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Nurturing Project Organizations: A Mode 2 Mission for the University?

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Abstract

Recent changes in UK research funding priorities have led to the emergence of large challenge-led, societally embedded research opportunities. We used semi-structured interviews with 27 academic, management and professional staff at the University of Edinburgh to explore the life cycles of selected projects and centres from planning and preparation through to decommissioning. We observed the degree to which pursuit of challenge-led opportunities induced the emergence of new project-level organizational forms or changed academics' modus operandi from "Mode 1" research to "Mode2" knowledge production. We further explored the levels of management input and administrative support expected and received by the project organization from its host

academic schools, colleges the university. We found that the size, complexity and disciplinary, interdisciplinary or transdisciplinary scope of the initiatives influenced their emergence as autonomous project organisations. "Role strain" affected many respondents as they sought to balance Mode 1 academic and Mode 2 leadership and management roles in their project organizations. Further exploration of the distribution of leadership management and professional support functions among project organizations and the support structures of academic schools, colleges and the university is warranted. We suggest that the university might usefully act as a boundary organization and adopt a Mode 2 knowledge exchange mission in support of multi-stakeholder projects.

1 Introduction

The emergence of "big research", notably in the fields of science, technology, engineering and mathematics (STEM), has given rise to a variety of organizational environments (e.g., powerful research "labs", collaborative research projects and inter-disciplinary centres) that complement and transcend the traditional discipline-based administrative structures of academia. The quantity, quality and impact of academic research enabled by these organizational units contribute to their institution's overall reputation as a "research university". The reputational narrative of the research university, in turn, foregrounds the individual achievements of established and aspirant academic researchers while assigning organizational infrastructures to the administrative hinterland of "research support". Government funding agencies (e.g., research councils) have heretofore aligned with this narrative, awarding resources to meritorious academics who are in turn supported and regulated by the administrative structures of their departments and schools. In this depiction, universities and funding agencies co-operate as intermediaries in the state patronage of individual academics in the expectation of eventual societal benefit from their research activities. Since the formation of UK Research and Innovation (UKRI) as a "federation" of research councils and other agencies in 2018, funding vehicles such as the Global Challenges Research Fund (GCRF), Industrial Strategy Challenge Fund (ISCF) and Strategic Priorities Fund (SPF) have been making large awards (£10 million and upwards per project) available for challenge-led, societally embedded research. This UK change mirrors similar shifts in EU funding and in awards made by global philanthropic organizations such as the Bill & Melinda Gates Foundation. In this paper we explore the organizational

implications for a UK research university seeking to adapt to the scale and scope of research and knowledge exchange activity predicated by the new funding patterns. We "unbundle" the terminology of academia and the university and position the latter as a "boundary organization" (Guston 1999) seeking to satisfy the interests of multiple stakeholders in the evolving research and knowledge exchange landscape. We assume that the scale and scope of the new challenge-led awards will favour their assignment to specific project organizations rather than to individual academics. We hypothesise a role for project organizations and their university hosts in accommodating disciplinary or interdisciplinary "Mode 1" research in an emerging transdisciplinary "Mode 2" model of knowledge production (Gibbons et al, 1994). Our qualitative study is focused on the individual experiences of university-based academic, management and professional staff involved in large collaborative research projects and centres. Our narrative is structured as follows: Section 2 introduces the conceptual frameworks that inform our research. Section 3 describes the objectives and design of our study. Section 4 presents the findings, which are discussed in Section 5, followed by concluding remarks in Section 6.

2 Conceptual Frameworks

Throughout this paper we take the position of reflective practitioners (Schön, 1983) wishing to effectively integrate Mode 1 and Mode 2 challenge-led, societally embedded knowledge production. We follow the advice of Christensen and Raynor (2003) to seek out good *circumstance-contingent* theories that will help us to better understand and improve research and knowledge exchange practices and enabling infrastructures in the institutional setting of the university. The conceptual frameworks outlined below are selected from a wide-ranging literature review based on our perception of their value to our study.

2.1 Academia and the University

We begin by making heuristic use of a semantic distinction, which we shall maintain throughout this paper, between the terms "academia" (loosely understood as a shared culture or community of researchers, educators and scholars) and "university" (understood as an institutional arrangement or environment closely associated with academia). The fact that the two terms are often used as synonyms attests to that close association, with universities often described as "academic institutions". An example of the potentially

misleading conflation of the two terms is provided by Etzkowitz and Leydesdorf (2000), who introduced the metaphor of the "Triple Helix of *university*–industry–government relations" while simultaneously alluding to the "network of relationships among *academia*, industry, and government" (our italics added). Van Waart et al (2015) usefully extend the triple helix metaphor to a quadruple helix by adding civil society as a fourth domain, and Calzada and Cowie (2017) present a penta-helix framework that includes a fifth stakeholder domain spanning the boundaries of the other four. The latter authors populate the fifth helix with an eclectic mix of boundary-spanning social entrepreneurs, activists, 'bricoleurs' and assemblers. Adopting the penta-helix metaphor while avoiding academia-university conflation allows us to position the university in the boundary-spanning domain, as shown in Figure 1.
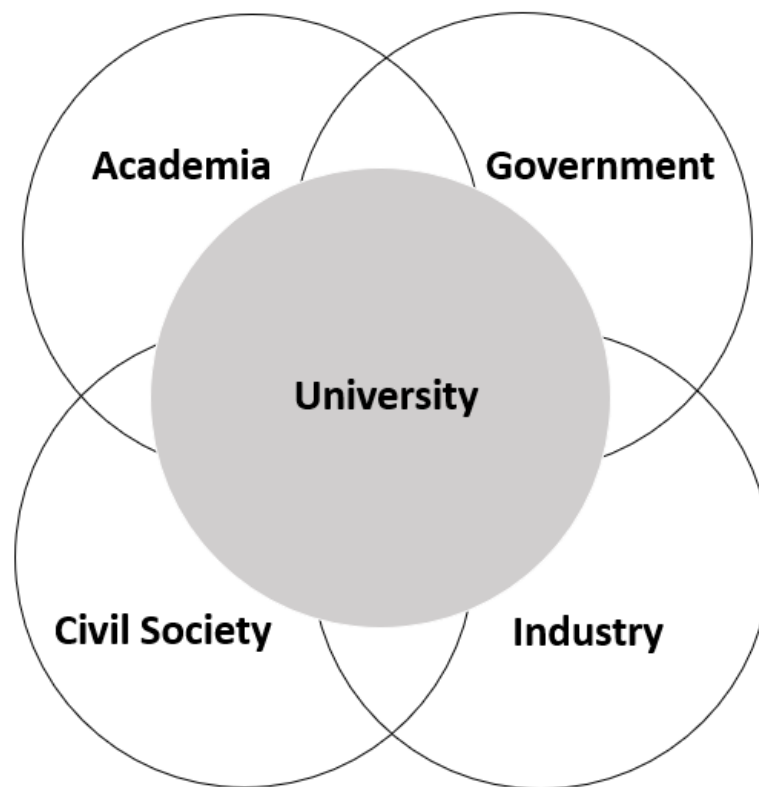

Fig 1 The University as a Boundary Organisation

(Based on Calzada and Cowie, 2017)

2.2 The University as a Boundary Organization

We have drawn a distinction between Academia and the University, and now position the latter as a boundary organization (Guston, 1999) in relation to four stakeholder domains (Figure 1). Boundary organizations can be seen as pluralistic organizations whose modes of strategizing and organizing are shaped by internal and external stakeholders with divergent goals and interests (Jarzabkowski and Fenton, 2006). As boundary organizations, universities can act strategically to adopt, adapt, re-interpret, resist, outsource or otherwise redistribute the missions thrust upon them by their stakeholders.

2.3 Project Organizations

We note that, given a policy-driven shift in emphasis towards complex, challenge-led, societally embedded research, there may be a "tipping point" where the scale, scope or complexity of funded projects demands their articulation as organizations in their own right (Freeman and Millar, 2017). The "project organization", as defined by Ratcheva and Simpson (2011) can be seen as a *temporary knowledge organisation* (Sbarcea and Martins, 2003) in which knowledge is co-constructed by participants working across "multiple boundaries and knowledge paradigms", consistent with the ideals of Mode 2 trans-disciplinary knowledge production (Gibbons et al., 1994). Ratcheva and Simpson (2011) highlight the distinction between project organisations (such as in "one-off" movie production), where the organisation ceases to exist on completion of the project, and more enduring "project-based organisations" (such as construction firms), which use projects as a way of working. We conceptualise project organizations (or, on a larger scale, centres and hubs) as potential boundary organizations which, like the university itself, must respond to the influential "pushing and pulling" of multiple internal and external stakeholders (Koppenjan and Klijn, 2004). As project-based organizations, centres and hubs may be no less temporary than their constituent project organizations, but their nomenclature suggests at least the possibility of sustainability.

2.4 Project Organizations and Mode 2

The focus of the study described below is on the project organization's response to a perceived funder-driven shift in emphasis from Mode 1 research towards Mode 2 knowledge production. In this conception we are immediately confronted by a terminology

that separates research from knowledge production. We instead choose the heuristic approach of considering Mode 1 as knowledge production via research and Mode 2 as knowledge production by other means, such as "knowledge exchange". This heuristic ignores both the many conflicting notions of what knowledge exchange actually entails and the fact that research might also be considered a knowledge exchange process. It does, however, allow us to think of Mode 1 and Mode 2 as complementary knowledge production processes to be accommodated by the project organization.

3 Objectives and Design of the Study

An opportunity to test the conceptual frameworks, outlined above, arose in 2018 when we were asked to undertake a project with the working title "Nurturing Cross-Disciplinary Research", in which the main research question was framed as follows:

How do participants involved in large (> £5m award value) collaborative research projects and centres perceive:

- Their role(s) at different stages in the life cycle of their exemplar initiative(s)
- Their identity and sense "belonging" in the various organizational units involved in the initiative
- The support needed, and received, from the relevant "professional bureaucracies" (Mintzberg, 1979, as cited in Musselin, 2006) across the university

The institutional setting for the study was the University of Edinburgh, one of the largest research-intensive universities in the UK. The most recent Research Excellence Framework, a research ranking used by the UK government to determine future research funding, ranked Edinburgh 4th in the UK for research power. The University's research income for 2017/18 was £280m. We addressed the research question using a qualitative approach, conducting semi-structured interviews with individuals involved in organizing large projects and/or centres, and performing research within them. While the study examined collaborative research projects and centres, the restriction of the sample set to large awards was designed to uncover projects that are beyond the normal scope of single investigator research and potentially enter the realm of Mode 2 knowledge production in pluralistic settings.

A purposive approach was employed to select an interviewee panel composed primarily of principal investigators (PIs) and management and professional staff drawn from the academic community and from the University's professional bureaucracies. While the overall panel was balanced in terms of gender, its composition was dominated by senior academics (holding the rank of professor) who tend to be more strongly represented as PIs in large (cross-disciplinary, inter-institutional) projects than academics or management and professional staff who are judged to be too junior, or who lack formal authority, to apply for external research funding. Approval for the study was obtained from the relevant Departmental Ethics Committee. Thirty five invitees were contacted and data was collected from twenty seven participants over a period of four months. Each respondent provided written consent to participation in the interviews and (with one exception) to the recording, transcription and analysis of the interview content. All data collected from participants were anonymised in the discussion of findings. Interview questions were framed around the assumption that large projects can be considered as "research infrastructures", broadly understood as encompassing not just generic physical resources and technologies, but also interchangeable forms of capital (in the sense introduced by Bourdieu, 1986), including the ideas, money, people and practices that enable the processes of research and knowledge production. Framing our questions around infrastructures also provides a contextual link to studies of knowledge infrastructures, open access and the information commons (Benkler, 2016). Prior to each interview, we explained this approach to the interviewee, referring to the linear sequence of "Research Infrastructure Key Stages" (Royal Society, 2018, p. 13), which identifies planning, preparation, construction, operation and decommissioning as key events in the research infrastructure life cycle.

3.1 Interviews

Interviewees were first asked how they identify emerging project opportunities and choose those in which they wish to become involved. Each interviewee was then asked to nominate one or more exemplar projects in which they participated, outlining the scale, scope and perceived purpose of the initiative from their own and other's point of view (e.g., those of funders, project teams, and host institutions). We then asked a series of questions on the strategies and institutional support structures perceived to be relevant at each stage in their exemplar project's life cycle.

4 Findings

4.1 Project identification and selection

Responses to our opening questions revealed a range of proactive and reactive approaches to identifying and pursuing research opportunities. Our respondents generally adopted the same lens (that of the PI) in pursuit of the same objective (maintaining an individual academic research trajectory) as reported in a similar study by O'Kane et al (2015). Most of our respondents were clearly seeking to fit their individual or group research plans to emerging funding opportunities, or vice versa. Their focus at the point of initial opportunity generally prioritized Mode 1 disciplinary or interdisciplinary academic research over Mode 2 transdisciplinary knowledge production. Nevertheless, when it came to nominating exemplar projects for later discussion, our heuristic approaches of selecting a minimum award level of £5m, and using the infrastructure metaphor to explore the processes of acquiring and deploying resources, proved reasonably effective in focusing our study on larger projects and centres involving multiple stakeholders, institutions and academic disciplines. At this point a distinction began to emerge between those who see a project or centre as a rewarding performance venue in which to generate new knowledge in their own field, and those seeking to act as impresarios, designing and directing broad coalitions to deliver change across multiple stakeholder domains. Tensions can arise between performers and impresarios. Several of the social scientists in our study, for example, expressed frustration at being engaged as "bolt on" additions to projects (e.g., in medical science), which fail to offer them adequate intellectual or financial recompense for their efforts. A further challenge is that the institutional support structures of academic departments and schools, and of the university itself, can come under strain in trying to administer initiatives that span multiple stakeholder domains, cultures and geographies. Many such tensions and challenges emerged in our exploration of the life cycle stages of large research infrastructures.

4.2 Life Cycle of Research Infrastructures

The idea of a simple linear sequence of life events in the history of a research infrastructure, with clearly distinguishable stages of planning, preparation, construction, operation and decommissioning, did not resonate with all of our interviewees. We acknowledged in our

exchanges that the infrastructure life cycle is often more fluid and iterative than suggested by the guide document (Royal Society, 2018, p. 13) and have grouped the stages below with that in mind. Findings at each life cycle stage are further categorized with reference to (i) strategies and (ii) institutional support structures and identities.

4.2.1 Planning and Preparation

Strategies

Respondents generally considered the distinction between planning and preparation of research infrastructures to be somewhat blurred, as noted above. One interviewee, however, perceived an important distinction between an *"academic, intellectual argument for research funding"* (for example, to the European Research Council), where preparation will follow if the argument is accepted, and making an infrastructural argument (e.g., for a large centre) where the two stages are combined in a single business case. Another respondent also distinguished between conceptual (academic) planning and the preparation of the resulting research proposal, while a third noted the difference between internal planning and preparation (deciding *"what we want to be"* as an organization) and external planning and preparation (deciding *"how we wish to engage"* with the world). It was further noted that, in today's funding climate, large consortia have no time to assemble and to plan a call response from scratch. They must be pre-formed and ready to respond with pre-planned *"shovel-ready"* projects.

Institutional Support Structures and Identities

We asked our interviewees to describe the roles played by the institutional support structures of their schools, and of the university and its colleges, during the planning and preparation phase of their exemplar initiatives. We also asked them how they personally identified with these different structures. Most PIs identified primarily with specific "academic tribes and territories" (Becher and Trowler, 2001) and with the institutional support structures of their schools.   Management and professional staff directly employed in school support roles also identified with those units, while those directly employed in (often fixed term) roles on specific projects were more likely to identify with the project as their organizational home.

Views of institutional support structures appeared to vary with the disciplinary reach of their project and the diversity of its external stakeholders' cultures and geographies.

Academic researchers from the same or adjacent disciplinary communities (in terms of subject specialisms and social norms) were generally content with the level of institutional support received through their schools. Those planning and preparing more complex interdisciplinary or transdisciplinary efforts, particularly those involving overseas partners, were less sanguine. There was a sense, most forcefully expressed by academics holding senior appointments at college or university level, that more needs to be done at that level to support large, complex projects (as opposed to supporting individual PIs seeking to lead them). Some project leaders, however, while acknowledging that school support structures struggle to effectively assist complex projects and their external partners, note that any form of institutional support external to the project team will be insufficiently *"up to speed"* on the project and its needs, and therefore unable to add significant value to its planning and preparation processes. Rather, these respondents see a need for *"small, coherent, well integrated teams"* operating as specific project organizations. This degree of project autonomy may not be easily granted by school support structures, and is more likely to be legitimized, if at all, at college and university levels.

4.2.2 Construction and Operation

Strategies

Study participants in less complex projects tended to see these "post-award" phases as a resumption of their normal activities, albeit with new funding. The continuity of work going on in well-established research groups insulates them from awareness of project construction, as they go about their agreed tasks and as their schools focus bureaucratic attention on financial accountability to funders. In contrast, leaders of more complex interdisciplinary and transdisciplinary projects were concerned with assembling their project organizations and constructing the "delivery space" in which to achieve immediate project goals and potentially to undertake future initiatives. An important aspect of the construction phase of more complex infrastructures was to establish "rules of access" to the resources – including the empowerment of stakeholder coalitions to influence the ongoing direction of the initiative and the composition of its "leadership constellation" (Denis et al., 2001).

Institutional Support Structures and Identities

Many of the insights provided for the planning and preparation stages were reiterated for construction and operation. Participants' sense of belonging to their academic tribe or organizational unit did not change, though there were some changes in levels of engagement with the exemplar projects themselves. One respondent noted that, as the operational phase of the project continues, its tightly knit starter community, having achieved its goal of winning the resources they set out to grasp, may disengage to some degree, or move on to plan and prepare for their next opportunity. It was also noted that school level support, may be less visible at this "post-award" stage of the project. Overall there is a sense of institutional support structures playing a more obscure *"behind the scenes"* role at these stages. Only one respondent offered the view that the university needs to be more engaged in the operational phase of large grant funded initiatives, so that it can make sensible decisions around their decommissioning or sustainability.

4.2.3 Decommissioning

Questions on the topic of decommissioning elicited more divergent responses than similar questions posed for other stages in the research infrastructure life cycle. Interviewees differed in their views as to whether decommissioning marks the natural end of life of a project or merely a stage in a continuous cycle of renewal, kick-started by further rounds of planning and preparation.

<u>Strategies</u>

Academic attitudes to decommissioning diverged between those whom we earlier characterized as either research performers or impresarios (Section 4.1, above). Research performers generally treated their projects as transient funding events that contributed to the trajectory of their ongoing research. The narrow view of projects as finite grants rather than potentially enduring organizations leads to tacit acceptance of their demise. Respondents whom we identified as impresarios, on the other hand, were more likely to take the view that *"a project that fails to view decommissioning through a sustainability lens is a failed project"*. Predictably, the leadership constellation of a proactive project organization is more likely to seek routes to sustainability over the course of its operational phase than an individual research performer. Not all projects need to be sustained, however, and respondents see little value in continued engagement in an initiative which they think has run its course and no longer provides a rewarding intellectual or

organizational home to its members. An interesting strategic observation is that more proactive project or centre leadership teams actively seek to cultivate their *"coalitions of the willing"* during earlier life cycle stages, and then manage a "revolving door" decommissioning and recommissioning process in order to emerge with an evolved membership, mandate and funding base. These proactive project organizations often engage with their original funders at an early stage in order to establish support for their recommissioning strategy.

<u>Institutional Support Structures and Identities</u>

Interviewees provided a wide array of observations and exhortations on current and future roles of institutional support systems in solving what they saw as problems of decommissioning and/or sustainability in large research infrastructures. Perceived problems included those of retention and protection of project data and facilities, effective communication and translation of project achievements for general audiences and, most frequently, the retention or "bridging" of project-specific academic and management and research professionals beyond the funded life of the project. Loss of the embodied knowledge of these staff, which needs to be acquired from scratch with new teams following funding "gaps" between projects, was seen as a particularly pressing issue. It was interesting to note that many respondents assigned these problems to the overall university system, with little speculation as to which institutional level (for example schools, colleges or the central university) should be dealing with different problems. This was in contrast to earlier stages of the project life cycle, where responsibilities at different institutional levels were more clearly discernable. An important observation made by one interviewee was that school infrastructures are set up to support discipline-based academics and not geared to sustaining management and professional staff that do not necessarily have academic aspirations. This point was echoed by another respondent who identified as an early career researcher (ECR). This interviewee did not regard themselves as also being an early career academic (ECA), and therefore saw little prospect of a fulfilling research career in a system geared to disciplinary academics. This suggests that, within the university, the institutional home of transdisciplinary management and professional staff, and of at least some research staff, lies outside the organizational hierarchies of disciplinary schools. Finally, three interviewees conceptually detached the institutional level of the university and its colleges from that of academic schools. Two of these suggested that the central university and its

colleges might contribute "end to end" strategic support to large research infrastructures, while the third (school-based) respondent noted that a focus on *"PI-driven"* academic support systems excludes the strategic vision available at the college and university level.

5 Discussion

5.1 Mode 2 Projects and Academia

An increased policy emphasis on Mode 2 knowledge production places new demands on an academic system that is equipped to support individual academics' pursuit of Mode 1 research, which may be either narrowly disciplinary or widely interdisciplinary, but retains its academic setting, as the account of Van Rijnsoever and Hessels (2011) suggests. Academics who engage with the Mode 2 dynamic are not being asked to abandon their Mode 1 orientation or their research reputations and careers but are being incentivised to also contribute their disciplinary expertise in Mode 2, which is "socially distributed, application-oriented, trans-disciplinary, and subject to multiple accountabilities" (Nowotny et al., 2003). From the participating academic's point of view, Mode 2 can be seen as both post-disciplinary and pre-disciplinary. The environment is post-disciplinary in the sense that disciplinary knowledge input is converted into other, derived forms in Mode 2, and pre-disciplinary in the sense that academics will expect to abstract new disciplinary knowledge from the Mode 2 setting. The risk taken by an academic in committing their disciplinary expertise in broad transdisciplinary coalitions must be mitigated by their ability to extract conventional academic value (e.g., reputation, revenue, publications) from their Mode 2 involvement. A further risk is the requirement to bring not only their disciplinary expertise, but also their time commitment and know-how as leaders, managers and communicators into the Mode 2 environment. Although we did not overtly discuss Mode 2 with our study participants (i.e., we did not challenge the "research" paradigm), these risks to academic integrity surfaced regularly during interviews. We mentioned above the frustration expressed by social scientists unable to extract disciplinary value from their engagement in large medical science projects, while leadership and management demands were variously resisted, ignored, outsourced or embraced by respondents. Several interviewees remarked on the "role strain" (Boardman and Bozeman, 2007) inherent in trying to be simultaneously a "cutting edge" academic and a leader, manager and ambassador in a large project. This

strain was eased if the initiative achieved the scale of a relatively autonomous project organization with its own management and professional staff in place.

5.2 Mode 2 Projects and the University

We have already asserted that, as boundary organizations, universities can act strategically to adopt, adapt, re-interpret, resist, outsource or otherwise redistribute the missions thrust upon them by their stakeholders. Academia, at least in the UK, has long had a dominant role in ensuring that the university supports and represents its evolving interests and missions to external communities. It is therefore of interest to consider how the university should work with academia to accommodate the policy emphasis on Mode 2 being transmitted through government funding agencies. The funding agencies are also boundary organizations, and work closely with universities in translating policy initiatives into funding calls prior to their delivery to academia. Our findings suggest that Mode 2 project organizations or, on a larger scale, centres or hubs, are salient units for delivery of Mode 2 missions. We further suggest that these organizational units differ from the more familiar (Mode 1) research projects and centres already supported by the disciplinary school-based institutional support structures of academia. Youtie et al (2006), for example, have shown how research centres represent an institutional link in the "epistemic evolutionary chain" leading from tentative, interdisciplinary experiments to new scientific fields and disciplines, and are therefore a good fit with academic schools. In contrast, Mode 2 project organizations are more concerned with coordinating multiple knowledge inputs in what is essentially a product design and development process (Postrell, 2002), where the products may include policy advice or societal interventions, for example. We suggest that university-based Mode 2 project organizations are best supported in the boundary organization space of the university and its constituent colleges, rather than in the hierarchies of academic schools. Here, the University might usefully take the position of a "meta-organization" (Ahrne and Brunsson, 2005; Gulati et al., 2012) whose Mode 2 mission is seen in terms of "orchestrating" its portfolio of project organizations and project-based organizations (centres, hubs) and of managing the resource flows between Mode 1 and Mode 2 configurations. This might include the creation of "hybrid spaces" (Perkmann et al., 2019) in which Mode 1 communities of academics can engage in Mode 2 and ensure that new initiatives and directions evolve along both Mode 1 and Mode 2 axes.

6 Concluding remarks

The conceptual planning for our study was based on a clear separation of the roles of academia and the university in research and knowledge production. Positioning the university and the project organisation as boundary organizations further emphasised their broker roles in relation to stakeholders in academia government, industry and civil society. We used this clear conceptual framing to hypothesise a role for project organizations and their university hosts in accommodating Mode 1 research in an emerging Mode 2 model of knowledge production. The limitations of our study are that our interview panel was drawn almost exclusively from the academic stakeholder domain, and that the projects discussed were selected based on the monetary value of the award, rather than on the basis of the purpose and structure of the project organization or its Mode 1 or Mode 2 characteristics. Bearing these limitations in mind, our findings did reinforce the sense of a tipping point in scale and complexity at which research projects gain salience as autonomous project organizations. At this point their leaders begin to come to terms with the role strain between their academic trajectories and their leadership and management roles and identities. The dynamics of productively combining Mode 1 and Mode 2 elements within single project organizations received less attention from the panel. While there was general agreement that the hierarchies of academic schools and those of the university and its colleges need to align better with the needs of emerging project organizations, the conceptual placement of these support structures into separate academic and university (boundary organization) domains was not explored in any depth. Further research should focus on specific case studies of project organizations where the Mode 1, Mode 2 or "mixed" purpose can be established in advance, and seek input from relevant actors outside the academic domain, including those such as research councils that operate in the putative boundary organization domain. Given the association between Mode 2 and knowledge exchange, the salience of a fully articulated Mode 2 mission for the university could also be further explored.

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Author contributions

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Analysed results: PLF, FK;

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