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Research Article

Risks for Academic Research and Possible Responses

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Academic research projects receive hundreds of billions of dollars in government investment each year. They complement business research projects by generating new foundational knowledge and addressing societal challenges. Despite the magnitude and importance of academic research, the management of it is often ad hoc. It has been postulated that academic research projects' inherent uncertainty and complexity make them challenging to manage. However, this retrospective analysis of input and voting from more than 500 academic research team members in facilitated risk management sessions found that many of the negative risks perceived as important were general, as opposed to being research-specific. Across 15 separate facilitated sessions, the top negative risks were related to funding, personnel, unreliable partners, study participant recruitment, and data access. Many of these risks would require system- or organization-level responses that are beyond the scope of individual academic research teams.

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Introduction

To generate new knowledge and address societal challenges, countries around the globe make multi-billion-dollar investments in academic research. The total higher education research and development (HERD) performed annually by universities, research hospitals, colleges, and research institutes affiliated with academic centres exceeds $370 billion USD based on the most recent year's HERD data available[1].

Academic research is funded primarily by governments [1]. It plays an important role in innovation systems by ensuring the provision of new knowledge from basic and applied research that private firms are unlikely to conduct because of the non-appropriable, public good, intangible character of knowledge and the risky nature of research[2]. The specific objectives of the funders of academic research vary but generally include the generation of new foundational knowledge or research findings that can directly or indirectly lead to social, health, environmental, or economic benefits[3]. A recent trend in publicly funded academic research is the mobilization of large interdisciplinary teams to address societal challenges, as exemplified by *Horizon Europe*[4], the UK's *Global Challenges Programme*[5], and the Canadian *New Frontiers in Research Fund – Transformation* stream[6].

Though the magnitude and importance of HERD investment around the world are large, managerial practice in the academic sector is often ad hoc, with some research leaders being openly "anti-management" due to concerns that management techniques are not compatible with discovery and innovation[7][8]. In the peer-reviewed literature focused on the leadership and management of academic research projects, there is strong agreement that the nature of research necessitates different approaches to project management than those used for traditional projects in other sectors. Many authors cite or paraphrase Ernø-Kjølhede's[9] statement: "The management of a research project is full of uncertainty and complexity. Research has substantial elements of creativity and innovation, and predicting the outcome

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of research in full is therefore very difficult." The peer-reviewed literature recommends modifying conventional approaches so that they are more likely to work for research[10][11][7][12][8][13][14]. This recommendation is consistent with international guidance to tailor project management approaches depending on the team, context, and focus of a project[15][16].

In project management, risks are understood to be uncertain events or conditions that, if they do occur, would have a positive or negative effect on one or more project objectives[15][16]. In practice, most project risk management focuses on identifying important negative risks, prioritizing potential negative risks based on their likelihood and impact, developing negative risk responses, and monitoring and controlling negative risks during project implementation[15][16]. Risk management has been identified as one of the most challenging aspects of academic research project management because the inherent uncertainty of research projects hinders risk identification, risk response planning, and risk monitoring[11][7]. Despite this concern, little has been published on the topic of risk management for academic research, with the exception of risk-based monitoring of clinical trials[17][18].

The small corpus of literature focused on research risk management emphasizes the need for tailored approaches to risk management for research and, in some cases, proposes alternative frameworks or approaches to research risk management[19][10][13][12]. The literature identifies some challenges and risks for academic research that also affect other types of projects. These general risks include staff turnover, schedule slippage, technological complexity, and unrealistic budget estimates[19][8][7]. Publications also identify risks that are directly associated with the nature of research, such as competition between researchers on the same team, publication delays due to intellectual property concerns, too great a degree of industry influence on academic research, and work with external partners not being valued or rewarded by university employers[20][21]. Except for the surveys led by Moore and Shangraw[7], there is little empirical data about risks or risk responses for research in the literature. Therefore, the objective of this study was to retrospectively analyze empirical data from a convenience sample of academic research team members to learn more about which negative risks for academic research projects are perceived to be important and possible responses to those risks.

Method

Data from over 500 participants of in-person and online facilitated sessions focused on risk management for academic research were analyzed (Table 1).

The first 1.5-hour workshop involved a large group (estimated 200+ research administrators and support staff) at a concurrent session presentation entitled "Risk Management for Research" at the 2015 Canadian Association of Research Administrators (CARA) Conference in Toronto, Canada. Fourteen (14) additional facilitated risk management sessions, with a total of 314 participants, were conducted as part of research project management courses and workshops.

Most course and workshop participants were Canadian, but academic research team members from the UK, Europe, and Africa were also among the participants.The number of participants in each session as well as their roles on research teams and primary discipline varied across the risk management sessions (Box 1, Table 1). Six of the facilitated risk management sessions had participants from a range of disciplines, six included only health sciences participants, two sessions included participants only from the natural sciences, and one session had a mix of participants from natural and social sciences.

- Researchers – principal investigators, lead researchers, (PIs) and other research team members with academic appointments
- Research staff – staff scientists, research associates, statisticians, technicians, and other staff who contribute research and scientific expertise through paid staff positions
- Project managers (PMs) – staff who have responsibility for project management, regardless of whether there title is "project manager" or something else (e.g., executive director, project director, program manager, project coordinator)
- Fellows – postdoctoral fellows and other researchers who hold time-limited fellowship positions and have completed doctoral work or achieved other discipline-specific degrees (e.g., medical doctor) before their fellowship
- Graduate students – individuals performing thesis research to fulfill PhD or master's degree requirements.

Box 1. Roles of Academic Research Team Member Participants

Note: Research teams may also include undergraduate students and representatives from external partner organizations (e.g., government policymakers, industrial sponsors); however, people with those roles were not included in the facilitated risk management sessions.

Facilitated risk management sessions were one to 1.5 hours in length. Each session started with a brief seminar that (i) defined risk and risk management according to the project management literature [15] [16] and (ii) presented a research risk management process (Figure 1) [12] developed by simplifying standard risk management processes described in the literature [15][16]. After the seminar, participants were led through the process to identify, prioritize and develop response for negative risks (Figure 1).

Most data generated during the process were captured using live online polling (Poll Everywhere) without any identifying information about participants. In other cases, brainstormed risks were recorded and displayed using projected computer screens, whiteboards, flip charts, or sticky notes, and voting was accomplished through the placement of individual stickers on flip charts or a show of hands.

Data were prepared for analysis by assigning risk categories and subcategory labels – for example, Funding-budget cut – to facilitate the identification of common risks and themes across sessions. The top three to five negative risks with the most votes were identified for each session (Table 1). In risk management sessions with more than 20 participants, there was often a natural clustering of three to five risks with many votes, followed by a large number of risks with significantly fewer votes, but this was not always observed. In cases where there was no obvious cluster, the three negative risks with the most votes were included in the analysis, or the top four risks, if there was a tie for third.

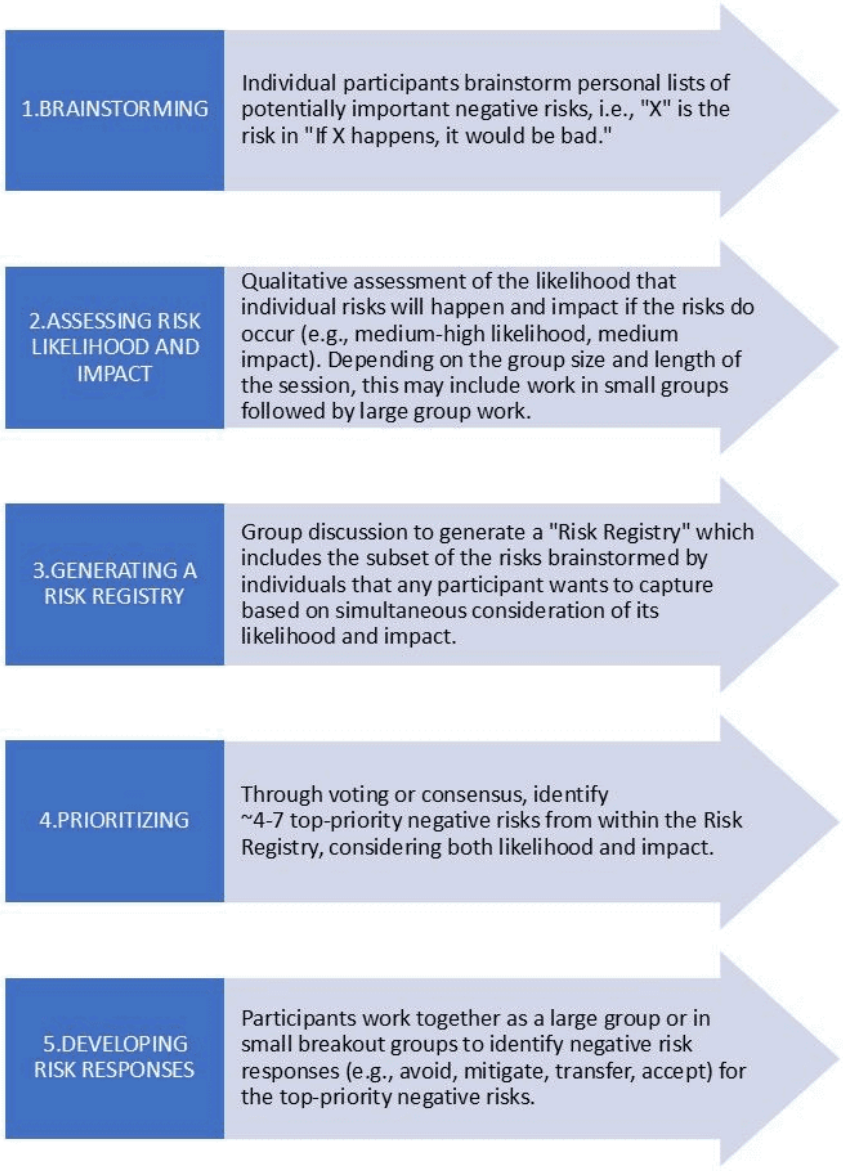

Figure 1. Facilitated Process for Negative Risk Management for Research

Results

Overall, participants' top negative risks were related to funding, personnel, unreliable partners, study participant recruitment, and data access.

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No.	Year	Participants	Context in Which Facilitated Session was Provided (in-person unless noted)	Top Negative Risks (in order of perceived importance based on participant voting)
1	2015	>200	1.5-hour workshop for research administrators and other support staff from a range of disciplines	1. Contractual – non-compliance (financial fraud or scope not delivered) 2. (tie) Funding – budget cut 2. (tie) Team – staff member leaves
2	2015	6	Part of a 25-hour health sciences graduate student course	1. Data – delayed access 2. (tie) Sample – delays with recruitment 2. (tie) Schedule – delayed approval to start
3†	2017	14	Part of a 6-hour workshop for natural sciences and social sciences graduate students and fellows	1. Team – team member leaves 2. Schedule – overly optimistic 3. Funding – funder withdraws
4†	2017	31	Part of a 6-hour workshop for health sciences fellows and PhD students	1. Partner – unresponsive 2. Partner – doesn't make needed contributions 3. Team – team member leaves 4. Funding – grant proposal not funded/renewed 5. Sample - underpowered/insufficient
5	2017	8	Part of a 25-hour health sciences graduate student course	1. (tie) Data – delayed access 1. (tie) Sample - underpowered/insufficient 1. (tie) Study– unable to retain participants 1. (tie) Schedule – delayed approval to start
6†	2018	42	Part of a 6-hour workshop for health sciences fellows and PhD students	1. Data – insufficient quality 2. Partner – lack of buy-in 3. Data – delayed access 4. Sample - underpowered/insufficient 5. Partner – doesn't make needed contributions
7	2018	25	Part of a 36-hour continuing education course for researchers, research staff, PMs, fellows, graduate students, and support staff from a range of disciplines	1. Partner – unresponsive 2. Partner – doesn't make needed contributions 3. Funding – grant proposal not funded/renewed 4. (tie) Team – team member leaves 4. (tie) Sample - underpowered/insufficient
8	2018	22	Part of a 3-hour workshop at an international academic conference for researchers, research staff, fellows, and graduate students from a range of disciplines	1. Data – delayed access 2. Partners – does not make needed contributions 3. (tie) Data – insufficient quality 3. (tie) Context –urgent issues crowd out research
9†	2018	10	Part of a 6-hour workshop for natural sciences researchers, research staff, fellows, and graduate students	1. Team – supervisor or PI leaves 2. Team – interpersonal conflict 3. Research – doesn't produce conclusive results
10†	2018	46	Part of a 15-hour workshop for natural sciences researchers, research staff, PMs, and support staff	1. Funding – budget cut 2. Funding – delayed start 3. (tie) Team – lacks essential skills

No.	Year	Participants	Context in Which Facilitated Session was Provided (in-person unless noted)	Top Negative Risks (in order of perceived importance based on participant voting)
				3. (tie) External – climate/environmental risks
11	2019	19	Part of a 6-hour workshop for researchers, research staff, PMs, fellows, graduate students, and support staff from a range of disciplines	1. Sample - underpowered/insufficient 2. (tie) Funding – budget cut 2. (tie) Data – delayed access 2. (tie) Schedule – delayed approval to start
12[†]	2019	41	Part of a 6-hour workshop for health sciences fellows and PhD students	1. Partner – lack of buy-in 2. Data – delayed access 3. (tie) Sample - underpowered/insufficient 3. (tie) External – policy/political uncertainty
13	2019	19	Part of a 6-hour workshop for researchers, research staff, PMs, fellows, graduate students, and support staff from a range of disciplines	1. (tie) Team – team member leaves 1. (tie) Study – undetected error in analysis 1. (tie) Equipment – failure to function
14[†]	2020	20	Part of a 15-hour online workshop for natural sciences researchers, research staff, PMs, and support staff	1. Funding – budget cut 2. (tie) Team – staff member leaves 2. (tie) Contractual – non-compliance (financial fraud or scope not delivered)
15	2021	13	Part of a 6-hour online workshop for researchers, research staff, PMs, fellows, graduate students, and support staff from a range of disciplines	1. External – another pandemic 2. (tie) Team – team member leaves 2. (tie) Funding – funding runs out

Table 1. Top Perceived Negative Risks in 15 Facilitated Risk Management Sessions

[†] = *workshop provided for a fee through the consultancy Research Project Management*

Funding-related risks and possible responses

Participants of eight of the 15 sessions voted one or more risks related to funding onto their short list of top negative risks. Usually, these groups focused on the risk of budget cuts or the risk that funders would withdraw. However, two groups identified the risk that grant funding would not be approved or renewed, and one group identified delays in funding as a negative risk that warranted a response even if the funds were eventually received. Participants' views that funding risks are important were consistent with Moore and Shangraw's[7] finding that only one project manager (out of five respondents to a question) reported that their large research project was completed within budget.

When participants of facilitated sessions were given the option of choosing specific risks to develop responses for (Figure 1, step 5), funding risks were the most popular choice across the 15 facilitated sessions. Participants' responses for funding risks included: (i) (mitigate likelihood) build and maintain strong personal relationships with the funder, (ii) (mitigate impact) invest time and resources in identifying additional alternative funders, (iii) (mitigate likelihood) incorporate and highlight milestones and deliverables that clearly align with the funder's preferences and needs, and/or (iv) (mitigate impact) proactively identify the activities and deliverables that will be delayed, cut, or partially reduced if negative risks related to funding are realized.

Personnel-related risks and possible responses

Participants of eight of the 15 facilitated risk management sessions voted the risk that a team member would leave or be unavailable as one of their top risks. This aligns with Moore and Shangraw's study, which found 57 percent of survey respondents had experienced staff turnover.[7] In some cases, participants focused on the risk that a team would become short-staffed if a staff person were hired away; in other cases, the concern was that the principal investigator or another key researcher would leave the

project (temporarily or permanently) or become ill or die, while others referred to general issues with turnover.

Personnel-related risks was the second most frequently selected category for risk response development during facilitated sessions. Proposed responses included: (i) (mitigate impact) encourage or require people to put important information in documents that others can access, (ii) (mitigate impact) require team members with highly specialized skills to train or mentor at least one other person on the team, (iii) (mitigate impact) in cases where an individual has a planned departure date, reserve their last two weeks for knowledge transfer activities, and/or (iv) (mitigate likelihood) offer a flexible work environment that is interesting, rewarding, and respectful of all team members so that people are less likely to look for work elsewhere.

Partner-related risks and possible responses

For participants of the facilitated risk management sessions, partners were research stakeholders such as government policymakers and industrial sponsors who would either contribute knowledge to the research or use the knowledge generated by it. Participants in five sessions identified the risk that a partner would lose interest, become unresponsive, or not deliver their planned contributions to the project. Several groups opted to develop potential responses to partner-related risks, identifying responses that were similar to the responses to funding risks in that they focused on building and maintaining relationships with partners and paying careful attention to fulfilling their needs.

Other risks identified by participants

Other negative risks were identified as important in more than one facilitated session. Seven groups identified risks associated with sample size (predominantly the risk that studies would not be able to recruit or retain a sufficient number of participants), and six groups identified risks associated with data (predominantly the risks that access would be delayed or that data quality would be insufficient).

The risk of contractual non-compliance (e.g., teams not producing deliverables specified in the research grant and/or misuse/fraudulent use of research funds) was identified as a top risk in just two sessions. However, contractual non-compliance is noteworthy because it was perceived to be one of the most important risks for academic research by almost all of the 200+ research administrators and support staff at a large group facilitated session at the CARA conference.

Some study participants identified risks that might be considered inherently associated with academic research, but these risks did not receive sufficient votes to be included among the top priority risks in Table 1. These inherent risks included: another group publishing findings before the research was completed (getting "scooped"); unintentional harm to research study participants; research that does not yield meaningful, reproducible, or publishable results; Research Ethics Board/Institutional Review Board approval is withheld or withdrawn due to safety concerns; and the risk that the technology needed to perform the research does not exist.

Discussion

Overall, most negative risks prioritized by participants in 15 facilitated risk management sessions were not directly associated with the uncertainty or complexity of academic research. There were commonalities across multiple facilitated sessions, with many participants identifying unstable funding, personnel turnover, and unreliable partners as one of their top priority negative risks. Notably, these are significant risks that could affect the work of any project in any sector, not just academic research.

As noted in Table 1, participants did identify risks that may be more closely associated with research projects than non-research projects, such as risks related to participant recruitment, sample size, data access, and data quality. Additionally, the risk of contractual non-compliance could be seen as being inherently associated with the uncertainty of research in that it is a challenge for academic research contracts to forecast work accurately. However, these risks are not unique to academic research and could also affect business R&D and a range of non-research activities such as corporate quality improvement initiatives, market research, and public consultations conducted by governments and government agencies. Also, though some individual participants did identify risks that seem more closely associated with research than other kinds of work – such as the risk of being “scooped” and the risk that research will not yield meaningful, reproducible, or publishable results – those risks were not voted into the shortlist of top negative risks of any session. Thus, contrary to what the literature predicts, the participants of this study did not see the uncertainty and complexity of research as the main drivers of important negative risks.

It is possible that the divergence between the risks that the literature suggests will be important and what

participants perceived to be important occurred because participants were primarily focused on foundational risks related to funding, team members, and partners, and would turn their attention to the negative risks uniquely associated with their projects once the foundational risks had been addressed. However, the consistency with which the same risks were identified by diverse participants across multiple facilitated risk sessions suggests that many academic research team members do perceive negative risks related to funding, research personnel, and research partners to be important risks that warrant risk responses.

Participants identified some individual- or team-level responses that could mitigate risks related to funding, research personnel, and partners. Nevertheless, the most important negative risks perceived by participants would require system- and organization-level management responses and remedies. For example, it was striking how many different groups identified unstable funding as a top risk, and while a research team might be able to address the risk for their project, e.g., by engaging with funders to decrease the likelihood of a budget cut for their project, in the absence of research funding reform, individual project funding stability may come at the direct expense of other projects that experience decreases in funding as a result. Similarly, there are limits to what a research team or principal investigator can do to mitigate the risk that a research team member will leave if the reason for that person's departure is that their salary is insufficient, or a grant is not renewed and there are no funds to pay staff. Additionally, the negative risks that participants perceived related to unreliable partners are noteworthy in the current context of the trend toward large-scale research grants that require partnerships with industry, government policymakers, and other knowledge users. For understandable reasons, some participants perceived such partnerships to create new risks they do not have the skill set to manage. Changes to research funding strategies, or additional partnership supports, may be required to address these partner-related risks.

Research organizations can use the work described in this paper in several ways Foremost, research teams and organizations could follow the steps described in Figure 1 to generate their own lists of top negative risks with responses, using the risks in Table 1 as a prompt after participants have had the opportunity to brainstorm a list of their own risks Secondly, Project Management Offices, where they exist, could take on the role of developing and disseminating project-level risk management strategies for the subset of risks in Table 1 that are most relevant to specific projects in their organizations. Thirdly, research administrators and research funders could use the study findings as an input to enterprise risk management, which, alongside other inputs, could lead them to develop mitigation strategies for risks that research teams cannot manage on their own. Finally, the process described in Figure 1 could be used in prospective studies which, by design, collect more detailed data about participants, their fields of study, and their reasons for believing that specific negative risks for research are important.

Limitations

This study has limitations. Foremost, it is based on retrospective analysis of a convenience sample of people who self-selected to learn more about project management for research, and the findings may not reflect the views of people who are less interested in research project management training.

Secondly, the responses of participants may not be informed or accurate. While it is likely that some of the 200+ participants of the risk session at the 2015 CARA Conference had deep knowledge and expertise related to academic project risks, many of the participants of the other 14 workshops and courses were researchers, staff, fellows, and graduate students who are in the early stages of their careers. As such, the findings may not accurately reflect the views and knowledge of more experienced research team members and academic leaders.

It is possible that the process used in the facilitated session de-emphasized risks that were uniquely associated with the complexity and uncertainty of individual research projects because those risks would vary depending on the type and context for research, so one participant's top unique risk would be unlikely to receive sufficient votes from other participants to make it past the individual brainstorming stage of the process.

Most of the participants were members of Canadian research teams, and the findings may not reflect the views of people in other countries. Further, the fact that six of the 15 sessions included exclusively participants from health sciences research teams may mean that risks related to that discipline may be over-represented.

Finally, it is not possible to assess the relevance of individual characteristics (e.g., role on the research team, educational background, years of experience, the research discipline, thesize or nature of the research project) because individual-level data were not

collected. For instance, participants of large international research natural sciences projects may have different views about risk than participants of regional health sciences research teams, and external partners may perceive risks differently than academic research team members. Prospective individual-level data from research studies with purposive sampling would be required to understand how individual and research characteristics contribute to risk perception and risk response planning for academic research projects.

Conclusions

A retrospective analysis of the input and votes of over 500 participants in 15 facilitated research risk management sessions found that negative risks related to funding, personnel, unreliable partners, study participant recruitment, and data access were perceived to be the most important for academic research projects. Overall, most of the negative risks that were prioritized by participants were general, as opposed to directly associated with the inherent uncertainty or complexity of academic research. Additionally, most of the negative risks that were perceived to be important by participants cannot be fully managed by research teams and would require system- and organization-level responses.

About the Author

In addition to being an adjunct professor and senior fellow at the University of Toronto, PA Paprica is the principal of the sole proprietorship Research Project Management. Research Project Management was paid a fee to provide seven of the facilitated risk management sessions for which data are provided in this manuscript (see Table 1 for details).

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Declarations

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