily considered as unethical in itself (Roig, 2015) or in violation of ethics but rather as a circumstance that may pose a risk of bias (Smith, 2006; see "[Bias](#)"). However, if a researcher does not recognise or declare them properly, both the interpretation of results and the conclusions can be affected (Vandenbroucke et al., 2000). Poor management of conflicts of interest may have many consequences, such as diminished integrity of the research, risk of bias, exposure of research participants to unnecessary risks in clinical trials and of patients to ineffective and unsafe treatment, erosion of public trust in research, and damaged institutional and individual reputations (IOM, 2009). The handling of conflicts of interest includes, but is not limited to, the disclosure of any conflicts and withdrawal from writing or reviewing (Smith, 2006; see Bero & Grundy, 2016). It is the common practice of journals to require the declaration of competing interests during the submission or review process (COPE Council, 2016; Shawwa et al., 2016) – for example, see the ICMJE disclosure form (ICMJE, n.d.). According to the updated ICMJE (2022, p. 3) recommendations, it is advisable to disclose all relationships and activities that represent actual conflict of interest or may be perceived as such, as this "demonstrates a commitment to transparency and helps to maintain trust in the scientific process".

An obvious conflict of interest may arise when research activity performed by a researcher supported by public funding is destined for the development of a product of market value (Hillerbrand & Werker, 2019). Research outcomes may be utilised for innovation by business. It is important to note that such innovations may in turn serve the original purpose of bettering societal conditions. Since the relationship between the source of funding and its final beneficiaries is complex, clearly distinguishing the contribution of research toward an innovation is essential, for example, to protect researchers' intellectual property rights (IPR). However, this may be problematic if the boundaries of IPR sharing are not clearly defined and full IPR protection is not provided within the collaboration framework of the RBC (also see under "[Credit](#)").

Competing interests may arise when a student intends to submit an internship report or a thesis containing sensitive and/or confidential information from an industrial partner (e.g., commercial secrets). Industrial partners may restrict the depositing of student work in HEI repositories, or restrict the public defence of theses. It is therefore advisable that co-supervisors should inform students if there are any limitations or restrictions related to collaborative outputs or other confidential information that the student may access during his/her internship/thesis research and discuss how to treat them.

Bias

Researchers should aim for objective, unbiased research results. Whenever a researcher is influenced by considerations other than seeking objectivity in his/her research, it may lead to bias (Steneck, 2006). Bias may occur as a result of ignorance, could be embedded in the design of research, or could result from the misrepresentation of data (Mullane & Williams, 2013). It may also result from failure to manage financial and other conflicts of interest. In particular, the sponsorship of research by industry may pose a risk of bias, for example, via the selective reporting of results (IOM, 2009). A correlation between funding sources and research outcomes has been observed in various industry-sponsored research projects, such as drug safety and efficacy studies, tobacco research, and chemical toxicity studies (see, e.g., Krinsky, 2013; Lundh et al., 2017). For example, various studies have demonstrated that research funded by the pharmaceutical industry is more likely to achieve positive results regarding treatment effectiveness than is research receiving funding from other sources (Steneck, 2006; see IOM, 2009). This may indicate bias in some cases, although other explanations also may be considered (Krinsky, 2013).

Bias is regarded as a questionable research practice (QRP) (Steneck, 2006). However, its impact should not be underestimated, since QRP is more widespread than FFP and may have more financial and health implications (Steneck, 2006). Bias in research arising from financial and other interests promoting false positive results contributes to the lack of reproducibility of research (Baker et al., 2020; Munafò et al.,

2017). It is therefore important to recognise the risk of interference with scientific judgement, and avoid bias, as well as to critically review previous research and report bias if detected. For example, as suggested by Roumen (2015), the research transparency and credibility may be enhanced by implementing the Recommendations for closing the credibility gap in reporting industry-sponsored clinical research of the Medical Publishing Insights & Practices (MPIP) initiative (see Mansi et al., 2012). For instance, the following are recommended: that researchers have the right to access the complete research data; that all research results (including negative or unfavourable results) be made public; that all contributions by research sponsors be disclosed; and that access to complete clinical study protocols and statistical methods used in the research be provided (Mansi et al., 2012). The International Committee of Medical Journal Editors (2022, p. 4) recommends that authors disclose “all relationships and activities that might bias or be seen to bias their work”.

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