Persistence and Flexibility of Publicly Funded Principal Investigators in Science, Engineering and Technology

Dr Conor O'Kane

Department of Management,
University of Otago,
Dunedin,
New Zealand

Email: conor.okan@otago.ac.nz

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ABSTRACT

The initiation and coordination of publicly funded research by principal investigators has become a far more complex and challenging task. National initiatives by policy makers are increasingly encouraging innovation and knowledge flows, and for research institutions to take on a more direct role in both national and regional economic development through technology transfer. We examine the strategic behaviours of principal investigators' as key actors in shaping research proposals and scientific avenues, and in delivering research projects that fit with the objectives of policy makers, industries and funding agencies. Our findings uncover four distinct strategic behaviour categoristions and how these can be distinguished based on the principal investigator's professional level and the nature of research in which they are engaged.

Keywords: strategy; principal investigator; publicly funded research; technology transfer

INTRODUCTION

Strategy-making and change processes have traditionally been viewed as taking the form of either occasional large-scale reorientations or a more continuous process (Miller and Friesen, 1984; Mintzberg, 1987; Quinn, 1982; Tushman and Romanelli, 1985). One of the most fundamental decisions any top-level manager has to make is whether to persist with their current strategic commitments or to change course, be it in a transformational or an incremental manner. In mapping out, positioning, and managing their research agenda within the imposed strategies, structures and confinements of a nationally funded research environment, principal investigators face similar challenges. There has, however, been a dearth of attention afforded to understanding the strategic behaviours of publicly funded principal investigators in this respect.

Fundamental changes are underway in the governance of public sector research. The manner in which public funding and research is organised has lead to the reorientation of research activities in third level institutions and public research organisations (Laredo, 2003). There is now an increasing emphasis in public research on problem-focused, interdisciplinary and collaborative research, and major strategic research programs bringing together the public/university and private/industry spheres supported by public authorities are ever more common (Adler, Elmquist & Norrgren, 2009; Hagedoorn, Link & Vonortas, 2000; Martin & Etzkowitz, 2000). The lack of in-depth understanding of the role of principal investigators within this changing environment constitutes a problem as it inhibits both these same acting research managers from improving in their role, as well as the funding agencies from effectively evaluating their performance (Alder et al. 2009). We examine the strategic behaviours of principal investigators' as key actors in shaping research proposals and scientific avenues, and in delivering research projects that fit with the objectives of policy makers, industries and funding agencies. Specifically, we ask the question "To what extent do principal investigators demonstrate strategic persistence or flexibility in managing publicly funded research projects?". The focus of our research looks to establish whether there are

different categories of principal investigators that deliver incremental and/or more leading edge research contributions, and if so, how the strategic behaviours adopted are distinguished.

The study context is Ireland's publicly funded science engineering and technology (STI) sector. We make a number of important contributions to the literatures of strategy and research policy. First we describe how strategy formulation by principal investigators is relevant to their application for, and positioning of, publicly funded research projects. Second, we develop a number of distinct behavioural categorisations which describe how principal investigators strategise in an increasingly complex and competitive publicly funded research environment. Third, in detailing how the behaviour categorisations of principal investigators can be distinguished based on their professional level and the nature of research in which they are engaged, we offer an insight into the blend or population of principal investigators that might exist in a publicly funded research environment.

LITERATURE

Theoretical View

Strategic choice is closely related to the notion of purposeful enactment, which involves the conscious processes, practices, and actions of key players that combine to form a firm's strategy, and the processes whereby the power holders within organisations decide upon courses of strategic action (Child, 1972) In mapping out, positioning, and managing their research agenda within the imposed strategies, structures and confinements of their own institution and a nationally funded research environment, principal investigators as key strategic actors regularly exercise such choice. Adopting this approach is consistent with others who have alluded to the level of autonomy and freedom experienced by academics when choosing the orientation of their activities (Whittington, 2007; Mintzberg, 1983).

Publicly Funded Research Environment

The nature of innovation is changing to being more collaborative between key stakeholders in business, government and society. Many of these changes have been accelerated by the strong adherence of policy makers to notions such as 'Academic Capitalism' (Slaughter and Leslie, 1997); 'Mode 2' knowledge production (Gibbons, Limoges, Notwotny, Scwartzman, Scott & Trow, 1994) and multi-stakeholder innovation systems and models for research and economic development such as the 'Triple Helix of Government, University and Industry' (Etzkowitz & Leydesdorff, 1997). National initiatives by policy makers are increasingly encouraging innovation and knowledge flows, and for research institutions to take on a more direct role in both national and regional economic development through formal technology transfer (Etzkowitz, 1998; Haeussler & Colyvas, 2011; Powell, Owen-Smith & Colyvas, 2007). Research institutions and principal investigators now have to contend with the increasing normalisation of the 'entrepreneurial university', and the expectation that they will undertake entrepreneurial activities to improve regional and/or national economic performance as well as the performance of their own institution (Etzkowitz & Leydesdorff, 2000).

The Principal Investigator

Drawing on a collection of principal investigator definitions from funding agencies relevant to the present study and a number of world leading institutions including the eight Ivy-League universities (table 1), it became apparent that there are a range of commonalities with regard to the expectations associated with the role.

INSERT TABLE 1

Despite the importance and formal status of the principal investigator role, much of the task description continues to be taken up by administrative duties and more general management responsibilities. Significantly, however, their responsibilities are somewhat heightened with the added expectations that they will develop and maintain their own status and expertise in

the field, demonstrate intellectual leadership, set the scientific direction, deliver technical success, and oversee the project's impact activities following its completion. It is argued here that these duties have been overlooked and neglected by the broader academic community. Specifically, their role as a strategist in anticipating, formulating, shaping and managing scientific projects consistent with those priorities set out in the funding programmes provided by policy makers have not been explored. The dearth of attention to the principal investigator in this regard is surprising if one considers their empirically proven importance in managing research projects, yet the lack of attention afforded to their broader role in the literature (Jain, George & Maltarich, 2009; McAdam, McAdam, Galbraith & Miller, 2010; Mosey & Wright, 2007; Rothaermel, Agung & Jiang, 2007). We next turn our attention to two common forms of strategic behaviour that are exercised by principal investigators when managing publicly funded research projects – 'strategic persistence' and 'strategic flexibility'.

Strategic Persistence

Strategic persistence can be understood as the extent to which a strategy remains stable over time (Finkelstein & Hambrick, 1990). In resonating with the design school of thought, 'persistent' strategy making is portrayed as a rational, deliberate and sequential process in which formulation is followed by implementation (Mintzberg, 1990). In line with broader theoretical views on strategic change, strategic persistence assumes that changes are relatively infrequent (e.g. Gersick, 1994; Greenwood & Hinings, 1988; Tushman & Romanelli, 1985). The implementation of strategic changes are said to arise following sustained periods of poor performance or a rational analysis of environmental conditions, assuming sufficient attention is being paid to the environment (Lant, Milliken & Batra, 1992; Schendel & Hofer, 1979). Despite this, it is possible that periodic changes of this kind will see the strategy as inert relative to the accumulation of changes in the environment (Burgelman, 1991; Snow & Hambrick, 1980). Drawing on descriptions from the literature, within the realms of the present study we define our construct of *strategic persistence* as "the extent to which

principal investigators are deliberate, sequential and focused in formulating their research projects, and the degree which their research commitments remain stable over time".

Strategic Flexibility

Strategic flexibility can be understood as the ability to implement strategic changes, either by continuously adapting to unanticipated changes, or by successfully adjusting to the more surprising consequences of planned changes (Lei, Hitt & Goldha, 1996; Nadkarni & Narayanan, 2007). The literature is replete with arguments in support of the view that strategic flexibility can positively influence performance (Grewal & Tansuhaj, 2001; Hitt, Keats & DeMarie, 1998; Johnson, Lee, Saini & Grohmann, 2003). Proponents of the flexibility performance link primarily point to its ability to facilitate strategic renewal, creativity, the realignment of resources, and exploitation of internal opportunities in increasingly competitive and dynamic environments. A key facet of strategic flexibility is its tendency to adopt a broad field of vision which helps ensure that relevant opportunities and developments are less likely to evade the strategist's attention, thus ensuring that they can adjust their strategies accordingly, be it towards or away from the opportunity in question (Doz & Kozonen, 2008; Nadkarni et al., 2007). Drawing on these descriptions from the literature, within the realms of the present study we define our construct of *strategic flexibility* as "the extent to which principal investigators are opportunistic and broad focused in formulating their research projects, and the degree to which they are agile and realign their research commitments over time".

Overview of Research Focus

The initiation and coordination of publicly funded research projects by principal investigators has become a far more complex and challenging task. In progressing their careers and satisfying their own research interests, principal investigators must simultaneously conduct

projects that are in line with public policy objectives, which are set out in the calls and tendering processes released by national funding bodies. To operate within such programmatic and imposed strategic contexts principal investigators must adopt varying degrees of flexibility and persistence in anticipating, formulating, shaping and completing their research activities. Little if any attention, however, has been afforded to examining the strategic behaviours of the individual principal investigator in this respect.

METHODS

Data Collection and Analysis

We adopt an interpretive research philosophy and utilised a multiple case study design (Burrell & Morgan, 1979; Yin, 2004). As alluded to already, the subjects of analysis are the cross -disciplined, -gendered, -aged, and -level principal investigators who conceived of and/or coordinated their respective projects. Table 2 presents an overview of the principal investigators and respective projects that were researched.[i]

Table 2

The second phase of data collection included an analysis of documentation relevant to both the project and the CV of the principal investigator (e.g. press releases, interim reports, final reports and workshop brochures, publication listings, patent listings etc.). Our primary research instrument involved thirty semi-structured interviews with each principal investigator amounting to just over 400 pages in transcripts. Analysis involved evidence (key words and phrases) of principal investigator behaviour exemplifying strategic persistence and/or flexibility, as set out in the study's definitions of the two constructs, firstly being coded and later extrapolated from the case studies, and then juxtaposed with findings from each of the other cases. This process had the effect of organising the data into two broad behaviour categories, i.e. 'strategic persistence' and 'strategic flexibility'. Further analysis was then used to sub-categorise the strategic behaviour of the principal investigators within

each of these behaviour categories. This process resulted in two more broad organising categories emerging, this time pertaining to the strategic intentions and behaviours of the principal investigator with respect to applying for or answering funding calls, i.e. reactive and proactive. Table 3 provides a summary of the study's four organisational categories and the key identifiers (words and phrases) associated with each.

TABLE 3

More in-depth analysis and the chronological ordering of these strategic behaviour sub-categories unearthed a fuller understanding of the relationship between the four higher level organising categories.

FINDINGS

Figure 1 depicts the four categorisations of principal investigator strategic behaviours to emerge following our analysis – 'research designers'; 'research leaders'; 'research activists'; and 'research followers'.

FIGURE 1

Research Designers

We found that certain principal investigators, entitled 'research designers' and made up of five professors all involved in basic research, are highly purposeful and outcome oriented in their role, and unerring in their passion and commitment towards their respective research agendas. As one professor commented 'I have no problem with changing your clothes to suit a particular project but not to lose your core. That core is you must have a strong idea of where you are going, where you want to go, and what you want to achieve' (P10.B). Formal planning and the careful alignment of research activities when mapping out their broader research agenda also formed a central component of these principal investigators' behavioural approach. For example, one principal investigator pointed out 'we have particular goals that

we are trying to solve and they are bigger than any one project. I always use projects as stepping stones to solving a particular set of problems…everything has to be interwoven' (P8.B). This finding is further substantiated by the views of another principal investigator of professorial status who commented 'we are always challenging ourselves to see as a group where exactly we are and what do we look like. That is most often the thing that focuses us which is crucial' (P11.B)

The clearly defined and outcome oriented research focus that these principal investigators persist with also ensured that they had a clear understanding of what they wanted to achieve in their discipline and they restricted their research activities and funding applications accordingly. This is exemplified by one principal investigator who remarked 'we want to build expertise and make a difference in our area. You could not do that if you were jumping around with funding. The most fundamental thing is who you are working with and the problem you are working on' (P9.B). Similarly, another professor commented, 'if we want to be successful in heading where we are trying to get to we cannot waste our time solely on trying to get the money' (P8.B). Indeed, it was pointed out by P7.B that such is their clarity around their research focus and intentions that 'there are a lot of very good principal investigators with impressive ideas but they refrain as they don't want to do these within the framework or in the direction the funding agency are trying to push them'. Whilst it is acknowledged that all principal investigators to a certain extent have to tailor their proposals to the wishes of the funding body in question, certain principal investigators are more selective about what they will pursue.

Research Leaders

The most pronounced behaviour category of principal investigators to emerge was varied both in terms of professional ranking and research type (i.e. applied or basic). We found that a selection of professors (6), research directors (4), senior researchers (3) and research leaders (1) involved in both basic and applied science had their strategic behaviour characterised by

their opportunistic nature and reluctance to commit to an overly focused research agenda. For example, one professor pointed out – 'part of the problem of trying to strategically plan out our projects for the next three years is that you get dragged a lot. It is hard to say "I want to work in this area" because you might not get funding or the time' (P3.A). Another professor commented 'it would be nice to be able to say our research focus is only on a, b or c, however, you have to be some bit flexible, we have survived and prospered simply because we have taken this type of strategic view' (P2.B). We would suggest that the decision of these principal investigators to adopt such an agile and emergent behavioural approach was largely explained by their distinct ambitions and determination not to forgo any career and research opportunity. As one senior researcher remarked 'you have to follow the technology and the direction of your field as it can often open up a whole new window of research and opportunity. You cannot ignore it because you know everyone else is going to adopt it in your field' (S4.A).

The agility, ambition and opportunistic nature associated with the strategic behaviours of these 'research leaders' meant that their research focus had the potential to be broadened and was not overly confined. As one director explained – 'we have a very clear core research focus from our founding date but we also have a huge amount of opportunistic funding activity around that core. We build our integrated story around the funding successes rather than defining rigidly what our core is and only applying for funding in that area' (D1.A). Another research director substantiated this behavioural approach when commenting – 'we would understand precisely what research agenda we are trying to drive forward. We always have a set of strategic projects that are promoting ourselves, but we will also opportunistically go into certain projects' (D2.A).

Research Activists

This category was made up four research leaders, a lecturer and one senior researcher involved in both basic and applied research. These principal investigators were similar to

'research designers' in terms of their purposeful and persistent commitment to a clearly defined core research agenda. They also resembled 'research leaders' to the extent that they had a distinct determination to progress their career, albeit within a more confined research area. This is exemplified by the views of one research leader: 'we only apply to the funding schemes that we want rather than the ones that are simply just available' (R8.A).

An almost stubborn determination to further themselves within a specific field, however, meant that they were more at the mercy of funding agencies and more dependent on the need to tailor their funding proposals with the perceived expectations of the funding body. A number of views illustrate this finding. For example, one lecturer suggested: 'you have to read the call's instructions and use this as a template. To get to conduct the research you often have to make it fit' (L1.A). Similarly, a senior researcher commented 'you deliberately frame what it is you believe in a way that answers the funding body's questions fully' (S2.B). Likewise a research leader explained 'while you have a problem you want to look at in an area you are passionate about, you need to make it look like you are solving it in a particular way to satisfy the wishes of the funders and reviewers' (R6.A). This reliance on funding bodies and the reactive behavioural approach towards securing public monies is consistent with our finding that no professor or research director with a more established status or profile was found to be in this category.

Research Followers

These principal investigators were similar to 'research leaders' in terms of the strategic positioning they adopted. However, in being made up of four research leaders and one research officer involved in both basic and applied research, their agile and opportunistic behavioural approach is better explained by the appetite of a more early-career principal investigator than the relentless ambition and levels of achievement associated with proven 'research leaders'. 'Research followers' are akin to research mercenaries and a distinguishable strategic focus in terms of a research agenda with which they are associated is

either absent or at least ill defined. As explained by one professor – 'in science you have some individual or sole traders who have to be highly tactical. They are not really part of the institution's strategic mission and every time smaller funding calls come up they have to try and grasp them' (P7.B). Fitting this description was one research leader who remarked – 'if I take a grandstand, well what if I don't get funded? I think science in general has this randomness about it. I don't think the plans that people use in business apply in science. It has to be based on flexibility' (R4.B).

Consistent with this behavioural approach 'research followers' were also found to be equal if not more pronounced in their efforts to satisfy the wishes of funding bodies in securing public monies. One principal investigator, for example, explained 'for the technology transfer sections in the proposals we would write the script as best we could, and to be honest you say what you think they will believe. It is not all lies but you must put the best foot forward' (R2.B). Another principal investigator pointed out how a template and the recycling of material was regularly used in his funding applications – 'we put together a system where we analysed all the past projects that were done in-house and all the scores so that members of staff could go into our depository and take what they wanted and tweak it as they wish' (R7.A). Table 4 provides an overview of principal investigator behaviour categories and strategies and how they applied to the study's respondents.

TABLE 4

DISCUSSION AND CONCLUDING COMMENTS

Our research makes a number of significant contributions to the strategy and research policy literatures. In uncovering four distinct strategic behaviour categorisations and the importance of strategy to the management of publicly funded research projects we demonstrate the relevance of both literatures to each other. In so doing we have embraced the need to carry out strategy research across different literatures, and to examine strategic processes in

institutional environments undergoing strategic transition (Floyd, Cornelissen, Wright and Delios, 2011). Second, we reveal how increasingly competitive and complex public funding environments create varying degrees of constraint and opportunity in which principal investigators can and must strategise. In this regard we demonstrate support for the contention that there need not be a fundamental opposition of ecological and strategic perspectives when describing the strategy making behaviours of principal investigators (Burgelman, 1991). Furthermore with regard to the identity of different principal investigators we find that they are strategically persistent when they have a clearly defined core research focus which they are passionate about, and exercise strategic flexibility when they are reluctant to commit to a core research agenda. We also indicate that this level of persistence and flexibility in their strategic behaviour is heavily influenced by their professional position or stage of career, and the type of research they are undertaking. Professors carrying out basic research were found to be strategically persistent and selective about their funding applications. Senior principal investigators (primarily) involved in applied research were found to be more strategically flexible and opportunistic in terms of developing their career and research agendas. Furthermore, early to mid stage career principal investigators with less status than their more senior counterparts, and who were involved in both basic and applied research, were found to be far more reactive in sourcing and acquiring public funding for their research endeavours.

Finally, the our findings have a number of implications for the practice of strategy. Firstly, principal investigators respond differently in the manner by which they position themselves, their activities and the manner in which they acquire key resources. Second, organisations would appear to benefit and should consider rewarding the variety in strategy types that are necessary to respond to internal and external demands as well as dealing with uncertainties and ambiguities. Finally, public funding bodies should acknowledge how principal investigators currently perceive and treat funding opportunities, and may wish to revise the balance and range of calls announced and/or the assessment criteria employed.

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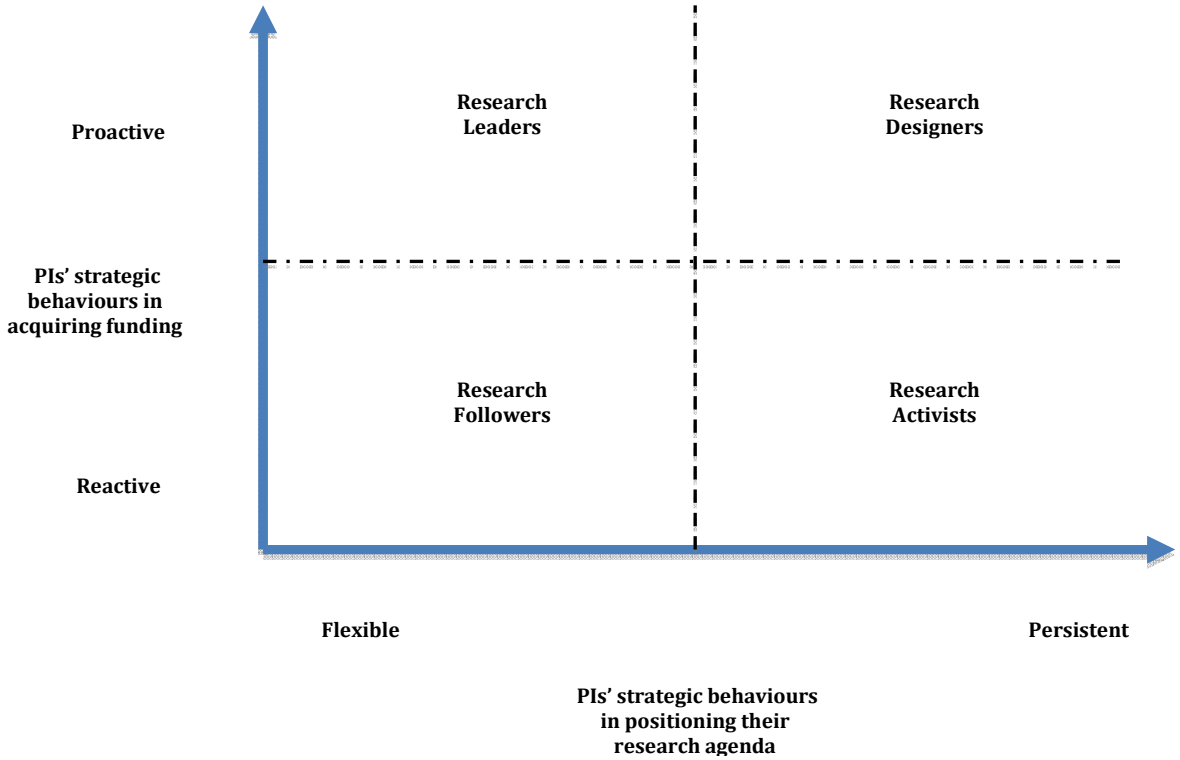
Figures

Figure 1 - Principal Investigator Strategic Behaviour Categories



TABLES

Table 1 - Funding Body Descriptions of the Principal Investigator

Funding Body	Description
Science Foundation Ireland (SFI)	The lead applicant responsible for the scientific and technical direction of the research programme and the submission of reports to SFI. They are the primary contact point and have primary fiduciary responsibility and accountability for carrying out the research within the funding limits awarded and in accordance with the terms and conditions Science Foundation Ireland (SFI)
Irish Research Council for the Humanities and Social Sciences (IRCHSS)	Principal Investigators shall be full-time members of the academic staff, either permanent or on temporary contracts of sufficient duration to cover the period of the project, of a (legitimate) third-level institution. They must be in a position to devote adequate time to the management and realisation of the project. The actual scope of involvement by the Principal Investigators in each project will be considered by the Assessment Board (AB) in their evaluation of the expertise of the proposed research team.
Food Institutional Research Measure	The Principal Investigator is the person who is responsible for the research activities in your area
European Research Council (ERC)	The Principal Investigator is the individual that may assemble a team to carry out the project under his/her scientific guidance
European Medicines Agency (EMA)	The Principal Investigator is the person with the responsibility for the coordination of investigators at different centres participating in a multicentre trial, or the leading investigator of a monocentre trial, or the coordinating (principal) investigator signing the clinical study report
National Aeronautics & Space Administration (NASA)	A Principal Investigator is the individual(s) a research organization designates as having an appropriate level of authority and responsibility for the proper conduct of the research, including the appropriate use of funds and administrative requirements such as the submission of scientific progress reports to the agency
National Science Foundation (NSF)	The Principal Investigator is the individual designated by the grantee, and approved by NSF, who will be responsible for the scientific or technical direction of the project. The term "Principal Investigator" generally is used in research projects, while

	the term "Project Director" generally is used in science and engineering education and other projects
Ivy League Descriptions of the Principal Investigator	
Funding Body	**Description**
University of Pennsylvania	A principal investigator is an individual designated by the University and approved by the sponsor to direct a project funded by an external sponsor. S/he is responsible and accountable to the University and sponsor for the proper programmatic, scientific, or technical conduct of the project and its financial management
Dartmouth University	The Principal Investigator has primary responsibility for achieving the technical success of the project, while also complying with the financial and administrative policies and regulations associated with the award. Although Principal Investigator's may have administrative staff to assist them with the management of project funds, the ultimate responsibility for the management of the sponsored research award rests with the Principal Investigator
Columbia University	The full administrative, fiscal and scientific responsibility for the management of a sponsored project resides with the Principal Investigator named in the award
Brown University	The Principal Investigator is the individual responsible for all scientific or technical aspects of the project and for the overall day-to-day management of the project or program. This person may be any member of the Brown faculty, or, with special permission and the signature of the senior officer for their division, a graduate student, medical student, or an exempt staff member
Cornell University	The Principal Investigator is the individual responsible for the conduct of the project. This responsibility includes the intellectual conduct of the project, fiscal accountability, administrative aspects, and the project's adherence to relevant policies and regulations. A project may have multiple individuals as PIs who share the authority and responsibility for leading and directing the project, intellectually and logistically
Princeton University	A Principal Investigator (PI) is an individual judged by the University to have the appropriate level of authority, expertise, and responsibility to direct a research project or program supported by a grant. There also may be multiple individuals serving as co-PIs who share the authority and responsibility for leading and directing the project, intellectually and logistically. Each PI/co-PI is responsible and accountable to the University for the proper conduct of the project or program. PIs are responsible for mentoring students involved in the project. They are also responsible for fulfilling

	the programmatic, management, and other requirements of the sponsoring organization
Harvard University	A principal investigator is the project director of a research grant or contract responsible for seeing that the work is carried out according to the terms, conditions, and policies of both the sponsor and the university. The principal investigator is solely responsible for the intellectual integrity of the work. Normally, a principal investigator must hold a full-time academic ladder appointment
Yale University	The Principal Investigator is designated by the University and approved by the sponsor to direct a project funded by an external sponsor. S/he is directly responsible and accountable to the University and sponsor for the proper programmatic, scientific or technical conduct of the project, and its financial and day-to-day management. The principal investigator is a critical member of the sponsored project team responsible for ensuring compliance with the financial and administrative aspects of the award. The principal investigator works closely with appropriate administrators within the University to create and maintain necessary documentation, including both technical and administrative reports; prepare budget justifications; appropriately acknowledge external support of research findings in publications, announcements, news programs, and other media; and ensure compliance with other Federal and organizational requirements. It is expected that the principal investigator will maintain contact with the appropriate sponsor representative with respect to the scientific aspects of the project and the business and administrative aspects of the award

http://www.sfi.ie/funding/grant-policies/sfi-investigator-titles/
http://www.irchss.ie/schemes/scheme06/FAQ.htm
www.nuigalway.ie/research/vp_research/.../FIRM%20Presentation.ppt
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Table 2 – Overview of Principal Investigator Interviews

Principal Investigator Details					Project Details		
I.D.	**Gender**	**Title**	**Institution**	**Area of Research**	**Focus**	**Partners**	**Nature**
P1.A	Male	Research and Training Coordinator, Dr.	University	Marine Science	National	6	Applied
O1.A	Female	Research Development Officer, MBA	State Research Centre	Marine Science	National	9	Applied
R1.B	Male	Research Leaders, Dr.	State Research Centre	Food Science	National	2	Basic
R2.B	Male	Research Leader, Dr.	State Research Centre	Food Science	National	3	Basic
R3.B	Female	Head of Food Safety Research, Dr	State Research Centre	Food Science	National	6	Basic
R4.B	Female	Research Leader, Dr.	State Research Centre	Food Science	International	9	Basic
P2.B	Male	Professor	University	Food Science	International	12	Basic
R5.A	Male	Research Leader, Dr.	University	ICT	National	2	Applied
P3.A	Male	Professor	University	ICT	International	2	Applied
R6.A	Male	Research leader, Dr.	University	ICT	International	10	Applied
R7.A	Male	Research Leader, Dr.	Institute of Technology	ICT	International	10	Applied
D1.A	Male	Executive Director	Institute of Technology	ICT	National	2	Applied
D2.A	Male	Executive Research Director, Dr.	Institute of Technology	ICT	International	5	Applied
P4.A	Male	Professor	Institute of Technology	ICT	National	2	Applied
P5.A	Male	Deputy Research Director, Prof.	University	Physics	International	3	Applied
S1.B	Female	Senior Researcher, Dr	University	Physics	National	3	Basic
S2.B	Male	Senior Researcher, Dr.	University	Physics	National	2	Basic
P6.B	Male	Professor	University	Physics	National	2	Basic
P7.B	Male	Professor	University	Physics	National	2	Basic
P8.B	Male	Research Centre Director, Prof	University	Chemistry	International	11	Basic
R8.A	Male	Research Leader, Dr.	University	Chemistry	International	7	Applied
L1.A	Male	Lecturer, Dr.	University	Chemistry	National	2	Applied
P9.B	Male	Professor	University	Geological Sciences	International	9	Basic
P10.B	Male	Professor	University	Biotechnology	International	3	Basic
S3.A	Female	Senior Researcher	University	Biotechnology	International	4	Applied
D3.A	Male	Lecturer, Executive Research Director, Dr.	University	Engineering	National	2	Applied
P11.B	Male	Professor	University	Engineering	National	3	Basic
S4.A	Male	Senior Researcher, Dr.	University	Engineering	International	5	Applied
D4.B	Male	Executive Research Director, Dr.	University	Engineering	International	2	Basic
R9.A	Male	Research Leader, Dr.	Institute of Technology	Engineering	National	2	Applied

Table 3 – Overview of Four Organisational Categories and Key Identifiers

Principal investigator strategic behaviours in positioning their research agenda		
Organising Category	**Strategic Persistence**	**Strategic Flexibility**
Definition	***"the extent to which PIs are deliberate, sequential and focused in formulating their research projects, and the degree to which their research commitments remain stable over time"***	***"the extent to which PIs are opportunistic and broad focused in formulating their research projects, and the degree to which they are agile and realign their research commitments over time"***
Key identifiers from case studies	- 'research purpose' - 'research core/focus' - 'research plans' - 'research clarity' - 'research integration' - 'research strategy' - 'direction' - 'deliberate' - 'passion' - 'patience' - 'commitment' - 'status/profile' - 'introspection' - 'ambition' - 'expertise' - 'collaboration' - 'originality' - 'selective funding	- 'broad focus' - 'flexible core' - 'money/funding' - 'status/profile' - 'follow' - 'achievement' - 'research opportunity' - 'research strategy' - 'determination' - 'career ambition'
Principal investigator strategic behaviours in acquiring public funding		
Organising Category	**Proactive**	**Reactive**
Definition	***"the extent to which PIs rely on their passion for, and the novelty of, their research ideas when applying for public funds"***	***"the extent to which PIs are highly structured in their funding applications and conform to the expectations of the funding body"***
Key identifiers from case studies	- 'core focus' - 'goals' - 'research plans' - 'research clarity' - 'research purpose' - 'deliberate' - 'patience' - 'commitment' - 'selective funding' - 'money/funding' - 'determination' - 'career ambition' - 'achievement'	- 'research flexibility' - 'research fit' - 'career ambition' - 'career focus' - 'funding opportunity' - 'funding body expectations' - 'instructions/guidelines - 'dependent/reliance on funding' - 'application template' - 'systems and processes' - 'pressure' - 'promotion'

Table 4 - Overview of Principal Investigator Behaviour Categories and Strategies

	Research Designers	Research Leaders	Research Activists	Research Followers
Strategy	**Planned**	**Entrepreneurial**	**Process**	**Umbrella**
Status	Professorial	Senior	Early-Mid Level	Early-Mid Level
Project Type	National and International	National and International	National and International	National and International
Research Type	Basic	Applied and Basic	Applied and Basic	Applied and Basic
Description	- Passion for, and commitment towards, a clearly defined core research focus - Incremental and interwoven research agenda - Highly deliberate, outcome oriented and selective about what research activities/funding calls to engage in - Reputation and novelty central to funding successes	- Opportunistic and reluctant to commit to an overly defined core research focus - Career ambitions; a desire to be a part of emerging and complimentary research activities; and concerns regarding funding limitations encourage flexibility - Reputation and novelty central to funding successes	- Persist with clearly defined research objectives - Early to mid-career PIs with a determination to develop a presence in their field - Deliberate tailoring of applications to make them 'fit' with the perceived expectations of the funding body	- Early to mid-career PIs who lack a distinguishable research focus - Ad-hoc research activities and funding applications - Use of templates and deliberate tailoring of funding applications to satisfy funding body expectations
Respondents	Professor (5) [P7.B; P8.B; P9.B; P10.B; P11.B]	Professor (6); Director (4); Senior Researcher (3); Research Leader (1) [P1.A; P2.B; P3.A; P4.A; P5.A; P6.B; D1.A; D2.A; D3.A; D4.B; S1.B; S3.A; S4.A; R9.A]	Senior Researcher (1); Research Leader (4); Lecturer (1) [L1.A; S2.B; R3B; R5.A; R6.A; R8.A]	Research Leaders (4); Research Officer (1) [O1.A; R1.B; R2.B; R4.B; R7.A]

Endnotes

[i] It should be noted that in the interest of confidentiality all respondents were allocated a unique identifier based on their position/status and the nature of research they were involved in. For example 'P1.B' referred to 'professor one who was involved in basic research'. Position/status and nature of research were deemed particularly appropriate for understanding the different strategic behaviours of principal investigators. More detailed analysis by gender, type of institution, specific subject area, partners, and national or international collaboration were beyond the scope of this research. This information was only included to enhance the contextual understanding of the data and respondents utilised, however, it may be used in future research and analysis.