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The Role of Project Coordinators in European Commission Framework Programme Projects

Results of the Innovation Radar PC Survey in FP R&I Projects

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Title:
The Role of Project Coordinators in European Commission Framework Programme Projects. Results of the Innovation Radar PC Survey in FP R&I Projects

Abstract:
This report presents key findings of the Innovation Radar Project Coordinators Survey in European Framework Programme Research and Innovation projects, a purposeful sample of European Framework Programme (FP) Project Coordinators (PC). The objective is to identify the practices and activities of PCs leading EU FP projects and to understand their impact on innovation outcomes. The survey findings confirm the lynchpin role of PCs in the European FP R&I projects. Their role clearly extends significantly beyond that identified in the Horizon 2020 User Guide which sees the PC as "*the main contact point between the consortium and the Commission for a particular grant*". The PC is far more than simply "*the proposal initiator in the submission phase*" but taking account of their prime role in project conceptualisation and consortia formation, the PC is in effect the principal translator of the EC funded research programme and responsible for how the majority of the European research budget is invested. Identifying the PC as a scientific entrepreneur significantly changes how the PC role is viewed. Recognising the PC as a scientific entrepreneur means their engagement with the PC during the project should be less about monitoring and oversight during project implementation, and more about providing the entrepreneur with support.

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Foreword

This report is prepared in the context of the three-year research project on Research on Innovation, Start-up Europe and Standardisation (RISES), jointly launched in 2017 by JRC and DG CONNECT of the European Commission. The JRC provides evidence-based support to policies in the domain of digital innovation and start-ups. In particular:

- Innovation with the focus on maximising the innovation output of EC funded research projects, notably building on the Innovation Radar;
- Start-ups and scale-ups – providing support to Start-up Europe; and
- Standardisation and IPR policy aims under the Digital Single Market priorities.

This research builds on the work and expertise gathered within the EURIPIDIS project.

This report presents the results of the Innovation Radar Project Coordinators Survey in Framework Programme Research and Innovation projects. Overall, the results highlight the role complexities in realising innovation potential and that further research is needed to examine the role given its importance in determining innovation potential for European Framework Programmes.

Acknowledgements

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Executive Summary

> *'The role and impact of Project Coordinators with regards to delivering innovation will be of growing importance, provided that the EU continues to fund basic science and curiosity-driven research.'*
>
> Innovation Radar PC Survey in FP R&I Projects.

This report presents key findings of the Innovation Radar Project Coordinators Survey in Framework Programme Research and Innovation projects, a purposeful sample of European Framework Programme (FP) Project Coordinators (PC). The objective is to identify the practices and activities of PCs leading EU FP projects and to understand their impact on innovation outcomes.

PC Characteristics and Motivations

A typical PC of a European FP project is male, and approximately 50 years old working as a university professor or senior researcher. Their personal motivation is to take on the leadership of a FP project depends on his/her host organisation. University-based PCs take on the PC role because of projects' **scientific opportunities and access to resources**. They are also motivated by the possibility of delivering a **social impact**. Commercial opportunities are incentives for industry-based PCs.

PCs express a strong evaluation of their scientific research knowledge and know-how. University-based PCs are more confident in their scientific research skills, whereas SMEs and Large Organisations PCs were more assured of their abilities with regards to commercialisation, project management and leading interdisciplinary projects.

Project Factors – Complexity and Challenges

PCs need to be competent to work across **several disciplines** and with different researchers and project partners from several disciplines as 55% of the projects surveyed reported that they incorporated more than two research disciplines. University-based PCs are more likely to work with two or more disciplines than PCs from private firms.

On average, PCs lead a project with 11 partners from nearly 6 countries. This means that PCs are managing already complex state-of-the-art scientific projects, with the additional challenge of difficult communications, cultural differences, and managing technology commercialisation.

Project Co-ordination Activities

The PC has primary responsibility for creation of the project concept in almost 60% of projects surveyed. The PC also has the primary responsibility for selection of project partners and planning timelines and budgets in a majority of projects. For planning **scientific and innovation goals it is the responsibility of the wider consortium** rather than the PC.

Once the project is funded, PCs become task oriented with their primary focus on delivering project tasks, controlling project resources, task planning and project reporting. Activities that are likely to influence post project outcomes such as managing technology transfer and commercialisation activities and managing interactions with external stakeholders are perceived to be of lower importance.

PCs also consider managing **technology transfer and commercialisation activities as most challenging task to manage**.

Project Impacts – Innovation Potential

PCs leading projects delivering **high innovation potential outcomes** perceived **institutional, project and market factors as significantly more important** to those projects that delivered low innovation potential outcomes.

Project consortia factors - the working relationships of the project consortia, the complementarity in knowledge across the partners, and clear alignment of tasks and objectives for each partner - were significantly more important than the other factors highlighting the importance of the PC project management role.

Significant differences exist in PC activities for high and low innovation outcomes between the two groups with respect to managing **technology transfer** and **commercial activities** with high innovation projects scoring this factor significantly higher than low innovation projects. Differences are also found for **managing external stakeholders** with high innovation projects scoring this item higher than low innovation projects.

Collaboration impact as measured by enhancement of the scientific and network relationship between the project partners also received a high level of importance from PCs.

Scientific opportunities of the project, access to additional research resources and the potential of the project to impact on society are personal PC motivators that significantly contribute to the innovation potential of FP research.

Conclusions and Recommendations

The survey findings confirm the lynchpin role of PCs in the European FP R&I projects. Their role clearly extends significantly beyond that identified in the Horizon 2020 User Guide which sees the PC as "*the main contact point between the consortium and the Commission for a particular grant*". The PC is far more than simply "*the proposal initiator in the submission phase*" but taking account of their prime role in **project conceptualisation** and **consortia formation**, the PC is in effect the principal translator of the EC funded research programme and responsible for how the majority of the European research budget is invested.

Identifying **the PC as a scientific entrepreneur** significantly changes how the PC role is viewed. From an EC perspective, recognising the PC as a scientific entrepreneur means their engagement with the PC during the project should be less about monitoring and oversight during project implementation, and more about providing the entrepreneur with support. In practical terms, strengthening the role of PCs would involve:

- Wider Role Recognition
- Tailored Role Preparation Development
- Enhancing Local Professional Supports to Realise Innovation Potential
- Increasing Female PC Participation in European Framework Programmes
- European Framework Supports for PCs
- Closing the Market Gap - Project Design and Delivery Innovation Potential Assessment
- Evaluation Criteria Reconfiguration

1 Introduction and Context

> *'A poor coordinator can shipwreck a project, but a good coordinator should stay rather invisible. Good project design is essential, meaning that it leads to a win-win for each individual partner.'*
>
> Innovation Radar PC Survey in FP R&I Projects

The European Framework Programmes have provided a means for collaboration between higher education institutions, public research organisations, civic society, SMEs, large enterprises, not-for-profit entities, regulators, industry associations, and other eligible stakeholders including local, regional and national government agencies across the European Union to pursue common research that can have potential impacts including scientific, technological, regulatory, societal and social etc. The European Framework programmes have led to the creation of different forms of research collaborations that have yielded research and cost synergies and enhanced the knowledge base of collaborating partners (Caloghirou et al, 2001). For example, Barajas et al, (2012:917) empirical study of Spanish participants in EU Framework Programmes between 1995 and 2005 found that: '(i) R&D cooperation has a positive impact on the technological capacity of firms, captured through intangible fixed assets and (ii) the technological capacity of firms is positively related to their productivity.'

At the centre of leading such large-scale multi-stakeholder pan-European research consortia are Project Coordinators (PCs) who are responsible for all aspects of such projects including the realisation of project level innovation potentials[1]. The individual in the PC role takes on multiple roles and responsibilities such as research scientists, research strategist, economic agent technology and knowledge transfer, collaboration and value creation, managerial and governance[2]. PCs do not receive any specific role preparation training to take on this critical and invisible role in leading such large-scale multi-stakeholder projects. In essence, they learn on the job how to discharge the PC role effectively. There is a growing body of research and empirical studies that have focused on the PC (see Cunningham et al., 2019; Cunningham et al., 2016; Del Guidice et al., 2017; Mangematin et al, 2014; McAdam et al., 2010; O'Kane et al, 2015; O'Reilly and Cunningham, 2017). However, there have been no studies to date that have specifically examined the PC role in the context of European Framework Programmes.

The Innovation Radar is an initiative from the European Commission that assesses the innovation potential of innovation projects supported by European Framework research programmes to understand the barriers and bottleneck to technology transfers emanating from the Framework Programme projects (see Box 1). The current report presents the results of the *Innovation Radar PC Survey in FP R&I Projects* 2019. The purpose and focus of this report is:

- To identify the practices and activities of PCs leading EU Framework programmes.
- To understand the impact/influence of the PC role and activities on the innovation potential of EU Framework programmes.
- To better understand the PC role success factors that can lead to project level innovation potential.

[1] Defined by De Prato, G., Nepelski, D., & Piroli, G. (2015b).

[2] See Cunningham, J. and O`Reilly, P. (2019).

Box 1: Innovation Radar: identifying innovations and key innovators in the EU Framework Programme

The Innovation Radar (IR) is an EC initiative whose main objective is to detect innovations and key innovators in EU-funded R&I projects (EC, 2014). The key element of the IR is the Innovation Radar Survey (IRS) developed by DG CONNECT and DG JRC (De Prato, Nepelski, & Piroli, 2015a). The IRS collects information on innovations developed by collaborative consortia in EU-funded research and innovation projects, their types, commercialisation plans and needs.

During its life-cycle, a FP project goes through three formal reviews. The IRS accompanies these reviews. At each review, based on information provided by project consortia, innovation experts can identify up to three innovations per project and up to three key organisations behind these innovations.

Innovation surveys, such as the IRS, suffer from the abundance of scattered information based on responses to individual questions. Simple indicators do not capture the complex reality of the dynamics innovation processes and the linkages between the actors and their practical application in the policy making purposes is limited. One way of addressing this limitation is to develop complex indicators (Arundel, 2007; Arundel & Hollanders, 2005). Such indicators can reveal significantly more about innovation activities, models and strategies than simple indicators relying on the frequency of responses to a single question (OECD, 2009). Therefore, the IR methodology includes the Innovation Potential and Innovator Capacity Assessment Frameworks. Whereas the first one makes use of complex indicators to capture the complexity of innovation development and commercialisation process, the second one profiles the innovators behind these innovations.

During the design phase of the Innovation Radar survey and assessment frameworks, external experts in technology commercialisation and technological entrepreneurship were consulted (McFarthing, 2015; Wilson, 2015). After the pilot data collection, the IR methodology and indicators used were statistically validated (Van Roy & Nepelski, 2018).

2 Project Coordinators

> *'Need official recognition within the local institutions of the important role of Project Coordinator.'*
>
> Innovation Radar PC Survey in FP R&I Projects

2.1 The PC Role Definition

The term PC is a commonly understood role within higher educational institutions and public research organisations in particular, and indeed in any organisation where there is collaborative research programmes. For scientists who take on the PC role for the first time it is viewed as an important career milestone and a prestigious career achievement (see Cunningham et al, 2014; Romano et al, 2017). Reflecting diverse activities contained within the role, Cunningham et al (2016) define PCs as: 'scientists who orchestrate new research projects, combine resources and competencies, deepen existing scientific trajectories or shape new ones that are transformative in intent, nature, and outcome that can be exploited for commercial ends and or for societal common good.' Other empirical studies of PCs affirm the leadership role of PCs due to their scientific expertise and report that they have the ultimate role responsibility for ensuring that the project is completed successfully against original project objectives (see Boehm and Hogan, 2014; Feeney and Welch, 2014, O'Kane et al., 2017; Kidwell, 2013). While the PC term is commonly used and understood, it is observed that science funding bodies, academic institutions and public research organisations have their own definitions which emphasise different aspects of the PC role (see Cunningham et al., 2014). The European Commission description as outlined in Table 1.1 clearly illustrates the PC is the initiator of a project submission for peer evaluation right through to project implementation and completion when awarded a grant.

Table 1.1 European Commission Definition of a Project Coordinator

The **Principal Coordinator** (PC) is the researcher applying for the EC grant. By creating a proposal in the Funding & Tenders Portal, the PC gets the role of "Primary Coordinator Contact (PCoCo)". As the host organisation, the PC should encode the organisation (via its Participant Identification Code – PIC) that would host the future project in case the proposal is successful (i.e. if the PC plans implementing the project at an institution different from its current employer, the PIC of the future host institution must be used, not the one of the current employer).

The ***Primary Coordinator Contact*** is nominated for each project as the main contact point between the consortium and the Commission for a particular grant. By default this is the proposal initiator in the submission phase.

The PCoCo can nominate or revoke an unlimited number of Coordinator Contacts (CoCos), who will then have the same rights - except the right to revoke the PCoCo.

All Coordinator Contacts can:

— nominate/revoke Participant Contacts for other organisations in the consortium Coordinator - for this reason, it is important to give all your partner organisations access to the proposal on the Funding & Tenders Portal as soon as possible.

— nominate/revoke Task Managers and Team Members in their own organisation

— assign Legal and Financial Signatories in their organisation to their projects

— make changes to project documents on the Funding & Tenders Portal

— submit proposals and project documents to the Commission

Source:*http://ec.europa.eu/research/participants/docs/h2020-funding-guide/user-account-and-roles/roles-and-access-rights_en.htm*

2.2 PC Role and Responsibilities

'At the end of the day, good research is done by individuals. Making individuals with different work styles to cooperate efficiently has been a huge challenge. Similarly, continuous harmonisation of the personal goals of individual researchers, and some transient and short term goals of individual partners, to follow the overall goals of the project has been challenging.'

Innovation Radar PC Survey in FP R&I Projects

The key role responsibilities of PCs are: (i) scientific leadership; (ii) delivering research dissemination and impact; and (iii) managing resources and relationships (see Cunningham et al., 2014). These responsibilities align to the standard criteria applied in EU funded research – Excellence, Impact, and Implementation.

The PC role is both complex and challenging. For example, as scientists for European Framework Programmes, the PC typically initiates a research project through mobilising a group of European scientists, industry and other relevant partners to develop a research-based work programme over a number of months (and in some cases years) that will have beneficial impacts to stakeholders and realise wider impacts. When awarded the funding, the PC role then becomes focused on ensuring that the planned project is delivered successfully, and that each partner fulfils their planned activities on time, and within the allocated budget. In designing the research project and its associated work programme, the PC has planned for effective project management, positive project dynamics, and strategic complementarity to ensure that the project is feasible and can be successfully delivered. Typically, project collaborators can be drawn from other European countries, from different disciplines, and from different industry or organisational settings. This can result in unexpected challenges for PCs in leading and managing such research consortia (see Cunningham et al., 2014). The key primary responsibility of PCs is providing scientific leadership that manifests itself initially through the research project proposal and then through the implementation and the delivery of the funded project. However the PC fulfils other roles – *research strategist, agent of economic policy, knowledge and technology transfer, collaborator and value and managerial governance*[3].

For the *research strategist role* the PC is constantly strategising about mobilising additional resources and networks to enable them to pursue their research ambitions and objectives, through boundary spanning activities. This often involves exhibiting scientific entrepreneurship traits.

The PC as *an agent of economic policy* means through the implementation of their funded research programmes that this yields knowledge that can be exploited typically through technology transfer mechanisms that will generate some wider level economic impacts.

The *knowledge and technology transfer* PC role involves initiating the exploitation of knowledge generated from the project with the support of their host institution and their project partners. This activity can contribute and support the innovation potential of the funded project, however some studies investigating the PC's role have found that they can face barriers in undertaking this aspect of the role.

In fulfilling the *collaboration and value creation role* the PC assembles research partners to secure competitive funding to realise planned research programmes. The rationale for including collaborative research partners includes access to complimentary expertise, resources, networks, equipment etc. The PC role is to assemble the best research consortia to realise the overall project objectives and secure the available resources, including funding. In addition, to secure the participation of collaborative research partners, the PC needs to understand the value motives of each partner and through their participation in research consortia how value is created for each project stakeholder. In order to do this effectively PCs need to have strong simmellian ties with

[3] See for an expand overview of these roles see See Cunningham, J. and O`Reilly, P., (2019).

industry, government, end users/consumers and other academics (see Cunningham et al, 2018).

In the PC *managerial and governance role*, they act as an agent and principal for the funding agency, and therefore have to allocate the costs and benefits to each partner through their own capabilities. The PC has to manage different governance systems of their own host institution, and that of their partners as well, thus creating a project governance system that supports the successful implementation of their project plan. The managerial aspect of the role is taking on managerial tasks associated with the project such as managing budgets, people, processes, and timelines. In fulfilling these roles, typically PCs in this role have to balance these activities with other responsibilities such as academic or research responsibilities.

Taking account of these roles, Cunningham and O'Reilly (2019) posit that the threshold responsibilities of PCs centre on the following:

- *Research Leader* – delivering stated research objectives.
- *Resource Allocator* – acquiring and deploying resources.
- *Innovation Enabler* – envision and maintain scientific and innovation alignment.
- *Project Co-Ordinator and Manager* – delivery of project objectives on time.
- *Boundary Spanner* – Management and coordinate internal and external boundaries.

2.3 Managing PC Role Tensions

'As a general remark I find industry and academia often have an uneasy marriage in large-scale projects. Industry often wants quick wins and prefers to divert funding towards already running internal projects, and considers the project to be a low-risk endeavour (as all financial risk covered by the EC funding) in which positive outcomes are welcomed, but often not actively pursued. On the hand, academia has very different incentives. Academics often stand not to gain from industry, and the reward model is different. Academics think long-term, and are rewarded in prestige, PhD degrees, publications, incentives which industry has no affinity with. I believe that the forced marriage between industry and academia in EC projects really needs to be carefully looked at, as the model we had in H2020 is not necessarily optimal.'

Innovation Radar PC Survey in FP R&I Projects

The nature of the PC role requires a careful management of tensions that arise from balancing and shaping scientific impacts, whilst aligning these with realising the innovation potential of the funded project through knowledge and technology transfer mechanisms. The PC is required to have a boundary spanning entrepreneurial opportunity orientation to deal with these tensions (Cunningham, 2019). The PC must reconcile these tensions effectively within these projects in order to successfully realise the project objectives.

The first of these tensions resides around *scientific versus economic objectives*. On the one hand, scientists have been trained to be excellent researchers, however they are now being expected to be knowledge brokers and technology transfer agents in exploiting the new knowledge that they create. The tension arises in how to balance these objectives in a manner that effectively delivers quality research and while also exploiting it through commercialisation.

The second source of tension centres on *balancing governance and fiduciary responsibilities*. The PC has to ensure that the allocated project budget is spent in accordance with the funding specific requirements. On the other hand, the PC has to ensure that an appropriate governance system is put in place for the project that addresses scientific, financial and other governance issues. This in turn means that the PC has to balance project research management with their scientific leadership of the project. The danger for PCs is that they spend a significant amount of their time on research management and less on scientific leadership and expertise, one of determining factors that enabled them to secure funding in the first instance.

The final tension is focused on *managing market shaping expectations*. To be successful, and indeed continue to be successful in securing research funding, the PC needs to demonstrate, and in some instance validate, the market potential of the research project. One of the on-going tensions is managing the market exploitation expectations of partners while also ensuring that the project is adaptive to meet any significant external market environmental changes that ultimately may change commercial value of knowledge generated from funded projects.

3 Data

This section provides an overview of the development of the Innovation Radar PC Survey in FP R&I Projects, data collection and data analysis, and limitations of the study.

3.1 Questionnaire Development

Examining the roles and responsibilities based on a wider literature review provided an identification of PC roles and responsibilities, along with the identification of antecedent factors for the PC affecting effectiveness and impact of project technology transfer and innovation outcomes (Cunningham and O`Reilly 2019). This review identified project level organisation factors affecting project coordination and effectiveness and the impact of projects for delivering innovations. It also examined effectiveness and impact criteria relevant to project delivery and the PC role. This lead to the identification of a range of factors relevant to the PC role as outlined in Table 3.1.

Table 3.1: PC Role: Key Identified Factors

Outside of their primary scientific responsibilities, we examined **roles, responsibilities and activities of PCs** as:

- Research strategist
- Agent of economic and policy
- Knowledge and technology transfer
- Collaboration and value creation
- Managerial and governance

The **antecedent individual factors** that influence PCs that we observed in our review are:

- Personal motivation
- Networks
- Individual knowledge and knowhow
- Incentives
- Policy environment
- Career trajectory, experience and professional development
- Other relevant and discrete factors – scientific domain, time allocation and gender

Project organisation factors that we identified include:

- Diversity of discipline
- Size of consortia
- Diversity of institution context
- Boundary spanner
- Research collaboration management capabilities

Effectiveness and impact: We identified the following effectiveness and impact factors as:

- Scientific impact
- Technology transfer impact and project innovation
- Scientific and technical human capital impact
- Economic impact
- Societal and social welfare impacts
- Collaboration and political impacts

Source: Cunningham, J. and O`Reilly, P., (2019).

Taking these identified factors into account the questionnaire was designed accordingly. The questionnaire has 23 questions (See Appendix 1 for final questionnaire) and consists of five main sections including:

(i) Personal details

(ii) Personal research activities and experience

(iii) Project details and design

(iv) Project coordination activities

(v) Project impact

3.2 Data Collection

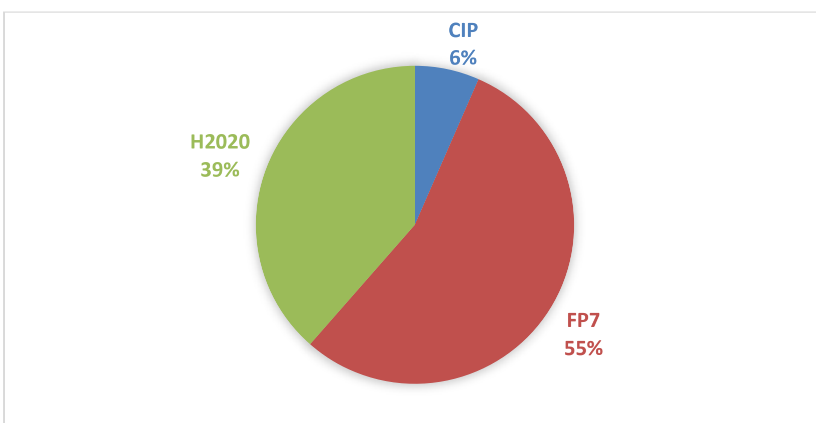
We pilot tested our questionnaire with 30 PCs some drawn from the European Commission Framework Programmes including FP7, Horizon 2020 and Competitiveness and Innovation Framework Programme. Through this process we refined the questionnaire further. Our random sample survey of PCs was taken from the Innovation Radar dataset. The finalised questionnaire was distributed electronically to 1,000 European Commission Framework Programme PCs. This yielded 269 useable responses, which equates for 26.9 per cent response rate. The questionnaire was administered by the Joint Research Centre between May and June 2019.

The projects included in the survey were funded through 3 European Commission funding schemes:

1. Competitiveness and Innovation Framework Programme (CIP) - With small and medium-sized enterprises (SMEs) as its main target, the CIP supports innovation activities (including eco-innovation), provides better access to finance and delivers business support services in the regions.
2. Framework Programmme 7 (FP7) - FP7 was the European Union's Research and Innovation funding programme for 2007-2013.
3. Horizon 2020 (H2020) - H2020 is the financial instrument implementing the Innovation Union for 2014-2020.

The survey respondents included 18 CIP projects, 151 FP7 projects, and 106 H2020 projects (see Figure 3.1).

Figure 3.1: Survey project funding sources



Source: Innovation Radar PC Survey in FP R&I Projects, 2019.

3.3 Study Limitations

The main study limitation is that our sample focused on the projects that were scanned by the Innovation Radar pilot phase, which covered mainly the ICT domain. Nevertheless our analysis further confirms findings of other empirical studies of PCs. We suggest that there is generalisability of our findings across other European Framework Programmes.

4 Project Coordinator Antecedent Individual Factors

'There is a need for the coordinator to have strong R&D leadership background in commercial environment'

'It was people driven and required passion for the subject.'

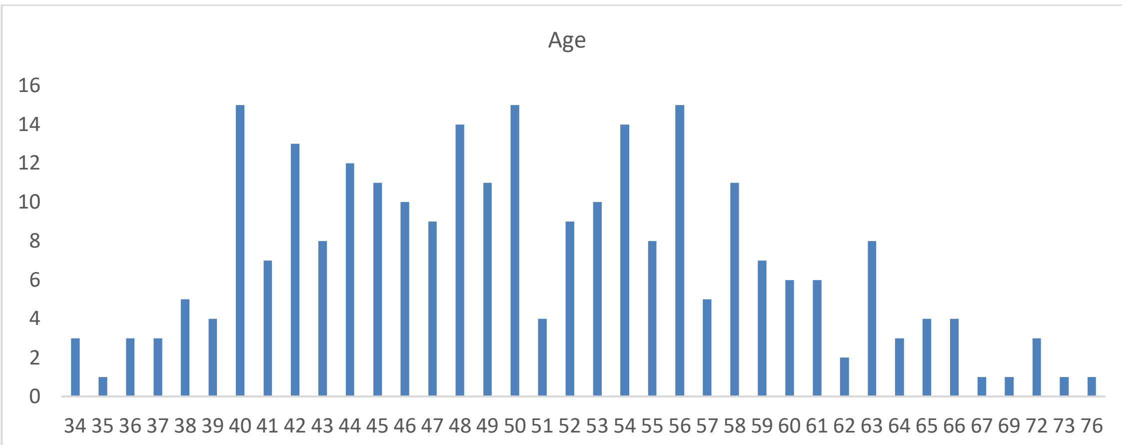
Innovation Radar PC Survey in FP R&I Projects

This section presents the results of the analysis of the influence of antecedent individual factors of PCs, and in particular the personal motivations to become a PC, knowledge and know-how factors.

4.1 PC age, gender and occupation

The mean age of the 269 survey respondents was 50.4 years and with minimum age as 33 years and the maximum age as 76 years (see Figure 4.1).

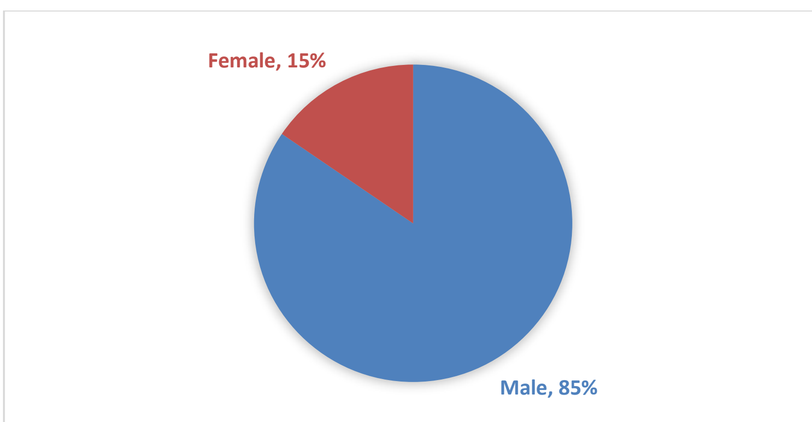
Figure 4.1: PCs age distribution



Source: Innovation Radar PC Survey in FP R&I Projects, 2019.

According to Figure 4.2, 85% of PCs that participated to the survey are male.

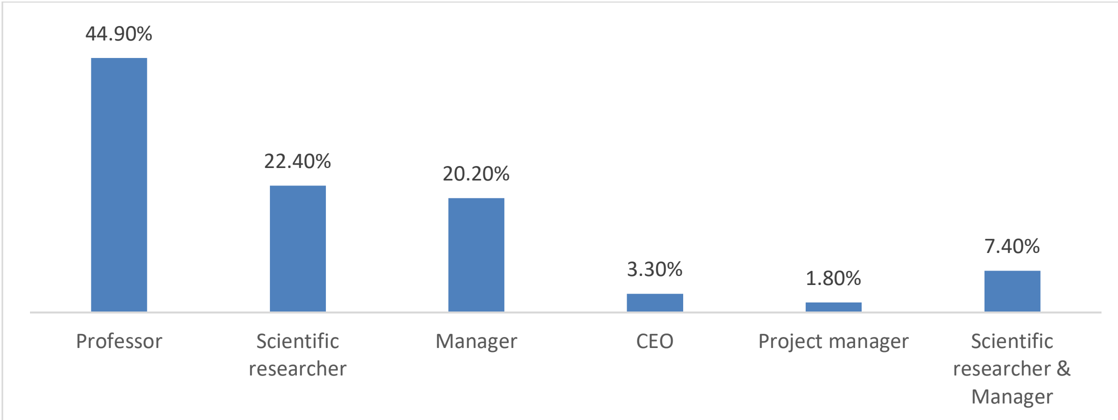
Figure 4.2: PCs occupations



Source: Innovation Radar PC Survey in FP R&I Projects, 2019.

PC were asked about their current job title and 45% reported that they were professors, 22% scientific researcher, 20% manager, 3.3% CEO, less than 2% project manager and 7% scientific researcher and manager (see Figure 4.3).

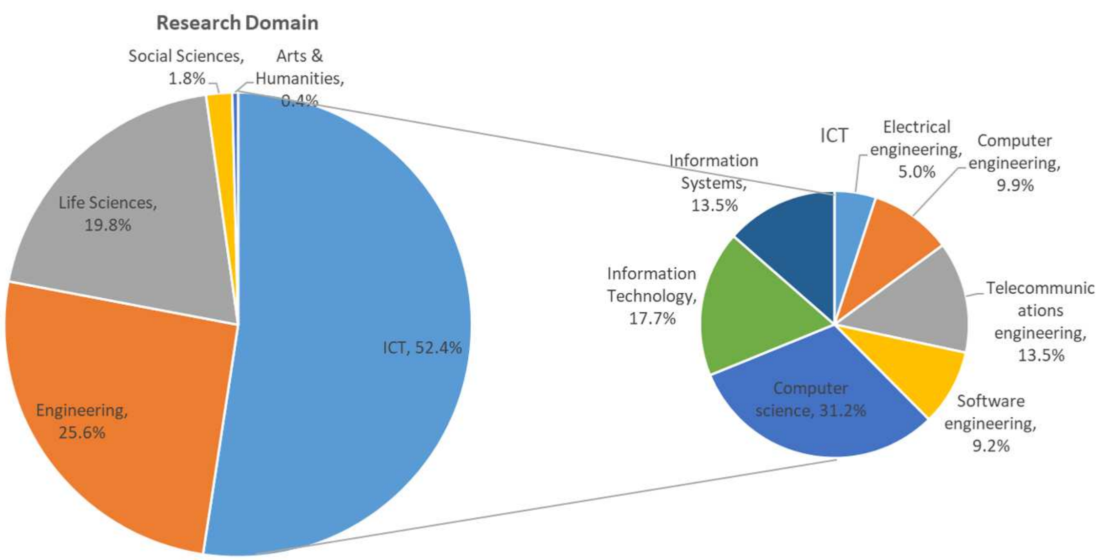
Figure 4.3: PCs occupations



Source: Innovation Radar PC Survey in FP R&I Projects, 2019.

In relation to research domain some 52% per cent of respondent were in the ICT, 26% in engineering, 20% in life sciences, less than 2% in social sciences and 0.4 per cent in arts and humanities (see Figure 4.4). Within the ICT sector 31% of respondent were in computer science, 13.5% in computer science, 13.5% in telecommunications engineering, 10% in computer engineering, 9% in software engineering and 5% in electrical engineering (see Figure 3.5).

Figure 4.4: PC research domain



Source: Innovation Radar PC Survey in FP R&I Projects, 2019.

4.2 Personal Motivations to become a Project Coordinator

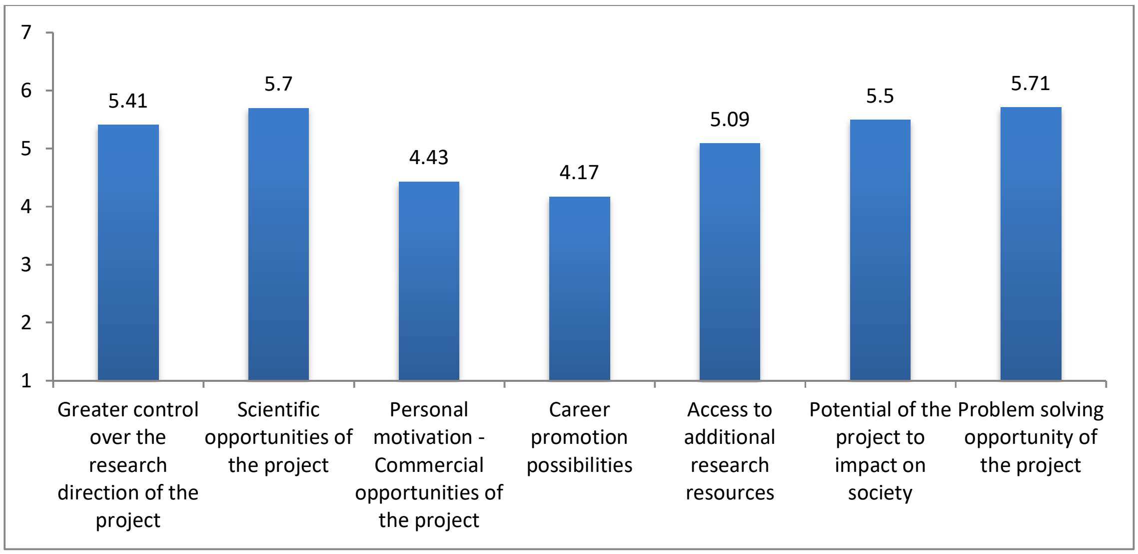
Cunningham et al (2016) in their empirical study of the motivations of PC in taking on the responsibility of the role identified a number of push and pull factors for this decision.

Key pull factors included control, career ambition and advancement, personal drive and ambition, and push factors identified were project dependencies and institutional pressures. Previous studies of PCs and scientists found that their main motivation for taking on the role of PC in a project relates to seeking and prioritising new knowledge.

Scientists choose to become the PC on projects to control their research agenda, fearful that if they do not take on this role that they will concede resources and influence (see Cunningham et al., 2016).

Our findings confirm the PC's strong personal motivation for accessing the scientific opportunities of the project and having control over their scientific direction. The data presented in Figure 4.1 below provide average responses to these motivators, where 7 is rated as very important and 1 rated as not important. PCs also identified a strong project outcome application motivation. Overall, career promotion possibilities relating to taking on the role of PC were considered less important (mean response = 4.17).

Figure 4.1 PCs personal motivations to become a PC



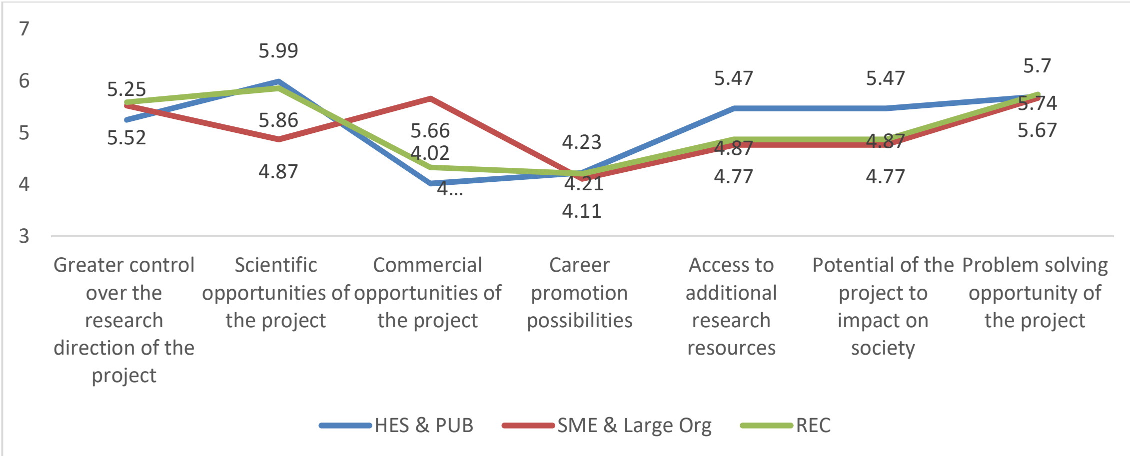
Source: Innovation Radar PC Survey in FP R&I Projects, 2019. Note: 1=not important, 7=very important; mean responses.

PC personal motivations to become a Project Coordinator by host organisation type

The project PCs involved in the study are based in a range of institutions – universities, research centres, commercial organisations, and public bodies. Each type of organisation will have its own mission and purpose for engaging European Commission FP projects, so it would be expected that the PC's employer organisation mission focus will impact on the PC's individual personal motivations for taking a leadership role in any given project.

From Figure 4.2 it can be seen that private entities are more motivated by commercial opportunities of the project with universities and research centres more driven by the scientific opportunities of the project, access to additional research resources, and the societal impact of the research. Means across the three organisation types were analysed to examine whether differences existed with respect to PC personal motivations. The instances in which differences were found were with regards to scientific opportunities of the project, commercial opportunities of the project, and access to additional research resources. This highlights commercial entities' focus on positive market outcomes while research bodies are more motivated by research and scientific outputs. Full results of these tests are provided in Appendix 2, Table A1.

Figure 4.2: PCs personal motivations to become a PC by host organisation

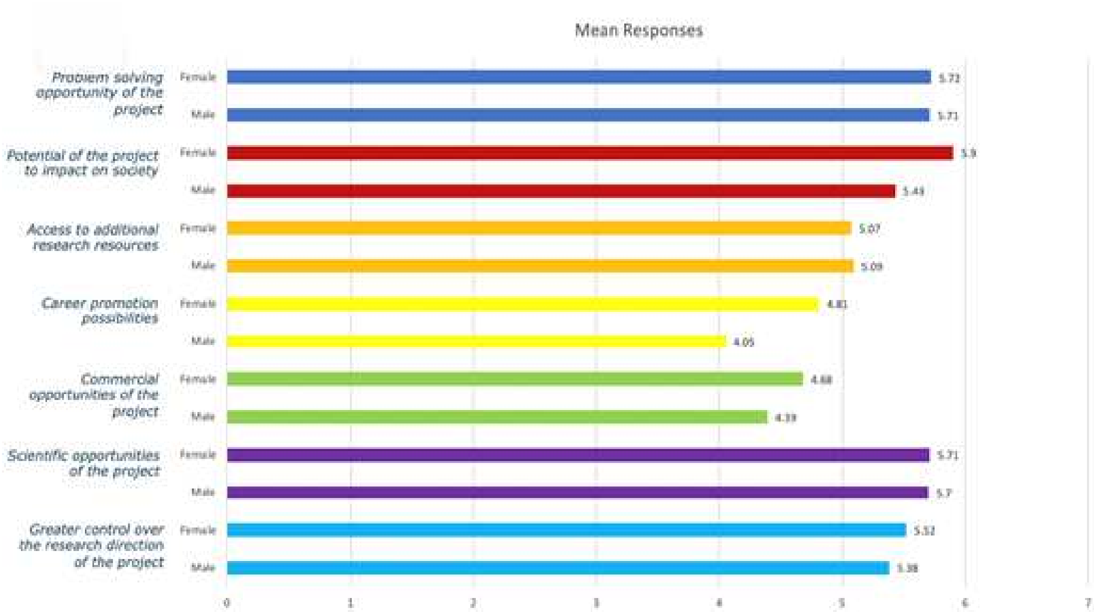


Source: Innovation Radar PC Survey in FP R&I Projects, 2019. Note: 1=not important, 7=very important; mean responses.

PC personal motivations to become a Project Coordinator by gender

A previous study of PC gender noted some PC gender differences (see Cunningham et al., 2017). Overall the potential of a PC leadership role to impact on career promotion possibilities for the PC was not very important. Interestingly, female PCs reported this as a significantly more important motivator than the male counterparts (see Figure 4.3). The potential impact of the research on society was also given a higher level of motivation by female PCs than male PCs. Full results are provided in Appendix 2, Table A2.

Figure 4.3: PCs personal motivations to become a PC by gender



Source: Innovation Radar PC Survey in FP R&I Projects, 2019. Note: 1=not important, 7=very important; mean responses.

4.3 PC knowledge and Know-How

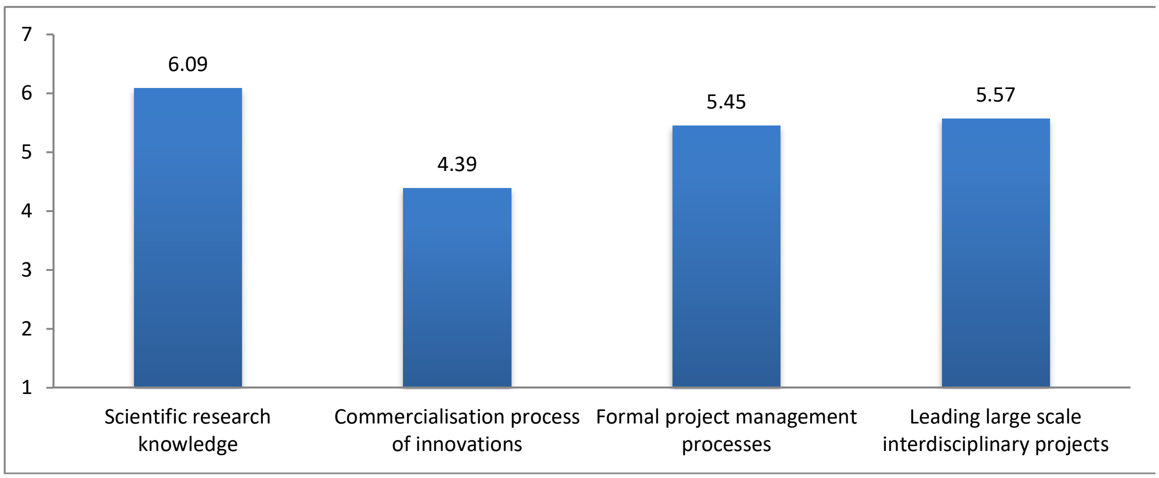
'The right balance of the technical, market and EC projects procedures knowledge is the key.'

Innovation Radar PC Survey in FP R&I Projects

PCs have knowledge and experience in their domain that is codified in academic outputs such as academic journal papers and patents. In addition, PC knowledge and know-how can be developed in environments and organisations outside their own institutional research and organisation environs. Such knowledge and know-how might be garnered through industrial experiences and the resultant knowledge and know-how can be used by the PC in the delivery of project innovation outcomes, and also in managing a pan-European research consortia with all the associated project management complexity.

Our findings indicate that PC's are confident in their scientific research knowledge while they are less confident in their understanding of the commercialisation of innovations (see Figure 4.4). A paired comparisons t-test between these variables indicated a significant difference in the means.

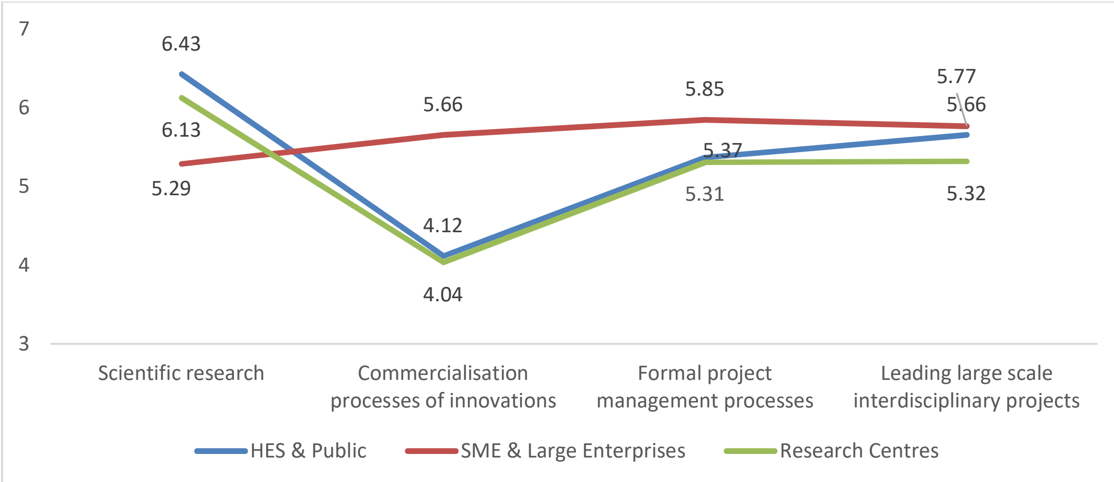
Figure 4.4: PCs' assessment of personal knowledge and know-how



Source: Innovation Radar PC Survey in FP R&I Projects, 2019. Note: 1=very poor, 7=excellent; mean responses.

Depending on their host organisation type, PC's differed significantly in their personal evaluation of their knowledge across the four key activities surveyed: (i) scientific research; (ii) commercialisation processes; (iii) project management skills; and (iv) leading large interdisciplinary projects. Interestingly but not surprising, HES (Higher or Secondary Education Organisation) and public body based PCs were more confident in their scientific research skills, whereas SMEs and Large Organisations were more assured of their abilities with regards to commercialisation, project management and leading interdisciplinary projects (see Figure 4.5). Full results in Appendix 2, Table A3.

Figure 4.5: PCs' assessment of personal knowledge and know-how by organisation type



Source: Innovation Radar PC Survey in FP R&I Projects, 2019. Note: 1=very poor, 7=excellent; mean responses.

4.4 Implications

In the main, the survey respondents confirmed expectations and the findings are in line with those of other studies. The personal motivations for taking on the PC role in the surveyed projects are potential scientific opportunities and access to resources for HES and public body PCs. For industry-based PCs the main personal motivator is commercial opportunities. HES and public body PCs also indicated a higher motivation for delivering a public good impact. Career motivations were not particularly important for PCs overall, although slightly more important for female PCs.

Overall PCs express a strong evaluation of their scientific research knowledge and know-how. This is as expected, as the typical PC has attained a senior position in their organisation and would require a strong profile to validate the commitment of consortia partners and deliver a positive evaluation at the proposal phase of the research funding programme.

In terms of professional development, PCs from HES and public bodies placed significantly lower evaluations of their knowledge and expertise in leading large interdisciplinary projects, project management, and particularly commercialisation processes compared to their industry-based counterparts.

5 Project Characteristics and Factors

'The diversity of project stakeholders was most challenging but after team building most important for the success.'

'I had a problematic partner and spent a lot of energy with EU support to handle that.'

'*Consortium leadership and clear organisation, roles and communication among partners I think is critical to maintain focus among the team.'*

Innovation Radar PC Survey in FP R&I Projects

European Framework Programmes at their core foster pan-European research collaborations between research organisations, industry and other relevant stakeholders. The sought benefits from such collaborations include the achievement of faster outcomes, shorter product lifecycles and competitive advantages (Edmondson and Nembhard, 2009). Previous studies indicate that larger project teams also provide a greater chance of recombining different types of knowledge, expertise and ideas, and thus innovation (Powell et al, 1996; Ruef, 2002). However, the benefits of diversity come at a cost. Under some circumstances, the coordination costs may outweigh the positive ones. This section analyses the role of PC in introducing complexity into the collaborative projects and how it affects their innovative output.

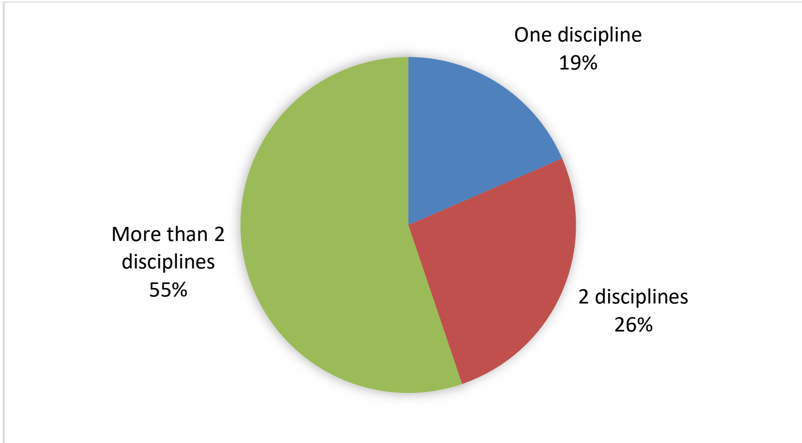
5.1 Project Complexity

Number of research disciplines

Multidisciplinary research is defined as the spanning of a diversity of knowledge areas, which could be disciplines, technological fields or industrial sectors (Rafols and Meyer 2010). In terms of research funding systems promoting multidisciplinary research, the thinking is that bringing together actors from different domains provides for a greater diversity of idea generation and creativity (Alves et al, 2007) and increases the likelihood of innovation (Cummings, 2005), particularly recombinant innovation (Fernandez-Ribas and Shapiro, 2009). However, multidisciplinary research is not without challenges. For example, too much distance between disciplines can lead to communication problems (Jeong and Lee, 2015).

Where a discipline is defined as a particular branch of knowledge (e.g. biomedical engineering), PCs were asked how many research disciplines could be identified. Not surprisingly, given the structure of EC research funding programmes, less than 19% of projects were based on a single discipline, and just over one-quarter were based on only two disciplines. In total, 55% of the projects surveyed reported that they incorporated more than two research disciplines (see Figure 5.1). This suggests a relatively high level of interdisciplinary complexity of a large proportion of EC funded research, requiring the PC to be competent to work across several disciplines and with different researchers and project partners from several disciplines. It also raises issues in relation to complexity in project conceptualisation and planning.

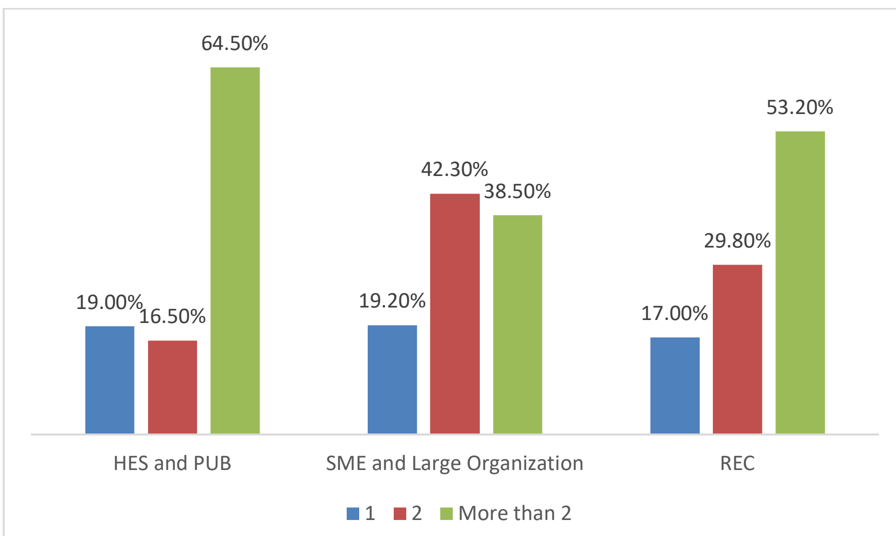
Figure 5.1: Research disciplines within projects surveyed



Source: Innovation Radar PC Survey in FP R&I Projects, 2019.

To determine whether there was a relationship between organisation type and number of disciplines involved in the project, statistical tests were used. The results revealed that PC in HES and public bodies are more likely to work with two or more disciplines (64.5%). A bar chart illustrating these differences is shown in Figure 5.2 below. Crossstabulated data is provided in Appendix 2, Table A4.

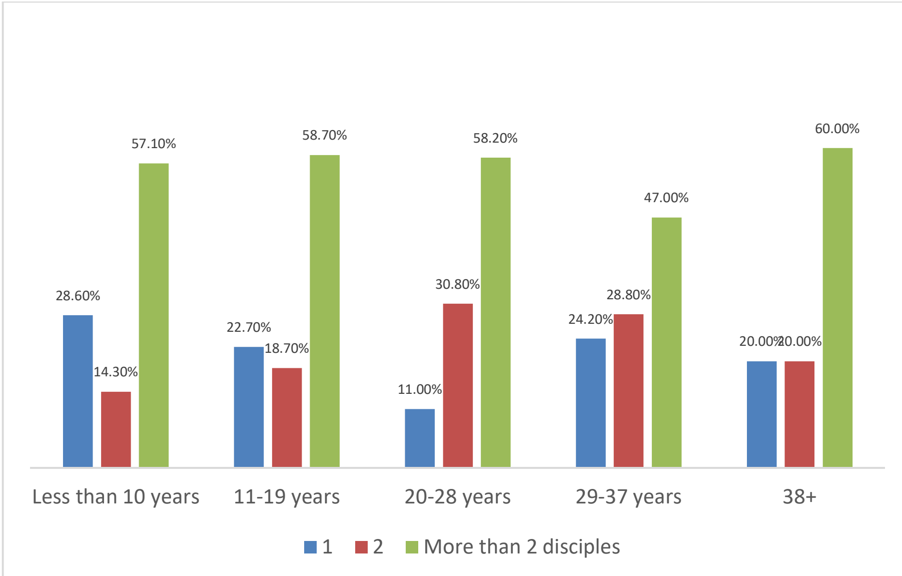
Figure 5.2: Number of disciplines allocated in projects by PC organisation type



Source: Innovation Radar PC Survey in FP R&I Projects, 2019.

No significant differences were found in the number of disciplines involved in projects based on the level of experience or gender of the PCs surveyed (see Figure 5.3 below), indicating that multidisciplinary challenges for PCs are similarly distributed across organisation types.

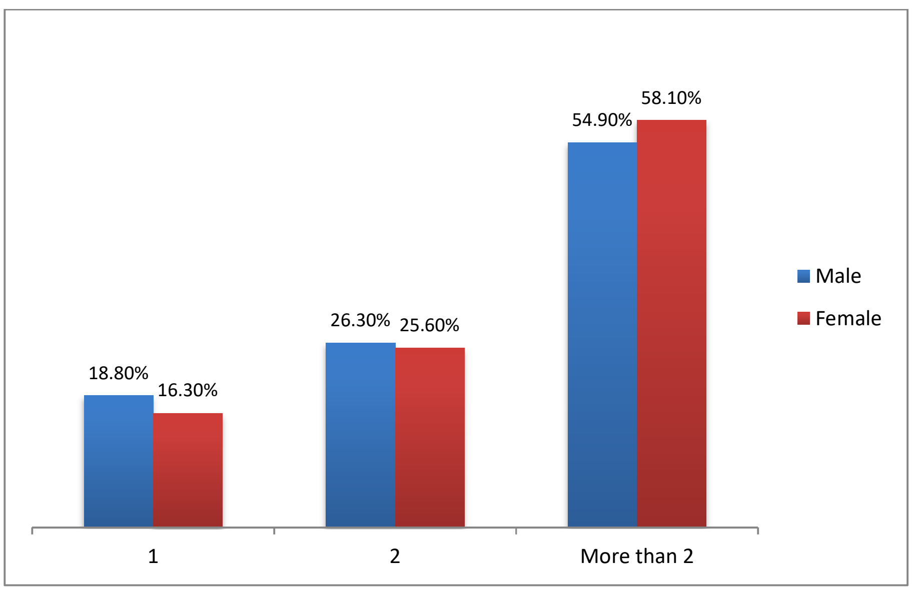
Figure 5.3: Number of disciplines allocated in projects by experience of PC



Source: Innovation Radar PC Survey in FP R&I Projects, 2019.

Gender differences were also examined with respect to number of disciplines allocated. Again no statistical differences were found here with a similar pattern emerging across the sexes despite the fact that there are fewer female PCs. Results are shown in Figure 5.4 below.

Figure 5.4: Number of disciplines allocated in projects by PC gender



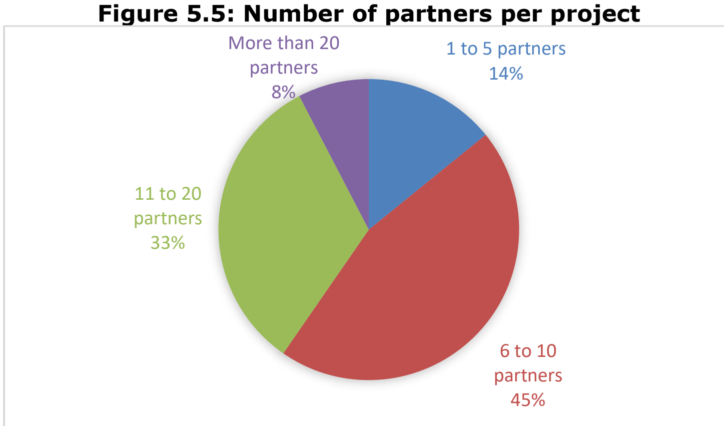
Source: Innovation Radar PC Survey in FP R&I Projects, 2019.

Number of project partners

When a large number of parties are involved, the process of communication, agreement, problem-solving and project coordination requires a complex process of integration and coordination of knowledge (Jeong and Lee, 2015). Creating such research consortia can also provide PC with additional challenges. The more complex and diverse research consortia are, it adds additional burdens in terms of co-ordination and costs (see Cunningham and O'Reilly, 2019).

The number of project partners involved in the projects surveyed ranged from 1 to 44 partners, with on average just less than 11 partners and a median of 9 partners per project reported. Fifty-nine per cent of projects reported up to 10 partners. From a project complexity perspective 33% reported between 11 and 20 partners and 8% reported more than 20 partners (see Figure 5.5).

Figure 5.5: Number of partners per project



Source: Innovation Radar PC Survey in FP R&I Projects, 2019.

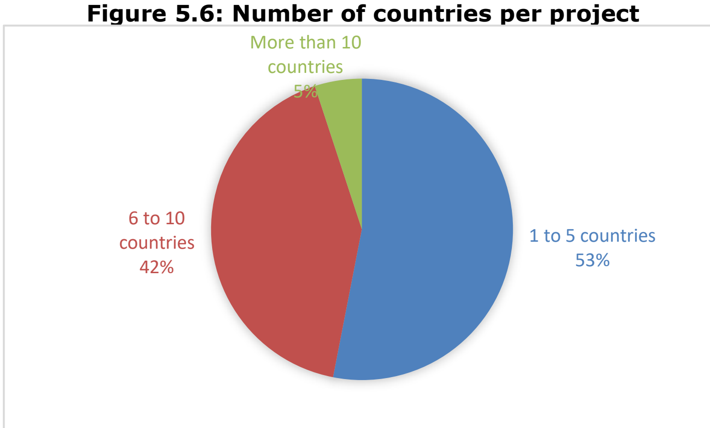
Interestingly, no significant differences were recorded for the number of partners involved in projects according to the PC's own organisation type. ANOVA for number of project partners by PC organisation type are provided in Appendix 2, Table A5.

Number of countries

Diversity in terms of the nationalities of the members, exposes the research team to different norms and beliefs, possible difficulties in communicating across cultural categories (Dahlin et al, 2005), and higher costs of coordination and management. Having international teams can also hamper diversity creation. Cultural differences lead to difficulty in transference or decoding of certain types of messages (Lundvall, 1992). Hence, the costs of international teams can exceed the gains of diversity (Faber et al, 2016; Sirmon and Lane, 2004), since resources can be diverted into smoothing cultural differences in the team, which comes at the expense of innovation and diversity creation (Nepelski et al, 2019).

The number of countries represented by partners in the projects surveyed ranged from 1 to 27 countries, with an average of 5.7 countries and a median of 5 countries reported across the projects. More than half of the projects (53%) involved partners from between 1 and 5 countries, and 42% of the projects involved partners from between 6 and 10 countries. Only 5% of projects were found to have more than 10 countries represented (see Figure 5.6).

Figure 5.6: Number of countries per project



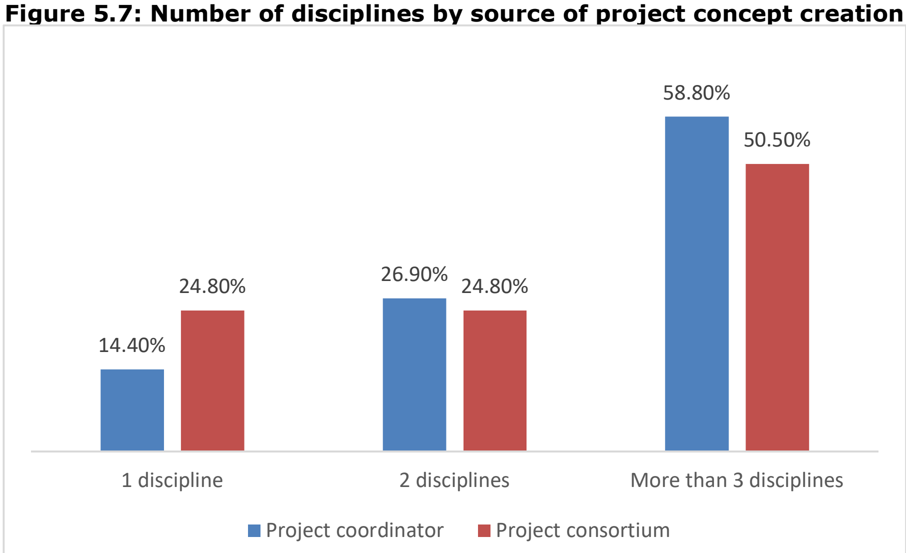
Source: Innovation Radar PC Survey in FP R&I Projects, 2019.

Influence of PC versus project consortium in introducing project complexity

The survey asked PCs whether the PC or the project consortium had responsibility for creating the project concept. To examine whether differences in complexity existed between projects which originated from one individual versus the wider consortium, t-tests were run. Full t-test results are shown in Appendix 2, Table A6.

With regards to the number of disciplines, again no statistically significant differences were found between coordinator driven project concepts versus consortium driven project concepts. For this, a cross-tabulation with χ^2 analysis was used. Full results shown in Appendix 2 with a bar graph illustrating the data given in below.

Figure 5.7: Number of disciplines by source of project concept creation



Source: Innovation Radar PC Survey in FP R&I Projects, 2019.

Impact of project complexity on innovation potential

A multiple linear regression was used to determine the impact of project complexity on average innovation potential. Project complexity was measured by number of disciplines, number of partners, number of countries and project size in terms of value. A significant positive result was found (F (3, 272) = 2.951, $p < .03$) which although was significant, produced a weak R^2 of 0.032. The number of countries and the project size in terms of value did not offer significant results in terms of the average innovation potential. However, the results for the number of project partners was significant ($B = .218$, $p =$

.017). This indicates when a larger number of partners are involved in a project, the likelihood of positive innovation potential outcomes is greater.

5.2 Implications

The survey identified high levels of project complexity across the portfolio of EC funded research. Several findings are worth highlighting.

Disciplinary complexity: More than 55% of projects involved more than two disciplines, requiring the PC to be competent to work across and integrate several disciplines. In terms of the formation of projects it means that PCs are networking with potential collaborators that are outside of their discipline. It is unclear whether the level of multi-disciplinarity is driven by the PCs and their collaborative networks or by the specific nature of the research topic calls. With PCs having responsibility for shaping the project concepts, which capture the discipline design of the projects, the capacity of PCs to conceptualise multidisciplinary projects is demonstrated.

Interestingly, the survey found significantly higher levels of disciplinary complexity in projects led by PCs from HES and public bodies. This raises a number of questions. First, is there a capacity or confidence among enterprise-based PCs to design multi-disciplinary projects? Second, given that industry-based PCs are more motivated to deliver market driven outcomes, is there a requirement for multi-disciplinary project to deliver innovation outcomes? And third, what scientific motivations are influencing HES and public research centre PCs to design such projects and what scientific planning horizon are they to?

Number of partners and countries: Project complexity is added to by the number of partners in a project and the geographic distribution of these partners. Extensive consortia management challenges are confirmed by the findings that the average EC funded project surveyed involves around 11 partners located in approximately 6 countries, with much larger numbers in some projects. This means that PCs are managing already complex state-of-the-art scientific projects, with the additional challenge of difficult communications, cultural differences, and complicated access to partners.

These complexities place a significant ambidextrous challenge on PCs the PC's capacity to implement technical project management approaches while at the same time using soft skills of influencing, negotiation, and communications. Evidence from other studies suggests that each of these are areas learned on the job and are not part of the PC's training and development, particularly for HEI and public body PCs, where professional development tends to be technical in nature. From a policy development perspective in relation to EC funded research programmes, the reliance of on-the-job learning, and particularly the importance of prior project management and coordination experience of PCs, is significant at the research proposal evaluation phase.

6 Project Coordinator Activities Factors

'Keep to the plan. Do not give in to consortium internal pressure, but still - be flexible when the situation calls for it. If problems surface, try to solve them asap, in extra face - to-face meetings if needed. Frequent task and WP meetings lead by WP leaders. Delegate technical decisions as much as possible. Seek consensus.'

'Impact is created with Face-to-Face planning/developing/reporting meetings, so that team spirit is created and co-operation deepened - not by allowing the project partners to do what they want themselves.'

Innovation Radar PC Survey in FP R&I Projects

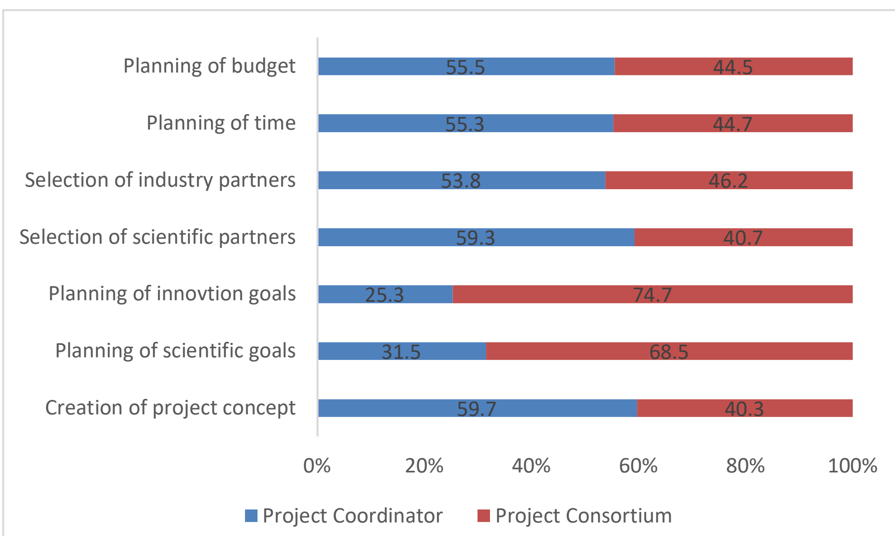
6.1 PC Project Development Responsibilities

The role of PCs as co-ordinator between different disciplines, different points of view and logics to deliver targeted outcomes has been approached in several studies (Adler et al, 2009; Bozeman and Corley, 2004; Comacchio et al, 2011; Jain et al, 2009). The PC coordinates the efforts of actors from different areas, including academia, higher education, policymakers and enterprise. Their role requires them to articulate different objectives, timeframes, logics and cultures. The primary role responsibility of PCs is scientific leadership but they fulfil other roles.

Distribution of project development responsibilities

In order to better understand who had primary responsibilities for planning, consortium assembly, goal setting and concept development tasks, PCs were asked to indicate whether the PC or the project consortium had primary responsibility for each task area (see Figure 6.1). The results indicated that the PC has primary responsibility for these tasks in many projects. Significantly, the PC had primary responsibility for creation of the project concept on almost 60% of projects surveyed. This clearly makes PCs a lynchpin in the design of programmes of research across Europe. The PC also has the primary responsibility for selection of project partners and planning timelines and budgets in a majority of projects. Planning of scientific and innovation goals however is the responsibility of the wider consortium (69% and 75% respectively).

Figure 6.1: Primary responsibility for project development tasks



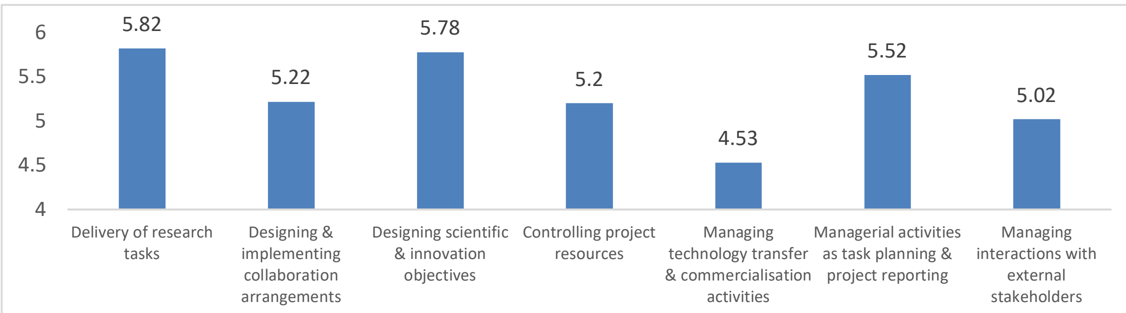
Source: Innovation Radar PC Survey in FP R&I Projects, 2019.

6.2 PC Activities in Delivering Innovation Potential Outcomes

> *'It was important, and still is, involve potential project stakeholders in technology transfer activities, because of the perceived distance between project results and product development.'*
>
> *'Co-design of end-user engagement is key for deployment of outcomes!'*
>
> Innovation Radar PC Survey in FP R&I Projects

PCs were asked to evaluate the importance of a range of project coordination activities in delivering the projects stated innovation objectives. Not surprisingly, the delivery and completion of research tasks was considered the most important. Interestingly, given that the question was asked in the context of delivering innovation objectives, activities relating to managing technology transfer and commercialisation of research received the lowest evaluation (see Figure 6.2).

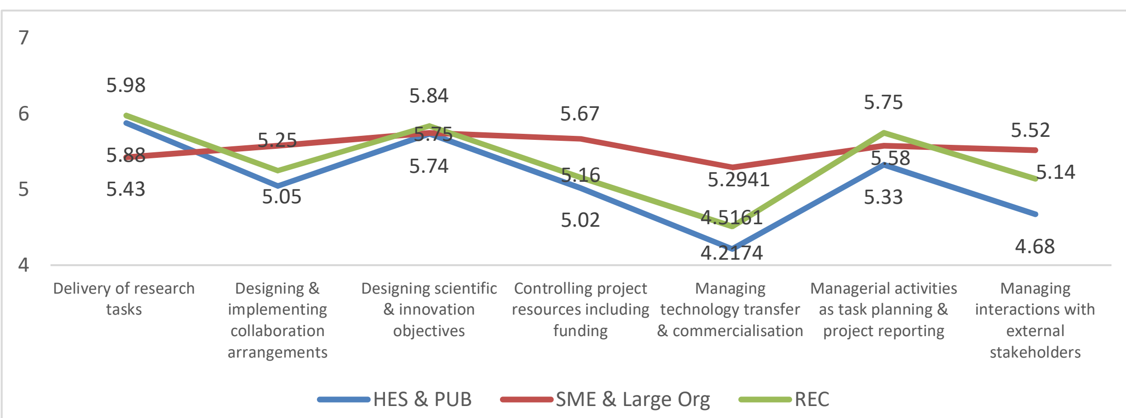
Figure 6.2: PC evaluation of importance of PC activities in delivering the project's innovation objectives



Source: Innovation Radar PC Survey in FP R&I Projects, 2019. Note: 1=not important, 7=very important; mean responses.

The data was explored to examine whether PC activities differed across the organisation included in the study. A number of key differences were found, most interestingly that HES and public organisations are significantly different to commercial organisations with regards to management of resources and technology transfer. This is shown in Figure 6.3 below. Full ANOVA results are provided in Appendix 2, Table A7.

Figure 6.3: PC evaluation of importance of PC activities in delivering the project's innovation objectives by organisation type



Source: Innovation Radar PC Survey in FP R&I Projects, 2019. Note: 1=not important, 7=very important; mean responses.

Impact of PC activities on innovation potential

T-tests were used to examine whether differences exist in PC activities for high and low innovation outcomes. Significant differences were found to exist between the two groups with respect to managing technology transfer and commercial activities with high innovation projects scoring this factor significantly higher than low innovation projects. Differences are also seen with regards to managing external stakeholders with high innovation projects scoring this item higher than low innovation projects. Full results are shown in Table 6.1 below.

Table 6.1: PC evaluation of importance of PC activities in delivering the project's innovation objectives for high and low potential innovation

	Mean	*SD*	*t*	*P*
Delivery of research tasks			.498	.619
Low Innovation potential	5.85	1.30		
High Innovation potential	5.77	1.29		
Designing and implementing collaboration arrangements			-1.345	.180
Low Innovation potential	5.11	1.37		
High Innovation potential	5.34	1.38		
Designing scientific and innovation objectives			-.483	.629
Low Innovation potential	5.74	1.20		
High Innovation potential	5.81	1.10		
Controlling project resources including funding			-.986	0.325
Low Innovation potential	5.11	1.39		
High Innovation potential	5.28	1.46		
Managing technology transfer and commercialisation activities			-2.929	.004**
Low Innovation potential	4.26	1.53		
High Innovation potential	4.81	1.50		
Managerial activities as task planning and project reporting			.224	.823
Low Innovation potential	5.53	1.39		
High Innovation potential	5.50	1.33		
Managing interactions with external stakeholders			-2.711	.007**
Low Innovation potential	4.75	1.71		
High Innovation potential	5.28	1.43		

Source: Innovation Radar PC Survey in FP R&I Projects, 2019. Note: ns = not significant, ** = p < .001

6.3 PC Delivery Challenges

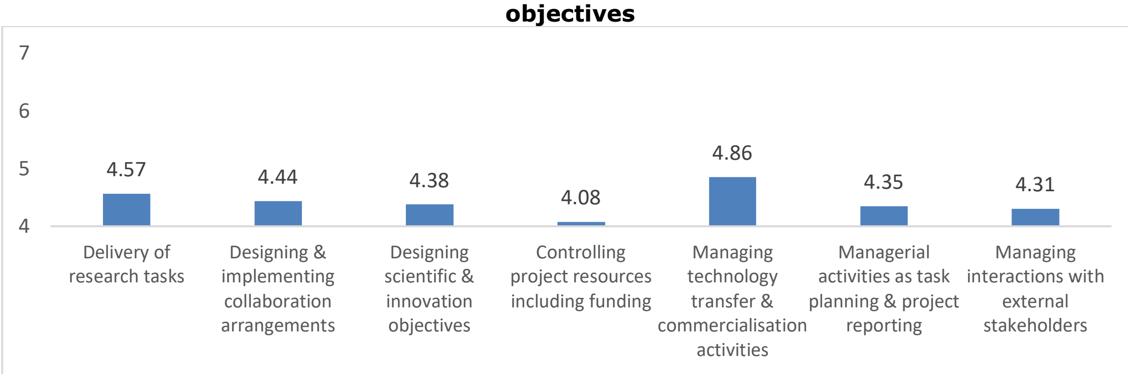
'The different approaches of the partners in the different countries was something enriching and challenging at the same time. Another thing I would like to remark was that we had to realize the project in unfavourable context. The market penetration of electric vehicles was much lower than expected. Managing the differences among partners and the progress of the project (reviews, deliverables…) was one my main activities.'

'The project co-ordinator lacks power to ensure partners deliver assigned tasks which makes it difficult at times to manage and ensure the project delivers as promised.'

Innovation Radar PC Survey in FP R&I Projects

The PCs were asked to evaluate the level of challenge involved in implementing a range of PC activities. Figure 6.4 presents the findings as perceived by PCs. Overall, the most significant challenges that PC reported in delivering innovation objectives centred on managing technology transfer and commercialisation activities. Interestingly the PCs also experienced challenges relating to the delivery of research tasks.

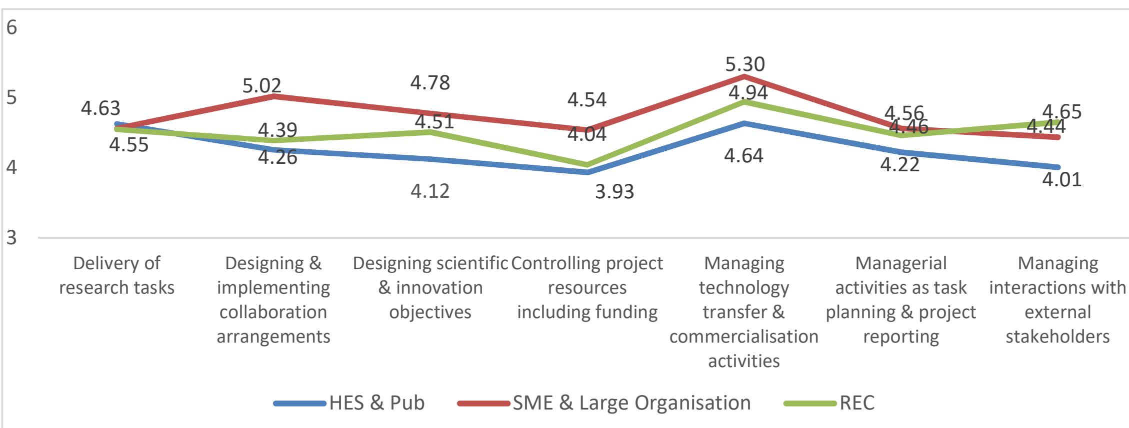
Figure 6.4: How challenging were PC activities in delivering the project's innovation objectives



Source: Innovation Radar PC Survey in FP R&I Projects, 2019. Note: 1=not at all challenging, 7=very challenging; mean responses.

Organisational differences were also examined and it was found that for designing and implementing collaboration arrangements, SMEs and Large Organisations found this to be particularly difficult in comparison to their public counterparts (see Figure 6.5).

Figure 6.5: How challenging were PC activities in delivering the project's innovation objectives by PC host organisation



Source: Innovation Radar PC Survey in FP R&I Projects, 2019. Note: 1=not at all challenging, 7=very challenging; mean responses.

Interestingly, SMEs and large enterprises find each of the activities more challenging than public bodies. This is most likely explained by the increased pressure and emphasis within these bodies for market and commercialisation opportunities. In the question which asked PCs to rank design challenges it was found that SMEs and large enterprises placed significantly more importance on this factor. Full reporting of these results can be found in Appendix 2, Table A8.

Gender

With regards to gender differences, no differences were found apart from on Managing Technology Transfer and Commercialisation Challenges, with women PCs finding the Commercialisation process more difficult than male PCs.

6.4 PC Project Impacts

'I think that to bring an innovative into a market product is a 20 years' period.'

'If you want coordinators to spend more effort on innovation, reduce the disproportionately large administrative burden!! Also, provide a better recognition for coordinating support staff. I was a CO-coordinator. This survey is the FIRST TIME this role was recognised by the EC and its officer.'

Innovation Radar PC Survey in FP R&I Projects

6.4.1 Project design impact criteria

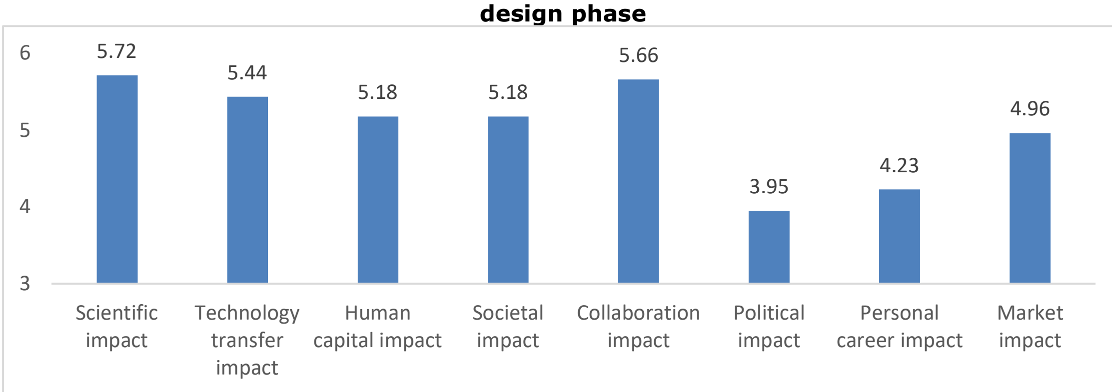
A widely quoted definition of a project is as 'a set of activities with a defined start point and a defined end state, which pursues a defined goal and uses a defined set of resources', and which has cost, quality, and time objectives and a project lifecycle (Slack et al, 2004). Measurement of PC effectiveness is intrinsically tied to the success or otherwise of the overall research project or research programme. The project management literature identifies a range of potential effectiveness criteria and these have been developed further in the innovation literature, particularly by Bozeman (2000, 2014). For the purposes of this study the following impact criteria were developed from the literature:

i. Scientific impact (e.g. number and quality of peer reviewed publications);
ii. Technology transfer impact (e.g. movement of know-how, technical knowledge or technology externally from the project);
iii. Human capital development impact (e.g. researcher learning and development including education);
iv. Societal impact (e.g. enhanced societal and public welfare outcomes);
v. Collaboration impact (e.g.: enhancement of scientific and network relationship between project partners
vi. Political impact (e.g. enhancement of project consortia in perspective of key funding and policy agents)
vii. Personal career impact (e.g.: enhancement of personal career positioning); and
viii. Market impact (e.g. Development of new product or service from project).

PCs were asked to rate the importance of each of these impact criteria during the project design phase (see Table 6.6).

Overall, scientific impact was significantly more important than market impact. Interestingly, collaboration impact as measured by enhancement of the scientific and network relationship between the project partners also received a high level of importance from PCs, indicating a level of importance being placed on the sustainability of relationships in the project consortium post project.

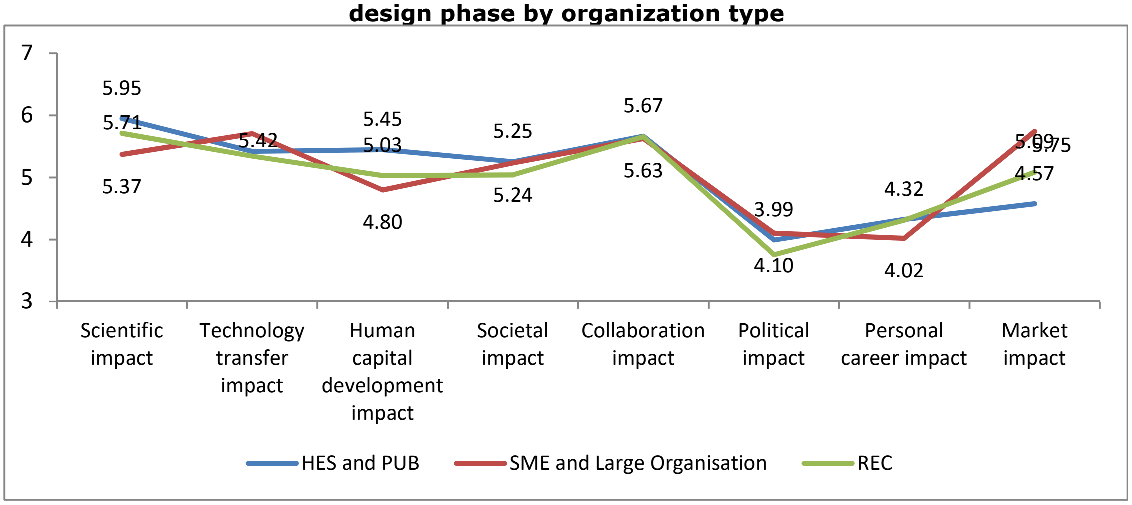
Figure 6.6: PC assessment of the importance of project impact criteria during project design phase



Source: Innovation Radar PC Survey in FP R&I Projects, 2019. Note: 1=not important, 7=very important; mean responses.

Again differences were examined between organisations and it was found that for Scientific Impact, HES and Public Bodies were significantly different to private entities such as SMEs and Large Organisations. Figure 6.7 below graphically illustrates the means across the organisation with respect to this question.

Figure 6.7: PC assessment of the importance of project impact criteria during project design phase by organization type



Source: Innovation Radar PC Survey in FP R&I Projects, 2019. Note: 1=not important, 7=very important; mean responses.

Significant differences were also found between organisations with respect to market impact, with HES and PUB and SMEs and Large organisations significantly different from one another. Not surprisingly, SMEs and large organisations placed greater emphasis on market impact, as demonstrated in Figure 6.7 above. No significant differences were found between the three organisation types (HES and public bodies, SMEs and large enterprises, and research centres) with regards to technology transfer, human capital development, societal impact, collaboration impact, political impact and personal career impact.

6.4.2 Factors for Successful Innovation Outcomes

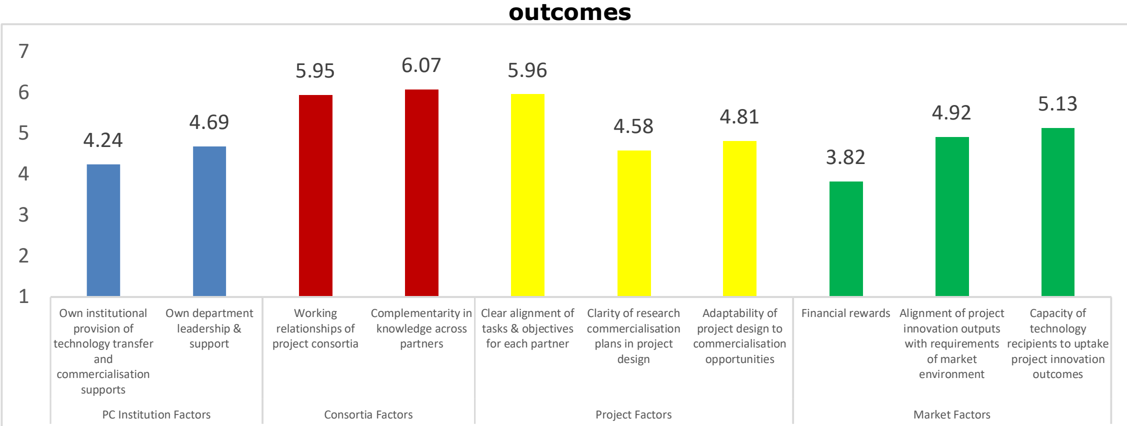
'I had the pleasure to work with a very strong consortium. In that framework, I really enjoyed very much my role as project coordinator. Further I would like to emphasis the very positive role of the project officer, who helped me in many different issues related to the good development of the project.'

'Consortium leadership and clear organisation, roles and communication among partners I think is critical to maintain focus among the team.'

Innovation Radar PC Survey in FP R&I Projects

PCs were asked to evaluate the importance they placed on a range of institutional, project consortia, project, market factors for the delivery of successful innovation outcomes for the project. Project consortia factors including the working relationships of the project consortia, the complementarity in knowledge across the partners, and clear alignment of tasks and objectives for each partner were significantly more important than the other factors (see Figure 6.8), highlighting the importance of the PC project management role.

Figure 6.8: PC assessment of the importance of factors for successful innovation outcomes



Source: Innovation Radar PC Survey in FP R&I Projects, 2019. Note: 1=not important, 7=very important; mean responses.

When asked to evaluate institutional, consortia, project, and market factors impacting on innovation outcomes, PCs leading projects delivering high innovation potential outcomes perceived institutional, project and market factors as significantly more important to those projects that delivered low innovation potential outcomes (see Table 6.2).

Table 6.2: PC assessment of the importance of factors for successful innovation outcomes for low and high potential innovations

	M	*SD*	*T*	*P*
Institutional factors			-2.929	0.004**
Low Innovation potential	8.36	3.27		
High Innovation potential	9.49	2.94		
Consortia factors			-1.035	.302^{ns}
Low Innovation potential	11.88	2.07		
High Innovation potential	12.13	1.83		
Project factors			-2.063	.040*
Low Innovation potential	14.87	3.79		
High Innovation potential	15.80	3.49		
Market factors			-2.901	0.004**
Low Innovation potential	13.12	13.12		
High Innovation potential	14.61	14.61		

Source: Innovation Radar PC Survey in FP R&I Projects, 2019. Note: ns=not significant, *=p<0.05, **=p<.001

6.5 Implications

While European Commission funded research programmes seek to coordinate the efforts of multiple actors to work together to deliver priority research and innovation outcomes, the survey findings highlight the lynchpin role of the PC in the implementation of these programmes. The findings demonstrate that the role of the PC extends far beyond the administrative and legal context set out in the EC definition of PCs (see Table 1.1).

In particular, with the PC being identified as having primary responsibility for the creation of project concepts, the influence of the PCs is clearly critical in the translation of EC research calls into research projects and in doing so influencing hugely significant investment in research and innovation activities across Europe. Beyond project concept development, PCs are at the centre of decisions relating to project consortia formation. This means that the PC has primary responsibility for the first two steps of the formation of EC funded research projects – project concept development and project consortia formation. It is only after these two critical steps are complete that responsibility for setting scientific and innovation goals within the context of the project concept and the consortia design that the extended project team become the responsibility of the wider team.

PC responses to the question project coordination activities show that once the project is funded, PCs become task oriented with their primary focus on delivering project tasks, controlling project resources, task planning and project reporting. Activities that are likely to influence post project outcomes such as managing technology transfer and commercialisation activities and managing interactions with external stakeholders are perceived to be of lower importance.

In terms of innovation outcomes, it is noteworthy that projects in which PCs placed a greater emphasis on managing technology transfer and commercialisation activities and managing interactions with external stakeholders, delivered innovations with higher potential as measured by the Innovation Radar. Where PCs were task focused as per their obligations under the funding agreements, there does not appear to be any significant impact on innovation potential outcomes.

As expected, the PC's own organisation influences the importance placed by PCs on coordination activities, particularly with regards to management of technology transfer and commercialisation and management of external stakeholders.

There is no formal training for PCs outside of in-house training provided by their own organisations. As stated elsewhere in the report, their development is through on-the-job training which more often than not is based on working with senior researchers. In this context, it is useful to consider further the delivery challenges identified by PCs. Interestingly, industry-based PCs found each of the project delivery activities areas more challenging than their HES and public body counterparts. They had particular challenges with activities for designing and implementing collaboration arrangements, which is unexpected given how much commercial activities are based on internal collaborations and partnerships with contractors, customers, and suppliers. It also contradicts the positive evaluation by the industry-based PCs of their personal project management and leadership of large scale projects knowledge and know-how reported earlier in this report (see Section 4.2). This suggests that the EC context, which typically involves collaborations with organisations from outside the PC context (e.g. industry-based PCs working with university researchers), is possibly more challenging for industry-based PCs than it is for HES-based PCs. This may relate to a lack of alignment of EC funded research programmes with demands of commercial setting. This poses questions for the organisation of EC funded research.

In terms of project design, it has already been observed that PCs lie at the fulcrum of project conceptualisation and consortia formation. This suggests that they are also the key influencer in setting project impact priorities. The PC survey responses indicate an important prioritisation of scientific impact objectives, but, as expected, found that industry-based PCs placed greater importance on market impact objectives.

The collaboration management capacity of the PC to build effective working relationships within project consortia, develop consortia with complementarity in knowledge and expertise, and to implement clear alignment of tasks and objectives for each of the partners were identified as the most important influences on delivering successful innovation potential outcomes as measured by the Innovation Radar. This has implications for the professional development of PCs and the evaluation of EC funded research proposals.

7 Recommendations

'It was a great to be Project coordinator of such a big Project…!'

Innovation Radar PC Survey in FP R&I Projects

7.1 Conclusions

Who and what is a PC?

Overall the survey findings confirm the lynchpin role of PCs in the EC research and innovation system. Their role clearly extends significantly beyond that identified in the Horizon 2020 User Guide which sees the PC as the "Primary Coordinator Contact is nominated for each project as the main contact point between the consortium and the Commission for a particular grant". The PC is far more than simply 'the proposal initiator in the submission phase', but taking account of their **prime role in project conceptualisation and consortia formation**, the PC is in effect the principal translator of the EC funded research programme and responsible for how the majority of the European research budget is invested. Significant personal motivations for envisioning project concepts and selecting to take on the position of the PC are to target scientific opportunities and retain control of the project. In this respect the PC is very much a scientific entrepreneur, a very different creature to the 'Primary Coordinator Contact' identified in the Horizon 2020 User Guide and indeed in many other definitions, including institutional definitions.

Identifying the PC as a scientific entrepreneur significantly changes how the PC role is viewed and engaged with by various stakeholders. From an EC perspective, recognising the **PC as a scientific entrepreneur** means their engagement with the PC during the project should be less about monitoring and oversight during project implementation, and more about providing the entrepreneur with support.

The survey findings indicate that during the project the PC prioritised in terms of importance coordination and management tasks. In this context they became more task focused and less strategic, with the strategic thinking phase already completed in the development of the proposal. However, a project has a three- or four-year duration. As with any research or innovation endeavour there is **uncertainty that requires the PC to have a capacity to pivot a project**, perhaps to optimise the innovation potential. Maintaining such a strategic disposition during the project has potential to provide a stronger focus on technology transfer and commercialisation outcomes.

Ultimately, the survey findings endorse the development and selection of PCs with ambidextrous capabilities. They have a capacity to lead a research initiative from concept development to technology transfer. At a minimum they have the scientific and project management competencies to deliver intended scientific outcomes. But they also have the capacity to lead complex project consortia built on different disciplines, different organisation memberships with their competing priorities, and different countries.

'Reviews pay a lot of attention to project management and deviations from what was planned 3-4 years ahead of time. Research directions may change during that time and flexibility should be part of the project execution as far as research and innovation happens.'

'Sometimes Projects may require substantial deviations from the original plan. In these cases, the role of the coordinator is too weak. Of course these decisions need a compromise among the partners but the coordinator should have more "power" (and of course more responsibilities).'

Innovation Radar PC Survey in FP R&I Projects

Implications for professional development of PCs

The survey findings offer a number of conclusions for the professional development of PCs and the design of professional development interventions for PCs.

First, the PC is a scientific entrepreneur. **Entrepreneurship training** relevant to the role relate to envisioning project concepts, designing project resource requirements (i.e. the consortia), and managing external stakeholders for the delivery of innovation outcomes.

Second, '**soft skills**' are essential to effective project leadership, particularly in complex research projects (such as the average EC funded project of 11 partners in 6 countries). Key skills in this regard include the ability to lead, manage cultural diversity, influencing and motivating project partner and stakeholders, and effective communications.

Third, **PC in industry and PCs on HES and public bodies do not necessarily have the same development requirements**. There are different antecedent factors involved including differences in personal and organisational motivations, and differences in experience and know-how. One size may not fit all.

7.2 Recommendations

Wider Role Recognition: While the PC role is commonly understood in practice, although typically poorly defined, there is a need for host institutions to appropriately and properly recognise the PC within their own context. More generally, within the wider funding, entrepreneurship and innovation European ecosystems, **the PC role continues to be an invisible and underestimated role**. There is a need for wider role recognition that reflects their influence and standing in leading and driving the innovation potential of European Framework Programmes. Moreover, such role recognition is essential to ensure that the best and most capable European scientists are in the PC role and advancing Europe's scientific and innovation trajectories.

Professional Development for PC Role: There is a requirement to better prepare PCs for the role given the project complexity and co-ordination tasks that is required for leading and managing large scale diverse pan-European research consortia. This is particularly required for new PCs. While there is technical information about the role and how to manage projects from a reporting and compliance perspective, **the role preparation needs to focus on developing their leadership, managerial, and technology transfer capabilities** beyond the scientific leadership role that is specific to the PC role. There is potential for European Framework Programme to take a pioneering lead in developing role preparation for PCs as part of their support of PCs and the development of European scientific human capital.

'We need more support in dealing with ethics management across different institutions, as well as data privacy, security and sharing in view of the GDPR, standardization procedures and connection across similar funded projects.'

'Would be nice if the IPR helpdesk could give practical advice on how to proceed to apply for a potential IPR claim, such as a patent.'

Innovation Radar PC Survey in FP R&I Projects

Enhancing Local Professional Supports to Realise Innovation Potential: Our survey results highlight that there is **a bottleneck for realising innovation potential that PCs experience in relation to technology transfer** arising from funded projects that they lead. Consequently, there is a need for more enhanced local institutional support for PCs within the context of European collaborative projects which have the additional complexity of multiple partners in multiple countries. There should be a renewed focus on removing barriers that they face in attempting to pursue project based innovation potentials. As female PCs reported that they find commercialisation and technology transfer as difficult activities, more local enhanced support is required to realise innovation potential of European Framework Programme Projects that they lead.

Increasing Female PC Participation in European Framework Programmes: As evidenced by the survey population, there is **a gender imbalance with respect to female to male PCs**. Consideration has to be given to increasing female PC participation in leading EC research programmes. While our survey findings reported no major gender differences there is a need collectively, at institutional, national and European levels, to encourage female scientists to take on the PC role based on local institutional support as well as proactive measures from European Framework Programme funders. Gender balance already features as an ex-æquo determinant in research evaluation processes and there is perhaps potential to extend this to the gender of the PC. Given increased emphasis on delivering innovation outcomes there is also a need to enhance the commercialisation process knowledge and know-how of female PCs given challenges identified.

European Framework Supports for PCs: There is an additional and unavoidable administrative and coordination workload for scientists in taking on the PC role. However, there must be continued effort to **streamline reporting requirements and other administrative activities** that PCs are required to undertake in a way that more effectively supports a revised definition of the PC role and enhances their ability to pursue project based innovation potentials. In addition, EU Project Officers play an important and invisible role in supporting PCs and further consider should be given to enhancing their formal engagements that contributes to realising project outcomes and dealing with challenging project dynamics.

Closing the Market Gap - Project Design and Delivery Innovation Potential Assessment: European Framework Programme project level design typically follows a work package format that breaks down the project management and other main tasks that need to be undertaken to realise the project outcomes. Consideration should be given to include a standard **work package in all future funded European Framework Programmes that is designed to assess the project innovation potential** through engagement with end users and other market/societal validation exercises and reduces the potential market gap for funded projects. Moreover, an interesting finding was the project consortium had more responsibility for planning of scientific and innovation goals. This requires further investigation to better understand the dynamics between the PC and consortia in relation to innovation and the reason for this may centre on lack of commercialisation capabilities of the PC. This dynamic may be creating an invisible bottleneck for the commercialisation and innovation potential of European Framework research programmes.

> *'I wished successful projects would have the opportunity for continued funding to avoid research and development for the file drawer."*
>
> Innovation Radar PC Survey in FP R&I Projects

Evaluation Criteria Reconfiguration: There is a need to reconsider and reconfigure the evaluative criteria and frameworks for European Framework Programmes. **The role of the PC, the number of project partners, the institutional context are factors that need to be taken into greater consideration for evaluation purposes** while maintaining the predominate focus on scientific merits and originality. Moreover, our findings highlight the more partners involved in a European Framework Programme it increases its innovation potential, therefore greater consideration needs to be given the design of the future European Framework Programmes to support the PCs in realising project innovation potential. To encourage this further is by evaluating this factor as a criteria in future European Framework project evaluation criteria and to give it a higher weighting.

Appendix 1: Innovation Radar PC Survey in FP R&I Projects Questionnaire

The Role and Project Coordinators in European Commission Framework Project:

Fields marked with * are mandatory.

This questionnaire has been designed to collect information on your role, practices, motivations and outcomes as a Project Coordinator in a specific European funded research project. Details about the project that is subject of this survey can be found in the invitation email you received. If you agree to participate to this survey, please answer the questions on the questionnaire as best you can. It should take approximately 20-25 minutes to complete. Your participation in this research survey is completely voluntary. You may decline altogether, or leave blank any questions you do not wish to answer. Your responses will remain confidential. Data from this research will be retained in a password protected electronic format until one year after confirmation of results of this study. The survey findings will be reported only in aggregated form in scientific papers and Joint Research Centre reports from the European Commission.

A privacy statement in the following link provides information about the processing and the protection of your personal data. If you require further clarification and information on this survey and the overall project please send an email to JRC-FP-PROJECT-COORDINATORS@ec.europa.eu.

Thank you for your assistance in this important endeavor.

A. PERSONAL DETAILS

1. Which is your current age category?

   Age ______________________

2. Which is your current job title?

   Professor — Chief Executive Officer

   Scientific researcher — Other

   Manager — If other, please specify

3. How many years have you been employed in your current organisation?

   Number of Years ______________________

4. How many years have been employed in total during your professional career?

   Number of Years ______________________

B. PERSONAL RESEARCH ACTIVTIES AND EXPERIENCE

5. Which of the following most closely describes your research domain?

   Life Sciences — Physical Sciences

   ICT — Social Sciences

   Engineering — Arts & Humanities

   Other

If your answer to Question 5 is ICT, which of the following most closely describes your ICT discipline?

Electrical Engineering

Computer Engineering

Telecommunications Engineering

Software Engineering

Computer Science

Information Technology

Information Systems

Other

6. How many EC funded projects (e.g. FP7, H2020) have you been Project Coordinator?

   Number of Projects ___________________________

7. How many of the EC funded projects on which you have been Project Coordinator have been over €500,000 in value?

   Number of Projects ___________________________

8. How do you rate your level of knowledge and know-how in the following activities *(1=very poor, 7 =excellent)*:

	Very poor **1**	**2**	**3**	**Average** **4**	**5**	**6**	**Excellent** **7**
Scientific research							
Commercialisation processes of innovations							
Formal project management processes							
Leading large scale interdisciplinary projects							

9. Evaluate your personal leadership qualities *(1=very poor, 7 =excellent)*:

Leadership Qualities	**Very Poor** **1**	**2**	**3**	**Average** **4**	**5**	**6**	**Excellent** **7**
Creativity							
Task orientation							
Risk-tolerance							
Ability to manage conflicts							
Ability to empathise							
Sense of responsibility							
Self-confidence and positive self-concept							
Assertive communication with project stakeholders							
Ability to recognise good performance							
Team building							
Empowering							
Leading by example							

C. PROJECT DETAILS AND DESIGN

Please answer the following questions in the context of the project for which you were the Project Coordinator. The project details such as project title and project number can be retrieved in the invitation email you received.

10. When leading this project how many employees worked in your unit?

Number of Employees ______________________________

11. A discipline is a particular branch of knowledge (e.g. biomedical engineering). Indicate to how many research disciplines the project can be allocated:

	1	**2**	**3**	**More than** **3**
Number of research disciplines in which the project is active				

12. How important were the following factors in your personal motivation to become a Project Coordinatorfor this project (1=not important, 7 =very important):

	Not important **1**	**2**	**3**	**Somewhat Important** **4**	**5**	**6**	**Very Important** **7**
Greater control over the research direction of the project							
Scientific opportunities of the project							
Commercial opportunities of the project							
Career promotion possibilities							
Access to additional research resources							
Potential of the project to impact on society							
Problem solving opportunity of the project							

13. How important were the following stakeholders for the delivery of the stated innovation objectives for this project (1=not important, 7=very important):

	Not important **1**	**2**	**3**	**Somewhat Important** **4**	**5**	**6**	**Very Important** **7**
Academic project partners							
Industry project partners							
Own organisation							
Small and medium enterprises							
Large enterprises							
Business support agencies							
Regulatory/standardisation agencies							
Business investors							
Accelerators and incubators							
Technology transfer experts							
Other							

If you selected the category "Other" in Question 13, could you specify the stakeholder?

14. Rank in order of importance each of the following project design priorities that influenced your consortium design at the *proposal development* stage for this project*:* (1 = most important, 8 = least important)

Project Design Priorities	**Ranking**
Clarity in project objectives	
Access to specialised knowledge	
Optimal commercialisation opportunities	
Internal knowledge sharing in the project	
Prior collaborative experience	
Effectiveness in project administration	
Capacity of consortium to adapt during project	
Capacity of project consortium to maintain consensus	

15. In terms of your role as Project Coordinator on this project, please indicate the extent to which you agree or disagree with the following statements *(1=strongly disagree, 7=strongly agree)*:

	Strongly Disagree **1**	**2**	**3**	**Neutral** **4**	**5**	**6**	**Strongly Agree** **7**
I helped project partners understand how their objectives and goals related to that of the overall project.							
I made many strategic decisions together with the project partners.							
I believed in the project partners ability to improve even when they made mistakes.							
I expressed confidence in the project partners ability to perform at a high level.							
I allowed project partners to conduct their tasks in their own way.							
I made it more efficient for project partners to do their job by keeping the rules and regulations simple.							
I allowed project partners to make important decisions quickly.							
I encouraged a high level of information sharing across the project consortia.							
I regularly provided support for new ideas.							
I focused on work-related rather than administrative communications to the team.							
I had a strong focus on learning.							

16. Indicate the impact of the following project design priorities on the delivery of project innovation outcomes (*(1=no impact, 7=significant impact):*

Project Design Priorities	**No Impact 1**	**2**	**3**	**Some Impact 4**	**5**	**6**	**Significant Impact 7**
Clarity in project objectives							
Access to specialised knowledge							
Optimal commercialisation opportunities							
Internal knowledge sharing in the project							
Prior collaborative experience							
Effectiveness in project administration							
Capacity of consortium to adapt during project							
Capacity of project consortium to maintain consensus							

D. PROJECT COORDINATION ACTIVITIES

17. Indicate who had the primary responsibility for each of the following tasks in this project *(select one only)*:

	Project Coordinator	Project Consortium
Creation of project concept		
Planning of project scientific goals		
Planning of project innovation goals		
Selection of scientific partners		
Selection of industry partners		
Planning of time		
Planning of budget		

18. How important were each of the following Project Coordinator activities in delivering the project's stated innovation objectives (1=not at all important, 7=very important):

Project Coordinator Activities	**Not at all Important** **1**	**2**	**3**	**Neutral** **4**	**5**	**6**	**Very Important** **7**
Delivery of research tasks.							
Designing and implementing collaboration arrangements.							
Designing scientific and innovation objectives.							
Controlling project resources including funding.							
Managing technology transfer and commercialisation activities.							
Managerial activities as task planning and project reporting.							
Managing interactions with external stakeholders							

19. Indicate to what extent the following Project Coordinator activities presented challenges to you in delivering the project's stated innovation objectives (1=not at all challenging, 7=very challenging):

Project Coordinator Activity	**Not at all Challenging** **1**	**2**	**3**	**Neutral** **4**	**5**	**6**	**Very Challenging** **7**
Delivery of research tasks.							
Designing and implementing collaboration arrangements.							
Designing scientific and innovation objectives.							
Controlling project resources including funding.							
Managing technology transfer and commercialisation activities.							
Managerial activities as task planning and project reporting.							
Managing interactions with external stakeholders							

E. PROJECT IMPACT

20. How important do you rate the following impact criteria for this project *during the project design phase (1=not important, 7 =very important)*:

	Not important **1**	**2**	**3**	**Somewhat Important** **4**	**5**	**6**	**Very Important** **7**
Scientific impact e.g. Number and quality of peer reviewed publications							
Technology transfer impact e.g Movement of know-how, technical knowledge or technology externally from the project							
Human capital development impact e.g. Capacity to perform and use research including researcher development							
Societal impact e.g. Enhanced societal and public welfare outcomes							
Collaboration impact e.g. Enhancement of scientific and network relationship between project partners							
Political impact e.g. Impact on relationship of project consortia with key external stakeholders (e.g. funding and policy agents)							
Personal career impact e.g. Enhancement of personal career positioning							
e.g. Market impact Impact on commercial sales or profitability							

21. Indicate the impact that each of the following criteria had on the project *during its final phase (1=no impact, 7 =significant impact)*:

	Not important **1**	**2**	**3**	**Somewhat Important** **4**	**5**	**6**	**Very Important** **7**
Scientific impact e.g. Number and quality of peer reviewed publications							
Technology transfer impact e.g Movement of know-how, technical knowledge or technology externally from the project							
Human capital development impact e.g. Capacity to perform and use research including researcher development							
Societal impact e.g. Enhanced societal and public welfare outcomes							
Collaboration impact e.g. Enhancement of scientific and network relationship between project partners							
Political impact e.g. Impact on relationship of project consortia with key external stakeholders (e.g. funding and policy agents)							
Personal career impact e.g. Enhancement of personal career positioning							
e.g. Market impact Impact on commercial sales or profitability							

22. How important were the following factors for successful innovation outcomes for this project? *(1=not important, 7 =very important)*:

	Not important **1**	**2**	**3**	**Somewhat Important** **4**	**5**	**6**	**Very Important** **7**
Own institutional provision of technology transfer and commercialisation supports							
Own department leadership and support							
Working relationships of project consortia							
Complementarity in knowledge across partners							
Clear alignment of tasks and objectives for each partner							
Clarity of research commercialisation plans in project design							
Adaptability of project design to commercialisation opportunities							
Financial rewards							
Alignment of project innovation outputs with requirements of market environment							
Capacity of technology recipients to uptake project innovation outcomes							

23. At which point in the project life cycle was your role as the Project Coordinator *most influential* for successful innovation outcomes of this project:

	Not Influential **1**	**2**	**3**	**Somewhat Influential** **4**	**5**	**6**	**Very Influential** **7**
Pre-project design							
Management during the project							
Project dissemination							

Comments

If you have additional comments on the role and impact of Project Coordinators with regards to delivering innovation outcomes from European Commission funded research please state them here:

Please indicate your email address if you are interested in receiving the final report of this research:

Appendix 2: Detailed results

Table A1: PC project personal motivations by host organisation – mean responses

Personal motivations	**Organisation Type**			*F*	*P*
	HEI & Public	SME & Large Enterprises	Research Centre		
Greater control over the research direction of the project	5.25 (1.355)	5.52 (1.428)	5.59 (1.151)	1.335	.265^{ns}
Scientific opportunities of the project	5.99 (1.730)	4.87 (1.189)	5.86 (1.668)	14.317	.000**
Commercial opportunities of the project	4.02 (1.730)	5.66 (1.189)	4.33 (1.668)	18.52	.000**
Career promotion possibilities	4.23 (1.990)	4.11 (1.783)	4.21 (1.792)	.077	.926^{ns}
Access to additional research resources	5.47 (1.534)	4.77 (1.515)	4.87 (1.686)	5.28	.006**
Potential of the project to impact on society	5.47 (1.557)	4.77 (1.295)	4.87 (1.357)	.969	.381^{ns}
Problem solving opportunity of the project	5.70 (1.430)	5.67 (1.061)	5.74 (.977)	.058	.944^{ns}

Note: ** = p < 0.001, ns = not significant, standard deviations appear in parentheses below means.

Table A2: Personal motivations of project coordinators - male and female

	M	SD	t	P
Greater control over the research direction of the project			-.527	0.599^{ns}
Male	5.38	1.62		
Female	5.52	1.38		
Scientific opportunities of the project			-.022	.983^{ns}
Male	5.70	1.39		
Female	5.71	1.50		
Commercial opportunities of the project			-1.004	.316^{ns}
Male	4.39	1.74		
Female	4.68	1.64		
Career promotion possibilities			-2.408	.017*
Male	4.05	4.05		
Female	4.81	4.81		
Access to additional research resources			.067	0.947^{ns}
Male	5.09	1.63		
Female	5.07	1.68		
Potential of the project to impact on society			-1.977	0.049*
Male	4.81	1.45		
Female	4.91	1.34		
Problem solving opportunity of the project			-.042	.966^{ns}
Male	5.43	1.21		
Female	5.90	1.28		

Note: * = p < 0.05, ns = not significant, *M* indicates mean, *SD* indicates standard deviation

Table A3: ANOVA results for knowledge and know-how by host organisation

Knowledge and know-how	**Organisation Type**			*F*	*P*
	HEIs & Public	*SME & Large Enterprises*	*Research Centres*		
Scientific research	6.43 (.961)	5.29 (1.289)	6.13 (.845)	23.833	.000**
Commercialisation processes of innovations	4.12 (1.456)	5.66 (1.055)	4.04 (1.22)	31.06	.01**
Formal project management processes	5.37 (1.092)	5.85 (.988)	5.31 (1.136)	4.687	.000**
Leading large scale interdisciplinary projects	5.66 (1.194)	5.77 (1.281)	5.32 (1.080)	3.307	.0.38^{ns}

Note: ** = p < 0.001, ns = not significant, standard deviations appear in parentheses below means

Table A4: Crosstabulation and $\chi 2$ results for source of project concept and project complexity

		Primary responsibility for creation of project concept		χ^2	P
		Project coordinator	Project consortium		
Number of disciplines allocated	1 discipline	23 14.4%	27 24.8%	4.684	0.096^{ns}
	2 disciplines	43 26.9%	27 24.8%		
	More than 2 disciplines	94 58.8%	55 50.5%		

Note: ns = not significant

Table A5: ANOVA results for number of project partners by PC organisation type

	HES and PUB	SME and Large Organisation	Research Centres	*F*	*p*
Project Partners	10.34 (6.62)	12.00 (5.35)	10.40 (5.82)	1.555	$.213^{ns}$

Note: ns = not significant, standard deviations appear in parentheses below means

Table A6: T-Test results for source of project concept creation - PC vs consortium

Primary responsibility for creation of the Project Concept	*M*	*SD*	*t*	*p*
Number of Project Partners			.445	$.656^{ns}$
Project Coordinator	10.82	6.35		
Project Consortium	10.49	5.52		
Number of Countries			-1.035	$.302^{ns}$
Project coordinator	5.61	2.26		
Project consortium	5.79	2.31		

Note: ns = not significant, *M* indicates mean, *SD* indicates standard deviation

Table A7: ANOVA results for PC activities by organisation type

PC Activities	**Organisation Type**			*F*	*p*
	HEI & PUB	SME & Large Org	REC		
Delivery of research tasks	5.88 (1.40338)	5.43 (1.25)	5.98 (1.12)	3.21	.042*
Designing and implementing collaboration arrangements	5.05 (1.45)	5.58 (1.23)	5.25 (1.34)	2.69	$.069^{ns}$
Designing scientific and innovation objectives	5.74 (1.30)	5.75 (1.05)	5.84 (1.03)	.224	$.80^{ns}$
Controlling project resources including funding	5.02 (1.51)	5.67 (1.19)	5.16 (1.37)	3.79	0.024*
Managing technology transfer and commercialisation activities	4.2174 (1.62)	5.2941 (1.39)	4.5161 (1.38)	9.22	.000**
Managerial activities as task planning and project reporting	5.33 (1.56)	5.58 (1.26)	5.75 (1.10)	2.617	$.075^{ns}$
Managing interactions with external stakeholders	4.6752 (1.76)	5.5192 (1.20)	5.1444 (1.49)	5.755	.004**

Note: ** = $p < 0.001$, * = $p < 0.05$, ns = not significant, standard deviations appear in parentheses below means

Table A8: One-way ANOVA model results for organisation type on challenging PC activities

	M	*SD*	*F*	*p*
Designing Scientific and Innovation Objectives			3.147	0.045*
HES and public organisations	4.12	1.75		
SMEs and large enterprises	4.78	1.60		
Research centres	4.51	1.54		
Managing technology transfer and commercialisation activities			3.372	0.036*
HES and public organisations	4.64	1.66		
SMEs and large enterprises	5.30	1.36		
Research centres	4.94	1.41		
Managing interactions with external stakeholders			4.206	.016*
HES and public organisations	4.01	1.81		
SMEs and large enterprises	4.44	1.51		
Research centres	4.65	1.38		

Note: * = $p < 0.05$, *M* indicates mean, *SD* indicates standard deviation

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