Research Article

Negative Risks in Academic Research Projects: A Retrospective Analysis of Data from a Convenience Sample of Hundreds of Research Team Members

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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 and 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 of research in full is therefore very difficult." Consistent with international guidance that recommends tailoring project management depending on the team, context, and focus of a project[10][11], the peer-reviewed literature about academic research management emphasizes modifying conventional approaches so that they are more likely to work for research[12][13][7][14][8][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[10][11]. In practice, most project risk management focuses on identifying important negative risks, analyzing potential negative risks to assess their likelihood and impact, developing negative risk responses (e.g., avoid, mitigate, transfer, accept), and monitoring and controlling negative risks during project implementation[10][11]. 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[13][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][12][15][14]. The literature identifies some challenges and risks for academic research that also affect other types of projects such as staff turnover, schedule slippage, technological complexity, and unrealistic budget estimates[19][8][7]. It also identifies 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 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

Retrospective analyses of data were performed on a convenience sample consisting of input from over 500 participants of in-person and online facilitated sessions focused on risk management for academic research (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.

Participants' roles, number, and primary discipline varied across the risk management sessions (Box 1, Table 1). Each of the 15 facilitated sessions was one to 1.5 hours in length and, after a brief seminar on project risk management, followed the same general simplified steps for academic research negative risk management[14], which were: individual brainstorming of negative risks, group

discussion and voting to identify the top negative risks, and the development of potential risk responses for selected negative risks (Box 2).

Most data 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.

- Researchers – principal investigators (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 the responsibility for project management, noting that their title may be something other than "project manager", e.g., executive director, project director, program manager, project coordinator, or some other title depending on the institution and size and scope of the research
- Fellows – postdoctoral or 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 (note: undergraduate students may also be part of a research team but none were included in this study)
- Support staff – research administrators, grant officers, technology transfer experts, legal counsel, and other staff who directly support the planning, administration, and implementation of academic research

Box 1. Roles of Academic Research Team Member Participants

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.

1. Ten to 15-minute seminar on the theory of risk management for academic research projects
2. Participant generation of a list of negative risks
    1. Individual brainstorming of negative risks
    2. Depending on the size of the group and length of the session, work in pairs or groups of 3 to identify negative risks that may be important based on simultaneous consideration of risk likelihood and impact if the risk were realized
3. Group discussion to generate a session risk registry that includes some, but not all, of the individually brainstormed risks
4. Individual voting to identify the top negative risks within the session risk registry, taking both likelihood and impact into account
5. Group discussion to compare the session's top risks with the top risks from other sessions (with the exception of the first session at the CARA Conference)
6. Participants working together (as a large group or in small breakout groups depending on the session format and duration) to identify possible negative risk responses (e.g., avoid, mitigate, transfer, accept) for two or three of the session's top negative risks.

Box 2. Process for the Facilitated Risk Management Sessions

Results

Overall, 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 by the participants of facilitated risk management sessions.

No.	Year	Partici-pants	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	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

No.	Year	Partici-pants	Context in Which Facilitated Session was Provided (in-person unless noted)	Top Negative Risks (in order of perceived importance based on participant voting)
				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 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

No.	Year	Partici-pants	Context in Which Facilitated Session was Provided (in-person unless noted)	Top Negative Risks (in order of perceived importance based on participant voting)
				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

Eight of the 15 groups 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 (Box 2, step 6), funding risks were the most popular choice across the 15 facilitated sessions. Suggested responses for funding risks generally 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.

Eight of the 15 sessions voted the risk that a team member would leave or be unavailable as one of their top risks. Participants' views that personnel risks are important align with Moore and Shangraw's[7] study, which found 57 percent of survey respondents had experienced staff turnover. In some cases, participants of facilitated risk management sessions 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. After funding risks, the risk of a team member leaving or being unavailable was the second most frequently selected risk for risk response development during facilitated sessions. Proposed responses often 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.

Some other negative risks were also identified as important in multiple sessions. 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). Five groups 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.

The risk of contractual non-compliance (e.g., teams not producing deliverables specified in the contract and/or committing financial fraud) 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.

Individual study participants did identify some risks that might be considered inherently associated with academic research, but these risks did not receive sufficient votes to be included among the top 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, the negative risks perceived as the most important by participants in facilitated risk management sessions were not directly associated with the uncertainty or complexity of academic research. Across multiple facilitated sessions, there were commonalities, with many participants identifying unstable funding, researcher/staff turnover, and unreliable partners as one of their top 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. 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. 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. Finally, 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. It is also 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. Notwithstanding these limitations, 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 grant funding is not renewed. 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 Box 2 to generate their own lists of top negative risks with responses, using the risks in Table 1 as an input to the process between steps 2a and 3. Secondly, 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 Box 2 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. Most of the participants were Canadians, and the findings may not reflect the views of academic research team members in other countries. 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 field, size or nature of the research project) because individual-level data were not collected. Additionally, 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 perceived to be important 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. Paprica was paid to provide some of the facilitated risk management sessions for which data are provided in this manuscript.

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Declarations

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