

Evaluation of the European Institute of Innovation and Technology (EIT)

Annexes

Education and
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***Evaluation of the European Institute of
Innovation and Technology (EIT)***
Annexes

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Table of Contents

Annex 1: Synopsis Report for the Open Public Consultation	1
Annex 2: Terms of Reference for this evaluation	24
Annex 3: Open Public Consultation research instrument	45
Annex 4: Partner survey research instrument	58
Annex 5: Graduate survey research instrument	70
Annex 6: Accelerator survey research instrument	84
Annex 7: List of interviewees for KIC level research	94
Annex 8: KIC-level case studies	97
Annex 9: Patent landscaping case results	137
Annex 10: Social Network Analysis Technical Report	170

Annex 1: Synopsis Report for the Open Public Consultation

Introduction

This sub-section of the report is a synopsis of the results of the Open Public Consultation (OPC) on the EIT, that was run as a component of the wider interim evaluation. The purpose of the OPC was to gather information (data, facts, knowledge) and opinions and views from a wide spectrum of stakeholders on the effectiveness, efficiency, relevance, coherence and added-value of the activities of the EIT and KICs. Whereas most of the research conducted as part of the interim evaluation involved participants and beneficiaries of the EIT, the OPC provided an opportunity to 'open up' the data collection exercise to a wider community of individuals and organisations and enable them to input into the evaluation. Abstract

Overview of OPC methodology

The OPC was managed by the evaluation team in line with the principles for consultations set out by the Commission's Better Regulation Guidelines – participation, openness and accountability, effectiveness and coherence.

Consultation questionnaire design

The OPC consisted of a structured questionnaire that was designed to be completed online (using SurveyGizmo). In addition or instead, respondents were given the opportunity to submit written responses. The questionnaire was designed by the evaluation team and reviewed by Commission Services prior to deployment. Questions were largely closed-ended, with a number of opportunities for respondents to provide more detailed open-ended comments. To encourage a good response rate, the questionnaire was kept as short as was feasible, and consisted of 24 questions.

Sample design and questionnaire distribution

As an open consultation exercise, the OPC was accessible to anybody who chose to respond. However, it was expected to be most relevant to individual citizens, public and private bodies, local/regional authorities, ministries and relevant stakeholders working in the field of innovation, whether or not they were or had been involved with the EIT.

The OPC was launched on 26 August 2017, and closed on 20 November 2016. It was primarily accessible via DG EAC's dedicated public consultation webpage, and was promoted via the European Commission's standard procedures for running a public consultation. The evaluation team was not involved in raising awareness of the OPC, or in encouraging specific organisations to respond.

The OPC received the following responses:

- A total of 159 questionnaires were submitted;
- In addition, 12 written submissions were sent to the Commission, and passed on to the evaluation team.

Broadly, this response rate is consistent with what would be expected of an OPC carried out as part of an evaluation exercise. The limitations of the data generated from the OPC are considered below.

Data analysis

Quantitative and qualitative data were analysed by the evaluation team, and the results are presented in this synopsis report.

The results of the OPC are presented below based on the following considerations and analytical protocols:

- OPC respondents were asked whether they consented to having their contributions published under their name, or whether they wanted to remain anonymous. In total, 30% of questionnaire submissions consented to having their identity made public, and 67% wanted to remain anonymous (the remaining 3% did not indicate their preference either way). Qualitative and open-ended responses are, therefore, only attributed to specific individuals or organisations where explicit permission was given; in other all cases we only indicate the key characteristics of the respondent (organisation type and whether they were involved in the EIT/KICs).
- Consultation participants who submitted written responses (as opposed to completing the online survey instrument) have been excluded from quantitative analysis, since they did not respond using the standard closed-ended answer codes, and could not be back-coded based on their answers. Their opinions have been included within the qualitative data analysis.
- Where relevant, quantitative data are disaggregated between: i) respondents that indicated that they were involved with the EIT/KICs; and ii) respondents that indicated that they were not involved with the EIT/KICs. This distinction is significant since it might be expected to influence their answers (e.g. due to their levels of knowledge/awareness of the EIT/KICs).
- Small sample sizes mean that we have not been able to undertake any other quantitative sub-group analysis (e.g. disaggregation depending on the type of organisation that responded, which KIC (if any) respondents were involved with).

Limitations of the OPC

It should be stressed that the achieved sample of respondents is not representative of the 'population' of stakeholders from the field of innovation. By its nature, an *open* public consultation is a self-selected sample, and so suffers from selection biases that mean we cannot extrapolate the results to represent everybody with expertise in innovation policy. The quantitative data presented in this synopsis report must therefore be treated with some caution, and not taken to represent a statistically valid assessment of the EIT.

Just over half of OPC respondents (52%) indicated that they were involved in the EIT and/or KIC(s) in some capacity. This can be seen as both a potentially positive feature (since these respondents would presumably be well-informed about the EIT and its operations) and a potentially negative feature (since as beneficiaries they may have an interest in the continuation of the EIT in its current form, and respond accordingly). As noted above, where relevant we have disaggregated data between respondents who were or were not involved with the EIT, so responses can be compared.

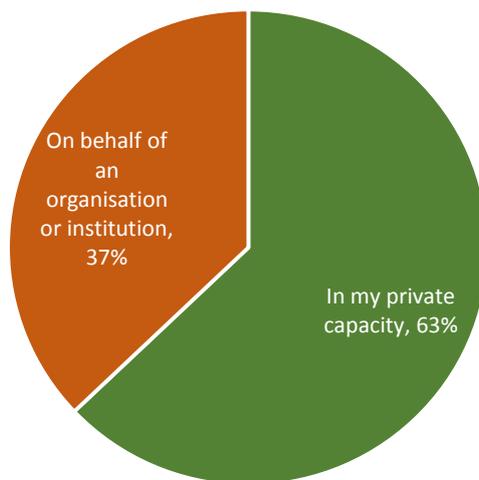
Results of the OPC

Participant type

As Figure A1.1 shows, most OPC participants (63% of all respondents) responded in their private capacity.

Figure A1.1 Whether OPC participants were responding on behalf of an organisation or as an individual

Q.1 In what capacity are you responding to this consultation?



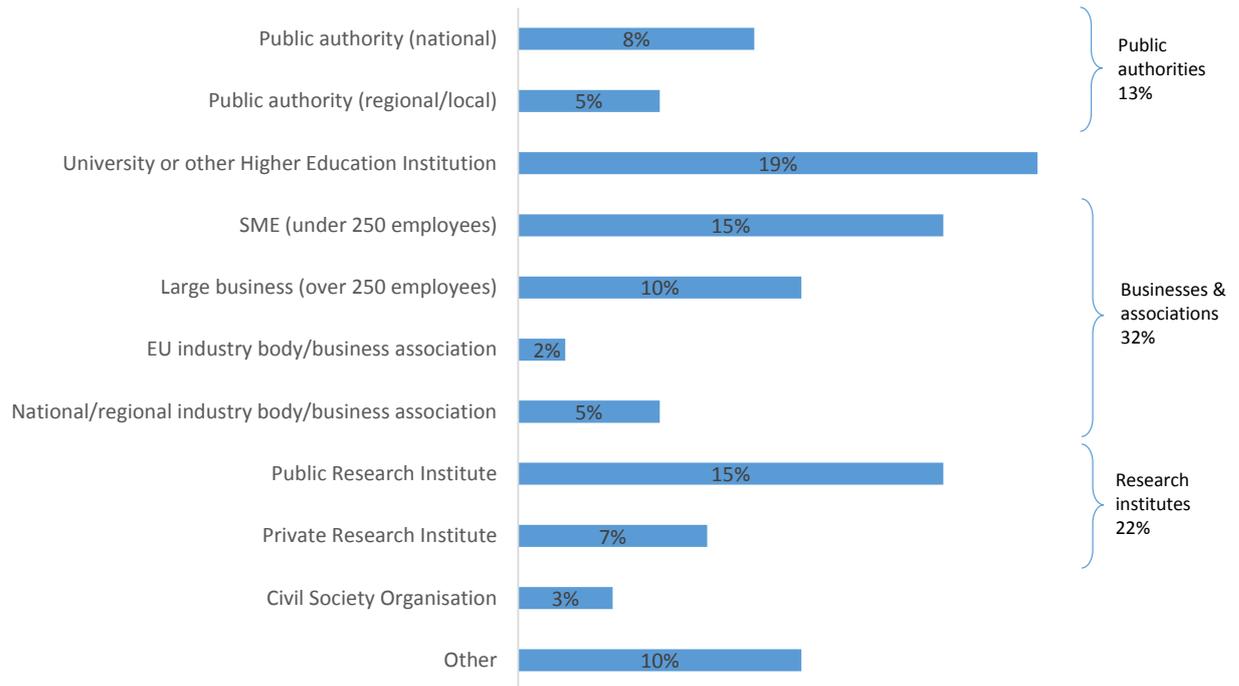
Base: all respondents (n=159)

Type of organisation or institution

Figure A1.2 shows the type of organisation that respondents represented. Around a third (32%) of respondents represented either a business or a business association, including 15% that were SMEs. Respondents from universities made up another 19% of respondents, whilst 22% came from research institutes.

Figure A1.2 The type of organisation that respondents represented

Q.2 What type of organisation are you representing?



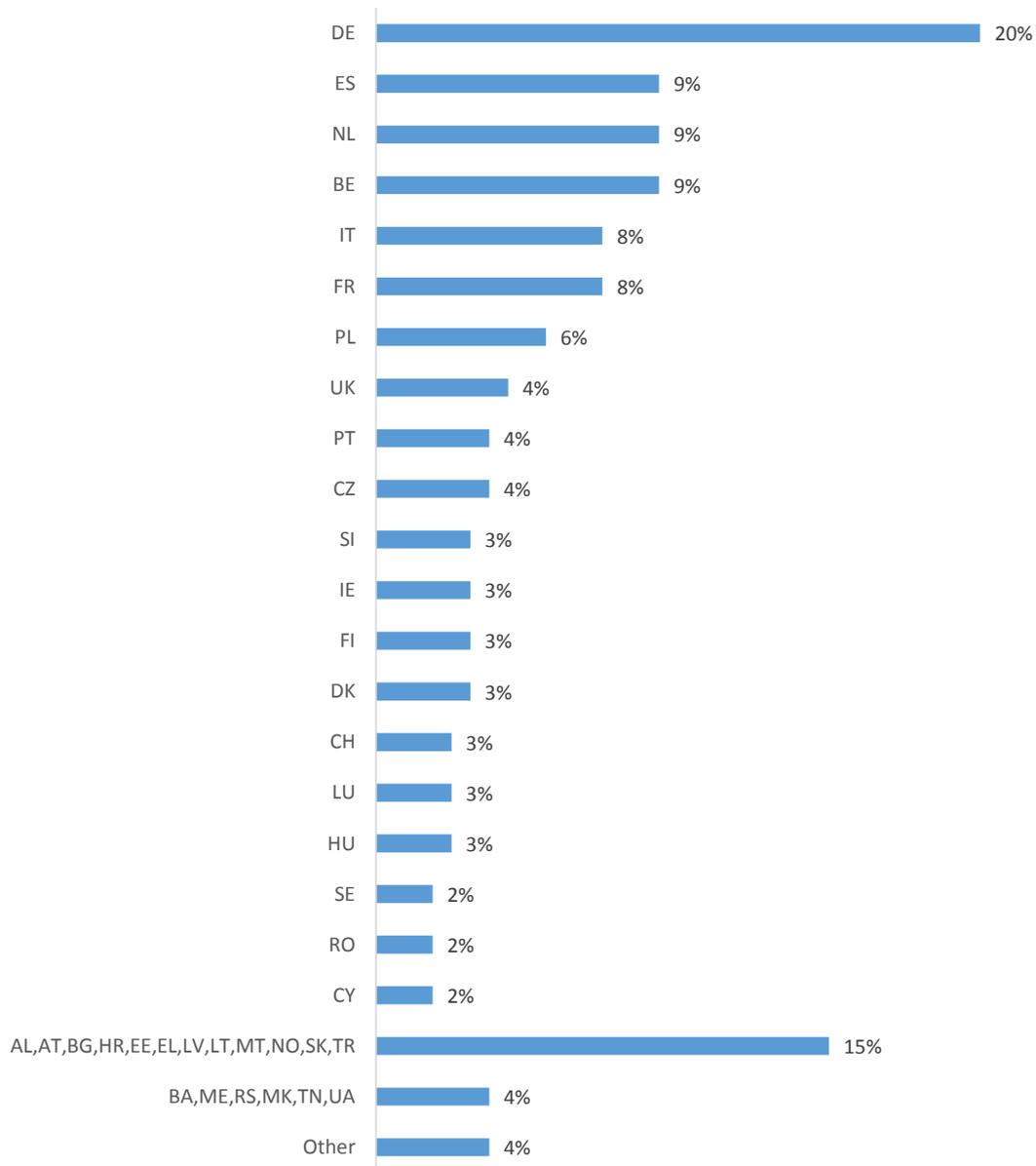
Base: all who responded on behalf of an organisation / institution (n=59)

Country of respondents

Figure A1.3 shows the country that respondents were located in. The most common country of location was Germany, which accounted for 20% of respondents. After this came Spain, the Netherlands, Belgium, Italy and France, each accounting for 8-9% of respondents.

Figure A1.3 The location of respondents

Q.4 In which country are you located?



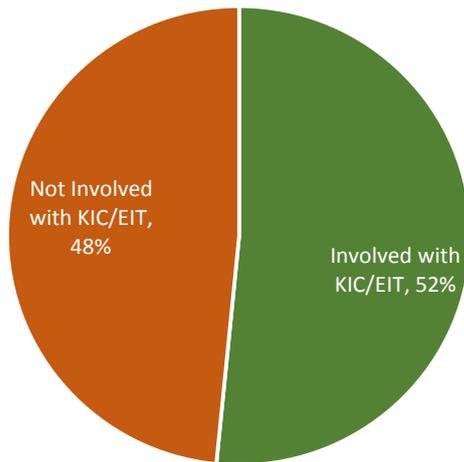
Base: all respondents (n=159); note: countries with 1.3% of respondents have been grouped (AL,AT,BG,HR,EE,EL,LV,LT,MT,NO,SK,TR), as have countries with 0.6% of respondents (BA,ME,RS,MK,TN,UA)

Involvement with the EIT / KICs

As Figure A1.4 shows, OPC responses were split almost half and half (52% to 48%) between organisations / individuals who were involved with the EIT/KICs, and those who were not. As noted above, in the remainder of this synopsis report we present data for both of these sub-categories.

Figure A1.4 Whether OPC participants were involved with the EIT and/or KICs

Q.5 Are you or your organisation involved with the EIT/ KICs in any way?



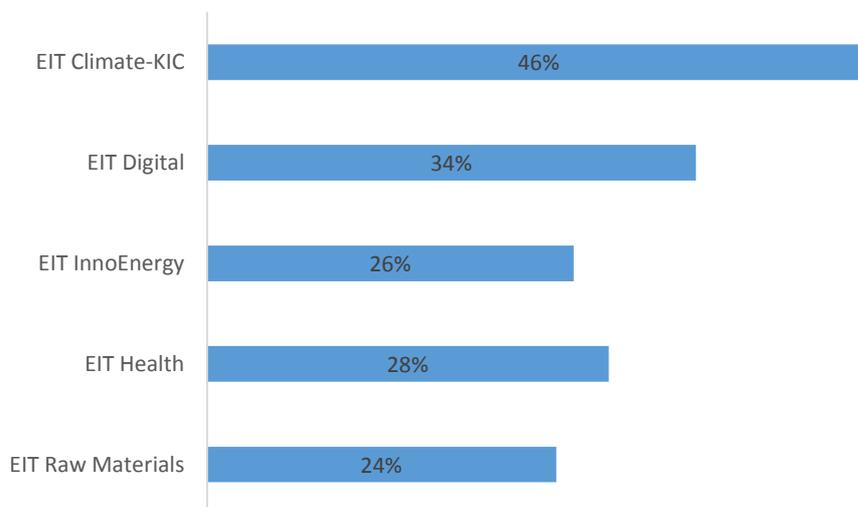
Base: all respondents (n=159)

Which KIC participants were involved with

The sub-group of OPC respondents who indicated that they were involved with the EIT/KICs were asked which KIC(s) they were involved with (Figure A1.5). All KICs were well 'represented' by respondents. Just under half (46%) of organisations/individuals were involved with the EIT Climate-KIC in some capacity, the most common KIC identified amongst respondents.

Figure A1.5 Which KIC(s) respondents were involved with

Q.6 Please indicate the KIC(s) that you are involved with.



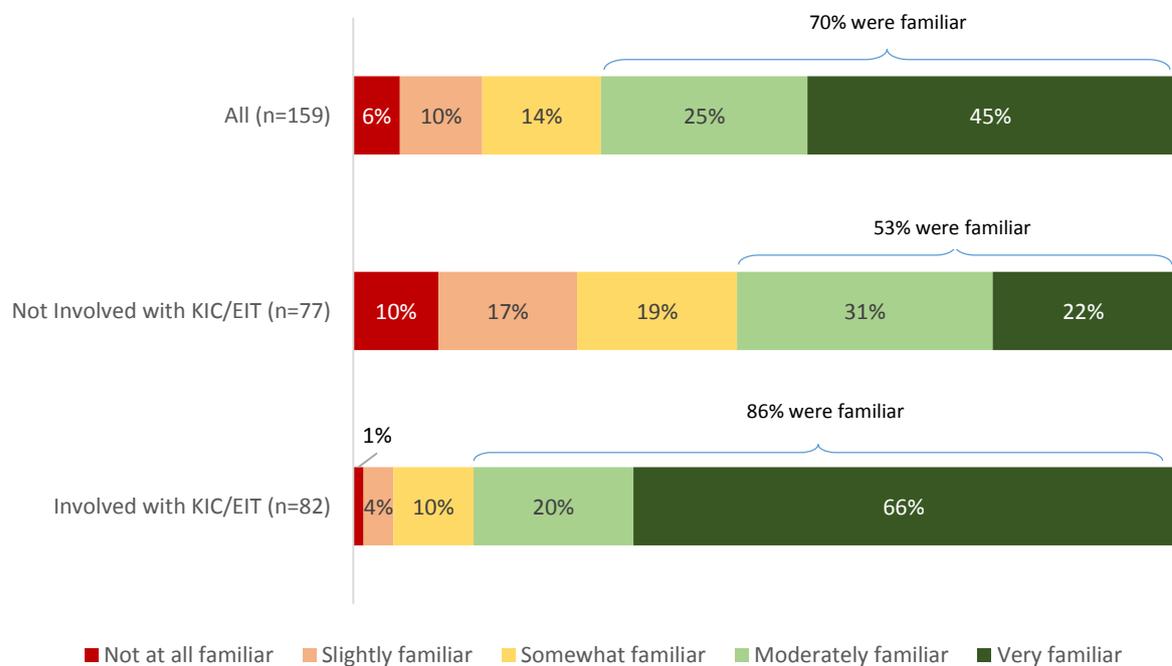
Base: all respondents who indicated that they were involved with the EIT/KICs (n=82). Note: respondents could select more than one KIC, so data sums to more than 100%

Familiarity with the EIT/KIC

Figure A1.6 shows how familiar OPC respondents indicated they were with the EIT and the KICs. We have presented data for all respondents, together with those respondents who indicated they were or were not involved with the EIT/KICs. Overall, 70% of respondents indicated that they were either 'moderately' or 'very' familiar with the EIT and the KICs. As can be seen, whether or not respondents were involved with the EIT/KICs had an impact on their familiarity. Some 86% of those who were involved in the EIT/KICs described themselves as 'moderately' or 'very' familiar with the EIT and the KICs.

Figure A1.6 Respondents' familiarity with the EIT/KICs

Q.8 How familiar are you with the activities of the EIT and the KICs?



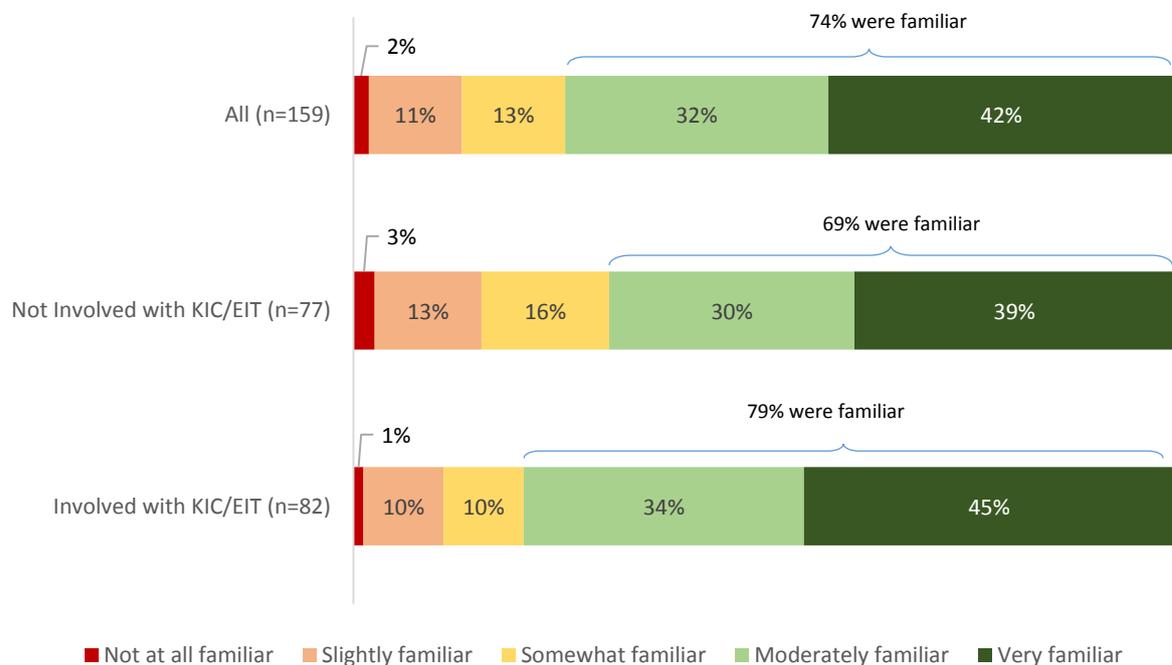
Base: all respondents

Familiarity with other EU innovation and knowledge triangle initiatives

The OPC also asked respondents how familiar they were with other EU activities in the field of innovation or knowledge triangle integration (Figure A1.7). Overall, OPC respondents described themselves as reasonably well-informed. Some 74% of respondents believed they were either 'moderately' or 'very' familiar with other EU innovation and knowledge triangle initiatives. Respondents may thus be characterised as reasonably well-informed about comparable initiatives and activities underway at an EU level (they were not asked about their familiarity with initiatives underway at a national or sub-national level).

Figure A1.7 Respondents' familiarity with other EU innovation or knowledge triangle initiatives

Q.9 How familiar are you with the EU's other activities in the field of innovation or the field of integration of education, research and business?



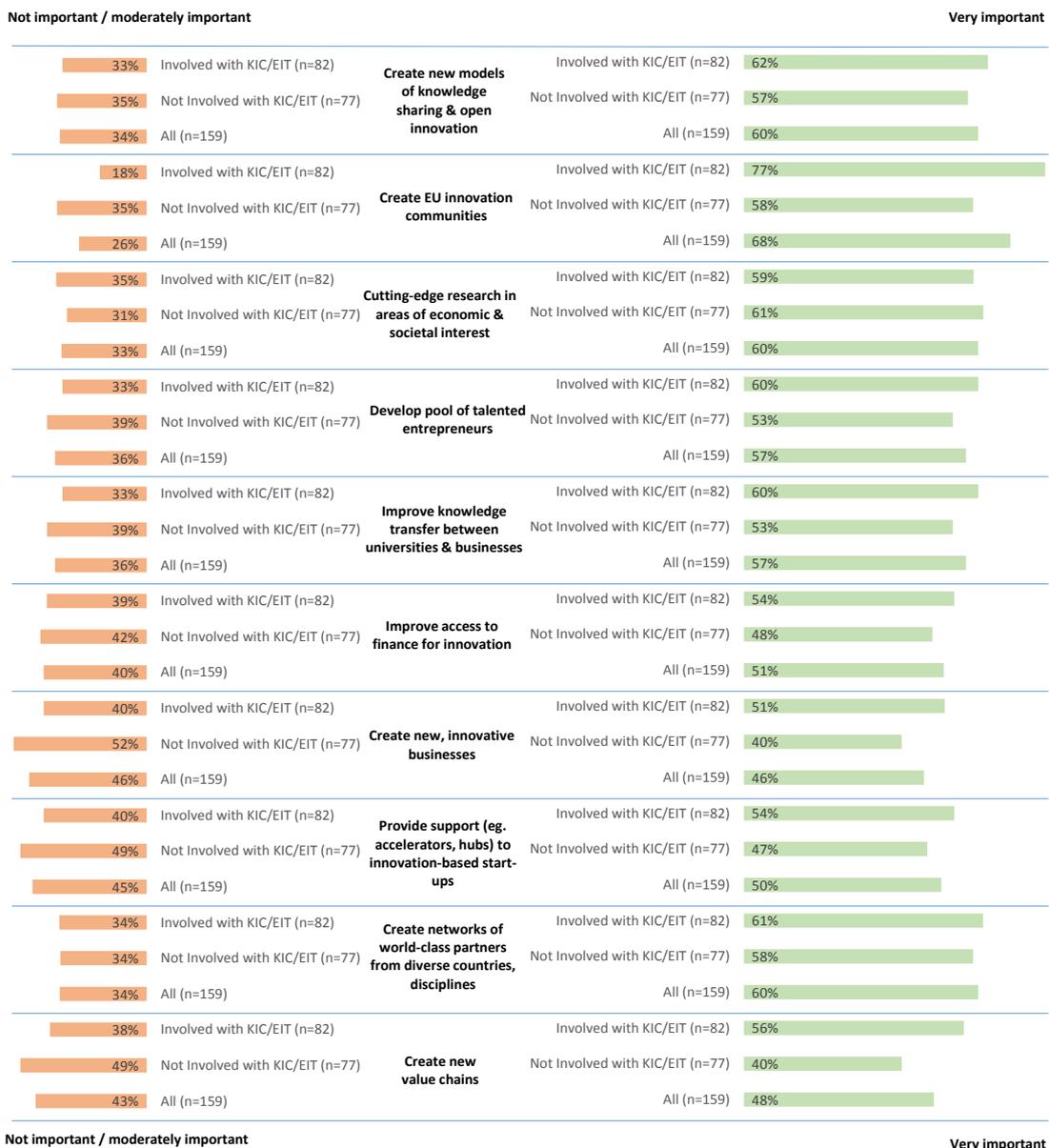
Base: all respondents

The importance of selected innovation goals to the EIT

The OPC asked respondents to rate the importance of a selection of innovation-related goals to the EIT (Figure A1.8). These are not the EIT's objectives; rather these are a general set of goals that devised by the evaluation team to test whether OPC respondents believed that the EIT was addressing the correct objectives in order to accomplish its overall mission to boost Europe's innovation capacity. Answers were broadly similar regardless of whether or not OPC respondents were involved with the EIT. Overall, the highest proportions of OPC respondents rated as 'very important' the following goals: creating EU innovation communities (68%), creating new models of knowledge sharing / open innovation, cutting-edge research, and creating diverse networks (all 60%).

Figure A1.8 Respondents' views on the importance of various innovation-related goals

Q.10 In order for it to achieve its mission (i.e. to enhance Europe's innovation capacity), how important is it for the EIT to deliver on the following?



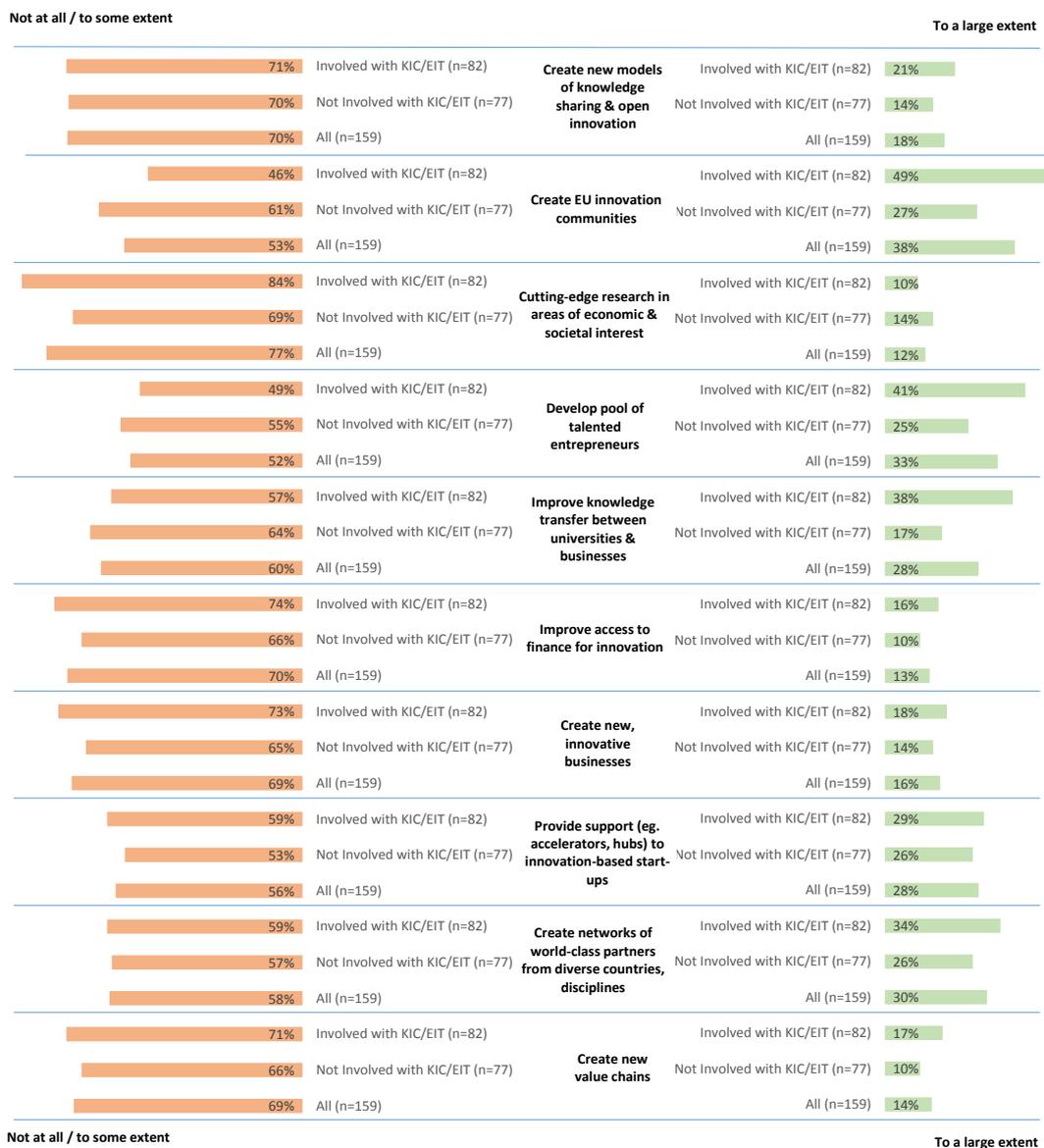
Base: all respondents; note: excludes 'no opinion' and no response, so does not sum to 100%

Whether the EIT actually delivers against selected innovation goals

Following on from Figure A1.9, as part of the OPC, respondents were asked whether they believed that the EIT was actually delivering against the selected innovation goals (Figure A1.9). Again, it should be noted that these are not the actual objectives of the EIT as set out in the Regulation; rather a set of goals devised by the evaluation team to explore with OPC respondents where they believe the EIT is delivering. We see a difference in response between respondents who were involved in the EIT and those that were not, which may suggest a communication / profile issue for the EIT. Areas where high proportions of respondents who were involved in the EIT believed that it was contributing 'to a large extent' included: creating EU innovation communities (49%), developing a pool of talented entrepreneurs (41%) and improving knowledge transfer (38%).

Figure A1.9 Respondents' views on whether the EIT contributes to various innovation-related goals

Q11. To what extent is the EIT actually contributing to the following?



Base: all respondents; note: excludes 'no opinion' and no response, so does not sum to 100%

The design and delivery of the EIT and the KICs

OPC respondents were asked whether they agreed with a series of statements concerning features of the design and delivery of the EIT and KICs (Figure A1.10). Broadly, OPC respondents – particularly those who were involved in the EIT/KICs – agreed with the rationale for the EIT/KICs (e.g. that innovation challenges should be dealt with at EU level). There was support for the idea that the EIT/KICs should foster a culture of innovation at higher education institutions (74% of all respondents ‘strongly agreed’ or ‘agreed’ with this statement). There was a lack of agreement that the results of the EIT/KICs are well known, and mixed views about whether the EIT/KICs are working well.

Figure A1.10 Respondents’ views on various features of EIT and KIC design and delivery

Q12. To what extent do you agree with the statements below?



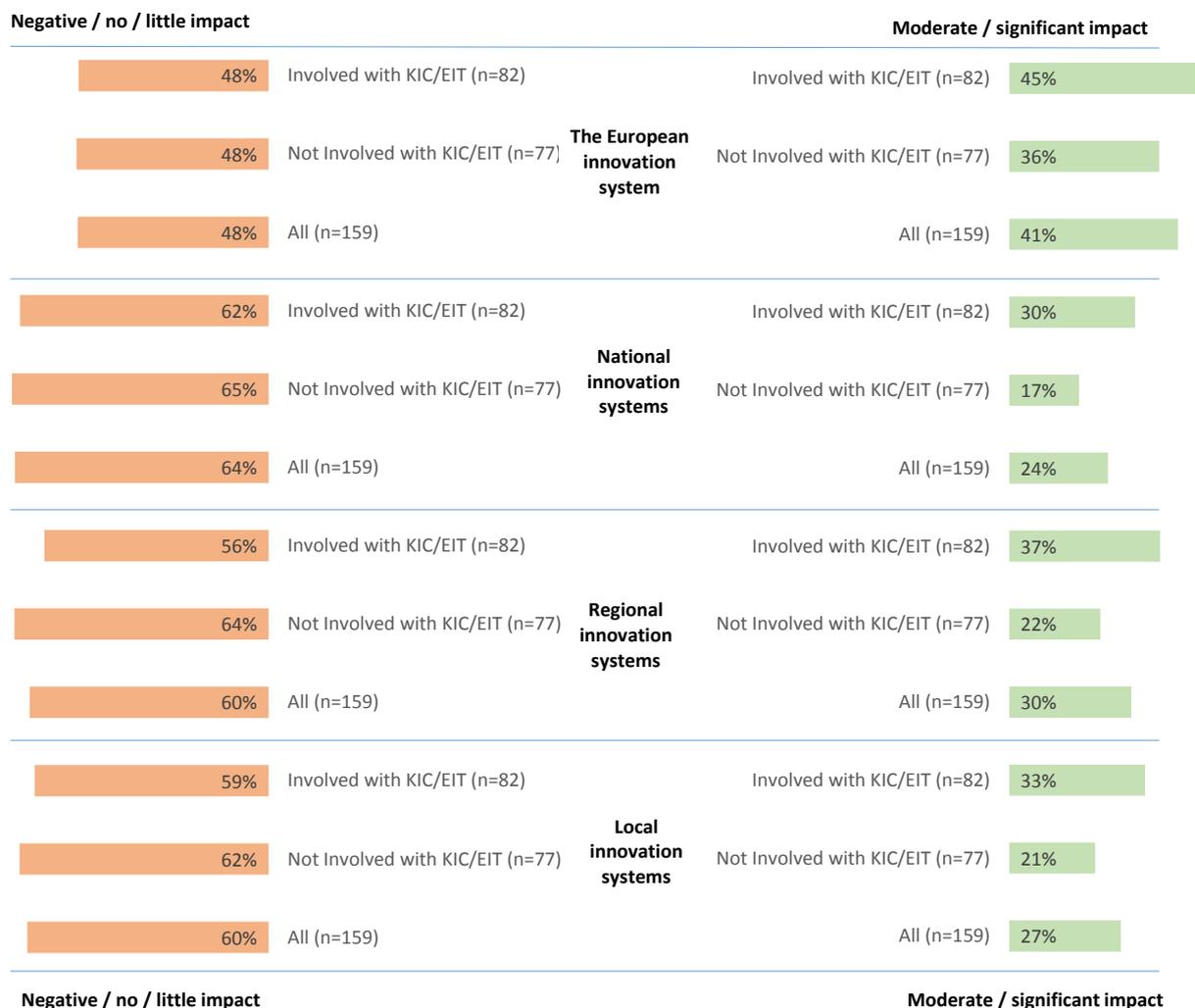
Base: all respondents; note: excludes 'neutral', 'no opinion' and no response, so does not sum to 100%

The impacts of the EIT on innovation systems

OPC respondents were asked to assess the impact of the EIT on various levels of innovation systems within Europe (Figure A1.11). Opinions were mixed, with the majority of OPC respondents considering that the EIT had had a 'negative', 'no' or 'little' impact on national, regional and local innovation systems. Indeed, the largest impact seemed to be at a European level, though still only 41% of OPC respondents considered that the EIT had had a 'moderate' or 'significant' impact. At each level of innovation system, a higher proportion of those respondents who were involved with the EIT/KIC rated the impact as 'moderate' or 'significant', than those respondents who were not involved with the EIT/KIC.

Figure A1.11 Respondents' views on selected impacts of the EIT on innovation systems

Q.14 In your view, what has been the impact of the EIT on?



Base: all respondents; note: excludes 'no opinion' and no response, so does not sum to 100%

Following on from this question, OPC respondents were asked to provide an explanation for their answer. Responses covered both positive and negative explanations for the impacts of the EIT/KIC. Key points raised by respondents were as follows:

- The extent to which the EIT/KICs influence innovation systems is determined by how well they engage and communicate externally: the views of respondents here were mixed. For some respondents, the KICs have successfully engaged with stakeholders outside of their immediate circle of participants and beneficiaries, particularly in countries or regions that lag behind in terms of innovation performance (linked with the EIT RIS activities of the KICs). However, for many other OPC respondents, the EIT and the KICs have been much less effective at external engagement than they should have been, which has negatively affected their ability to influence innovation systems. This issue was variously attributed to: a lack of profile or visibility, meaning that external stakeholders are unaware of the achievements and good practice models of the KICs; and a view amongst some that KICs are too much a 'closed shop' made up of a small number of partners and beneficiaries, with limited engagement with non-participants. Some OPC respondents observed that there was little evidence of KIC/EIT involvement and engagement at a national level, where there is significant opportunity to influence innovation systems and the framework conditions that enable and support innovation. According to one OPC respondent:

"Although 4 out of 5 existing KICs have a CLC based in the Netherlands and Dutch participants are receiving more EIT funding than any other country, these CLCs are not getting much policy attention and have not really been embedded in the NL innovation system"

Philips, KIC partner

- *CLCs are a key mechanism for influencing local and regional innovation systems:* several OPC respondents noted the importance of the *physical* presence in a locality that CLCs provide, which was important in influencing on the local or regional innovation system. As one respondent noted (the identity of the KIC and the region/country have been removed to protect anonymity):

"The impacts are focussed on the specific regions where the EIT and KICs work. In [] KIC, for example, the area of [] in [], here the KIC had a great impact on the regional and local innovation system. But it is difficult to generalise this, as many other regions in Europe do not benefit from the KIC activities"

Individual, former employee of KIC partner and graduate of EIT-label course

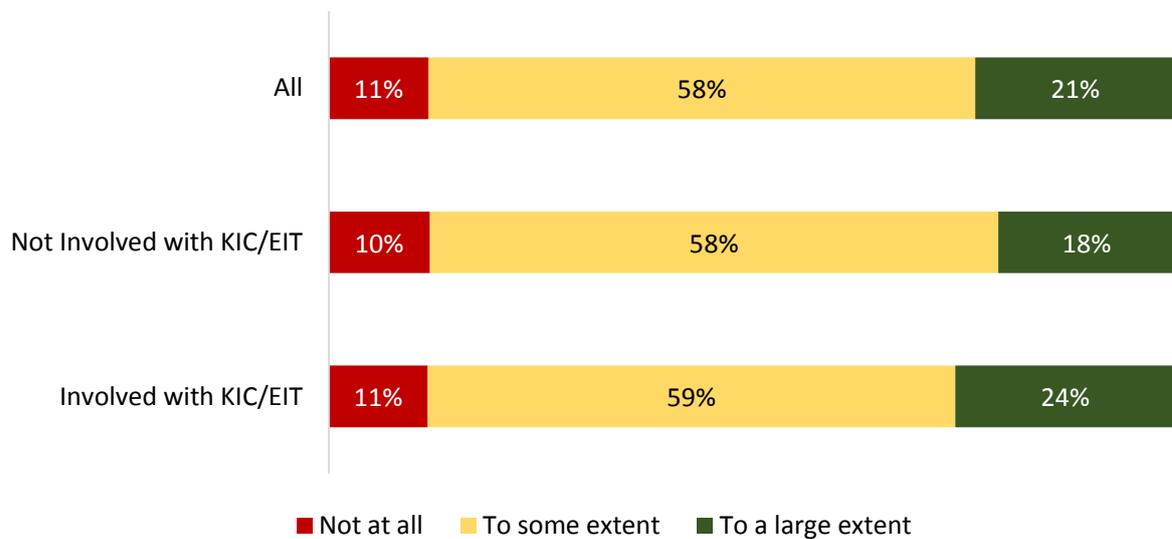
- *Affecting an innovation system takes time and resource, and the KICs are mostly too young to have achieved this:* some respondents argued that KICs – particularly the second wave of KICs – have not been in place long enough to have a noteworthy impact on innovation systems. Relatedly, it was argued that the annual budgets of the KICs are also too small to expect system-level changes at a national and even possibly regional level. These OPC respondents believed that any changes were likely to take place at a local level.

Impacts of the EIT on Europe's innovation capacity

Figure A1.12 shows OPC respondents' views on whether the EIT contributes to strengthening Europe's innovation capacity. As these data show, opinion was fairly consistent regardless of whether or not OPC respondents were involved with the EIT/KICs. A majority of all respondents (58%) believed that the EIT had contributed to strengthening Europe's innovation capacity 'to some extent'; just 21% of all respondents believed the EIT had contributed 'to a large extent'.

Figure A1.12 Respondents' views on whether the EIT contributes to strengthening Europe's innovation capacity

Q.15 To what extent does the EIT contribute to strengthening Europe's innovation capacity?



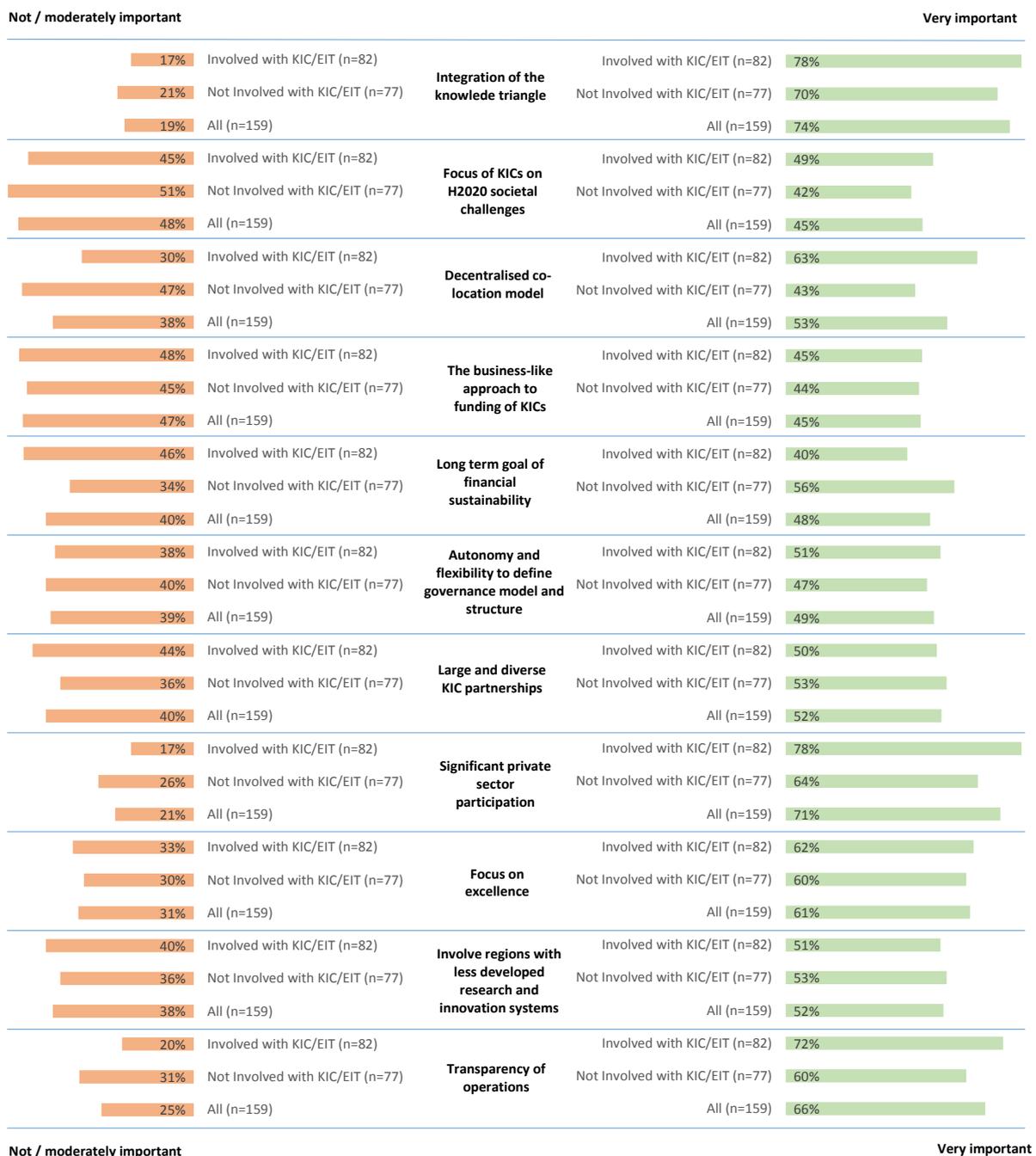
Base: all respondents; note: excludes 'no opinion' and no response, so does not sum to 100%

Key features of the KIC model

OPC respondents were asked to identify the features of the KIC model that were most important to the achievement of the EIT’s mission (Figure A1.13). Features that were had the highest proportion of ‘very important’ ratings included: the integration of the knowledge triangle (74% of all respondents), private sector participation (71%) and transparency of operations (66%).

Figure A1.13 Respondents’ views on key features of the KIC model

Q.17 How important are the following characteristics of the KICs in order for the EIT to achieve its mission of enhancing Europe’s innovation capacity?



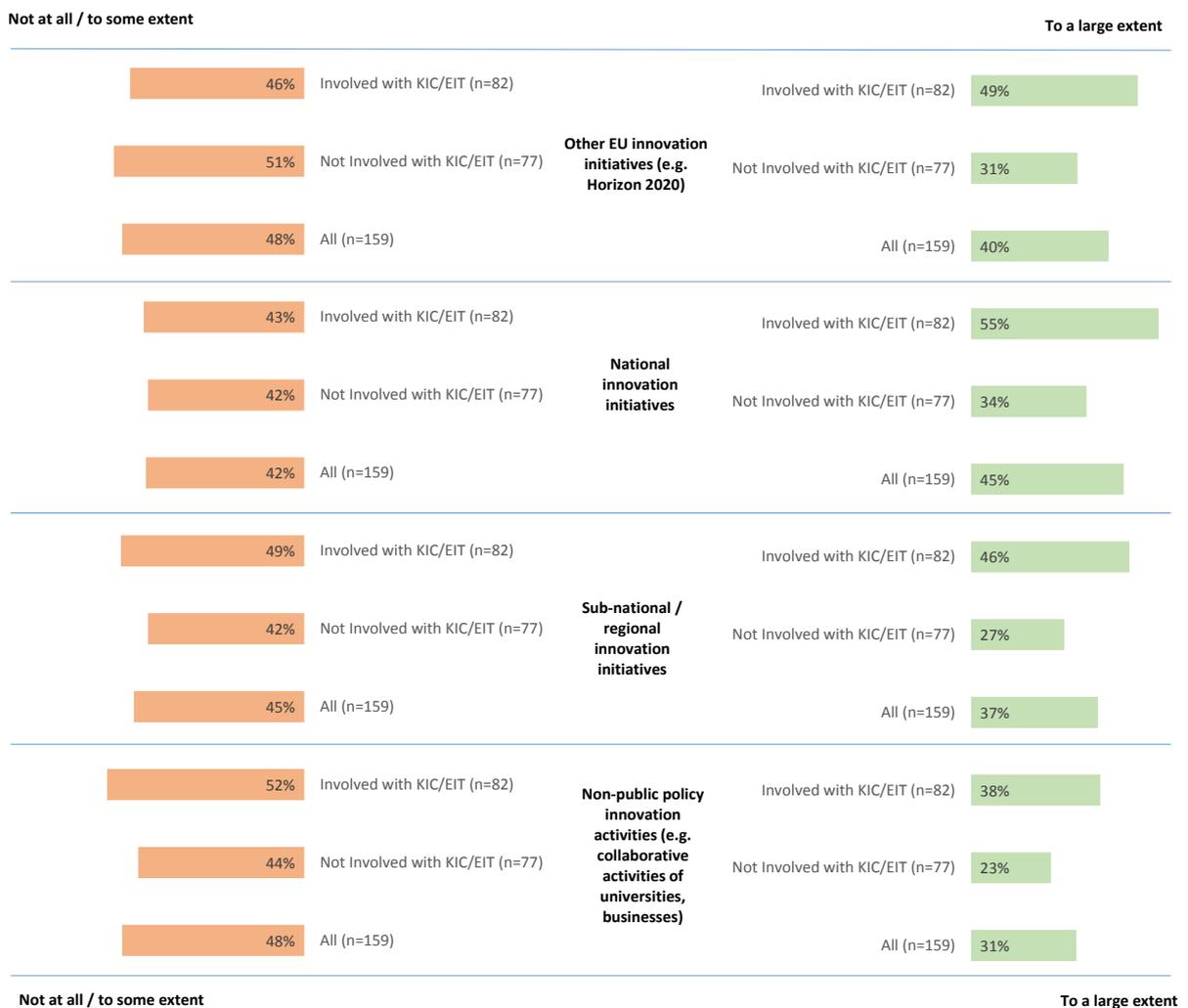
Base: all respondents; note: excludes ‘no opinion’ and no response, so does not sum to 100%

The distinctiveness of the EIT/KICs

Figure A1.14 shows OPC respondents' views on the extent to which the EIT is distinctive from other innovation initiatives, including those at a European, national and sub-national level, as well as innovation activity that takes place outside of public policy. Views were mixed, and overall it is clear that OPC respondents did not perceive the EIT/KICs to be markedly different from other innovation activities, whether public policy or non-public. Under half of all respondents believed the EIT was distinct 'to a large extent' from other EU innovation initiatives (40% of respondents), or national innovation initiatives (45%). Proportions were lower when the subject of comparison was sub-national innovation initiatives (37%) or non-public policy initiatives (30%). Respondents who were involved with the EIT/KICs were slightly more likely to indicate that the EIT was distinct 'to a large extent' than respondents who were not involved with the EIT/KICs.

Figure A1.14 Respondents' views on whether the EIT is distinctive from other innovation initiatives

Q.18 To what extent is the EIT distinctive from existing initiatives that support innovation?



Base: all respondents; note: excludes 'no opinion' and no response, so does not sum to 100%

The added value of the EIT / KICs

OPC respondents were asked to identify what they saw as the key added value of the EIT/KICs, and to explain their answer(s). The following points were made:

- *The EIT's grounding in the knowledge triangle model was seen to provide a holistic approach to innovation:* many OPC respondents (whether explicitly or implicitly) noted the value of the knowledge triangle model, in the sense that it brought together partners from business, higher education, and the public sector, and also in the sense that the KIC model encompasses innovation support, training and education, and entrepreneurship support. It was suggested by some OPC respondents that this was a new way of working that facilitated open innovation and brought new ideas and perspectives to the innovation process. According to one respondent:

"The key added value [of the EIT/KICs] is the integration of the three sides of the knowledge triangle, i.e. education, innovation and research. No other EU instrument integrates education into research and innovation activities which is a stronghold and is expected to deliver on improved entrepreneurship and innovation capacities"

DIGITALEUROPE, KIC partner

- *The entrepreneurship education element of the EIT/KICs was seen as a key differentiator compared to other innovation activities:* entrepreneurship education – working with graduates to inspire and support them to start their own businesses – was often identified by respondents as one of the most important ways in which the EIT added value. Similarly, embedding innovation and innovation-related soft skills such as problem solving, was highlighted as an added value of the EIT-label courses, as one respondent explained:

"The integration of innovation and entrepreneurship into education is a clear success story [of the EIT]. Some Masters [courses] include an "engineering business case" where some companies are directly involved by posing a "from idea to market" real engineering problem to the students. Students work on this problem and contrast their solutions with the solutions adopted by the companies. All the students consider very positive such approach".

Universitat Politècnica de Catalunya, KIC partner

- *KICs were seen to be favourable to small businesses and start-ups:* it was also noted that the importance that KICs place on start-ups and the role of start-ups in innovation was an important way in which the EIT differentiated itself from other innovation initiatives (whether EU or national), which could often come to be dominated by large businesses and universities.
- *KICs bring together partners from different fields and a range of countries:* the pan-EU (and international) scope of the KICs brings together organisations from multiple countries, which makes them distinct from national innovation initiatives. This provides KIC partners and beneficiaries with links to expertise and markets that they might otherwise find it difficult to access. It was also suggested by OPC respondents that the KICs operationalise public-private partnerships in a way that other public innovation support initiatives often do not. Other respondents broadened this perspective to note the added value from the diversity of organisations that are involved in KICs, and the way in which KICs have brought together these partners to focus on a specific sector and/or societal challenge.
- *Compared to many other research and innovation initiatives, KIC-backed innovation projects are often smaller and quicker:* some respondents contrasted the innovation projects funded by KICs with other research and innovation

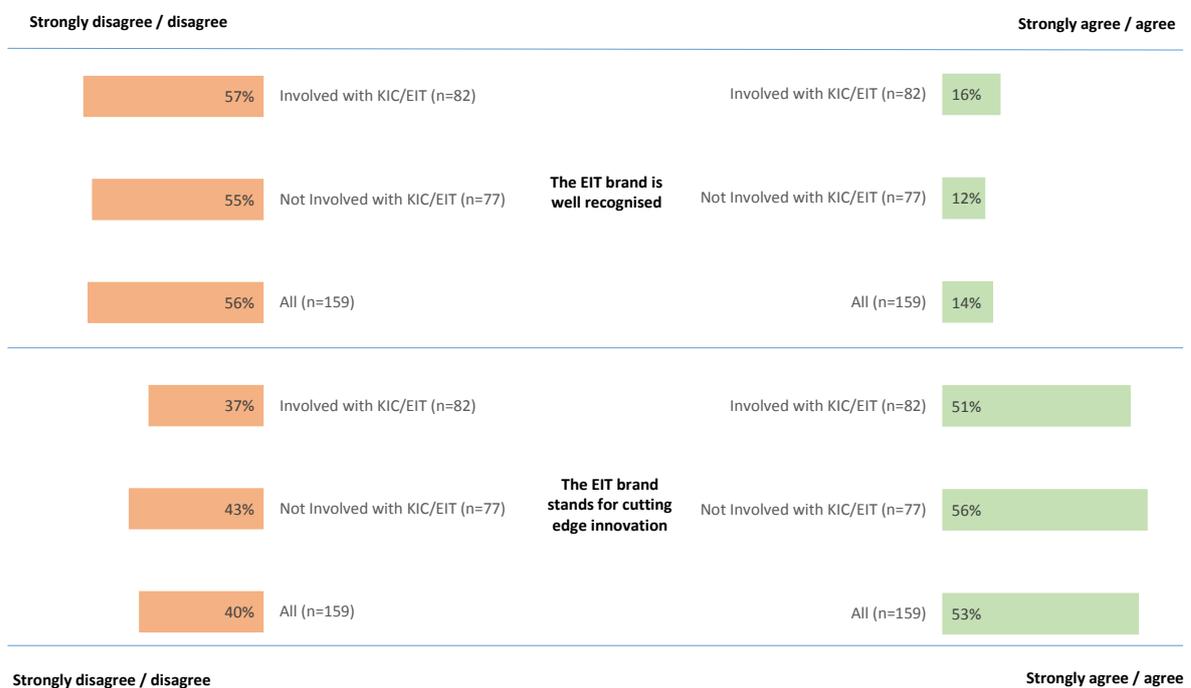
initiatives (such as those funded via the Framework Programmes), and noted that the KIC-backed projects tend to be smaller in size, shorter, more collaborative, and more focussed (e.g. on a specific issue or product). This makes KIC-backed projects better suited to addressing innovation challenges in a fast-moving market than would be the case if other public (primarily EU) funding programmes were used. Moreover, KIC-backed projects were also – in principle – closer to market than is often the case with public research and innovation support schemes, which, respondents suggested, differentiated the EIT and made it more likely that the initiative could support significant change.

The EIT brand

OPC respondents were asked about their views on the strength of the EIT brand (Figure A1.15). Just over half (56%) of all OPC respondents disagreed that the EIT brand is well recognised, a proportion that was similar regardless of whether respondents were involved with the EIT/KICs, which suggests that this opinion is not based on familiarity (or lack thereof) with the EIT. There was slightly more support for the view that the EIT brand stands for cutting edge innovation (supported by 53% of all OPC respondents, though disputed by another 40%). Interestingly there was relatively little difference in opinion on the EIT brand depending on whether or not the respondent was involved with the EIT/KIC(s).

Figure A1.15 Respondents' views on the EIT brand

Q.20 To what extent do you agree or disagree with the following statements?



Base: all respondents; note: excludes 'neutral', 'no opinion' and no response, so does not sum to 100%

OPC respondents were invited to explain their answer as regards the EIT brand, though most used this opportunity to talk more generally about the profile of the EIT. Respondents made the following observations about the brand and profile of the EIT:

- Awareness and understanding of the EIT/KICs is largely restricted to the individuals and organisations directly involved in delivery: several respondents expressed a view that KIC partners and other organisations with direct involvement with the EIT were knowledgeable about what organisation's purpose and achievements, but beyond this, awareness and understanding was more limited. Many respondents noted that awareness amongst the general public was negligible, but some did not see this as a major issue at present, as the EIT needed to establish itself first. However, notably, some OPC respondents argued that awareness of the EIT amongst two core sets of stakeholders – universities and businesses – was also not yet widespread. It was also suggested that the EIT did not have a profile amongst the venture capital community. There was also seen to be limited awareness of the EIT at Member State level (i.e. within national government). Summing up, one respondent noted that:

"EIT does excellent things but is not well known outside partners. It is Europe's best kept secret"

Individual, not directly involved with EIT/KIC

- *Awareness and profile might be linked to the geography of EIT delivery:* various respondents from countries where the EIT was not active (i.e. there were no Co-Location Centres – CLCs) argued that the limited awareness of the EIT amongst the wider research and innovation community was due to its lack of presence in some countries. The EIT RIS activities were not seen as a sufficient way in which the EIT could build its profile: a physical presence in countries was seen as a requisite. According to one respondent:

"[The EIT is] not known in Greece, except those who have specific interest to get informed about. For example, less people know about the EIT label or how to actively participate in synergies, clusters and open innovation. EIT brand is known to some extent only in countries where there are KICs. EIT Headquarters very rarely contact with other organisations, consumers, citizens, etc.

Individual, not directly involved with EIT/KIC

- *There is some confusion about the difference between the EIT and the KICs, though the latter have a higher profile:* several respondents noted a lack of awareness of the relative roles of the EIT and the KICs. The KICs – which through their activities have a greater public presence – were seen by some respondents to have a more recognised brand and profile. For one respondent, it was the KICs that were key to the brand:

"It is the different KICs which are implementing the mission of the EIT. Hence, it is important that they are recognized in the first place. The EIT as host and guiding institution does not have to be recognized to such an extent since it is not market / partner-facing"

Public Research Institute, KIC Partner

- *The EIT has yet to establish its brand as a source and enabler of innovation:* Opinions were mixed on the EIT's brand in terms of innovation. For some respondents, the EIT had yet to establish itself as a leader the field of innovation specifically, as opposed to a funder of research. Part of the problem, it was suggested by some respondents, was that the EIT has struggled to position itself as distinct from the Framework Programmes, and that whilst the research and innovation community in Europe knows about Horizon 2020, this is not the case for the EIT. Relatedly, even when the EIT is connected with innovation support, it was suggested it was simply seen as another public funding agency:

"The EIT and KIC brands remain insufficiently known. When their name is known, it is often reduced to yet another funding mechanism, ignoring their role in boosting cross-boundary innovation capacity and actually working with partners and stakeholders on co-constructing solutions. Those who know the brand do understand that it aims at cutting edge innovation, although the level of ambition may still vary across themes and geographies"

Individual, involved with a KIC

- *Brand-awareness and reputation building will take time, but more can be done:* some respondents stressed that the EIT is a relatively new institution, and that it will take time and a track record of success before a brand and reputation can be developed. Relatedly, some OPC respondents questioned how well the EIT and the KICs are promoting its achievements, particularly in terms of the products and

businesses that have made use of the support offered by the KICs. It was noted that good news is essential in building the brand of the EIT.

Improvements to the EIT/KICs

OPC respondents were asked to complete an open-ended question that asked them: "What could the EIT / KICs do differently to have a larger beneficial impact?" The following improvements were suggested by respondents (note that this list includes contradictory suggestions, but that we have included all of the points made by OPC respondents):

- *Promote the achievements of the EIT and KICs more effectively and more widely:* the visibility of the KICs in particular was raised by respondents several times in their responses to the OPC, and a common recommendation was that the EIT and KICs look to do more to promote their successes and achievements. One suggestion was more EIT activity to build networks, and the alumni networks were cited as a way in which a community of EIT beneficiaries can be developed who will then disseminate information on what the EIT is and can achieve. It was also suggested that the evidence that KICs do promote on their websites is too focussed on outputs and measures of expenditure. It was suggested that a more compelling case for the EIT could be made with greater promotion of success stories and measures of impact, which would help attract partners – particularly SMEs – for whom the benefit of participating in the EIT is not presently clear. According to one individual who responded to the OPC:

"Publish and talk numbers, products, solutions which succeeded on the market. Don't talk about innovation and technology in general. We don't care much how much money has been spent, how much engineers and researchers involved, talk about the impacts and benefits. Be part of everyday life, not just people from science, research etc."

Individual, not involved in EIT/KICs

- *Improve transparency in KIC decision-making and processes:* several OPC respondents believed that the KICs should be more open as regards how they allocate resources and the reasons behind the strategic decisions that they take (e.g. which innovation projects to support). According to one OPC participant:

"EIT and KICs must be as professional in handling their rules and timelines as they demand it from partners and stakeholders, and their decisions need to be consistent over time and based on high quality assessments, if they want to keep the trust of stakeholders"

Individual, involved with EIT/KIC

- *Improve EIT linkages with other networks and programmes, whether at EU or national level:* some respondents argued that the EIT and the KICs are insufficiently connected to other, related activities and networks, and that this hampered information sharing and alignment. Examples included: incubation and business accelerator networks; venture capital networks; business angels. Some OPC respondents wished to see greater involvement of representatives from these networks in KICs.
- *Encourage greater amounts of cross-KIC working:* given the importance of a multi-disciplinary approach to innovation, various respondents argued that this should be better integrated into the KICs' operating models. One respondent suggested the use of joint calls for innovation projects involving multiple KICs, where technologies and products spanned more than one KIC (e.g. around digitalisation).

- *Develop national-level linkages:* in their response to this question and other parts of the OPC, various respondents queried whether the EIT/KICs had sufficient visibility or enough of a presence at a national level, as opposed to a EU or sub-national level (where the CLCs may be very visible). Suggestions included: greater promotion and KIC involvement in national-level policy discussions, and some form of 'national contact point' model whereby advice and support was available to any organisation that wished to get involved with a KIC (regardless of whether there was a CLC in their country).
- *Widen participation in the EIT and KICs:* whilst acknowledging the impact that the introduction of the EIT RIS had had in increasing participation in the EIT from countries and regions with weaker innovation performance, some OPC participants still perceived the EIT as an initiative that focussed on the traditional centres of innovation excellence. Respondents to the OPC described the KICs as 'closed shops' that replicated and built on pre-existing networks involving the 'usual suspects'. These respondents argued that more should be done to encourage and enable the participation of partners from countries where there were no CLCs and little KIC activity.
- *Extend KIC activity into schools:* some respondents believed that entrepreneurial and innovation education should be brought into schools, rather than restricted to graduates or working age adults, since this would ensure that the next generation of individuals was more entrepreneurially-minded.
- *Simplify the administrative burden associated with participation in a KIC:* several OPC respondents raised a concern about the administrative burden associated with involvement in a KIC, though many did not provide specific examples of what they believed needed to be changed. It was noted by some respondents that KIC autonomy – whilst it made them more adaptable and flexible – resulted in variable administrative requirements and delivery models and made working across KICs more difficult, as they had to familiarise themselves with how each KIC operated. Broadly, moving the EIT into H2020 was seen by some respondents as a move with negative impacts, as the framework programme structure was not seen to suit the KICs, with their autonomy and need to operate with agility. Specifically, some respondents highlighted increased financial and reporting requirements of participation in the KICs as a result of closer alignment with H2020. One respondent made the case as follows:

"If the EIT is supposed to foster an innovative way of working that is really different from the traditional instruments in H2020, it should be granted more regulatory leeway to do so, without being forced into every element of the H2020 straightjacket, e.g. applying its ill-fitting framework partnership agreements to the EIT, its KICs and their partners. EIT should define upfront the framework in which new KICs should fit, in order to prevent new negotiations and constructions varying from KIC to KIC"

Large business, KIC partner

- *Abolish the single year grant agreements and move to a more long-term model of KIC funding:* various respondents queried the value of having grant agreements that only lasted for a single year, and called for the introduction of a multi-annual grant agreement. This would, for example, align better with the timeframe for innovation projects, which may take several years to set up and generate outcomes.
- *Amend governance arrangements:* some OPC respondents called for even more autonomy at the level of the KIC, which they believed should be given greater freedom to design and manage its activities. Relatedly, respondents also suggested

that the EIT headquarters should take more of a strategic support and leadership role, with a Governing Board that takes a more involved role in the KICs, by visiting them more and providing advice and guidance.

- *Revisit the requirement that KICs move towards financial sustainability:* several respondents questioned whether sustainability was desirable or feasible. In particular it was argued that this has led KICs to seek to maximise income streams that go against how some OPC participants believed the KICs should operate. Notably this included: i) the size of the fees charged, which some respondents believed were prohibitively high and excluded SMEs and other resource constrained organisations; and ii) the role of IP as a source of income for the KICs, with some respondents arguing that IP should remain exclusively with the partners within an innovation project. One respondent explained their thinking thus:

"We are worried about the direction in which discussions on the sustainability are developing. The KICs are facilitators, supporters, promoters of new solutions, products and business. But the intellectual property and benefits should remain the properties of the organisations which developed it. The return on investment for the EIT and the KICs is in the achievement of their objectives of competitiveness of Europe, sustainable economic growth and job creation"

Large business, KIC partner

Annex 2: Terms of Reference for this evaluation

TERMS OF REFERENCE

Evaluation of the European Institute of Innovation and
Technology

Contracting Authority: European Commission

1. Context

1.1. Background

Europe has been facing structural weaknesses in innovation capacity and the ability to use its research and education qualities in delivering new services, products and processes. This has been slowing down sustainable economic growth and job creation. The European Institute of Innovation and Technology (EIT) was established in 2008 to address these issues by fostering the integration of higher education, research and innovation, notably through the operations of the pan-European partnerships between universities, research centres, companies and other innovation actors.

The EIT is crucially different from other innovation initiatives in three respects. First, it adopts a broad definition of innovation, which includes societal challenges¹. Second, the EIT aims to achieve innovation by integrating education, research and business. Finally, the EIT achieves its objectives as a result-oriented investor into its Knowledge and Innovation Communities (KICs): independent legal entities coordinating top public and private organisations in the knowledge triangle co-funded by up to 25% from a 7-15 year grant.

The goal of this evaluation is to assess the EIT's work as identified in the EIT Regulation and Horizon 2020 Regulation, and in particular examine how the EIT fulfils its mission. The evaluation should focus on the work of the EIT, while taking into account the fact that the EIT primarily operates via the KICs.

1.2. The EIT's objectives

1.1.1 General objectives

The EIT's general objectives are to contribute to sustainable European economic growth and competitiveness by reinforcing the innovation capacity of the Member States and the Union in order to address major challenges faced by European society. It does this by promoting synergies and cooperation among, and integrating, higher education, research and innovation of the highest standards, including by fostering entrepreneurship (knowledge triangle integration).

1.1.2 Specific objectives

The **specific objective** of the EIT is to integrate the knowledge triangle of higher education, research and innovation and thus to reinforce the Union's innovation capacity and address societal challenges². The EIT implements activities to achieve its objectives primarily through the KICs. In addition it ensures that experiences are shared between and beyond the KICs through targeted dissemination and knowledge sharing measures, thereby promoting a faster uptake of innovation models across the Union.

In addition, on 1 January 2014, the EIT has become a member of the Horizon 2020 programme. Since then, in addition to its original objectives, the EIT and its KICs seek synergies and interaction across the priorities of Horizon 2020 and with other relevant initiatives, as identified in the Horizon 2020 Regulation. The EIT contributes through the KICs to the specific objectives of the Horizon 2020 priority "Societal challenges" and to the specific objective "Leadership in enabling and industrial technologies"³.

¹ The concept of "innovation" is defined in the Horizon 2020 programme and the EIT amended regulation as the process, including its outcome, by which new ideas respond to societal or economic needs and demand and generate new products, services or business and organisational models that are successfully introduced into an existing market or that are able to create new markets and that provide value to society.

² The EIT Monitoring Strategy of December 2015 elaborates the specific objectives of the EIT into more detail.

³ As identified in Annex I, part VII of the Horizon 2020 Regulation.

1.3. Description of the initiative/intervention

1.1.3 Overall EIT design

The EIT was designed as an independent EU body with the goal of taking a different route to addressing the EU innovation challenges. The EIT governance combines the addressing of strategic European priorities with the implementation of thematic business plans. The strategic orientation is provided at the EIT level, primarily through its Governing Board, while the business plans are developed and implemented by independent Knowledge and Innovation Communities (KICs).

The Governing Board of the EIT is made up of proven leaders in business, research and education, with a role to provide strategic direction to the whole EIT family. The EIT headquarters in Budapest are set up as a lean organisation which coordinates policy, launches the calls for proposals and manages the funding granted by the EU.

KICs are independent legal entities which function as highly integrated pan-European partnerships with the mission of bringing together – on a long term basis – excellent universities, research centres, small and large companies, as well as other innovation actors. A KIC has a large degree of autonomy in defining its legal form, internal organisation, membership, agenda and working methods, allowing it to choose the approach that is best suited to meet its objectives. Each KIC has its own head office, its own system of management, its own co-location centres – nodes of knowledge triangle excellence in a given geographical location – and its own network of partners operating across the EU and beyond.

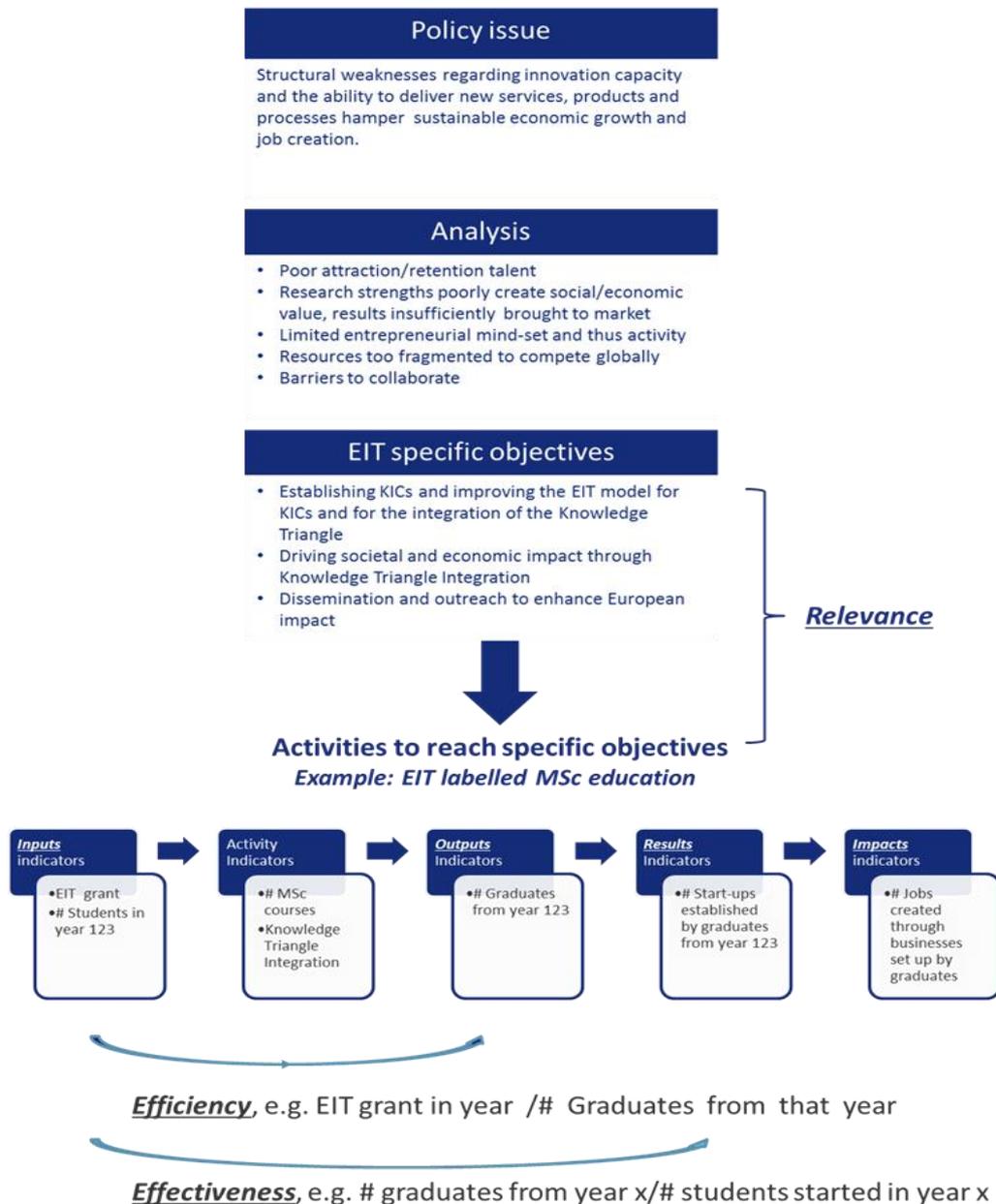
KICs are designated in an open, transparent call in a competition of consortia of knowledge triangle partners. Each proposal for a KIC sets specific objectives, develops a business model, and devises a structure to deliver the results. The winners – one KIC per societal challenge – receive the mandate and resources to implement their initial plans over seven to fifteen years.

EIT overall activities

The EIT is meant to achieve its objectives through the following general sets of activities:

- Transferring and applying higher education, research and innovation activities for new business creation: the KICs create new business opportunities in the form of both start-ups and spin-offs and innovation in existing industries and services.
- Innovation, including research, in areas of key economic and societal interest: the EIT's focuses on areas with high potential for socioeconomic impact and a clear relevance to the challenges addressed in Horizon 2020.
- Providing education and talent in order to develop skilled and entrepreneurial-minded people: the EIT integrates research, education and entrepreneurship, facilitating the development of new and innovative EIT label curricula.
- Dissemination of best practice and systemic knowledge-sharing: the EIT implements outreach activities and uses its alumni network across the EU, pioneering new approaches to a European innovation and knowledge-transfer culture, including in SMEs.
- An innovative funding model: within the framework of Horizon 2020 the EIT is testing out new and simplified approaches to funding and governance.
- - Linking regional development to European opportunities: through the KICs and their co-location centres the EIT ensures a better connection between higher education, the labour market and regional innovation, in the context of regional and national smart specialisation strategies.
- International dimension: the EIT is conscientious of the global context it operates in and helps to forge links with key international partners.

Diagram 1: An indicative outline of the EIT intervention logic:



Note: the MSc education only provides an example.

Source: EIT Monitoring Strategy, December 2015.

Synergies and complementarities

The EIT and the KICs seek synergies and complementarities with the European and global initiatives. These efforts are facilitated by the EIT and the DG Education and Culture through, for example, the annual meeting with Commission services, EIT and KICs. They are also built into the KIC model, elements of which reflect objectives and lesson learned from other EU programmes (e.g. the Knowledge Triangle concept echoes aspects of Erasmus+ and the University-Business Dialogue; the Co-location Centre concept echoes concepts from EU Regional Policy).

The European Fund for Strategic Investments (EFSI), established in June 2015, will provide another opportunity for synergies. EFSI aims to overcome the current investment gap in the European Union (EU) by mobilising private financing for strategic investments which the market cannot finance alone. The EIT and KICs are well placed to take advantage of the Fund, which supports among others policies of innovation, research and technological development, including research infrastructure, and pilot and demonstration facilities, and projects relating to human capital.

1.1.4 Budget of the initiative

The budget of the EIT was over 300 million for the period 2008 – 2013 and it is planned to be 2.3 billion in the period 2014 – 2020.

1.1.5 Eligible countries

In the 2009 KIC call the proposed KICs must have contained at least three independent partner organizations established in at least three Member States, and the majority of the partner organizations had to be established in the Member States.

In the 2014 KIC call, the proposed KIC must have contained at least three independent partner organisations established in at least three different Member States, and at least two thirds of the partner organisations forming the proposed KIC had to be established in Member States.

The eligibility rules of a particular KIC call are applied to the new partners joining an existing KIC for as long as the KIC in question has a valid Framework Partnership Agreement with the EIT.

1.4. EIT operations

In 2009, three first-wave KICs were designated in the fields of sustainable energy (KIC InnoEnergy), climate change (Climate-KIC) and information and communication society (EIT Digital, which was until 2015 named EIT ICT Labs). In 2014, two second-wave KICs were designated in the areas of healthy living and active ageing (EIT Health) and raw materials - sustainable exploration, extraction, processing, recycling and substitution (EIT Raw Materials). The EIT will launch at the beginning of 2016 a call for two third-wave KICs: Food4future - sustainable supply chain from resources to consumers (EIT Food) and in Added-value manufacturing (EIT Manufacturing).

The EIT is designed to follow an 'investor approach' by incentivising each KIC to optimally pool and leverage EIT funds with funds from other sources into tangible economic and social impact. The EIT funds up to 25% of KICs activities and in doing so leverages EU money to achieve a greater effect. The model is outlined in detail in the **Principles for financing, monitoring and evaluating KIC activities**⁴. In 2014, the financial support from the EIT to the first wave of KICs amounted to approximately 214 million EUR.

The latest report on the implementation of the EIT's programme is the **EIT 2014 annual activity report**⁵. During 2014, the EIT Regional Innovation Scheme⁶ was introduced and piloted as a new element of the EIT outreach strategy. A new EIT website and new EIT Community brand identity was launched including brand architecture, community values, brand tone and new visual as well as a naming convention for the EIT KICs.

⁴ <http://eit.europa.eu/sites/default/files/EIT-Principles-financing-monitoring-evaluating-KIC-activities.pdf>

⁵ <http://eit.europa.eu/sites/default/files/EIT%20GB%20Decision%20-%20Annual%20Activity%20Report%202014.pdf>

⁶ <http://eit.europa.eu/activities/outreac/eit-regional-innovation-scheme-ris>

During 2015, the EIT underwent a number of significant reform initiatives. The **Principles on KICs' Financial Sustainability**⁷ were passed by the Governing Board, the EIT and the KICs' entered into a comprehensive revision of the grant cycle framework, and the December 2015 Governing Board passed the Monitoring Strategy and the updated Principles for financing, monitoring and evaluating KIC activities. In 2015, the EIT also conducted a review of the KICs' co-funding model – the KICs' Complementary Activities.

1.5. Implementation of EIT – KIC model

The EIT's relations with the KICs are set out by the legal framework (the EIT Regulation, the Horizon 2020 Regulation, the EIT's Strategic Innovation Agenda, the Horizon 2020 Rules of Participation⁸ and the applicable umbrella EU regulations⁹), the Framework Partnership Agreement, the annual Grant Agreements and the documents that the EIT passes on the basis of these documents. As an illustration, the EIT verifies the compliance of the KICs' grant implementation with the EIT Financial Regulation and the other legal bases and takes corrective actions where needed. These legal documents provide a background for the grant-related obligations of the EIT and the KICs.

At the same time, KICs are designed as independent legal entities which are, through their articles of foundation, responsible to their partners. As a result, the EIT does not have a direct influence on the majority of the KICs' activities. Some examples of the KICs' autonomy include:

- the amounts allocated to specific activities in the KICs' business plans;
- the KICs' communication activities (although the EIT does evaluate the KICs' overall communication strategies);
- the selection of KICs' partners;
- the KICs' day-to-day operations.

The EIT does, however, have the ability to provide incentives to the KICs. Some examples include:

- the competitive portion of the KICs' funding rewards the achievement of key performance indicators;
- the EIT evaluates the KICs strategies' alignment with the EIT's mission and Strategic Innovation Agenda: a portion of the KICs' budget is determined based on this alignment;
- as of 2016, the funding for the Regional Innovation Scheme will reward the outreach of the KICs towards all EU regions.

This interaction of legal grant-related obligations, the KICs' autonomy, and alignment with the EIT overall strategy is a unique characteristic of the EIT innovation model.

1.6. Evaluation and monitoring

1.1.6 EIT's Evaluation and Monitoring Operations

The EIT internal evaluation and monitoring strategy was adopted in December 2015 with two main objectives: 1) to support the EIT and its KICs to learn lessons from experience; and 2) to account for the use of resources. To this end, the EIT evaluation and monitoring system aims at ensuring quality of deliverables, contribution to Horizon 2020 priorities, lessons learning from the most successful KIC activities, and

⁷ <http://eit.europa.eu/interact/bookshelf/governing-board-decision-principles-kics%E2%80%99-financial-sustainability>

⁸ http://ec.europa.eu/research/participants/data/ref/h2020/legal_basis/rules_participation/h2020-rules-participation_en.pdf

⁹ Specifically http://ec.europa.eu/budget/biblio/documents/regulations/regulations_en.cfm

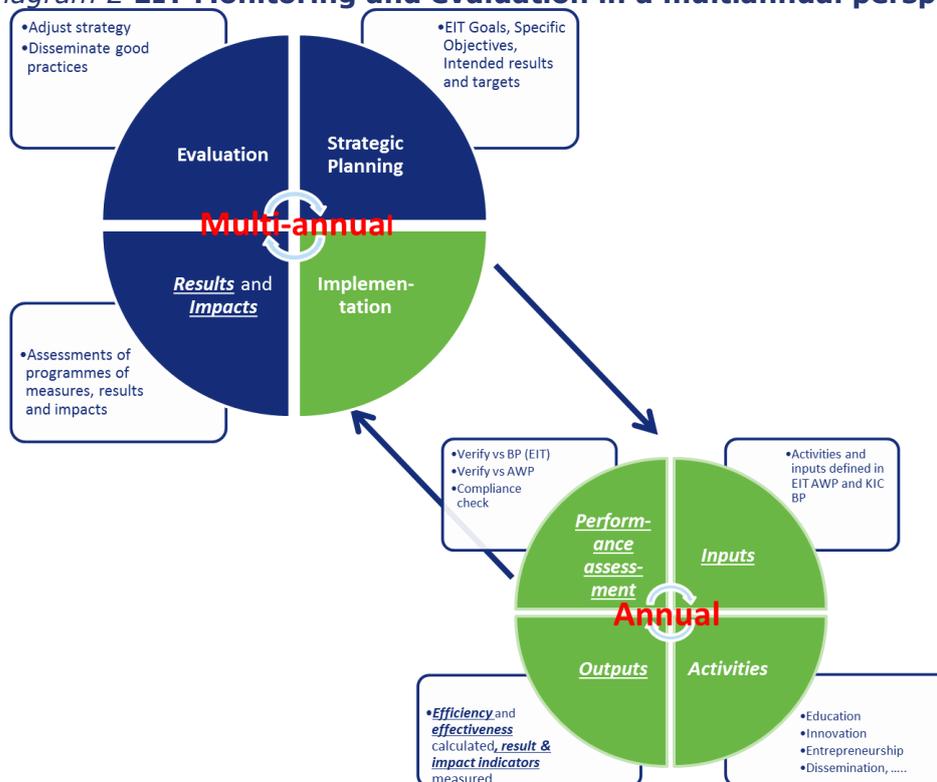
at the same time, allowing for sufficient flexibility in KICs' operations and openness to new ideas and partners. This system also allows the monitoring of the relevance, efficiency, effectiveness, utility / sustainability and impact of EIT investments and activities, and demonstrating that these maximise results and create impact.

Designed in 2012, the EIT's Performance Measurement System pioneered a system to track performance and to support a results-oriented monitoring on the implementation of the EIT's strategy. It consists of four levels, reflecting the multi-layered governance of the EIT:

- The Horizon 2020 perspective: the provision of information on the EIT's contribution to Horizon 2020 objectives
- The EIT perspective which has two components: the monitoring and assessment of the operational and organisational efficiency and effectiveness of the EIT and of outputs, results and impacts of EIT specific activities, i.e. dissemination, outreach and improvements of the EIT KIC model.
- The Cross-KIC perspective: standardised information on key elements of KICs including outputs, results, impacts, operational efficiency and effectiveness, and elements as the degree of Knowledge Triangle Integration. This information is used among others in the annual decisions about allocation of funds to KICs and in the communication of results of the EIT Community to external stakeholders.
- The KIC perspective: KICs monitor and assess operational and organisational efficiency and effectiveness and their outputs, results and impacts.

The data for these analyses is collected by the EIT through a multidimensional toolbox. This includes the KIC annual Business Plan Reports, Key Performance Indicators (KPIs), monitoring and topical reviews.

Diagram 2 EIT Monitoring and evaluation in a multiannual perspective



Source: EIT Monitoring Strategy, December 2015.

The EIT has made changes to the Key Performance Indicators over time to accommodate the developing understanding of the KICs' performance measurement. The indicators used for the 2015 Grant Agreements are:

- Attractiveness of Education Programs;
- Number of new graduates;
- Number of business ideas incubated;
- Number of start-ups created;
- Knowledge Transfer/ Adoption;
- New or improved products/ services/processes launched.

The cross-KIC key performance indicator results are presented in Table 1:

Table 1: Cross-KIC key performance indicators over time

	Results in period covered by evaluation (2011-2015)	Results in 2011-2014	Results in 2014 only
Applications to EIT Masters and PhDs	22000	17350	3788
Graduates from EIT Masters and PhDs	900	500	241
Business ideas incubated	1300	900	443
Start-ups created	300	180	90
Knowledge transfers and adoptions	800	550	285
New or improved products, services and processes launched	330	170	71

Note: 2011-2014 and 2015 figures are rounded to the nearest 10.

Note 2: 2014 figures are taken from the EIT contribution to the Horizon 2020 Monitoring Report 2014.

Note 3: 2015 figures are based on the KICs' Business Plans.

1.1.7 Previous evaluations of the EIT

An **independent expert evaluation of the EIT** was conducted in 2010-2011¹⁰, with a focus on the procedural topics related to the initial setting up of the EIT and the KICs. The European Commission published its **opinion on the evaluation** in November 2011 (COM/2011/0816 final)¹¹. The present evaluation will analyse the effects triggered by this initial governance setup, in line with the evaluation topics and questions presented in section 2.2.

2. Task specification for the assignment

The goal of this evaluation is to assess the EIT's work as identified in the EIT Regulation and Horizon 2020 Regulation, and in particular examine how the EIT fulfils its mission. The evaluation should focus on the work of the EIT, while taking into account the fact that the EIT primarily operates via the KICs.

¹⁰ http://eit.europa.eu/sites/default/files/eitreport_en.pdf

¹¹ <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52011DC0816>

The evaluation has to comply with the requirements of the Commission's Better Regulation Guidelines¹².

The evaluation will cover the **time scope** from January 1 2011 until at least December 31 2015. The contractor needs to take into account that on January 1 2014 specific EIT objectives associated with the Horizon 2020 Regulation entered into force¹³. If evidence is available from the 2016 activities as well, the contractors will be expected to use it if appropriate and feasible. The evaluation will cover the entire geographical scope of the EIT's and its KICs' activities.

The **main output** of the evaluation will be the Commission report to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions accompanied by a Staff Working Document (SWD)¹⁴. The evaluation will provide the Commission evidence and data for designing the EIT's future activities and initiatives, including the next Strategic Innovation Agenda (SIA) of the EIT, and for assessing if there is a need for a possible amendment of the EIT regulation.

The evaluation will inform the Member States, the innovation community (notably research, higher education and business members of the community), the general public and other stakeholders about the performance of the EIT and its achievements. The evaluation will, more widely, also contribute to improving the work of the EIT and its Knowledge and Innovation Communities (KICs). A follow up action plan will be drawn by the European Commission on the basis of the recommendations made in the evaluation report.

The results of the evaluation will contribute and feed into the Horizon 2020 mid-term evaluation and into the EIT review, both of which are due by the end of 2017. However, to comply with the evaluation requirements of the Horizon 2020 Regulation the EIT evaluation results must be available mid-2017 at the latest. The Governing Board of the EIT will take due account of the findings of the evaluations in the programmes and operations of the EIT.

2.1 Legal framework of the evaluation

The independent external evaluation of the EIT is a mandatory requirement from the Regulation (EC) No 294/2008 as amended by the Regulation (EU) No 1292/2013 establishing the European Institute of Innovation and Technology (EIT Regulation). The EIT review is a mandatory requirement of the Regulation (EC) No 1291/2013 on establishing the Horizon 2020 Programme (Horizon 2020 Regulation). The strategic priorities of the EIT in the period 2014-2020 are set out in the EIT's Strategic Innovation Agenda, passed in the Decision No 1312/2013/EU of the European Parliament and of the Council.

Legal regulations

Article 16 paragraph 2 of the **EIT Regulation**¹⁵ stipulates: "By June 2011 and every three years after the entry into force of a new financial framework, the Commission shall provide for an evaluation of the EIT. It shall cover all activities of the EIT and the KICs and shall assess the added value of the EIT, the impact, effectiveness, sustainability, efficiency and relevance of the activities pursued and their relationship

¹² http://ec.europa.eu/smart-regulation/guidelines/toc_guide_en.htm

¹³ While sharing many objectives with the EIT founding Regulation, the Horizon 2020 Regulation changed the focus of some of the EIT's objectives and added some new ones. The contractor needs to take into account these changes, which took place in the middle of the evaluated period.

¹⁴ In compliance with the Better Regulation Guidelines, the SWD will summarise and present the final results of the evaluation process and will be based on the work conducted by independent expert evaluators.

¹⁵ <http://eit.europa.eu/regulation>

and/or complementarity with existing national and Community policies, to support higher education, research and innovation. It shall take into account the views of stakeholders, at both European and national level."

Article 17 of the EIT Regulation stipulates on the **Strategic Innovation Agenda**¹⁶ as adopted in the Decision No 1312/2013/EU on the Strategic Innovation Agenda of the EIT: "The SIA shall define the priority fields and the long-term strategy for the EIT and shall include an assessment of its socioeconomic impact and its capacity to generate the best innovation added-value."

Article 32 paragraph 2 of the **Horizon 2020 Regulation**¹⁷ stipulates: "By 31 December 2017, the Commission shall carry out, with the assistance of independent experts selected on the basis of a transparent process, a review of the EIT, taking into account the evaluation provided for in Article 16 of Regulation (EC) No 294/2008. The KIC call in 2018 shall be launched subject to a positive outcome of that review."

The review shall assess the progress of the EIT against all of the following:

(a) the level of consumption and the efficiency in the use of the funds allocated according to Article 6(3) of this Regulation, differentiating between the amount used for the development of the first wave of KICs and the effect of the seed money for the subsequent waves, and the ability of the EIT to attract funds from the partners in the KICs and especially from the private sector, as set out in Regulation (EC) No 294/2008;

(b) the contribution of the EIT and the KICs to the priority "Societal challenges" and the specific objective "Leadership in enabling and industrial technologies" and the performance assessed on the basis of the indicators defined in Annex I;¹⁸

(c) the contribution of the EIT and the KICs to the integration of higher education, research and innovation;

(d) the ability of the KICs to integrate relevant new partners where they can provide added value."

Article 32 paragraph 3 of the Horizon 2020 Regulation stipulates: "By 31 December 2017, and taking into account the ex- post evaluation of the Seventh Framework Programme to be completed by 31 December 2015 and the review of the EIT, the Commission shall carry out, with the assistance of independent experts, selected on the basis of a transparent process, an interim evaluation of Horizon 2020, its specific programme, including the European Research Council (ERC), and the activities of the EIT."

Implementation of legal regulations in the evaluation

To ensure compliance with the above legal requirements, the present evaluation will assess all the topics outlined in the legal regulations. In addition, to allow the two evaluation exercises – the EIT Regulation *EIT evaluation* and the Horizon 2020 Regulation *EIT review* – to feed into the Horizon 2020 mid-term evaluation due by end of 2017, the EIT review will be finalized half a year ahead of the legal requirements.

The contractor is expected to take into account the overall EIT mission and objectives as defined:

- in the EIT Regulation,
- in the Strategic Innovation Agenda (SIA), and
- in the Horizon 2020 Regulation.

¹⁶ <http://eit.europa.eu/eit-community/eit-qlance/eit-strategy-2014-2020>

¹⁷ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:347:0104:0173:EN:PDF>

¹⁸ This refers to the Annex I of the Horizon 2020 Regulation.

Should any questions arise about the interpretation of the legal regulations, the contractor is invited to communicate them immediately to the contracting authority.

2.2 Evaluation questions

The evaluation focuses on the EIT as a whole. However, where appropriate the evaluation questions refer explicitly to the KICs and in answering these the contractor is expected to analyse the work of the KICs. The contractor is encouraged to consider specific KIC case study/studies for this purpose. Where the contractor's expert judgment is that a question is best answered by covering the operations of the KICs, they are invited to do so. In all cases where the KICs operations are analysed, the contractor should indicate and explain any differences between the KICs.

In line with the EIT Regulation and the Horizon 2020 Regulation, the present evaluation should cover the topics listed below. Specific evaluation questions that the evaluation is required to answer at the minimum are listed under each topic. The contractor is called upon to use their knowledge and experience to refine and elaborate the evaluation questions and, where appropriate, propose others to the Commission with the aim of improving the focus of this evaluation. The contractor should note that the questions proposed under some of the evaluation topics do not necessarily cover the entire aspect of the topic concerned. The questions deal with issues the Commission is particularly interested in and which the contractor therefore should address, in addition to any other issues which the contractor may see as requiring attention in the case of each question.

ET1. The EIT's **systemic level impact**, which aims to explore how the EIT has affected innovation and knowledge triangle integration in the EU¹⁹

- 1.1 What has been the EIT impact on innovation in the EU?
- 1.2 What has been the EIT impact on the innovation systems in the different EU regions?
- 1.3 What has been the EIT impact on national innovation systems in the EU?
- 1.4 What has been the impact of the EIT education label²⁰ programmes on the employability, entrepreneurialism and innovativeness of its graduates? How was this impact achieved?
- 1.5 What has been the EIT's impact on job creation, societal challenges and economic growth? How was this impact achieved?
- 1.6 Please explore the EIT's results and impact as compared to other broadly similar EU initiatives.

ET2. The EIT's **effectiveness**, which aims to explore how successful the EIT has been in progressing towards its objectives:

- 2.1 To what extent and how have the EIT's objectives, as identified in its legal framework and programming documents, been achieved? What factors, and to what extent, influenced the achievements observed?
- 2.2 Specifically, what has been the EIT's contribution, through the KIC model²¹, to the integration of higher education, research and innovation in Europe?
- 2.3 How effective has the EIT been in developing and managing the KIC model for the purpose of achieving the EIT's objectives?

¹⁹ Specifically taking into account the EIT's mission of contributing to sustainable European economic growth and competitiveness, reinforcing the innovation capacity of the Member States and the Union by promoting synergies and cooperation among, and integrating, higher education, research and innovation.

²⁰ <http://eit.europa.eu/activities/education/eit-label>

²¹ An independent legal entity coordinating top public and private organisations in the knowledge triangle co-funded by up to 25% from a 7-15 year grant.

- 2.4 To what extent have the KICs been effective in integrating relevant new partners, including from outside the EU, where they can provide added value? How has the EIT managed this process?
- 2.5 What has been the EIT and its KICs' level of consumption and the efficiency in the use of funds allocated through the implementation of the Horizon 2020 Regulation? Which factors and to what extent affected this result? How has the EIT supported the development of the absorption capacity of the KIC?
- 2.6 How effective have the KICs' education programmes been in attracting relevant students and in raising the overall awareness of the programmes' distinctive profile? Please note if any differences are found between EU and non-EU students.

ET3. The EIT's **efficiency**, which aims to explore the relationship between the resources used and the changes generated by the EIT and the KICs' work:

- 3.1 To what extent have the costs of the EIT been proportionate to its benefits?
- 3.2 To what extent have the costs of the KICs been proportionate to their benefits?
- 3.3 What factors, and to what extent, influenced the efficiency with which the EIT's achievements were obtained?
- 3.4 To what extent do differences exist in the costs and benefits accruing to Member States and stakeholders from the EIT and its three 2009 KICs? What is causing them? To what extent are they justified in the context of the EIT's mission?
- 3.5 To what extent have the seed funds for the establishment of second-wave KICs (EIT Health and EIT Raw Materials) been efficiently used?

ET4. The EIT's **relevance**, which aims to explore the relationship between the wider EU innovation needs and problems and the objectives of the EIT's work:

- 4.1 To what extent have the original objectives of the EIT proven to have been appropriate for the EU needs in the context of the innovation gap?
- 4.2 To what extent is the EIT's objective of supporting of innovation through knowledge triangle integration still relevant in the EU?
- 4.3 To what extent have the EIT and the KICs affected EU policy development and implementation in their individual thematic areas?
- 4.4 How successful have the EIT and the KICs been in communicating the outputs, results and impacts of their work to stakeholders and the general public?
- 4.5 How successful have the EIT and the KICs been in engaging their stakeholders and the general public in their activities?
- 4.6 How relevant is the KIC model²² for supporting innovation in EU?

ET5. The EIT's **EU added value**, which aims to explore the EIT's added value compared to innovation interventions at level of member states:

- 5.1 What is the EIT's added value compared to innovation interventions that the Member States undertake themselves?
- 5.2 Are there any indications of spill-overs on the Member States level arising from the EU intervention?

ET6. The EIT's **coherence**, which aims to explore the relation of the EIT's work with the other initiatives in the field of innovation and in specific KIC societal challenges:

- 6.1 What is the relation of the EIT's work with the other EU, national and regional initiatives in the field of innovation and in specific KIC societal challenges²³?
- 6.2 To what extent have the EIT and the KICs contributed to the relevant Horizon 2020 priorities?

²² An independent legal entity coordinating top public and private organisations in the knowledge triangle co-funded by up to 25% from a 7-15 year grant.

²³ This should include, among the KICs' other actions, their involvement in the development of policies in their thematic area of operations.

- 6.3 To what extent is the EIT, including its governance model, coherent with the wider EU innovation policy?
- 6.4 What is the relationship and/or complementarity of the EIT and KICs activities pursued with existing national and Community policies to support higher education, research and innovation?

ET7. The EIT KICs' **sustainability**, which aims to explore how likely the EIT and KIC model is to last:

- 7.1 What progress has the EIT made towards achieving the financial sustainability of its activities ?
- 7.2 How has the EIT progressed in developing its sustainability strategy and what are its distinct factors?
- 7.3 How successful have the KICs been in attracting funds from partners and especially from the private sector, and how successful has the EIT been in supporting and incentivising them towards this goal?
- 7.4 How likely is the KIC model to be sustainable after the maximum foreseen grant period of 15 years?

ET8. **Horizontal questions**, which cover issues related to several of the above topics.

- 8.1 How effective has the EIT been in the use of performance measurement instruments, such as Key Performance Indicators? Are these instruments relevant?
- 8.2 What is the effect of the EIT's grant cycle framework on the overall performance, including also efficiency and effectiveness, of the EIT?
- 8.3 What improvement and learning initiatives has the EIT put in place in order to increase its performance (including also its efficiency, relevance, EU added value and coherence)? How has the EIT transferred the lessons learned from first wave KICs to the second wave KICs?
- 8.4 Which are the main factors and processes that affected the EIT's work in each of the evaluation topics?

2.3 Horizon 2020 EIT review questions

As indicated in section 2.1, this evaluation joins the EIT evaluation and the EIT review. As part of the EIT review, the Horizon 2020 Regulation defines specific questions. These questions are already present in section 2.2; however, for ease of reference the specific EIT review questions are questions number 2.2, 2.4, 2.5, 3.5, 6.2 and 7.3.

2.4 Other tasks under the assignment

2.4.1 Recommendations

The contractor is expected, as part of the evaluation's reports and deliverables, to issue recommendations for each evaluation theme. In addition to these, the contractor is also invited to issue recommendations on the following topics:

- How can the EIT's cost-effectiveness be increased?
- How can the identified the bottlenecks and weaknesses be overcome?
- What should be changed / adjusted to achieve the EIT's Horizon 2020 objectives? What should be maintained?
- To what extent and how do the objectives need to be changed to reflect the changes that occurred?
- How can the innovation potential across Europe be better joined in the work of the EIT and the KICs?
- How can the long term sustainability of the EIT and its KICs be achieved?

2.4.2 Open Public Consultation

On top of the consultation of experts and stakeholders (see chapter 6.1), the contractor is required to prepare and conduct an open online public consultation which will reach a wide spectrum of respondents with the interest in the operation of EIT and

KICs. The contractor will follow the general principles and minimum standards for consultation set by the Commission's Better Regulation Guidelines²⁴.

The main elements of such a public consultation will emanate from the evaluation questions outlined in Chapter 2.2 and will include the aspects of impact, results, effectiveness, efficiency, relevance, coherence and EU added value of EIT and KICs.

The consultation will be internet based, will be launched through the Commission dedicated website and will run for a period of 12 weeks at minimum. The consultation will be carried out in the English language. The advertisement chosen should be adapted to all potential target audiences.

After the consultation has ended, the written contributions made by stakeholders will be published on the Commission dedicated website.

Once consultation work is completed, the input received will be thoroughly analysed by the contractor. Such an analysis will contain a description overview of the profile of respondents, qualitative appreciation of the responses/respondents and a detailed qualitative/quantitative analysis based on substance/content of the responses. A clear distinction should be made between information (data, facts) and subjective opinions and views provided by respondents.

An overall Synopsis report²⁴ covering the results of the open public consultation as well as other consultation activities that took place in the framework of the evaluation will be drawn up by the contractor and annexed to the evaluation report.

3. Reporting and deliverables

3.1 General reporting requirements

Each report (except the final version of the Final Report) should have an **introductory page** providing an overview and orientation of the report. It should describe what parts of the document, on the one hand, have been carried over from previous reports or been recycled from other documents, and on the other hand, represent progress of the evaluation work with reference to the work plan.

All reports must be written in English²⁵.

The final report, the Annexes and the executive summaries should conform to the corporate visual identity of the European Commission by applying the graphic rules set out in the European Commission's Visual Identity Manual, including its logo. The template for graphic requirements is provided in separate Annex.

All reports will be submitted in electronic format appropriate to the document kind (such as .docx, .xlsx, .pptx or equivalents in open formats) suitable for printing and **for web-publishing on the European Commission's website**. Exchange of advance copies as well as other non-formal communications shall take place via electronic mail. Final report and executive summaries will be submitted also in 3 paper copies.

The Commission will comment on all reports within maximum 30 calendar days. In the absence of observations from the Commission within the deadline the report will be considered as being approved.

²⁴ See the requirements in the Commission Better Regulation Guidelines / Guidelines on Stakeholder Consultation http://ec.europa.eu/smart-regulation/guidelines/toc_guide_en.htm

²⁵ The evaluation texts should be accessible to a wide audience. The contractor is encouraged to refer to the English writing guidelines: http://bookshop.europa.eu/is-bin/INTERSHOP.enfinity/WFS/EU-Bookshop-Site/en_GB/-/EUR/ViewPublication-Start?PublicationKey=HC3010536

Within 10 working days²⁶ of receiving the Commission's observations the Contractor will submit the report in definitive form, taking full account of these observations, or explaining clearly why they could not be followed. Should the Commission still not consider the report acceptable, the Contractor will be invited to amend the report insofar as such amendments do not interfere with the independence of the evaluator in respect of their findings, conclusions or recommendations.

As for the expectations of the responsible body on the quality and contents of reports (concerns the Inception and Final Reports), please refer to the standard checklists that have been provided in the overall context of the Framework Contract.

3.2 Inception Report

The inception report by the Contractor must describe in detail the proposed methodology for the evaluation, how the methodology is going to be implemented in the light of an examination of the quality and appropriateness of existing data, and in particular how the methodology will provide answers to, and assessments of, each evaluation question. A detailed work plan including the allocation of experts per task per number of working-days should also be provided.

3.3 Interim Report

The report is to be produced after the desk and field research has been completed, and should, to the extent possible, include some preliminary conclusions. The report must as a minimum provide:

- An overview of the status of the evaluation project including task in section 2.3;
- A description of problems encountered and solutions found;
- A summary of initial findings and results of the data gathering, including the open public consultation, with a separate section responding to the evaluation questions specified in the Horizon 2020 Regulation, as identified in section 2.3 of this TOR;
- An assessment of the data, whether it meets expectations and will provide a sound basis for responding to the evaluation questions;
- A conclusion whether any changes are required to the work plan, or any other solutions should be sought in order to ensure that the required results of the evaluation are achieved. If any such issues are to be identified, they must be discussed in the meeting with the Steering Group dedicated to this report;
- A proposal for the final structure of the Final Report, as well as a structure of the Executive Summary.

3.4 Draft Final Report

This document should deliver the results of all tasks covered by these Terms of Reference. It must provide the conclusions of the evaluator in respect of the evaluation questions which must be clearly based on evidence generated through the evaluation. The draft Final Report should contain exploratory recommendations developed on the basis of the conclusions reached by the evaluator and fully substantiated by appropriate evidence.

The report must be clear enough for any potential reader to understand the purpose of the evaluation, what was evaluated, how the evaluation was designed and conducted, what evidence was found, what conclusions have been drawn on the basis of this evidence and what recommendations are being made / lessons learnt on the basis of these conclusions.

The structure of the report should reflect its different uses and follow a broad classification into:

²⁶ In case of the draft Final Report, it will be 20 days.

- **Main report:** The main report must present, in full, the results of the analyses, conclusions and recommendations arising from the evaluation. It must also contain a description of the subject evaluated, the context of the evaluation, and the methodology used (including an analysis of its strengths and weaknesses).
- **Report from the consultation activities:** An overall Synopsis report covering the results of the open public consultation as well as other consultation activities that took place in the framework of the evaluation will be drawn up by the contractor and annexed to the evaluation report.
- Summary list of conclusions and recommendations
- **Annexes:** These must collate the technical details of the evaluation, and must include the Terms of Reference, questionnaire templates, interview guides, any additional tables or graphics, and references and sources.

3.5 Final Report

The Final Report follows in principle the same format as the draft Final Report. Furthermore, it is accompanied by an **Executive Summary** of no more than 6 pages. The Executive Summary outlines the evaluation's main conclusions, the main evidence supporting them and the recommendations arising from them. After being agreed with the Commission Services, it should be translated into French and German by a professional translation agency.

On top of that, **an abstract** of no more than 200 words in English, French and German should be provided. The purpose of the abstract is to act as a reference tool helping the reader to quickly ascertain the evaluation's subject and the main conclusions.

The Final Report must take into account the results of the quality assessment of the draft Final Report, and the relevant discussions with the Steering Group insofar as these do not interfere with the independence of the Contractor in respect of the conclusions they have reached and the recommendations made.

The contracting authority will publish the Final Report, the Executive Summary, the Abstract, the annexes and the Quality Assessment Grid providing assessment of the evaluation final report on the Commission's central website.

In view of its publication, the final report by the contractors must be of high editorial quality. In cases where the contractor does not manage to produce a final report of high editorial quality within the timeframe defined by the contract, the contracting authority can decide to have the final report professionally edited at the expense of the contractor (i.e. deduction of these costs from the final payment).

Raw data and datasets

Any final datasets²⁷ should be provided as structured data in a machine readable format (e.g. in the form of a spreadsheet and/or an RDF file) for Commission internal usage and for publishing on the Open Data Portal, in compliance with Commission Decision (2011/833/EU).²⁸

²⁷ Any type of raw data collected in the course and as part of the contract. The data formats may include long-established formats such as CSV or XLS, but also newer web formats like JSON and XML or advanced formats for interlinked data such as RDF and SQL.

²⁸ If third parties' rights do not allow their publication as open data, the tenderers should describe in the offer the subpart that will be provided to the Commission free of rights for publication and the part that will remain for internal use.

The data delivered should include the appropriate metadata (e.g. description of the dataset, definition of the indicators, label and sources for the variables, notes) to facilitate reuse and publication.

The data delivered should be linked to data resources external to the scope of the evaluation, preferably data and semantic resources from the Commission's own data portal or from the Open Data Portal²⁹. The contractor should describe in the offer the approach they will adopt to facilitate data linking.

4. Organisation, timetable and budget

4.1 Organisation

The contract will be managed by Unit B3, Innovation in education, EIT and MSCA, of the European Commission Directorate-General for Education and Culture.

A Steering Group will be involved in the management of the evaluation. The responsibilities of the Steering Group will include:

- providing the external evaluator with access to information;
- supporting and monitoring the work of the external evaluator;
- assessing the quality of the reports submitted by the external evaluator,
- ensuring that the Contractor's independence is not compromised;

Should any questions arise about the interpretation of the legal regulations, the contractor is expected to communicate them immediately to the contracting authority.

The Horizon 2020 mid-term evaluation, due by end of 2017, to which this evaluation will contribute, will be supported by a High Level Expert Group. The contractor is expected to provide a timely contribution based on evidence to the High Level Expert Group.

4.2 Meetings

It is expected that the contractor participate in four meetings in Brussels with the evaluation Steering Group. The evaluation team leader and other relevant experts must participate in these meetings. For these meetings, **minutes should be drafted by the contractor** within 5 working days, to be agreed among the participants and approved and signed by the chair person, who will be appointed from Unit EAC A4.

4.3 Timetable

The indicative starting date is **February 2016**. The contract will start after both parties have signed it. The period of execution of the contract is **12 months**.

The following outline work plan and indicative timetable are envisaged:

Deadline (from starting date)	Task
<i>Kick-off</i> February 2016	The project is kicked off at a meeting between the Contractor and the evaluation Steering Group in Brussels
<i>Inception Report</i> March 2016	Contractor prepares inception report and presents it to the evaluation Steering Group in Brussels.

²⁹ For a list of shared data interoperability assets see the ISA program joinup catalogue (<https://joinup.ec.europa.eu/catalogue/repository/eu-semantic-interoperability-catalogue>) and the Open Data Portal resources.

<i>Interim Report</i> August 2016	Desk and field research completed. Contractor presents interim report to the evaluation Steering Group in Brussels.
<i>Draft Final Report</i> December 2016	Contractor presents a draft final report to the evaluation Steering Group in Brussels.
<i>Final Report</i> February 2017	Taking account of the Commission's comments contractor sends final report and summary to the evaluation Steering Group in Brussels.

4.4 Budget

The estimated maximum budget for the evaluation of the EIT, covering all the results to be achieved by the contractor as listed in sections 2 and 3 above, is **EUR 350,000**.

5. References

5.1 Basic documents

The links to major relevant documents have been provided in the appropriate footnotes of the relevant sections of the TOR and the contractors are invited to consult them. In addition, this section outlines the links also relevant for the evaluation:

The web sites of the European Institute of Technology and its KICs:

- <http://eit.europa.eu/>
- <https://www.eitdigital.eu/>
- <https://eithealth.eu/>
- <http://eitrawmaterials.eu/>
- <http://www.climate-kic.org/>
- <http://www.kic-innoenergy.com/>

Associated web sites:

- <http://eitalumnistartupdays.com/>
- <http://eit.europa.eu/innoveit>
- <https://www.youtube.com/user/EITeu>

Selection of studies and reports

- OECD (2015) *The Innovation Imperative: Contributing to Productivity, Growth and Well-Being*³⁰ provides a current international perspective to analyzing innovation.
- The Horizon 2020 monitoring report for 2014, which is planned to be available by end of first quarter of 2016.
- European Commission (2014) *Enabling synergies between European Structural and Investment Funds, Horizon 2020 and other research, innovation and competitiveness-related Union programmes: Guidance for policy-makers and implementing bodies*³¹.
- OECD/Eurostat (2005) *Measurement of Scientific and Technological Activities, Oslo Manual – Guidelines for Collecting and Interpreting Innovation Data*³² provides one approach to measuring innovation. It has however not been designed to take into account the knowledge triangle and has been updated through OECD's Innovation Strategies.

³⁰ http://www.oecd-ilibrary.org/science-and-technology/the-innovation-imperative_9789264239814-en

³¹ http://ec.europa.eu/regional_policy/sources/docgener/guides/synergy/synergies_en.pdf

³² <http://www.oecd.org/sti/inno/2367580.pdf>

- Makarow M. et al (2014) *Final evaluation of the Eurostars Joint Programme*³³,
- Technopolis et al. (2012) *Education in the Knowledge Triangle*³⁴;
- LERU (2015) *The Economic Contribution of LERU Universities*³⁵ provides a perspective into quantifying the economic impact of knowledge triangle integration.

EIT related studies

- Ecorys UK Ltd. and EFMD (2013) *Educational activities of the Knowledge and Innovation Communities of the European Institute of Innovation and Technology – experiences, innovative practices and ways forward*³⁶
- ICF GHK and Technopolis (2013) *Study on the policy of the EIT and its KICs regarding Intellectual Property Rights*³⁷
- Technopolis (2013) *Analysis of synergies fostered by the EIT in the EU innovation landscape*³⁸
- Ecorys (2012) *Study on the concept, development and impact of co-location centres using the example of the EIT and KIC*³⁹
- European Commission (2011) *EIT Impact Assessment & Executive Summary*⁴⁰

Please note that these studies have captured evidence up to 2013, at a time when the KICs were only operating for three years. The KICs' activities have intensified significantly since the publishing of these studies, especially after the inclusion of the EIT into the Horizon 2020 programme.

5.2 Documents and information to be provided after contract signature

After the contract has been signed, the contractor will, among others, receive the following sets of documents:

- All audit reports with remaining open recommendations, including audits from the European Court of Auditors, the Internal Audit Service of the Commission and the Internal Audit Capability of the EIT. If necessary to achieve the evaluation's objective and at the contractor's request, audit reports will be provided in which the recommendations have been closed, as well as the background documents for each audit.
- All the KICs' business plan implementation and assessment reports and supporting documentation for years 2011, 2012, 2013, 2014 and, after they have been received by the EIT, the draft implementation reports for 2015 (the grant cycle foresees the implementation report for 2015 to be accepted by the EIT in July 2016).
- The Framework Partnership Agreement between the EIT and the first wave KICs for the period 2011-2015, as well as for the period 2016 – onwards.
- The 2015 EIT review of KICs' Complementary Activities.

³³ https://ec.europa.eu/research/sme-techweb/pdf/ejp_final_report_2014.pdf

³⁴ <http://bookshop.europa.eu/en/education-in-the-knowledge-triangle-pbNC0213123/>

³⁵ <http://www.leru.org/index.php/public/news/investing-in-research-innovation-and-education-really-pays-off-/>

³⁶ http://ec.europa.eu/education/library/study/2013/eit-kics_en.pdf

³⁷ http://ec.europa.eu/education/eit/doc/eit-kics_en.pdf

³⁸ <http://bookshop.europa.eu/en/analysis-of-synergies-fostered-by-the-eit-in-the-eu-innovation-landscape-pbDU0213701/?CatalogCategoryID=om.ep2IxKIwAAAEEnX5At6XbN>

³⁹ http://ec.europa.eu/education/eit/doc/eit-colocation_en.pdf

⁴⁰ <http://eit.europa.eu/interact/bookshelf/executive-summary-impact-assessment>

6. Requirements

6.1 Consultation of experts and stakeholders

As part of the data collection and analysis, the contractor is expected to conduct separate consultations with experts and stakeholders, including:

- public authorities, including local and regional governments;
- KICs' partners;
- other innovation and knowledge triangle integration stakeholders;
- universities;
- research organisations;
- students;
- businesses, including startups and SMEs;
- professional higher education institutions;
- interested nongovernmental organisations;
- EU bodies dealing in innovation and the fields of KICs' work.

The contractor is also expected, as part of the desk research, to take into account the stakeholders' published opinions.

6.2 Methodology

The contractor will have a free choice as to the methods used to gather and analyse information and for making the assessment, but must take account of the following:

- The evaluation must be based on recognised evaluation techniques, as well as those stemming from the emerging domain of big data analytics when relevant.
- The choice and a detailed description of the methodology must form part of the offer submitted. There should be a clear link between the evaluation questions addressed and the corresponding methodology proposed. The evaluation questions can be further elaborated, e.g. by providing operational sub-questions under each question.
- Secondary data should be obtained from all existing literature relevant to the evaluation subject, including any existing robust (academic) research into the topic.
- Primary data should be obtained from the broadest possible variety of sources and should also include the views of key informants beyond those directly involved in and benefiting from the intervention.
- Where relevant, the approach of combining various traditional and new data sources is encouraged. The data sources used should be as diverse as possible ranging from administrative (open) data, statistical data, large and small scale survey data to social media, sensor-based or mobile phones data. Innovative data-driven approaches that benefit from combining and linking small and big data and the use of advanced data analytics tools or visualization techniques are encouraged.
- Considerable emphasis should be placed on the analysis phase of the evaluation. In addressing the evaluation questions, quantitative indicators should be sought and used as far as possible. The contractor must support findings and recommendations by explaining the degree to which these are based on opinion, analysis and objectively verifiable evidence. Where opinion is the main source, the degree of consensus and the steps taken to test the opinion should be given.
- For the design of the cost-effectiveness assessment, the tenderer should use the results of the "Study on Cost-Effectiveness of Education and Culture Spending

Programmes" (Ecorys, 2013)⁴¹ as a basis for their proposal. The tenderer should specify which of the approaches described in the mentioned study they will use or, alternatively, what design they propose for such an assessment.

- The choice of the consultation method will determine the consultation tools. The selection of the most appropriate consultation tool or their mix should take into account proportionality, the degree of interactivity needed (e.g. written consultation, online discussion for, stakeholder events) or accessibility consideration (on-line connectivity, language). All consultation documents (i.e. presentations, surveys, questionnaires) will have to be endorsed by the Commission prior to their publication.

The contractor is expected to use other evidence as necessary to answer the specific evaluation questions. The possible sources include:

- evidence from public authorities, including from eligible countries which have been underrepresented in the EIT's activities;
- evidence from the performance of non-EU countries' innovation models;
- evidence from researchers specializing in innovation and knowledge triangle integration;
- evidence from other stakeholders taking part in EIT activities (such as venture capital fund managers / participants at EIT roundtables);
- evidence from a selection of EIT startups, alumni and students.

6.3 Quality assurance

The Contractor shall, as a minimum, apply the quality assurance procedures described in the Quality Plan included in their bid for Framework Contract EAC/22/2013. The offer should describe how the Quality Plan will be applied during the implementation of this specific contract.

6.4 Resources

The Contractor shall ensure that experts are adequately supported and equipped. In particular, sufficient administrative, secretarial and interpreting resources, as well as junior experts, must be available to enable senior experts to concentrate on their core evaluation tasks.

For each of the main team members (team leader, quality assurance expert, report writer and other senior experts), the offer should include, preferably in their respective CVs, a list of evaluations in which they have participated, the dates of each project and their specific role in it.

6.5 Conflict of interest

The Contractor shall ensure that both their organization and the individual experts proposed for this evaluation are not in a situation of conflict of interest regarding this specific assignment, and shall include a Declaration of absence of conflict of interest as part of their offer.

⁴¹ http://ec.europa.eu/dgs/education_culture/evalreports/index_en.htm#crossHeader

Annex 3: Open Public Consultation research instrument

About you

LOGIC Show/hide trigger exists.

1. In what capacity are you responding to this consultation? *

- In my private capacity (i.e. as an individual)
- On behalf of an organisation/institution

LOGIC Hidden unless: Question "In what capacity are you responding to this consultation?" #1 is one of the following answers ("On behalf of an organisation/institution")

2. What type of organisation are you representing? *

- Public authority (national level)
- Public authority (regional or local)
- University or other Higher Education Institution
- A micro, small or medium sized business (i.e. an enterprise with less than 250 employees)
- A large business (i.e. a business with more than 250 employees)
- A European level industry body/business association
- A national or regional industry body/business association
- Public Research Institute
- Private Research Institute
- Civil Society Organisation
- Other, please specify:

LOGIC Hidden unless: Question "In what capacity are you responding to this consultation?" #1 is one of the following answers ("On behalf of an organisation/institution")

3. What is the name of your organisation?

4. In which country are you located? *

- | | | |
|---|--|--|
| <input type="checkbox"/> Albania | <input type="checkbox"/> Greece | <input type="checkbox"/> Poland |
| <input type="checkbox"/> Austria | <input type="checkbox"/> Hungary | <input type="checkbox"/> Portugal |
| <input type="checkbox"/> Belgium | <input type="checkbox"/> Iceland | <input type="checkbox"/> Romania |
| <input type="checkbox"/> Bosnia and Herzegovina | <input type="checkbox"/> Ireland | <input type="checkbox"/> Serbia |
| <input type="checkbox"/> Bulgaria | <input type="checkbox"/> Israel | <input type="checkbox"/> Slovakia |
| <input type="checkbox"/> Croatia | <input type="checkbox"/> Italy | <input type="checkbox"/> Slovenia |
| <input type="checkbox"/> Cyprus | <input type="checkbox"/> Latvia | <input type="checkbox"/> Spain |
| <input type="checkbox"/> Czech Republic | <input type="checkbox"/> Liechtenstein | <input type="checkbox"/> Sweden |
| <input type="checkbox"/> Denmark | <input type="checkbox"/> Lithuania | <input type="checkbox"/> Switzerland |
| <input type="checkbox"/> Estonia | <input type="checkbox"/> Luxembourg | <input type="checkbox"/> the former Yugoslav Republic of Macedonia |
| <input type="checkbox"/> Faroe Islands | <input type="checkbox"/> Malta | <input type="checkbox"/> Tunisia |
| <input type="checkbox"/> Finland | <input type="checkbox"/> Moldova | <input type="checkbox"/> Turkey |
| <input type="checkbox"/> France | <input type="checkbox"/> Montenegro | <input type="checkbox"/> Ukraine |
| <input type="checkbox"/> Georgia | <input type="checkbox"/> Netherlands | <input type="checkbox"/> United Kingdom |
| <input type="checkbox"/> Germany | <input type="checkbox"/> Norway | <input type="checkbox"/> Other, please specify: |

 *

LOGIC Show/hide trigger exists.

5. Are you or your organisation involved with the EIT/ KICs in any way? *

- Yes
- No

LOGIC Hidden unless: Question "Are you or your organisation involved with the EIT/ KICs in any way?" #5 is one of the following answers ("Yes")

6. Please indicate the KIC(s) that you are involved with (*select all that apply*).

*

- Climate-KIC
- EIT Digital
- KIC InnoEnergy
- EIT Health
- EIT Raw Materials

LOGIC Hidden unless: Question "Are you or your organisation involved with the EIT/ KICs in any way?" #5 is one of the following answers ("Yes")

7. Please specify the nature of your involvement with the above KIC(s)

8. How familiar are you with the activities of the EIT and the KICs? *

- Not at all familiar
- Slightly familiar
- Somewhat familiar
- Moderately familiar
- Very familiar

9. How familiar are you with the EU's other activities in the field of innovation or the field of integration of education, research and business? *

- Not at all familiar
- Slightly familiar
- Somewhat familiar
- Moderately familiar
- Very familiar

The EIT and its objectives

10. In order for it to achieve its mission (i.e. to enhance Europe's innovation capacity), how important is it for the EIT to deliver on the following.... ?

	Not important	Moderately Important	Very important	No opinion
... Creation of new models of knowledge sharing and open innovation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... Creation of innovation communities across the EU	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... Cutting edge and innovation-driven research in areas of key economic and societal interest	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... Development of a pool of talented, skilled and entrepreneurial people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... Improved connectivity and knowledge transfer between universities, research labs and businesses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... Improved access to finance for innovation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... Creation of new, innovative businesses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... Support services (eg. accelerators, hubs) to innovation-based start-ups	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... Creation of new networks and collaborations of world-class partners from diverse countries, sectors and disciplines	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... Creation of new value chains (e.g. through a more "networked" or collaborative approach or through the development of new products or technologies)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

11. And to what extent is the EIT actually contributing to the following....?

	Not at all	To some extent	To a large extent	No opinion
... Creation of new models of knowledge sharing and open innovation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... Creation of innovation communities across the EU	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... Cutting edge and innovation-driven research in areas of key economic and societal interest	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... Development of a pool of talented, skilled and entrepreneurial people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... Improved connectivity and knowledge transfer between universities, research labs and businesses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... Improved access to finance for innovation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... Creation of new, innovative businesses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... Support services (e.g. accelerators, hubs) to innovation-based start-ups	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... Creation of new networks and collaborations of world-class partners from diverse countries, sectors and disciplines	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... Creation of new value chains (e.g. through a more "networked" or collaborative approach or through the development of new products or technologies)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

12. To what extent do you agree with the statements below?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	No opinion
The EIT and its KICs address the needs of the markets in which they operate	<input type="radio"/>					
The innovation challenges the EIT and KICs are tackling can most effectively be addressed at the EU level	<input type="radio"/>					
The EIT complements well the existing European and national initiatives to support innovation	<input type="radio"/>					
The purpose of the EIT and its KICs is clear and well founded	<input type="radio"/>					
The EIT and its KICs are successful in bringing together the top innovation actors from across the EU	<input type="radio"/>					
In order to strengthen its innovation performance, the EU needs to foster a culture of innovation at higher education institutions and in educational programmes	<input type="radio"/>					
The results of the EIT and its KICs' work are well known	<input type="radio"/>					
The EIT and its KICs are working well	<input type="radio"/>					

13. Please explain your answer. Examples would be particularly welcome:

14. In your view, what has been the impact of the EIT on...?

	Negative impact	No impact	Little positive impact	Moderately positive impact	Significant positive impact	No opinion
... The European innovation system	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... National innovation systems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... Regional innovation systems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... Local innovation systems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

15. Please explain your answer. Examples would be particularly welcome:

16. To what extent does the EIT contribute to strengthening Europe's innovation capacity

- Not at all
 To some extent
 To a large extent
 No opinion

Specific characteristics of KICs

A KIC has a number of specific characteristics which distinguishes it from other initiatives at European and national level. These are summarised below:

- **Integration of the three sides of the knowledge triangle:** the KICs support the entire innovation value chain by delivering a portfolio of activities comprising education, research & development to business creation and innovation. Moreover, KIC partnerships comprise all three sides of the knowledge triangle (education, research and innovation).
- **Thematic focus on Horizon 2020 societal challenges:** each KIC focuses on a specific Horizon 2020 societal challenge.
- **Large and diverse partnerships:** each KIC has 100-200 partners representing businesses, higher education institutions, research organisations and other stakeholders. The five operating KICs collectively have more than 800 partners.
- **High degree of autonomy:** each KIC is organised as an independent legal entity, led by a full time Chief Executive Officer (CEO). It sets its own objectives, business plan and structure.
- **Long-term perspective:** each KIC is set up for a minimum of seven years, which is longer than other trans-European research and innovation collaborations, such as the consortia in FP7 / Horizon 2020 projects.
- **A geographically distributed network of innovation hubs:** each KIC consists of five or six co-location centres that are spread across Europe. Together, the five KICs operate in more than 30 locations across 14 European countries.
- **Business-like approach to funding:** the financial model of KICs follows an 'entrepreneurial logic', whereby the EIT provides seed investment of up to 25% of the total KIC budget and the KICs raise additional funds from private sources, from other EU or national funding instruments, or from income generated by their own activities.
- **A long-term goal of financially sustainable KICs:** EIT funding for KICs is available for 7-15 years. Over this time period it is expected that the KICs will become 'financially sustainable'.
- **Clear targets and deliverables:** KICs must produce annual business plans, including an ambitious portfolio of activities from education to business creation, with clear targets and deliverables, looking for both market and societal impact.

17. How important are the following characteristics of the KICs in order for the EIT to achieve its mission of enhancing Europe's innovation capacity?

	Not important	Moderately Important	Very important	No opinion
The integration of the three sides of the knowledge triangle i.e. education, research and innovation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Thematic focus of KICs on Horizon 2020 societal challenges	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A decentralised and geographically distributed co-location model	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The business-like approach to funding of KICs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The long term goal of financial sustainability of KICs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Autonomy and flexibility in defining the governance model and structure in order to adapt to specificities of the thematic area and related markets	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Large and diverse KIC partnerships	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Significant private sector participation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Focus on excellence i.e. cutting edge or breakthrough innovation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bringing on board actors from regions with less developed research and innovation systems to improve their innovation capacity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Transparency of operations, both internally and to the wider public	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

The added value of the EIT/KICs

18. To what extent is the EIT distinctive from existing initiatives that support innovation?

	Not at all	To some extent	To a large extent	No opinion
Other EU innovation initiatives / activities (e.g. other areas of Horizon 2020)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
National innovation initiatives / activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sub-national / regional innovation initiatives / activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Non-public policy innovation activities (e.g. collaborative activities of universities, businesses)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

19. In your view, what is the key added value of the EIT/ KICs?

The EIT brand

20. To what extent do you agree or disagree with the following statements?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	No opinion
The EIT brand is well recognised	<input type="radio"/>					
The EIT brand stands for cutting edge innovation	<input type="radio"/>					

21. Please explain your answer:

Closing questions

22. What could the EIT / KICs do differently to have a larger beneficial impact?

23. If you have any other comments, please add these here:

24. Responses or contributions received may be published on the Commission's website along with the identity of the respondent/ contributor. Do you agree to your response/ contribution being published?

NB: Regardless of the option chosen, your response/ contribution may be subject to a request for access to documents under Regulation 1049/2001 on public access to European Parliament, Council and Commission documents. In this case, the request will be assessed against the conditions set out in the Regulation and in accordance with applicable data protection rules.

*

- My response/ contribution may be published under the name indicated
- My response/ contribution may be published, but should be kept anonymous
- I do not agree to my response/ contribution being published

Action: Review

Here you can review your answers, download them as PDF and submit your survey.

Please click the Submit button below to register your answers

Thank You!

Thank you for taking our survey. Your response is very important to us.

Annex 4: Partner survey research instrument

Your background

1. Please provide the following information about you and your organisation

The name of your organisation:

Which of the following best describes your organisation:

- Public authority (national level)
- Public authority (regional or local)
- University or other Higher Education Institution
- A business with up to 250 employees
- A business with more than 250 employees
- A European business organisation / association
- A national or regional business organisation / association
- Public Research Institute
- Private Research Institute
- Civil Society Organisation
- Other, please specify:

Your name:

Your role / job within your organisation:

2. In which country is your organisation located (if multiple countries, please select your headquarters):

- | | | | |
|---|--|--|--|
| <input type="checkbox"/> Austria | <input type="checkbox"/> France | <input type="checkbox"/> Lithuania | <input type="checkbox"/> Slovenia |
| <input type="checkbox"/> Belgium | <input type="checkbox"/> Germany | <input type="checkbox"/> Luxembourg | <input type="checkbox"/> Spain |
| <input type="checkbox"/> Bulgaria | <input type="checkbox"/> Greece | <input type="checkbox"/> Malta | <input type="checkbox"/> Sweden |
| <input type="checkbox"/> Croatia | <input type="checkbox"/> Hungary | <input type="checkbox"/> The Netherlands | <input type="checkbox"/> Switzerland |
| <input type="checkbox"/> Cyprus | <input type="checkbox"/> Iceland | <input type="checkbox"/> Norway | <input type="checkbox"/> United Kingdom |
| <input type="checkbox"/> Czech Republic | <input type="checkbox"/> Ireland | <input type="checkbox"/> Poland | <input type="checkbox"/> Other (please specify): |
| <input type="checkbox"/> Denmark | <input type="checkbox"/> Italy | <input type="checkbox"/> Portugal | <input type="text"/> |
| <input type="checkbox"/> Estonia | <input type="checkbox"/> Latvia | <input type="checkbox"/> Romania | |
| <input type="checkbox"/> Finland | <input type="checkbox"/> Liechtenstein | <input type="checkbox"/> Slovakia | |

LOGIC Show/hide trigger exists.

3. Are you still a registered partner of the KIC?

- Yes
- No

LOGIC Hidden unless: Question "**Are you still a registered partner of the KIC?**" #3 is one of the following answers ("No")

Why did you stop being a registered partner of the KIC? Please specify your reason(s) below:

LOGIC Hidden unless: Question "Are you still a registered partner of the KIC?" #3 is one of the following answers ("Yes")

4. What type of KIC partner are you?

- Core partner
- Affiliate / associate partner
- Don't know

LOGIC Hidden unless: Question "Are you still a registered partner of the KIC?" #3 is one of the following answers ("No")

5. What type of KIC partner were you?

- Core partner
- Affiliate / associate partner
- Don't know

LOGIC Hidden unless: Question "Are you still a registered partner of the KIC?" #3 is one of the following answers ("Yes")

6. Which KIC are you are partner of?



Climate-KIC
EIT Digital
KIC InnoEnergy
EIT Health
EIT Raw Materials

LOGIC Hidden unless: Question "Are you still a registered partner of the KIC?" #3 is one of the following answers ("No")

7. Which KIC are you were partner of?



Climate-KIC
EIT Digital
KIC InnoEnergy
EIT Health
EIT Raw Materials

Your motivation for becoming a KIC partner

8. To what extent were the following motivations reasons why your organisation became a KIC partner?

	To a large extent	To a moderate extent	To a small extent	Not at all
Reputational benefits from association with the EIT	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reputational benefits from association with KIC	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Opportunities to work with leading businesses in your sector	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Opportunities to work with leading universities and/or research institutions in your sector	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
General networking opportunities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Access to grant-funding	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Access to investment (e.g. venture capital)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To keep abreast of technological developments in your sector	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To recruit skilled graduates and/or post-graduates	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (please describe)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

LOGIC Hidden unless: Question "Other (please describe)" is one of the following answers ("To a large extent", "To a moderate extent", "To a small extent")

What were the "other" motivations?

KIC engagement with organisations in your sector

9. To what extent do you agree with the following statements about the organisations that are currently KIC partners:

	Strongly disagree	Disagree	Agree	Strongly agree	Don't know
There is a good balance of types of organisation (universities, large businesses, SMEs, research organisations)	<input type="radio"/>				
There is a good balance of partners from different countries	<input type="radio"/>				
Partners include the leading research universities	<input type="radio"/>				
Partners include the most innovative businesses	<input type="radio"/>				
Partners include top-class research organisations	<input type="radio"/>				
The number of partners is about right	<input type="radio"/>				

10. If you disagreed with any of the statements above, please describe why you say this and what the KIC could do to improve this:

11. To what extent do you think that the following are strong brands in terms of supporting innovation within your sector?

	To a large extent	To a moderate extent	To a small extent	Not at all	Don't know
The KIC	<input type="radio"/>				
The EIT as a whole	<input type="radio"/>				

Operations of the KIC

LOGIC Hidden unless: QUESTION NOT FOUND! is one of the following answers [NO OPTIONS SET]

12. How effective do you think that the KIC is in communicating its activities and achievements with its partners?

- Very ineffective
- Ineffective
- Effective
- Very effective
- Don't know

LOGIC Hidden unless: QUESTION NOT FOUND! is one of the following answers [NO OPTIONS SET]

13. How effective do you think that the KIC is in communicating its activities and achievements with organisations that are not part of the KIC?

- Very ineffective
- Ineffective
- Effective
- Very effective
- Don't know

LOGIC Hidden unless: QUESTION NOT FOUND! is one of the following answers [NO OPTIONS SET]

14. Please explain your answers to the preceding two questions, and identify any ways in which communication could be improved:

The effectiveness of the KIC delivery model

15. Are there any features of the KIC business model that could be improved? Please explain your answer:

16. How effectively do you think that the KIC is delivering activities in the following areas:

	Very ineffective	Ineffective	Effective	Very effective
Creation of knowledge communities to support innovation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Improved access to finance to support innovation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Supporting innovation-driven research	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Supporting knowledge transfer between businesses and universities / research organisations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Supporting the creation of a pool of talented graduates to enable innovation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Supporting workforce training to enable innovation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Support to entrepreneurs to start new innovative businesses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Support to entrepreneurs to scale innovations developed with assistance from the KIC	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

LOGIC Hidden unless: Question "Other activities" is one of the following answers ("Very ineffective", "Ineffective", "Effective", "Very effective")

Please specify what the "other activities" are:

17. What factors, positive and negative, explain the effectiveness with which the KIC is delivering?

18. In what ways could the KIC delivery model be improved to make it more effective? Please explain your answer, including a description of the benefits that would result from these changes:

19. To what extent does the KIC add value to existing initiatives and activities within your sector that support innovation? Please consider how the KIC differs from other existing initiatives and activities.

	Not at all	To a small extent	To a moderate extent	To a large extent
Other EU innovation initiatives / activities (e.g. other areas of Horizon 2020)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
National innovation initiatives / activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sub-national / regional innovation initiatives / activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Non-public policy innovation activities (e.g. collaborative activities of universities, businesses)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

LOGIC Hidden unless: Question "Other" is one of the following answers ("Not at all", "To a small extent", "To a moderate extent", "To a large extent")

Please specify what the "other" initiative or activity is:

20. What are the main differences between KIC activities and other existing initiatives and activities?

The impact of the KIC

LOGIC Show/hide trigger exists.

21. Overall, what impact has being a KIC partner had, or do you expect it to have, on the innovation capacity of your organisation?

- No impact
- Small impact
- Moderate impact
- Large impact
- Don't know

LOGIC Hidden unless: Question "Overall, what impact has being a KIC partner had, or do you expect it to have, on the innovation capacity of your organisation?" #21 is one of the following answers ("No impact", "Small impact", "Moderate impact", "Large impact")

Please explain your answer, giving specific examples these impacts if there have been any:

22. Other than impacts on innovation capacity, what other impacts has being a KIC partner had on your organisation? Please explain your answer, giving specific examples of these impacts:

23. Has the KIC met your expectations in terms of the benefits of being a KIC partner?

- Not met expectations
- Partly met expectations
- Met expectations
- Exceeded expectations
- Don't know

Logic Show/hide trigger exists.

24. Thinking beyond your organisation, what impacts has the KIC had, or do you expect it to have, on innovation within your sector?

- No impact
- Small impact
- Moderate impact
- Large impact
- Don't know

Logic Hidden unless: Question "Thinking beyond your organisation, what impacts has the KIC had, or do you expect it to have, on innovation within your sector?" #24 is one of the following answers ("No impact", "Small impact", "Moderate impact", "Large impact")
 Please explain your answer, giving specific examples of these impacts if there have been any:

25. What impacts has the KIC had, or you expect it will have, in the following areas?

	No impact	Small impact	Moderate impact	Large impact
Job creation in Europe	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Economic growth in Europe	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Addressing societal challenges	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

26. What improvements could be made to increase the impacts of the KIC? Please explain your answer, indicating the impacts that would be generated as a result of these changes:

Other comments

27. Are there any additional comments you would like to make about the KIC and the EIT more broadly?

Thank You!

Thank you for taking our survey. Your response is very important to us.

Annex 5: Graduate survey research instrument

Background

1. Personal information

Nationality

Country of residence

Gender

- Male
- Female
- Prefer not to say

Age range

- 18-25
- 26-35
- 36-45
- 46-55
- More than 55

Prior experience (work and education)

LOGIC Show/hide trigger exists.

2. What was your status prior to participating on the EIT labelled postgraduate programme?

- Student
- In full time employment
- In part time employment
- Looking for a job
- Entrepreneur
- Other, please specify:

*

LOGIC Show/hide trigger exists.

3. What was your highest level of education prior to the EIT labelled postgraduate programme?

- Bachelor
- Masters
- Ph.D.
- Other, please specify:

*

4. In which discipline did you obtain this qualification?

- Arts and humanities
- Business and economics
- Education
- Engineering
- Information and communication technology
- Law
- Mathematics
- Medical and life sciences
- Physical sciences
- Social sciences
- Other, please specify:

*

LOGIC Hidden unless: (Question "What was your status prior to participating on the EIT labelled postgraduate programme? " #2 is one of the following answers ("In full time employment") OR Question "What was your status prior to participating on the EIT labelled postgraduate programme? " #2 is one of the following answers ("In part time employment"))

What was your job title?

LOGIC Hidden unless: (Question "What was your status prior to participating on the EIT labelled postgraduate programme? " #2 is one of the following answers ("In full time employment") OR Question "What was your status prior to participating on the EIT labelled postgraduate programme? " #2 is one of the following answers ("In part time employment"))

How many years of work experience did you have?

0-1	▲
2-3	■
4-5	■
6-10	■
More than 10	▼

LOGIC Hidden unless: Question "What was your status prior to participating on the EIT labelled postgraduate programme? " #2 is one of the following answers ("Entrepreneur")

5. Briefly describe the business you were developing or running prior to enrolling in the EIT labelled post-graduate degree programme:

Programme details

6. In which year did you complete the EIT labelled post-graduate degree programme?

7. Please indicate the postgraduate programme which you completed:

- Climate KIC Masters Programme
- Climate KIC Ph.D. Programme
- KIC Innoenergy Masters Programme
- KIC Innoenergy Ph.D. Programme
- EIT Digital Masters Programme
- EIT Digital Ph.D. Programme

8. In which institution did you enrol for your Masters/ Ph.D. programme?

Motivation for enrolling on the EIT labelled postgraduate programme

9. How did you hear about the EIT education labelled postgraduate programmes?

- Through my graduate school
- Through a conference
- Through industry fairs
- Through lecturers/professors at my university
- Through the EIT / KIC website
- Through social media
- Through a friend
- Other, please specify:

10. To what extent did the following aspects influence your decision to apply for this postgraduate programme as opposed to others?

	Not at all	To a small extent	To a moderate extent	To a large extent	To a very large extent
International mobility offered by the programme	<input type="radio"/>				
The multidisciplinary nature of the programme combining technical knowledge (e.g. energy, climate change, digital) with entrepreneurial and innovation education	<input type="radio"/>				
The opportunity to study at one or more top European university	<input type="radio"/>				
Hands-on approach to innovation and entrepreneurship education i.e. learning based on exposure to real life issues	<input type="radio"/>				
The international recognition of the KIC / EIT brand	<input type="radio"/>				
The international mix of students	<input type="radio"/>				
The opportunity to take a double degree	<input type="radio"/>				
Focus on entrepreneurship and innovation	<input type="radio"/>				
Focus on societal challenges	<input type="radio"/>				
Access to a wider community / network of alumni, start-ups, entrepreneurs, researchers and partners	<input type="radio"/>				
The financial support on offer	<input type="radio"/>				
'Added value' activities such as summer schools, study visits, guest lectures and internships with leading companies	<input type="radio"/>				
<input type="text" value="Enter another option"/>	<input type="radio"/>				

Programme delivery

11. To what extent do you agree with the following statements?

The Msters/ Ph.D. degree programme I completed...

	Not at all	To a small extent	To a moderate extent	To a large extent	To a very large extent
Embedded entrepreneurship throughout the programme	<input type="radio"/>				
Embedded social responsibility throughout the programme	<input type="radio"/>				
Gave me an opportunity to interact with renowned researchers in the field	<input type="radio"/>				
Gave me an opportunity to engage with real businesses and entrepreneurs	<input type="radio"/>				
Gave me the skills and confidence to develop viable solutions to societal challenges	<input type="radio"/>				
Empowered me to start a business	<input type="radio"/>				
Provided insight from other disciplines which improved my understanding of the primary field of study	<input type="radio"/>				
Used active and student-centred learning methods including innovative tools and delivery mechanisms which improved my learning experience	<input type="radio"/>				
Satisfied me so that I would recommend it to friends and acquaintances	<input type="radio"/>				

Skills development

12. To what extent have you developed the following skills as a consequence of the EIT labelled programme?

	Not at all	To a small extent	To a moderate extent	To a large extent	To a very large extent
The ability to think beyond boundaries and explore and generate new ideas	<input type="radio"/>				
The ability to inspire and support others in the process of ideas generation	<input type="radio"/>				
The ability to transform ideas into viable business propositions	<input type="radio"/>				
The ability to protect business ideas or business models by the creation of Intellectual Property Rights.	<input type="radio"/>				
The ability to use knowledge, ideas or technologies to create new or significantly improved goods, services, processes or policies or new business models	<input type="radio"/>				
Knowledge and understanding of cutting-edge research methods, processes and techniques	<input type="radio"/>				
The ability to apply cutting-edge research methods within the field of study	<input type="radio"/>				
Specific expert knowledge in the domain of my field of study	<input type="radio"/>				

Recognition of the qualification

13. To what extent do you agree with the following:

	Not at all	To a small extent	To a moderate extent	To a large extent	To a very large extent
The qualification I received is well recognised in Europe	<input type="radio"/>				
The qualification I received is/ will be a major distinguishing factor in my career	<input type="radio"/>				
The qualification I received helped/ will help me in securing a job	<input type="radio"/>				

Additional activities undertaken during and after the programme to support your experience

14. Additional activities taken during the programme:

	Yes	No	Don't know
Were you made aware of the wider services / projects of the KIC and the EIT whilst on the programme?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Were you encouraged to take part in other KIC related activities?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

15. Did you participate in any of the following activities during or after the programme?

	Yes	No	Don't know
KIC InnoEnergy innovation projects	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
KIC InnoEnergy Highway®	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
EIT Digital innovation projects	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
EIT Digital Challenge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
EIT Digital Accelerator	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Climate Launchpad	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Climate KIC Accelerator	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Climate KIC Pathfinder Projects	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Climate KIC Innovation Projects	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

LOGIC Hidden unless: Question "What was your highest level of education prior to the EIT labelled postgraduate programme?" #3 is one of the following answers ("Masters")

16. Would you / or are you interested in pursuing one of the KICs Doctoral Programmes?

- Yes
- No
- I already am
- Don't know

The added value of an EIT labelled postgraduate programmes

17. In your view, what are the key distinguishing factors of the EIT labelled postgraduate programmes as compared to other similar programmes?

	Significantly better than other programmes	Better than other programmes	As good as other programmes	Not as good as other programmes	No comment
International mobility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The multidisciplinary nature of the programme combining technical knowledge (e.g. energy, climate change, digital) with entrepreneurial and innovation education	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Focus on entrepreneurship and innovation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Focus on societal challenges	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Innovative approaches to programme delivery	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Opportunities to engage with renowned researchers and leading businesses in the field	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Access to a wider community / network of alumni, start-ups, entrepreneurs, researchers and partners	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

18. Access to further support for business start-up and career opportunities.

	Not at all	To a small extent	To a moderate extent	To a large extent	To a very large extent
To what extent did your involvement in this programme increase your understanding of your options for business start up?	<input type="radio"/>				
To what extent did your involvement in this programme provide access to people and organisations who have helped to enhance your career opportunities?	<input type="radio"/>				

Post-graduation career path

19. Please indicate your employment status - 6 months after finishing the EIT labelled postgraduate programme and now (tick all that apply)

	6 months after finishing the programme	Present
Employed full time	<input type="checkbox"/>	<input type="checkbox"/>
Employed part time	<input type="checkbox"/>	<input type="checkbox"/>
Seeking employment	<input type="checkbox"/>	<input type="checkbox"/>
Thinking of starting up a company	<input type="checkbox"/>	<input type="checkbox"/>
A founder of a company	<input type="checkbox"/>	<input type="checkbox"/>
An early employee of a start up (started within the past 5 years)	<input type="checkbox"/>	<input type="checkbox"/>
Continuing education	<input type="checkbox"/>	<input type="checkbox"/>
<input type="text" value="Enter another option"/>	<input type="checkbox"/>	<input type="checkbox"/>

20. How well do you think EIT labelled postgraduate programme has prepared you for your chosen career path?

- Not at all prepared
- Inadequately
- Adequately
- Quite well
- Very well prepared

21. To what extent has the EIT labelled post graduate programme contributed to career progression?

- Not at all
- To a small extent
- To a moderate extent
- To a large extent
- Not applicable

22. Since earning your EIT labelled degree, have you...

	Yes	No
Published any research papers in refereed journals?	<input type="radio"/>	<input type="radio"/>
Published any research papers in non-refereed journals?	<input type="radio"/>	<input type="radio"/>
Applied for any patent(s), copyright(s), trademark(s) or design rights?	<input type="radio"/>	<input type="radio"/>
Been awarded any patent(s), copyright(s), trademark(s) or design rights?	<input type="radio"/>	<input type="radio"/>
Successfully commercialised any new ideas or technologies?	<input type="radio"/>	<input type="radio"/>
Developed or contributed to the development of new products, processes or services?	<input type="radio"/>	<input type="radio"/>

Other comments

23. What aspects of the EIT labelled programme did you like the most?

24. Are there any aspects of the programme that you did not like or that you think can be improved

- Yes (please describe below)
- No

Comments

25. If you have any other comments, please add these here:

Thank You!

Thank you for taking our survey. Your response is very important to us.

Annex 6: Accelerator survey research instrument

Your business and the support you received

LOGIC Show/hide trigger exists.

1. Which of the following best describes the current status of your business:

- An idea / gestation stage
- A prototype / validation stage
- A trading business
- Ceased trading
- Other (please describe):

LOGIC Hidden unless: Question "Which of the following best describes the current status of your business:" #1 is one of the following answers ("A trading business")

What year did the business start trading?

2. Please provide the following information about your business:

- The name of your organisation:

- Do not yet have a name

3. In which country is or will your business be located (if multiple locations, please select the country it is or will be headquartered in):

- | | | | |
|---|--|--|--|
| <input type="checkbox"/> Austria | <input type="checkbox"/> France | <input type="checkbox"/> Lithuania | <input type="checkbox"/> Slovenia |
| <input type="checkbox"/> Belgium | <input type="checkbox"/> Germany | <input type="checkbox"/> Luxembourg | <input type="checkbox"/> Spain |
| <input type="checkbox"/> Bulgaria | <input type="checkbox"/> Greece | <input type="checkbox"/> Malta | <input type="checkbox"/> Sweden |
| <input type="checkbox"/> Croatia | <input type="checkbox"/> Hungary | <input type="checkbox"/> The Netherlands | <input type="checkbox"/> Switzerland |
| <input type="checkbox"/> Cyprus | <input type="checkbox"/> Iceland | <input type="checkbox"/> Norway | <input type="checkbox"/> United Kingdom |
| <input type="checkbox"/> Czech Republic | <input type="checkbox"/> Ireland | <input type="checkbox"/> Poland | <input type="checkbox"/> Other (please specify): |
| <input type="checkbox"/> Denmark | <input type="checkbox"/> Italy | <input type="checkbox"/> Portugal | <input type="text"/> |
| <input type="checkbox"/> Estonia | <input type="checkbox"/> Latvia | <input type="checkbox"/> Romania | |
| <input type="checkbox"/> Finland | <input type="checkbox"/> Liechtenstein | <input type="checkbox"/> Slovakia | |

4. What was the name of the programme that you received support from:

- KIC InnoEnergy Highway®
- Climate-KIC Accelerator
- EIT Digital Business Development Accelerator
- Health Accelerator
- Other (please provide details):

5. How did you hear about the above accelerator programme?

- Referrals from entrepreneurs affiliated with the accelerator
- Outreach by KIC
- Referrals from entrepreneurial associations
- Referrals from upstream impact investors

6. What year did you start and finish receiving support via the programme:

Start:

Finish:

7. When you first received support from the programme, at what stage was your business at:

- An idea / gestation stage
- A prototype / validation stage
- Already set up

Your motivations for receiving support from the programme

8. To what extent were the following motivations reasons why you sought support from the programme

	Not at all	To a small extent	To a moderate extent	To a large extent
The EIT brand	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The KIC brand	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The range of support offered	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The team's credentials	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

LOGIC Hidden unless: Question "Other" is one of the following answers ("To a small extent", "To a moderate extent", "To a large extent")

Please describe "other":

Your motivations for receiving support from the programme

Page description:

Please indicate in the following the area and type of support you accessed from the from the KIC? (please tick all that apply)

Business development support:

- Consulting
- Technology assistance
- Training programmes e.g. seminars and vocational training courses covering topics such as financing, design, PR, marketing, legal aspects and other subjects
- Tailored one-to-one mentoring or coaching
- Investor readiness support

Infrastructure support:

- Access to office space
- Shared back-office services
- Access to laboratories and research facilities

Network support:

- Access to potential customers
- Access to potential investors
- Access to potential partners

Financial support:

- Grants
- Investment

Other support:

- Other

Please describe what "other support" you received:

The support you received from the programme

9. How satisfied were you with the support you received?

- Very unsatisfied
- Unsatisfied
- Satisfied
- Very satisfied

10. Could any features of the support you received have been improved? If so in what ways:

LOGIC Show/hide trigger exists.

11. Do you think that you could have received this support from another source?

- Yes
- No

LOGIC Hidden unless: Question "Do you think that you could have received this support from another source?" #11 is one of the following answers ("Yes")

Please describe the source you could have used:

The added value of the support you received

LOGIC Show/hide trigger exists.

12. Were there any forms of support that you needed but which were not provided by the programme?

- Yes
- No

LOGIC Hidden unless: Question "**Were there any forms of support that you needed but which were not provided by the programme?**" #12 is one of the following answers ("Yes")
Please indicate the types of support that were not provided by the programme:

LOGIC Hidden unless: Question "**Do you think that you could have received this support from another source?**" #11 is one of the following answers ("Yes")

13. Why did you choose to access support from the KIC instead of this other support?

14. Overall, how would you rate the impact of the programme on your idea / business:

- No impact
- Small impact
- Moderate impact
- Large impact

15. Please explain your answer, indicating why the programme did or did not have an impact:

16. To what extent do you agree or disagree that your participation in the accelerator/ incubator programme produced the following benefits/ results?

	Strongly agree	Agree	Disagree	Strongly disagree
Better understanding of the market	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Better knowledge about competitors	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Better understanding of IPR issues	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Better understanding of technical issues	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Better business model	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Helped convert business idea into a viable business proposition	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reduced time to market	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Access to our first customer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Access to potential partners	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Access to seed / growth funding	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Access to pool of EIT graduates	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

LOGIC Hidden unless: Question "Other " is one of the following answers ("Strongly agree","Agree","Disagree","Strongly disagree")

Please describe "other":

The impacts of the support you received

LOGIC Show/hide trigger exists.

17. Did the programme help advance your business idea to the next level?

- Yes
- No

LOGIC Hidden unless: Question "**Did the programme help advance your business idea to the next level?**" #17 is one of the following answers ("Yes")

18. Please indicate the progression achieved:

- Concept to pilot
- Pilot to post-revenue
- Post-revenue to growth
- Other (please specify):

19. Would you have made this progress without the support you received from the KIC?

- Yes
- Yes, but not as quickly
- Not at all

Logic Show/hide trigger exists.

20. Has your business accessed investment from another source after receiving support from the KIC?

- Yes
- No

Logic Hidden unless: Question "Has your business accessed investment from another source after receiving support from the KIC?" #20 is one of the following answers ("Yes")

21. How important was the KIC in helping you access the investment:

- Not at all important
- Slightly important
- Moderately important
- Very important

Other comments

22. Are there any additional comments you would like to make about the KIC and the EIT more broadly?

Thank You!

Thank you for taking our survey. Your response is very important to us.

Annex 7: List of interviewees for KIC level research

Organisation	Category	Name of the interviewee	Job title/ Role
EIT	Staff	Dr. Márton Herczeg	Project officer - Raw Materials
EIT	Staff	Christian Wilk	Digital Project Officer
EIT	Staff	Ivana Komarkova	Health KIC project officer
EIT	Staff	Wim Cofino	Secoded National Officer (leading the knowledge triangle review)
EIT	Staff	Marian Belko	Education Officer
EIT	Management	Mathea Fammels	Head of Unit Policy and Communications
EIT	Management	Martin Kern	Director
EIT	Management	Jari Ahola	Head of Unit Services and Finance
EIT	Management	Stefano Fontana	Head of Unit Partnerships Management
EIT	Ex-Management	Jose Manuel Leceta	Former Director
EIT	Board	Yrjö Neuvo	Ex-Board member Artemis / NIAC
EIT	Board	Alexander Von Gabain	Former Chair of the Board
EIT	Board	Jana Kolar	Ex-Board member CERIC-ERIC,
EIT	Board	Elpida Keravnou-Papailiou	EIT- GB Current Committee
EIT	Board	Peter Olesen	EIT- GB Current Chair
EIT	Board	Jeroen Van der Veer	EIT GB - Current member
EIT	Board	Patrick Pendergast	EIT GB - Current member
EIT	Board	Giovanni Colombo	EIT GB - Former member Vice President of Istituto Superiore Mario Boella
EIT Climate-KIC	Staff	Katarina Bohusova	EIT Employee
EIT Climate-KIC	Partner/Board	Kees van Deelen	Member of Governing and Supervisory Board and representative of TNO (partner)
EIT Climate-KIC	Board	Naren Bhojaram	COO
EIT Climate-KIC	Board	Prescott Price	CFO
EIT Climate-KIC	Board	Mike Cherret	former Director-Operations
EIT Climate-KIC	Board	Daniel Zimmer	Interim Director of Sustainable Land Use; former Director of Innovation
EIT Climate-	Board	Ebrahim Mohamed	Director of Education

Organisation	Category	Name of the interviewee	Job title/ Role
KIC			
EIT Climate-KIC	Partner/Board	John Schellnhuber	Chair of the Governing Board and representative of PIK (partner)
EIT Climate-KIC	Board	Malte Schneider	Director of the German CLC and Director for Decision Metrics and Finance; former Deputy Director of Innovation
EIT Digital	Staff	Fabio Pianeso	Research Director
EIT Digital	Staff	Chahab Nastar	Chief Strategy Officer
EIT Digital	Staff	Anders Flodstrom	Education Director
EIT Digital	Staff	Federico Menno	Quality lead High Impact Initiatives
EIT Digital	Staff	Marko Turpeinen	Director of Silicon Valley node
EIT Digital	Partner	Ales Pustovrh	ARISE partner, ABC Accelerator Slovenia
EIT Health	Board	Koen Debackere	Chairperson of the Board
EIT Health	Staff-Management	Sylvie Bove	CEO
EIT Health	Staff-Management	Ursula Muhle	Director- Education
EIT Health	Staff-Management	Andy Browning	Director- Innovation
EIT Health	Staff-Management	Kurt Holler	Director- Enterprise
EIT Health	Staff-Communications	Sabine Schumann	Director of Communication
EIT Health	Partner	Ricardo Rueda	Abbot Laboratories, Spain
EIT Health	Partner	Ulla Wewer	University of Copenhagen, Denmark.
EIT Health	Partner	Katrien Van Gucht	iMinds, Belgium
EIT InnoEnergy	Board	Diego Pavia	CEO
EIT InnoEnergy	Board	Hervé Bernard	Member of the KIC IE Supervisory Board
EIT InnoEnergy	Management	Arne Lorenz	KIC IE Operations Manager EU
EIT InnoEnergy	Management	Torsten Fransson	Cross KIC Education manager
EIT InnoEnergy	Management	Henrik Svensson	KIC IE Education manager
EIT InnoEnergy	Management	Mikel Lasa	KIC IE Iberia, CEO

Organisation	Category	Name of the interviewee	Job title/ Role
EIT InnoEnergy	EIT	Antonios Fysekidis	KIC Inno Energy EIT Education Officer
EIT InnoEnergy	Partner	Eduardo Román	Tecnalia, Solar Photovoltaic Manager
EIT InnoEnergy	Partner	Enrique Soria	CIEMAT, Head of Renewable Energy División
EIT InnoEnergy	Partner	Charlotta Ekman	Minesto, COO
EIT InnoEnergy	Partner	Fredrik Ahlström	Minesto, CFO
EIT Raw Materials	Member Board	Anne-Christine Ritschkoff, Ph.D.,	Executive VP Strategic Research, VTT,
EIT Raw Materials	Staff	Pier Luigi Franceschini	CLC South General Manager
EIT Raw Materials	Staff	Dr. Denise McCluskey	CLC Baltics Education
EIT Raw Materials	Management/ Board	Dr. Andreas Klossek	two interviews, one as COO, the other one when he was "promoted" as one of the Interim CEOs
EIT Raw Materials	Management/ Board	Dr. Karen Hanghøj	Chief Technology and Education Officer, Interim CEO
EIT Raw Materials	Management/ Board	Prof. Luc Moens	Deputy Chair Board
European Commission	EAC	Lucia Recalde	European Commission – ex EAC HoU
European Commission	RTD	Matthew King	DG RTD B1
European Commission	EAC	Denis Crowley	European Commission – EAC HoU
European Parliament		Vincent Reillon	Role of EP / EC Innovation systems
External	External	Jerzy Langer	European Research Advisory Board (EURAB)
Member State	Member State	Lee Vousden	BEIS -Policy Specialist

Annex 8: KIC-level case studies

EIT Digital: High impact Initiatives

Introduction

High Impact Initiatives are technology and business development projects with an impact potential that is higher than usual start-ups and scale-ups; that are directly relevant for the EIT action lines; and that benefit from substantive investment and high intensity of support. They are selected through calls and actively engaged in by the EIT Digital's action line leaders themselves, and are fully executed by the participating partners at EIT Digital's colocations. Each action line has a running HII (or a call for one) amounting to a total of five HIIs, as of December 2016.

Rationale

Some ideas are expected to deliver great results, and therefore benefit from more intensive support by EIT Digital (budget and hands-on support). In return, partners in the HII must invest more: up to 75%, of which 50% in kind and 25% in cash. Only to some extent, the in-kind contributions by partners can be (financially) linked to other activities, projects and research facilities in their portfolio.

EIT Digital provides the remaining 25% plus direct support for the project.

Activities

The activities of EIT Digital in specific HII projects include daily involvement in the project, by means of business developers, coaches and project supervision by experienced advisors. For instance, the daily or weekly meetings of the project staff are attended by EIT Digital business coaches. In this way, EIT Digital makes sure that its capabilities and the project are used to their maximum benefits

In a few HII's, EIT Digital takes equity in the scale-ups that have an important role in (or result from) the HII. See the table below for a comparative overview with 'regular innovation activities' supported by the EIT Digital:

High Impact Initiatives (HII)	Open innovation projects by EIT Digital partners ('regular innovation activities')
EIT Digital publishes targeted calls, linked to societal challenges as well as the EIT Digital Innovation Action Lines. In short: top down	EIT Digital publishes open calls, linked to the EIT Digital Innovation Action Lines. In short: bottom up
Project duration of 3 years (in some cases 2 years) with a project review after every year, before deciding on continuation	Project duration of 1 year (in some cases 2 years)
EIT Digital HQ staff participates in the project team, e.g. attending regular meetings	EIT Digital HQ staff monitors progress through progress reports
EIT Digital business developers participate in the project team	EIT Digital business developers regularly discuss progress and commercial opportunities with the project team
Modern project management and collaboration tools, e.g. agile and scrum	Project management tools decided on by the (lead) project partners
Engage prospective customers through co-design	Project partners decide on the level of customer engagement
Most of the activities take place at one of EIT Digital's CLCs	No requirement on the use of CLC, although this is suggested by EIT Digital
Co-funding by EIT Digital: 25% in cash plus in kind contribution (participation of HQ staff and business developers, and use of CLC) Co-funding by partners: 25% in cash and 25-50% in kind (e.g. project management,	Co-funding by EIT: 25% in cash Co-funding by partners: 25-50% in cash plus 25-50% in kind (e.g. project management, researchers and lab/test facilities) also depending on other funders (e.g. national or

High Impact Initiatives (HII)	Open innovation projects by EIT Digital partners ('regular innovation activities')
researchers and lab/test facilities)	regional governments)
Relatively large projects, between 2 and 6 Million euro per year	Large, medium-sized or small projects, between 0.5 and 1.5 million euro per year, depending on the technical and commercial characteristics of the project
The project management team and lead researchers should commit close to 100% of their time to the project	No detailed requirements on the level of commitment of the project management team and lead researchers
The project management team includes a person that is interested and capable of leading a start-up / spin-off to commercialise and scale the product	No detailed requirements on team members having the skills and possibilities to commercialise the product

Examples of some ongoing HIIs:

- Trusted Cloud is an activity to develop a modular, secure cloud platform with storage and hosted services. It is designed with security and privacy as founding principles so as to differentiate against current, USA based cloud storage initiatives.
- Cyber-Physical System is initiated to develop platforms and methods for the fusion of robotics, computers and fabricated objects in an industry 4.0 environment. It offers ready-to-deploy packages and demonstrates applications in concrete use cases.
- Fit to Perform is targeted towards drivers in the logistics industry. As their health is often seriously affected by a mostly sedentary lifestyle while driving, the HII aims to develop methods for health monitoring and prevention of cardiovascular issues integrated into the vehicle computers.
- ACTIVE is aimed at next generation infrastructures such as software defined networking and other future approaches to computer networking that can cope with the rapidly increasing speed requirements and number of devices on the internet.
- Street Smart Retail is aimed at physical store owners to fuse the traditional store concept with online retail. The HII's purpose is to develop a Digital Retail Suite for store owners as a single package to deploy and boost store efficiency.

Street Smart retail

One successful HII is Smart Street Retail, headed by Sandro Battisti, an entrepreneur and scientist originally from Brazil. Battisti and his team are developing a suite of software tools that enable street retail shops to more actively engage customers in their store. EIT Digital describes this suite as follows:

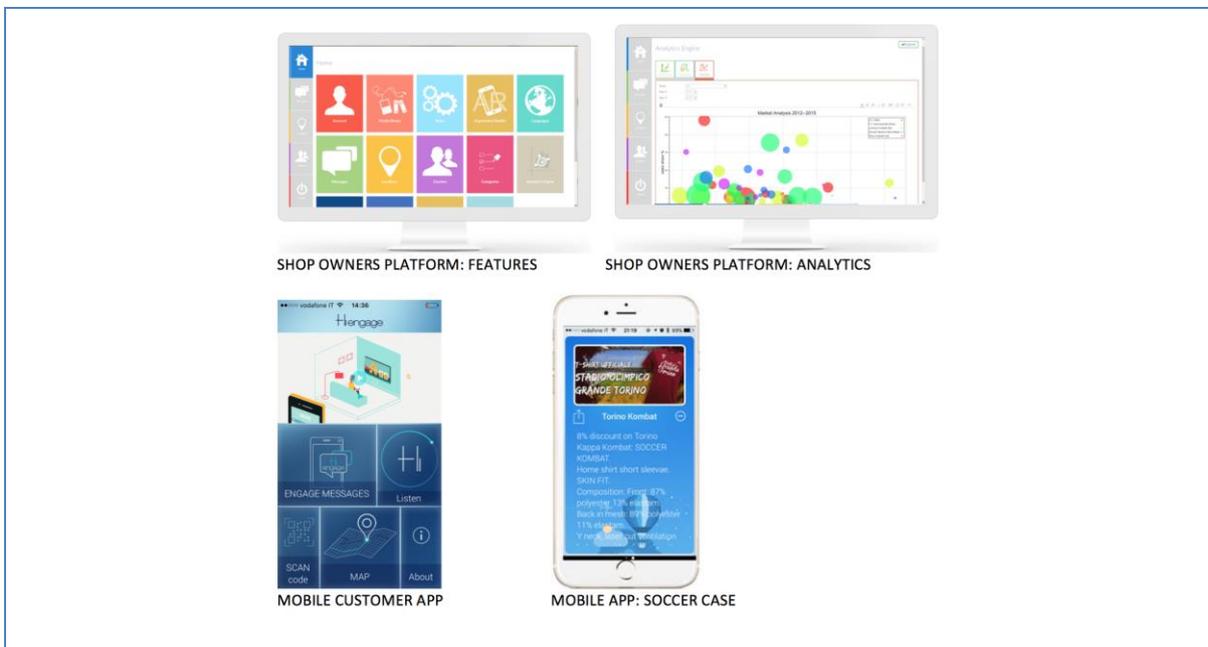
- Digital Retail Suite (DRS) enables shop owners to collect and analyse data streams about customers from multiple sources in real-time data, and to tailor powerful in-store shopper experiences, in order to increase sales, conversion rates and retention rates.
- Sales assistants on the shop floor accordingly sell better and more by the real-time profiling of customer's preferences and discounting strategies offered in-store that are tailored for each single customer.
- Shop owners can measure the performance of sales assistants, as well as compare the performance of their companies with competitors. The main indicators DRS offers are: sales growth (5%), conversion rate growth (10%) and retention rate growth (10%).

The problem that this suite addresses is that street shops often see their customers browse and have a look at their products, that they later order online for lower prices.

The Street Smart Retail suite offers the retailers customer analytics and web shop capabilities that allow shops to see who's in the store, what kind of products he or she likes and offer relevant discounts or offers. This creates a seamless shopping experience, so it makes no difference anymore for the customer if they visit the store offline or online. In this way, conversion rates (from browsing to shopping) are increased such that the retail stores regain their edge with respect to web shops. This will increase the competitive advantage of retail SMEs, enabling them to provide new products via multiple channels and to differentiate against global competitors. From the perspective of societal challenges, Street Smart Retail is relevant for maintaining the economic and social contribution of shopping streets and city centres.

The Street Smart Retail suite is made with a modular approach to keep it flexible and affordable. All modules connect to a central backbone that is operated as part of the suite. Some mock-ups of what the suite looks like are displayed below. Of course, there is also a lot of behind the scenes coding to combine all the data streams and deliver the right data to the right application interface.

The Street Smart Retail suite user interfaces



Source: EIT Digital

Sectors targeted are, to start with, banks, insurance, automotive, and fashion. The markets targeted are Europe (in particular Italy, Germany, Finland) and subsequently Latin America. The markets were chosen as they have a good digital infrastructure and capable retail stores as well as strong presence from the project consortium partners.

The HII has been running since 2015 and has been very successful: The HII has sold more than 25 products to medium sized and large retailers of which 30% came from start-ups and 70% from partners.

According to the project leader, the success of an HII lies in selecting the right people with entrepreneurial experience *and* technical know-how. Another success factor lies in the project partners like Olivetti, Deutsche Telekom, British Telekom, Nokia, Philips, Reply and Telecom Italia. For specific new innovations, some 10 start-ups are added to the mix; some were coached by an accelerator, some financed by EIT Digital's sub-grantee mechanism.

The success is portrayed by the launch of a spinoff next year, in which EIT Digital takes some 25% equity. Taking equity is one of the means to enhance the financial sustainability of the EIT, as the expected return can fund new EIT activities.

The Smart Street Retail initiative is received well by its participants, though some critique is also in place: the scale of about $\pm 6\text{m}/\text{year}$ is not always relevant. Some smaller but highly promising initiatives could also benefit from the HII approach. The call is thus for the possibility to have some smaller projects and, through smaller teams, more focused teams for product development. As such, EIT Digital should keep the lower margin of HII project size at $2\text{m}/\text{year}$.

Reflection

EIT Digital and each individual action line benefits from having at high impact, high visibility projects running to display the capabilities of EIT Digital partners. Such projects require high commitment and involvement. From the example of Smart Street Retail that was reviewed, it seems that EIT Digital is capable of selecting the right project staff as well as capable and committed corporate partners. Successfully including SMEs and start-ups in the project is arguably a good way to launch them into the commercial world. In addition, the fact that the project team, hosted at EIT Digital's location, wants to continue the project as their own venture with equity from EIT Digital, shows that the project team believes in the product.

Risk bearing participation such as equity can deliver high kick-backs if the developed product is and remains successful, and when the timing of EIT Digital's exit from the company is right. It has to be noted that for a decent return, not only the equity itself needs to be re-earned but also the total project costs incurred by EIT Digital at an interest rate higher than market interest rates. This would mean that the return also covers for risks in other participations. Whether this will be the case can only be assessed after the exit of EIT Digital out of the ventures concerned. It does seem logical to take this approach, and EIT Digital can have the additional edge over traditional equity investors that they know much better where they invest in considering the intensive project involvement beforehand.

One of the overarching challenges for EIT Digital is to retain or increase its visibility, in order to attract partners and investors. This can be well done by addressing societal challenges, with successful examples that at least pay themselves back. Therefore, HIIs are a clear and promising model.

EIT Digital: ARISE Network Programme

This case study provides an example of a channel being used by EIT Digital to extend its reach and influence beyond its partners and CLCs.

Introduction

ARISE Europe, part of the EIT Regional Innovation Scheme (EIT RIS), is a programme of EIT Digital designed to enhance innovation capacity in EU countries where EIT Digital is not present with one of its Node Partners or Associate Partners. Its objective is to connect local and regional Innovation Centres to EIT Digital's innovation and education ecosystem to subsequently strengthen them. To do so, ARISE has partner incubators in the following countries:

Arise partners (brown) in Europe and core network (green)



Source: ARISE

The partners are:

- ABC Ljubljana, Slovenia, a business accelerator centre
- BGI Lisbon, Portugal, a business accelerator centre
- Found.ation Athens, Greece, a technology hub
- HardGamma Ventures, Poland, a venture capital fund
- Inits Vienna, Austria, a business incubator
- JIC (South Moravian Innovation Centre), Czech Republic, a business acceleration centre

- Start-up Wise Guys Tallinn, Estonia, a B2B start-up accelerator

These partner offices were selected after a public call with the following selection process:

Selection process for partners

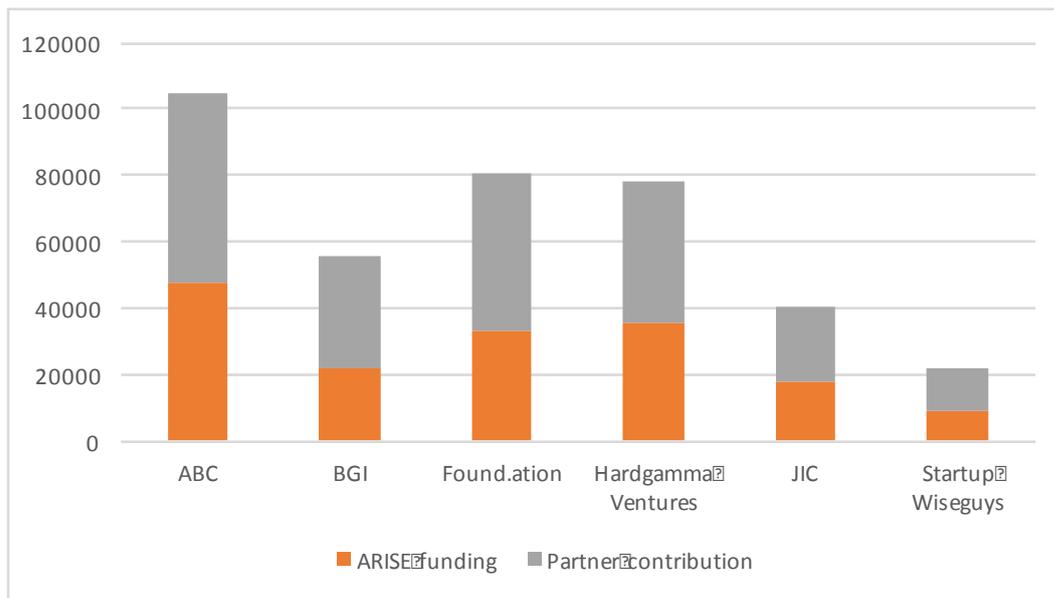
	How	Who	Objective	Output
Phase I	<ul style="list-style-type: none"> • Individual assessment of submitted material • Consensus meeting 	<ul style="list-style-type: none"> • ARISE team • EIT Digital BDs • External members 	Quality of <ul style="list-style-type: none"> • Application • Applicant • track record • positioning in the global landscape 	Shortlist I
Phase II	VC interviews	ARISE team	<ul style="list-style-type: none"> • Confirm conclusions from Phase I • Insights on programs, activities, network • Fit with EIT Digital • Level of commitment 	Shortlist II
Phase III	Site visits	ARISE team	<ul style="list-style-type: none"> • Confirm conclusions from Phase II • Quality of the team, of the portfolio and of the premises • Initial discussion of joint activities 	Final shortlist

Source: ARISE

After selection, they have to fulfil KPIs such as the number of companies assisted and referred to EIT, the number of events organised and (type of) audience reached. ARISE sets these demands to ensure quality. ARISE works with the partner offices to organise activities in a 50/50 financing construction. As the programme leader said, *"We want commitment from our partners and not just hand out money. That's why we chose for co-financing."*

Adding up the financial contributions from EIT Digital and the regional partner, total annual budget per ARISE region is between €22k (Estonia) and €105k (Slovenia). The fairly limited budgets reflect that the focus is on networking, communication and scouting activities.

Selection process for partners



Source: ARISE

Rationale

The rationale is that by collaborating with EIT Digital through the ARISE programme, regionally-focused organisations get connected to EIT Digital partners, including global companies, leading research centres and top ranked universities. Through EIT Digital's business developers, start-ups can enjoy faster access to the wider European market and investors. Practical cooperation include joint scouting and subsequent coaching of scale-ups, and to develop co-branded events to mobilise local stakeholders like venture capitalists, academia and public authorities. ARISE selects scale-ups, young businesses that have a working business model, seed capital and that are ready to expand into Europe. ARISE offers these scale-ups:

- Connect their local ecosystems to a network of about 140 partners representing global companies, leading research centres and top ranked universities
- Strengthen Innovation centres capabilities, linking them to EIT Digital's innovation activities, business communities, access to market and financial
- Foster entrepreneurial skill development by connecting local talents and educators to schools

Doing so the ARISE programme reaches out to include local hubs from countries that do not yet have the infrastructure to host a full node. What's more, even the countries that are unable to partner in the ARISE programme (for example due to lack of co-financing, poor internet infrastructure or lack of critical mass) are under attention of ARISE and host events every now and then, as is the case in for example the former Yugoslavian republics in southeast Europe.

Activities

ARISE serves their missions with the following activities:

Overview of activities in ARISE programme

	Activities	Objectives	How
	Scale-ups co-scouting	Find best local scale-ups to bring to the attention of EIT Digital accelerator and include in their funnel	Direct contacts and interactions with Innovation Centers Participation in local events, including co-branded events EIT Digital Open Hours
	Co-branded events	Increase EIT Digital's and ARISE partner's local footprint Mobilize and involve new stakeholders (industry at large, academia, government, public utilities, etc.)	Public communication
Innovation	Industrial brokerage events (planned)	Bridge the gap between innovators (startups, SMEs) and market stakeholders (e.g. corporates)	Brokerage connecting startups with corporates in need of specific innovative solutions
	Online promotion	Raise the awareness to the Master School and the Summer Schools	Student challenge for developing innovative business ideas
	Education fairs	Create local footprint for prospective Master's students and professionals	Participation in most important local fairs open for international community in ARISE countries
Education	Road shows	Mobilise Computer Science students interested in EIT Digital Master and Summers Schools Raise local academia awareness and interest towards our T-shaped approach education	Half-day events in ARISE cities involving local universities, partnering Innovation Centers and cities

Source: ARISE programme

In addition to these activities, ARISE works together with their partners in the following ways:

Business innovation projects

ARISE carries out business innovation projects with its local partners, bringing together investors, start-ups and SMEs. They provide them the framework for collaboration with EIT Digital and its partners in joint activities for ecosystem stimulation, joint support to boost technology projects, start-ups and scale-ups at the European level and mentoring, market access and fundraising opportunities.

These activities support the partner ecosystems by improving the available services, for example by working together with EIT Digital's experts - mentors, business developers, access to finance experts, and business communities. It also increases visibility at the European level by connecting to EIT Digital's innovation and education activities, while there is a co-funding mechanism for joint activities.

Education and skill development initiatives

ARISE establishes connections with universities and schools to offer opportunities for skill development on different levels. It connects academic institutions and individuals to the EIT Digital network of 20 leading European universities among the 140 partner

organisations and fosters entrepreneurial skill development through innovative education programmes.

This is claimed to generate benefits for several target audiences: **students** can become part of an excellence programme offered by the leading European ICT innovation community without having to pay tuition fee. They can connect with the next generation of digital entrepreneurs, attend Summer Schools for which a scholarship is also available; **IT professionals** can gain access to digital knowledge and skills on Big Data, Internet of Things, System Architecture and E-health; **universities** can learn about best practices in blended education, and strengthen their links with local innovation ecosystems; Finally, **businesses** can get in touch with experts, participate in education and get support for digitalization of their business (model).

Progress and achievements

The programme leader is content with the progress made and future plans. Financial sustainability is in reach by requesting fees for the matchmaking that ARISE practically entails. Regional partners value the function that ARISE fulfils, especially in linking their (peripheral) region to the core of the EIT Digital network. For example, in 2015, together with its six Innovation Centres, the ARISE Europe programme scouted 90 European start-ups. Out of them, nine were selected to join the EIT Digital Accelerator programme.

ARISE stakeholders are in favour of keeping an eye on cross-KIC opportunities. These interactions between EIT Digital and other KICs acknowledge that many products are not only software, only energy or only health: often either some or all the aspects come together in a single product. That doesn't mean though that the different KICs should rather be merged. Some activities may be jointly executed but there are distinct differences. For example, EIT InnoEnergy really focuses on younger start-ups with an idea for a (physical) innovation, that takes more product development steps than digital innovations and business models. This means that different instruments should be used and different networks approached.

A tangible example of a fruitful event is that of Meet&Match, held in December 2016 at the IBM Innovation Centre in Ljubljana. Meet & Match was created to fill the gap that more mature start-ups perceive in business and networking opportunities within the region. Start-up events are said to exist but their focus is often on younger start-ups. The event used a kind of *speed dating* setup to have 9 corporates and 17 start-ups meet. Participants from both sides found the event "*immensely valuable*." It also made EIT Digital and ABC more visible to start-ups and corporates alike. A spillover effect was in the fact that some start-ups developed ideas to collaborate with each other, too.

The partner KPIs kept by ARISE show the following results for 2016. Most KPIs are well met, except for the number of scale-ups reached and the number of government representatives attending the activities. According to the ARISE programme manager, the lack of progress on reaching scale-ups can be explained by the immature start-up and scale-up market (brokers, financing, legal support, etc.) in some of the countries covered by ARISE. Even when supporting institutions are in place, one of the challenges is that the entire country is served by a single institution. One of the plans to address the low level of participation to ARISE events, by government representatives, is organise events in conjunction with government-oriented events.

Partner KPIs

Partner KPIs	2016 target	2016 result
# of scale-ups	97	46
# co-branded activities	13	23
# of founders attending	67	146
# of government attending	110	43
# of general audience	650	909
# of social media posts	105	107
# of press mentions	28	41

Source: ARISE

The ARISE 2016 activity report also addresses the contribution of the ARISE network to student recruitment. This activity concerns the EIT Digital Master School and feeds into the set of EIT Digital attempts to increase the number of European Master students.

Via websites, social media platforms and specialized platforms such as Masterstudies.com and Studentcompetitions.com, the coordinator and the regional partners of the ARISE network promoted the EIT Digital Master School. Website statistics are being used to track the extent to which ARISE regions (their countries) are reached by these communication/marketing activities.

The 2016 results indicate that additional steps are needed. For example, the list of 31 top countries from which students and other users visited a special EIT Digital section of Masterstudies.com, contains two ARISE countries (the list does contain many non-EU countries, including large and small countries).

ARISE provided stipends for students participating in the EIT Digital Summer School. This helped to reach a number of 34 participants from ARISE countries (in 2016, up from 30 students in 2015).

In addition, ARISE organised a call and provides students with financial support to attend the EIT Digital Master School 3-day Kick-off event (October 2016, Rennes, France). 28 students applied; 16 were invited.

Example: Collaboration with ABC in Ljubljana

ABC Ljubljana was willing to discuss collaboration with EIT Digital in the ARISE network. They started the collaboration early 2015 as a response to the ARISE call. ABC explained that Slovenia and southeast Europe, compared to western European countries, are really developing countries with respect to entrepreneurial ecosystems. Their motivation was to get the quality of EIT Digital services and network towards their region, and in return offer more perspectives for the companies they help, and for the students they inform about EIT Digital's Summer Schools and Master School.

ABC is enthusiastic about their collaboration with EIT Digital. The events they jointly organise deliver the results they're looking for: new companies to help and investors to connect with. One example is a software developer for road vehicle driving simulations, of which the data generated should help self-driving cars learn how humans drive. The company now has a European perspective that otherwise would be unthinkable. Another example, coincidentally in the motor vehicle sector too, is a company that develops plug-and-play hardware to remotely monitor vehicle conditions, also for older vehicles.

ABC mentioned that the match is good and that EIT digital has high standards that they uphold – this is understood to maintain focus. However, in countries where funding for start-ups and scale-ups very limited ("you reach the national newspaper

with €15k of start-up money”) the EIT focus on Europe-ready scale-ups can be a bit too ambitious. Micro-equity or financing for smaller start-ups may deliver more impact. This illustrates that there is still room for the ARISE start-up scenes to develop further, such that their maturity matches the strict demands of EIT digital, as well as for policy instruments to be further adjusted.

Reflection

Business opportunities are all about the right connections. ARISE seems to be an effective means to gain foot on the ground and connect the relevant hubs to the EIT Digital core. The enthusiasm of ABC shows that the ARISE programme works for them, while their remarks about the match between ARISE’s ambitions and the realities of south eastern Europe shows that EIT Digital remains focused on their main mission to focus on maturity and scale of initiatives. The active relations of ABC with universities and the collaborative roadshow they have done with EIT Digital can be trusted to raise awareness and attract eager, ambitious students.

EIT Digital: Silicon Valley Hub

Introduction

As the San Francisco Bay Area (where the “Silicon Valley” is actually located) is the world’s leading region for ICT innovations, the goal of EIT’s Silicon Valley hub is to create a two-way bridge between the European EIT Digital ecosystem and the Bay Area ecosystem.

The main routes for strengthening this bridge are through innovation and entrepreneurship, and through entrepreneurial education. To do so, the SV hub connects to European partners that already have connections in the Bay Area as well as with local consulates of European countries through their consulate liaison program.

Although the hub is an initiative of EIT Digital, the scenario of the hub becoming relevant for other KICs, has been on the table from day one (i.e. EIT’s hub instead of EIT Digital’s hub).

The hub has been established in 2015 by Marko Turpeinen, an EIT veteran since 2010, professor and successful entrepreneur. He was the Finnish hub director for EIT Digital and he was selected to do pioneering work to set up the EIT Silicon Valley Hub. Currently, they are looking for a new director for the years to come. In 2016, the ambition of the Silicon Valley Hub is to significantly grow the volume and impact of their activities and also to build a strong industry engagement programme with US-based actors.

Rationale

The rationale is that although the European presence in terms of Member States and private enterprises in the Bay Area is really strong and the EU is the region’s largest trade partner, there is no orchestrated representation from the European Union itself. Bay Area entrepreneurs and investors mention that Europe is complex and complicated with many different groups to deal with: Member States, regions, cities, (virtual) institutes and various representations. To that end, the Silicon Valley hub was set up with the following rationale:

- EU parties active in Silicon Valley have an interest in collaboration among each other. However, the reason that it’s not being done is that it’s nobody’s KPI. For example, the French hub has no obligation to help the Portuguese, although they could surely benefit from each other.
- The Silicon Valley hub makes the European complexity more understandable and the continent more approachable. It helps US investors to look more broadly into the landscape of what’s happening in Europe.

Activities

The SV hub extends the EIT Digital network and its programmes to the US. The SV hub, similar to the European EIT nodes and hubs, has a focus on education, innovation and business acceleration. As the European eyes and ears, the SV hub actively scans for the developments and lessons in the US that can benefit EIT Digital programmes and partners, and vice versa. Since its start roughly two years ago, here’s an overview of the activities performed:

Efforts to stimulate joint strategic research-to-innovation initiatives resulted in the launch of the trans-Atlantic federated Software Defined Networking (SDN) test-bed and certification activity. This initiative is led by EIT Digital. SDN is a technology that allows more flexibility over the data formats and protocols that are sent over communication networks by moving routing decisions from the hardware layer to software. This flexibility requires standardised software for interoperability, so joint efforts are effective to ensure wider adoption, nationally and internationally.

The SV hub also made connections with other accelerators in the Bay Area and helped 20 start-ups in the EIT Digital network to become established in the US. This was achieved by trade missions and matchmaking events, assistance by business developers and connecting stakeholders at events.

More structurally, the hub has been looking at specific partnerships as a means to lift the EIT Digital brand. Because they work with a small team, the SV hub has to collaborate with other local parties (and benefits from doing so). For example, MindtheBridge is a partner for organising start-up events. For the education part, the SV hub collaborates with Coursera. For example, Coursera is developing and launching packages of courses using the “blended education” concept (a mix of management, technology and other courses). EIT Digital is one of Coursera’s partners for pilots, including joint content creation. As a result, Coursera is already offering ten blended education courses that reached 300.000 students in 2016. The content is developed by a network of 20 participating European universities, activated by EIT Digital and Coursera. The ten courses are:

- Software Architecture for the Internet of Things
- Development of Real-Time Systems
- Web Connectivity and Security in Embedded Systems
- Quantitative Formal Modelling and Worst-Case Performance Analysis
- Embedded Hardware and Operating Systems
- Introduction to Architecting Smart IoT Devices
- System Validation (2): Model process behaviour
- The Impact of Technology
- Architecting Smart IoT Devices
- System Validation: Automata and behavioural equivalences

For the next years, a reverse collaboration is also envisaged. The University of California at Berkeley and HAAS business school are selected as credible and relevant partners to create content for Coursera/EIT courses.

Furthermore, the EIT Digital SV hub stimulates student mobility by organising intern and student visits to US or Berkeley and the other way round, Stanford students going to the EU.

On the innovation side, there are three thematic initiatives:

- The Future Networks Initiative: a European project for a new generation of software based networking is now connected to US players. The future networks initiative addresses the ever growing scale of the internet in terms of connected devices, throughput and desired speed. This is for example driven by Internet of Things developments, the increasing use of streaming services for content delivery increasing “virtualisation” of machines in the cloud. Partners jointly develop and test with AT&T, CISCO, DELL. The non-profit IEEE is their main partner outside the corporate world here, and the consortium will meet at a workshop in Berlin (2017).
- Smart Cities: the SV hub initiated a set of focused innovation activities with the aim of creating or supporting start-ups. One of approaches taken is connect existing Smart Cities pilots in Europe as well as expand them to the US. The focus is on themes where data and urban issues overlap, such as urban pollution awareness. One result is Ambiciti; a team formed from the joint forces of UC Berkeley and Paris (Numtech) that now develops pilots in the Bay Area.
- A further planned initiative is around Industry 4.0, to bring big companies such as Schneider Electric, Cisco, GE digital, and Intel together to form a thematic Industry 4.0 hub in the US. This will mirror what EIT Digital is setting up in EU. The idea is to bring relevant collaborations from the EU to the US and vice versa to create a more fertile ground to launch and develop ideas.

Another activity was to bid for an Horizon 2020 project to host a European Research and Innovation centre in the Bay Area. This would additionally strengthen the US-EU industrial ties. The proposal was led by EIT Digital in collaboration with other KICs. This project proposal wasn't successful; wasn't funded by H2020. One of the explanations suggested in our interview, is that the focus was too much on digital innovations. However, an important element of the plan was to have more cross-KIC collaborations in the Bay Area. This would address the tension between each Knowledge and Innovation Community working on 'its own' technologies and themes (Climate KIC, EIT InnoEnergy, Health KIC, etc.) while many of today's challenges call for a truly interdisciplinary approach. Take for example Smart Cities or e-health; these challenges require solutions from multiple disciplines, domains and technologies. As an alternative to the H2020 proposal, the SV hub is now organising Cross-KIC collaboration by themselves to deliver the same results as the H2020 project would have.

At a more pragmatic level, the SV hub had to invest in setting up its presence in SV. Practicalities were sometimes pretty taxing. It took quite some resources, for example on the administrative side. Things like tax regulations or how to run a foundation in the US.

Still, signs of impact are appearing: increased visibility of EU innovations in the US; more effective collaboration; active participation in creating new education and start-up programmes. The SV hub sees lots of cross-KIC opportunities and wants to continue to attract and integrate new partners and their funds.

As regards financial sustainability of the initiative, some credible ideas are:

- Membership fees for US partners for our foundation
- Accelerator program: pay for service model for scale-ups
- EIT digital can take equity in some of the new companies that get substantial support
- To receive fees for the coordination of programmes and projects

Looking back, one of the drivers and signs of progress is that because EIT is perceived as a strong partnership from the EU, the SV hub is a credible party to generate and attract interest in the Bay Area. It was no problem to get in front of interesting people in the valley. EIT is a large, strong partnership that raises interest. The EIT is seen as a partner to 'play with' by American stakeholders.

A note has to be made that during the time of setting up the hub since 2014 there has been a constant economic boom. It should be interesting to see what happens when the next dip comes. Maybe the hub can be a gateway for US-based and other investors that try to spread their risk towards other digital hotspots, such as Berlin, Paris, Amsterdam, London, Stockholm.

At the same time the EIT is not so easy to understand as a whole. When representatives of EIT Digital say they are EU funded with 130 partners, and that EIT Digital is just 1/6 of a bigger EU apparatus then people are easily confused by (European) complexity. It therefore took some effort to shape the pitch that the SV hub really makes things simpler.

Reflection

Though running for a short time, the SV hub is making progress towards their mission: to connect EU and US digital innovation hotspots with business and education for two-way exchanges of ideas and capital. Outlooks for the future, as described in the sections above, are promising given the effectiveness of the efforts in such a short time. Though the ideas for financial sustainability are there, it remains to be seen how the market values them and whether they can be sustained in an economically heavy weather that might emerge in the future, given the cyclic nature of economic growth

and decline. The SV hub is certainly aware of its size and strengths, for example by partnering with the right parties instead of making own efforts. Because of these efforts and preliminary successes, it may be justified to support this EIT (Digital) representation in the Bay Area for a longer term to safeguard both the image and the efforts already made.

EIT InnoEnergy: Developing game changers

This case study discusses the iterative improvements / strategic changes made to EIT InnoEnergy Master's programme in response to outcomes to date.

Introduction

This case study presents the efforts that EIT InnoEnergy has made to develop their Master's degree courses within the EIT InnoEnergy Master School since 2015. It mainly focuses on what EIT InnoEnergy refers to as the 'Version 1 to Version 2 Exercise', and makes an attempt to estimate the early visible results.

The underlying idea of EIT InnoEnergy's entire educational activities is to offer students engineering courses and training programmes with strong industrial elements, and with a broad direction towards innovation and entrepreneurship in a wider extent than offered by traditional university Master's programmes. EIT InnoEnergy aim to produce tomorrow's entrepreneurs and to develop future game changers with a focus on sustainable energy. This is provided through cooperation between several European top universities and industrial partners.

A previous study conducted by the Technopolis Group hints at the relevance of studying the development of the EIT InnoEnergy Master School.⁴² In the study, EIT InnoEnergy Masters students and industrial representatives criticised how the industrial influences of the Masters programmes were presented. This study, although limited in its scope, gave reason to believe that EIT InnoEnergy overstated the strength of the industrial contacts within the Masters programme descriptions: the experience of former Master students was that EIT InnoEnergy was unable to deliver the content that was initially described. Industrial representatives expressed similar thoughts, arguing that strong leadership and entrepreneurship are qualities that come from a long working life experience rather than from university education and training, and not characteristics they as future employers expect from new graduates.

The study also highlighted some imperfections in the marketing of the educational Masters programmes, in relation to the recruitment of new students as well as towards relevant industries.

Constraints to cooperation

To understand the importance of changes made by EIT InnoEnergy, and how these adjustments have been motivated, a brief outline of the most important changes is necessary. EIT InnoEnergy has set up and implemented a six-stage strategy (Version 1 to Version 2 Exercise)⁴³ to improve the Masters programmes, comprising of the following modifications:

- Involving more industrial input in the curriculum and syllabus of courses;
- Instigating extensive efforts to motivate lecturers;
- Developing more educational and pedagogical teaching;
- Improving the performance assessment of students during the admission process;
- More clearly and better defining targeted learning objectives in each Masters programme; and,
- Strengthening the requirements of industrial pairing to students' Masters theses.⁴⁴

Another new feature is the *Human Capital function*. This is used to identify and involve successful students in EIT InnoEnergy education innovation and business projects. It

⁴² Miriam Terrell, Emma Ärenman and Göran Melin (2016) "Study on industrial needs and students preferences in relation to KIC InnoEnergy Master School".

⁴³ V2 synonymously with all the changes made (Will be referred to as V1 and V2).

⁴⁴ EIR business plan 2015 – KIC InnoEnergy.

also helps students to better adapt and orientate their skills and talent towards the demands of the external labour market.

The pursuit of quality improvement is a primary explanatory factor for the changes.⁴⁵ The increased elements of entrepreneurship are in line with what EIT InnoEnergy from the outset strive to offer their students, but the transition from V1 to V2 has provided the Masters programmes with educational features which go beyond a pure focus on technical challenges. The programmes now attempt to offer engineering-focused entrepreneurs better contact with potential future employers, teach them solutions to more general everyday problems, and lets the students participate in innovation projects to an even greater extent. This is what EIT InnoEnergy refers to as *challenge-based education*.

The approach has led to increased demands on the teachers' pedagogical skills. It similarly places higher demands on the students' responsibility for their own studies, which is why requirements concerning students' prior knowledge have also increased. An essential difference between the V1 and V2 admission process is that students now have to file a personal letter with their application, as well as participating in admission interviews. EIT InnoEnergy have also had the objective of increasing the number of accepted students, as former admission numbers did not reach the target of 300. A step in attaining this has been to significantly increase the number of admissions in relation to admission capacity. The number of students now exceeds potential capacity by 50 per cent⁴⁶. The assumption is that high-performing students at undergraduate level are likely to be admitted to a number of rival Masters degrees and therefore final student numbers enrolling will be in line with the target. Although it is difficult to estimate the success rate for this concept of expanding the number of students, KIC IE Master School did register 270 master students in their programmes in Autumn 2016, demonstrating a 20 per cent increase in registrations compared with admissions in Autumn 2015.

A secondary feature, in addition to the V1-V2 exercise, has been to increase communications between partner universities in order to create more consistent cooperation and overcome a previous lack of dialogue and knowledge sharing between the Masters programmes and partner universities. The monitoring process of the performance levels of teachers and students has also been simplified. For instance, the development of a uniform survey questionnaire for *all the students* in EIT InnoEnergy Masters School has created opportunities for meta-evaluations, covering all the Masters programmes, and used for student input in the design of the *challenge-based education*. Likewise, the establishment of common databases between the host universities has strengthened the dialogue in a comparable way.

A major responsibility in these changes lies with the EIT InnoEnergy education manager, whose role is to communicate to all host universities the efforts needed for an effective implementation. However, all the Masters programmes also have their own programme director, and it is their accountability role to operationalise the modifications into the Masters programmes at the institutional level.

EIT InnoEnergy believes that V2 will strengthen the Masters School and its cooperation between stakeholders, but acknowledges that there have been challenges on the way. For instance, legal and bureaucratic differences between the host countries, due to the partner universities geographical spread, has increased the V2 implementation phase. Another obstacle has been to engage industrial stakeholders which has been hampered, according to InnoEnergy, mainly due to the labour market's slow adjustment to future demands for sustainable energy. Companies that

⁴⁵ This also concerns the EIT-label.

⁴⁶ Formerly 20%

are trying to fill current competence gaps are strongly focused on short-term needs, with a large demand for civil nuclear energy skills, which do inhibit the market demand for EIT InnoEnergy's possessed expertise. EIT InnoEnergy's ambition is to provide the skills needed for the next 30 years. However, their strong focus on low carbon energy sources does limit the number of company HR departments that are willing to engage with them. The EIT InnoEnergy Masters School has therefore restricted its industrial dialogue to company departments that focus solely on sustainable energy.

It is difficult to give an explicit picture of how potential stakeholders - defined as partner universities, students (active and potential) at EIT InnoEnergy Masters School, and partner companies - value the change to V2. The EIT InnoEnergy education management explains that EIT InnoEnergy has been successful in implementing V2, but identifies the EIT financing structure as a major challenge as it only posts funding for *one year* at a time. This must be set against the admission processes of the Masters programmes, since the host universities schedule and budget for admitted students for *three years*, as the preparations for intake are initiated in the year the students send in their applications⁴⁷. The combining of short-term funding with collegial governance structures within the host universities has thus been demanding. The implemented changes are based on long-term ambitions. However, the lack of a secure budget has meant less financial input from the host universities, as the short-term financing adversely affects their ability to influence the education at grass root level.

EIT InnoEnergy Masters School also considers input from the internal survey directed to the students mentioned above. The EIT InnoEnergy education management also testifies that the Masters education is now accessible to more entrepreneurship. Expected benefits from the challenge-based education include better wage conditions, working careers and a high degree of self-employment. It is however still too early to assess how the changes are valued by the students, as the implementation is still at an early stage. The same goes for the partner participants' perception of V2. However, and as already mentioned, the market demand for student expertise within sustainable energy continues to be a challenge for EIT InnoEnergy. It remains to be seen how the energy market will react to the changes that V2 represents since no students have yet graduated since its implementation. On the other hand, there are examples of good cooperation with private partners, such as EIT InnoEnergy students participating in innovation projects with the Spanish energy company Iberdrola.

It can also be noted that the quality of the Masters programmes is assured by EIT InnoEnergy using their own EIT quality label (since 2013, earned by all Masters programmes within KIC IE Masters School) as an instrument to mainly ensure industrial influence. Continuous work from EIT InnoEnergy is carried out to confirm that the programmes preserve the quality in order to maintain the EIT label, and has been an important instrument provided by EIT in the improvement of the educational activities. So far, the Masters School has spread to thirteen host universities in five countries in the European Union. The EIT InnoEnergy educational management points out that universities separate from the EIT InnoEnergy cooperation also make use of the label in the design of their own educational programmes. They do this mainly by accessing the content of the EIT quality label through the publication of the EIT-label handbook (published April 2016).

Role of KIC

EIT InnoEnergy uses the knowledge triangle as a basis in their working methods, and it targets full integration between enterprise, research/innovation and higher

⁴⁷ Followed by two year long programme

education. In practice, this means a high degree of knowledge exchange between participants in education, research and industry within EIT InnoEnergy's total commerce. Increasing the students' understanding of the EIT InnoEnergy working standards and, at an early stage, integrating the students in other EIT InnoEnergy activities, are key factors in the updating of the Masters programmes. The support from the aforementioned *Human capital function* complements this approach by capturing strong performing students and getting them involved in EIT InnoEnergy innovation projects.

Implementation of V2 has to this point been manifested in the Masters programmes' curricula: regarded as the first step in the "V1 to V2 exercise". Intensification of the entrepreneurship element has led to a reduction in hours spent in traditional lectures, laboratory sessions and seminars. Instead, students are now more involved in innovation projects. V2 appears to be therefore visible mainly amongst the students, but it is still difficult to see how students perceive the *visible changes* since none of the active students experiencing the transfer to V2 have yet to graduate. It was EIT InnoEnergy's intention to conduct evaluations of this issue during late autumn 2016, but these have as yet not been carried out. Equally, it is still early to tell how private partners view the V2 changes.

Nevertheless, a successful early implementation of the *challenge-based education* is a tangible result. In addition, there has been an increase in the number of admitted students. As mentioned before, 270 students were admitted in the autumn 2016, representing an increase of 20 per cent compared to the autumn 2015 admission. The future impact of V2 is difficult to assess at this stage, but earlier evaluations emphasise that previous EIT InnoEnergy Masters students are more likely than other Masters students to start their own businesses: the expected outcome of V2 is that this will be further enhanced. Another aim and expected outcome is to give the current students even better opportunities to reach high corporate positions, and consequently in future to have the potential to influence corporate and industrial strategies. Moreover, EIT InnoEnergy has the ambition to contribute to national and multi-national innovation systems in Europe, although V2's significance for this goal is obviously not yet possible to ascertain.

Conclusions and reflections

It is important to stress that many actors, including thirteen host universities and several participating private companies, are involved in the coordination and development of the Masters programmes. EIT InnoEnergy is of course the driving force but the EIT, which is similarly responsible for four additional KICs, is the central funder. The challenge has been for these numerous institutions to act as a unifying force, taking a variation of specific interests into account.

Conversations with EIT InnoEnergy representatives reveal that short-term funding from the EIT is problematic, as the Masters programmes and their transfer to V2 are long-term investments. The problem occurs as the applicants and admitted students are budgeted for operations within the universities for two additional years, apart from the year that EIT ensures funding. Since partner universities have limited possibilities to influence funding, the opportunities to have an impact on the design of Masters programmes have decreased as well. This has resulted in a cycle where partner universities themselves have contributed less financially, creating a persistent clash between EIT's short-term funding structures and the collegiate steering groups within host universities. EIT InnoEnergy has found this issue challenging to handle.

Furthermore, the low interest from EIT InnoEnergy partner companies' HR departments has limited the number of company representatives with which to engage with. This has made it difficult to maintain close industrial contacts. Stiff competition from cheaper, fossil-fuel energy sources mainly explains this, and has had a negative impact on the market demand for sustainable energy skills. On the other hand, EIT

InnoEnergy are making investments in sustainable energy for the future, suggesting that this may be a temporary challenge and one where public intervention is required to help develop initial capacity in the absence of market demand. Furthermore, it should be expected that students considering applying to the EIT InnoEnergy Master School are aware of the characteristics of the energy market.

The focus on entrepreneurship has in previous years led to better career opportunities for those who have undergone education within the EIT InnoEnergy Masters School, and alumni surveys conducted by EIT InnoEnergy that preceded the "V1 to V2 exercise" show that their students are self-employed entrepreneurs to a higher degree than students who had participated in similar educational programmes. It is however too early to predict the impact from the V2 changes. EIT InnoEnergy believes, however, that strengthened career possibilities and industrial connections are strong selling points for students and it intends to carry out continuous meta-evaluations based on inputs from the Masters students.

It has in this case study not been possible to collect any primary information from EIT InnoEnergy member companies. Neither have we been able to reach students studying, or considering to study, at the EIT InnoEnergy Masters School. The conclusions should consequently be viewed with caution.

EIT InnoEnergy: Support to Minesto

This is an interesting example of an ocean energy technology on the cusp of commercialisation with a full scale trial off the Welsh coast in 2017. The case study provides useful insights on the benefits of KIC being a partner in early stage companies and bringing financial insight and supply chain contacts.

Introduction

Minesto is a marine energy technology company whose mission is to minimize the global footprint of the energy industry by enabling commercial power production from low velocity tidal and ocean currents. The company was founded in 2007 and has offices in Gothenburg (Sweden), Holyhead (Wales) and Portaferry (Northern Ireland). Minesto's award winning and patented product, Deep Green, is the only proven marine power plant that operates cost efficiently in areas with low velocity currents.⁴⁸

Renewable resource forecasts suggest that the ocean can be a great source of energy and that just 0.1 percent of the energy in waves has the potential to supply the world's energy needs five times. Technology sponsors are currently exploring the ocean as an energy source using different technologies to exploit wave energy, tidal stream energy, temperature differences and salinity gradients.⁴⁹

Minesto's patented hydropower plant Deep Green uses low-velocity currents to convert energy from tidal currents into electricity. The Deep Green technology has an advantage in that it can cost efficiently run in low-velocity environments, compared to more common technologies that depend on high velocity zones of tidal stream energy. Minesto's technology is based on the same principle as a wind kite with a design that makes it move more than ten times the velocity of the water currents.⁵⁰

EIT InnoEnergy's involvement in Minesto

In May 2015, Minesto secured a €13m investment from the European Regional Development Fund through the Welsh European Funding Office (WEFO), for the commercial rollout of Deep Green. The same year, EIT decided to provide support worth €3.5m to Minesto, and this support from EIT InnoEnergy was directed to the last stage of development before the commercialisation of the Deep Green technology.⁵¹ Less than a year later, in June 2016, EIT InnoEnergy decided to expand its support to Minesto by funding an additional €1m for the further development of the full-scale model of Deep Green.

The financial support from EIT InnoEnergy represents six percent of Minesto's total budget between the years 2015-2018. In return, EIT InnoEnergy receives warrants in Minesto, making EIT InnoEnergy a minority owner of Minesto. Minesto states that one of the main differences between EIT InnoEnergy and other R&D supporting programmes is the demand of reimbursement if Minesto fails to deliver certain results and to meet specific and general obligations. The demand of reimbursement was tricky to understand and manage for Minesto during the application process. Finally, the reimbursement to EIT InnoEnergy was decided at a later stage when the application had already been granted.

The partnership between Minesto and EIT InnoEnergy consists of the following three phases:

⁴⁸ Minesto. (2015). "POWER TO CHANGE THE FUTURE"

⁴⁹ http://ec.europa.eu/research/energy/eu/index_en.cfm?pg=research-ocean

⁵⁰ Tomas Åström, Tommy Jansson, Jakob Kuttenkeuler & Jens Österlund. (2012). "Evaluation of Minesto AB's development plan related to key system performance".

⁵¹ Minesto. (2015). "POWER TO CHANGE THE FUTURE".

- Firstly, the support from KIC InnoEnergy, mainly comprising of financial support and the provision of services, enabled Minesto to move on with their development plans;
- Secondly, the support from EIT InnoEnergy gave Minesto a better prospect of achieving a successful Initial Public Offering (IPO) in 2015;
- Third, the current phase is about building and maintaining important networks which EIT InnoEnergy has brought to Minesto, as well as gaining critical knowledge about the emerging ocean energy supply chain.

EIT InnoEnergy seeks to make a diverse set of investments into different renewable energy prospects with the objective of creating long-term value and profit for each investee company and therefore generating returns for EIT InnoEnergy. Minesto's Deep Green technology is one of a limited number of technologies that have the possibility to extract energy from the ocean and be commercially competitive in the near future. According to a report⁵² by Minesto, a CEO of EIT InnoEnergy stressed the importance of Minesto having a proven technology when it decided to invest in the company. Additionally, Minesto's skilled workforce was regarded as a key strength and differentiating feature.

According to Minesto, the financial support provided by EIT InnoEnergy promotes the development work within Minesto in an efficient way. The company explains that the support came at a phase in its development when it needed strong additional financial backing: it was important in the early stages of development of Deep Green, as it enabled Minesto to carry on with their plans to develop the company further. The investments by EIT InnoEnergy combined with funding from the Welsh European Funding Office (WEFO) also contributed to a better position for the company's IPO in 2015. This IPO, which brought additional investment into Minesto, accelerated the development of the company and its product further.

Today, the support provided to the company by EIT InnoEnergy is mostly about maintaining and developing Minesto's current partnerships. Furthermore, EIT InnoEnergy has provided specific knowledge to help it to reach the next level. As an example, Minesto highlights that relevant industrial knowledge is important as well as knowledge of public and private financing. In total, Minesto has interacted with five to eight people at EIT InnoEnergy, some who are helping out with administrative tasks while others have focused on the technical aspects of the partnership.

As for Deep Green, Minesto is planning to commence installation of the first commercial scale, 0.5MW power plant off the coast of Anglesey in North Wales, UK, in 2017. The second stage will be to increase the number of plants to three, forming a 1.5MW array which includes inter-array cables, foundations and on- and offshore electrical infrastructure. Minesto has consent to develop a marine energy array of up to 10MW at the site⁵³.

KIC's role and added value

R&D companies need to choose between a variety of options and financial instruments to promote their development. Minesto states that a partnership with a KIC has advantages to other funding instruments or programmes since the KIC is adapted to meet the real needs of development companies. In choosing to form a partnership with EIT InnoEnergy, Minesto was heavily influenced by the KIC's thorough knowledge and understanding of the challenges they faced as a development company.

⁵² Minesto. (2015). "POWER TO CHANGE THE FUTURE"

⁵³ See <http://minesto.com/holyhead-deep/>

EIT InnoEnergy came to Minesto's attention through their involvement in another Swedish marine energy company. Minesto saw this as an indication that EIT InnoEnergy could be an interesting partner. The earlier involvement in and experience of the marine energy field indicated to Minesto that EIT InnoEnergy would have an understanding of the specific needs of the company and would therefore be a trustworthy partner. In interviews, Minesto emphasized that EIT InnoEnergy from the outset showed that they intended to be actively committed to the company and its development. Minesto very much appreciates the fact that it has been easy to make contact with and to get a response from the people at EIT InnoEnergy.

Minesto points out that the application process, with its manageable administrative burden, was a key factor in easing the decision to apply for financial support from EIT InnoEnergy. Even though the initial application was rejected by EIT InnoEnergy, it resulted in some useful advice for the company. Minesto built on this feedback when submitting another, improved application, which was then approved. Minesto states that the short time between the submitted application and the decision to grant it was another positive experience. Minesto highlights all these factors as important in the company's decision to collaborate with EIT InnoEnergy.

The Minesto company board does not as a rule participate in decisions regarding the company's involvement in support programmes, but in the case of the decision to enter a partnership with EIT InnoEnergy the board was actively involved.

The partnership between Minesto and EIT InnoEnergy has generated several positive outcomes. On a more technical note, Minesto underlines that the partnership with EIT InnoEnergy and the funding of WEFO were important factors that made it possible for the company to build the first Deep Green Technology power plant. A more indirect result of the partnership is that it encouraged the company to procure an independent evaluation of Minesto's market potential, IP portfolio and development strategy. Minesto estimates that the independent evaluation has increased the company's credibility and promoted an improved public perception. Consequently, Minesto argues that the company's market position has significantly increased through its partnership with EIT InnoEnergy.

Apart from the support of EIT InnoEnergy and WEFO, the commitment of these two players was an important contribution in building the Deep Green power plant. The IPO in 2015 also contributed to the construction of the power plant. Minesto argues that one of the more unexpected outcomes of the company's partnership with EIT InnoEnergy has been the inclusion of a long-term road map for the company's development and expansion. This road map was initiated by EIT InnoEnergy and, although it has a long-term perspective that is outside of the immediate scope of the partnership of Minesto and EIT InnoEnergy it has been identified as a positive side effect for Minesto.

Minesto points out some specific factors that have contributed to the results generated by the partnership with EIT InnoEnergy. The active involvement and long-term perspective of EIT InnoEnergy is highlighted as a key success factor, as is the fluent dialogue between the two organisations. Minesto also sees it as crucial that the relationship with EIT InnoEnergy is based on mutual openness where the two partners have supported each other along the way. Minesto argues that the cooperation with EIT InnoEnergy has been helped by the two partners having the same initial understanding of the partnership. Minesto's capacity and previous experience in dealing with public/private financial support has been useful in this context and enabled the positive outcomes. On a more negative note, Minesto states that it has been time consuming for the company to fulfil all the auditing and reporting requirements that arise from the partnership. Overall, however, the well-functioning collaboration of Minesto and EIT InnoEnergy has resulted in the company developing further, benefiting both parties.

Minesto has progressed since the start of the partnership with EIT InnoEnergy, which is in line with the company's initial expectations. However, there are certain aspects that can be developed further, such as greater networking across the energy sector.

Today, Minesto regards EIT InnoEnergy as a strategic partner in the company. It is actively involved in Minesto and helps to bridge the gap between development and commercialisation. Minesto argues that this active involvement comprises of the KIC introducing networks which can bring benefits, providing some industrial skills, as well as an advisory role. These activities demand both technical and market knowledge and are indicators of EIT InnoEnergy's broad scope that fits the current needs of the company. In addition, Minesto states that there is an ongoing discussion between the partners as to how to proceed towards full commercialisation of the Deep Green technology.

Conclusions and reflections

The support from EIT InnoEnergy has developed and moved Minesto further towards commercialisation of its Deep Green technology, mostly through enabling the construction of the first power plant. Although the support from EIT InnoEnergy has been very important, it should be noted that the involvement of WEFO was another decisive factor in building the power plant.

The active and committed involvement of both parties has enabled a successful relationship based on mutual respect. The partnership is still rather young, and the progress has been rapid. That said, the support of EIT InnoEnergy to Minesto's progress has not exceeded the company's initial expectations. Minesto representatives state that they had relatively high - but realistic - expectations of the partnership. Even though the partnership between EIT InnoEnergy and Minesto undoubtedly has contributed to the development of the company, Minesto representatives find it impossible to estimate what actually would have happened without the support. The same applies to the issue of estimating if and to what degree the support from EIT InnoEnergy resulted in any crowding out of other possible investments or investors.

EIT InnoEnergy is regarded as a strategic partner for Minesto's further development towards commercialisation. The role of EIT InnoEnergy has been described as the link between the development phase and commercialisation. Everything indicates that EIT InnoEnergy is going to have an important role in the future of Minesto, with a focus not only on the project but on the bigger picture. The investment from EIT InnoEnergy is a clear signal of the confidence they have in the Deep Green solution. The EIT InnoEnergy support clearly shows the company and the market the strength of the company's business case and partnership.

Finally, Minesto highlights as positive that there has been room for flexibility and adjustments along the way in the partnership. For a company like Minesto, this is important. Since the collaboration started, there has been some changes in the set-up of the partnership. The guidelines provided by EIT InnoEnergy have helped the company to correct early shortcomings. A lesson for similar cases would be that there must be flexibility enough to ensure that early shortcomings can be adjusted along the way.

EIT InnoEnergy: Regional innovation (Iberia)

This case study explores the systemic impact of EIT InnoEnergy and assesses to what extent EIT InnoEnergy Iberia's activities support regional innovation.

Introduction

EIT InnoEnergy Iberia S.L. was established in Spain in July 2011. The parent company, EIT InnoEnergy SE, is a majority shareholder and the remaining shareholders include eight Spanish partners and three from Portugal. These shareholders comprise of three universities (BarcelonaTech (UPC), Esade (Universidad Ramon Llull) and Instituto Superior Técnico Lisboa), three research institutes – IREC (Catalonia Institute for Energy Research), Tecnalia and Ciemat – and five private companies (Gas Natural Fenosa, Iberdrola, EdP, Comsa Emte and Galp).

EIT InnoEnergy Iberia has the ambition to be an important player in both the Spanish and Portuguese energy innovation systems. To help fulfil this ambition, it transmits information about itself through a variety of targeted and general channels, both to raise awareness of EIT InnoEnergy services and to attract potential partners or clients.

EIT InnoEnergy Iberia carries out targeted efforts aiming at fostering collaboration with key local stakeholders in the innovation ecosystems of Spain and Portugal. It is a member of the Supervisory Board of RIS3CAT-Energia (the Catalan Government's response to the regional Smart Specialisation initiative launched by the EU). During 2015, several formalized joint programmes with other institutions were carried out to promote entrepreneurship and business creation in collaboration, including:

- Cleantech Camp, in collaboration with city of Barcelona and La Caixa;
- CleanTech Start in collaboration with Madrid+D (Madrid regional Government);
- Lisbon Challenge in collaboration with city of Lisbon, Beta-I and other local stakeholders; and,
- Ecopreneurs for the climate in collaboration with Greenbiz, in Barcelona.

Additionally, the annual InnoEnergy Award to the best cleantech start-up from Portugal and Spain was launched in 2015.

There have also been meetings on different topics with key institutional actors such as the Spanish Centre for the Development of Industrial Technology (CDTI), the Spanish Ministry for Economy (MINECO), the Spanish Ministry for Industry, Energy and Tourism (ENISA). The Spanish Ministry of Science and Technology, and the Foundation for Science and Technology Portugal.

Lastly, EIT InnoEnergy Iberia uses press contacts as channels to disseminate information and generate interest amongst a broader set of target groups. For example, it holds a press list (updated October 2015) with some 60 Spanish contacts (comprising the business media and wind and renewables sectors) which is the basis for EIT InnoEnergy Iberia's media coverage. Information is also relayed to more general media outlets across Spain, such as main national or regional newspapers. The press list for Portugal covers some 30 contacts, comprising both the general and business press.

KIC's role and added value

EIT InnoEnergy Iberia points to three elements that differentiate them from other players in Iberia:

- Specialists in sustainable energy – EIT InnoEnergy Iberia knows the sector well and has an extensive network;
- Commitment when supporting players – the KIC becomes a shareholder in all new ventures or agrees on a success-based royalty scheme with established

commercialising party, and is able to leverage its networks across Europe to open up channels to market; and,

- Pan-European perspectives - the KIC brings a pan-European dimension which is felt to be unique compared to other public sector players operating in the Iberian peninsula.

In the past six to eight years, Spain and Portugal have suffered from a significant lack of either country or regional innovation policy. Coinciding with the economic crisis, this resulted in very few funds and public programmes promoting innovation in the energy sector. This lack of government support has meant that public institutions have been operating in “survival mode”.

EIT InnoEnergy Iberia has worked independently of government, delivering against its own corporate objectives, with no agreed strategies with government institutions. It has established numerous contacts with national and regional institutions in order to increase awareness of the EIT InnoEnergy ‘offer’ and to generate interest in collaboration. So far, and despite expectations of more institutional interest, the outcomes from this brand building exercise have resulted in only a few actual collaborations in a limited number of Iberian regions.

At the same time, however, the KIC has embedded itself in local ecosystems, with both formal and national partners. This has happened with some large utilities, manufacturers and R&D organisations in Spain and Portugal, and with local partners and alliances in entrepreneurship in business creation and investors. Collaborations at city level have taken place – for example, the KIC has launched a sustainability programme in Barcelona. EIT InnoEnergy Iberia is also part of the EIT RIS 3⁵⁴ initiative in Barcelona and Catalonia, as well as the Spanish Alliance for Energy Research and Innovation (ALINNE).⁵⁵

Stakeholders we have interviewed point out that to date EIT InnoEnergy Iberia has had only a limited impact nationally, and that their activities are known only to a limited extent outside member and associate organisations. Furthermore, the KIC is regarded as an international entity, rather than national or local. Some member companies also do not see a perfect fit between the KIC’s activities and what they are doing. One member company representative holds the view that EIT InnoEnergy Iberia offers less than what (scarce) public support mechanisms can offer. Another associate member (a public research institute) that participates in EIT InnoEnergy Iberia projects regards the organisation’s operations as very similar to typical R&D projects such as those funded under Horizon 2020. This research body has been unable to participate in other types of more market-focused projects proposed by EIT InnoEnergy Iberia and led by companies. This, however, is due less to the projects not being relevant and more to do with the research institute following a more traditional ‘Horizon 2020’ way of working: “*we find it difficult to accommodate to the new type of EIT InnoEnergy projects*”.

EIT InnoEnergy Iberia also discussed collaboration on PhD programmes with the Ministry of Education in Spain. However, the Ministry had their own programmes and schemes which was not compatible with that of EIT InnoEnergy. Collaboration with the Catalonian regional industrial PhD programme however, has been established.

⁵⁴ RIS3 is a process, supported by the European Commission, at the end of which regional/national strategies should identify activities, in which an investment of resources is likely to stimulate knowledge-driven growth. For more details see: <http://s3platform.jrc.ec.europa.eu/eye-ris3>

⁵⁵ “Alianza por la Investigación y la Innovación Energéticas” (ALINNE) is a national public-private pact set up in 2016 by the Minister of Science and Innovation with the challenge of strengthening Spain’s international leadership in energy innovation energy. At the end of 2016 some 50 partners – public institutions, universities, research institutes and private companies – were collaborating in the Alliance.

Overall, EIT InnoEnergy Iberia believes that they have improved their operations, but still need to target their efforts a little better. They also need to reinforce business development and support activities in order to connect their activities more effectively with partners.

Coherence and relevance of EIT InnoEnergy Iberia's activities

Given the importance of social and economic goals, the EIT InnoEnergy Iberia offer is coherent and relevant. Sustainable energy is one of the key priorities for Spain and Portugal (and many of their regions). The KIC is well aligned with what local and regional governments are aiming to achieve. Barcelona is one city level example where key topics such as Smart Cities and mobility and energy efficiency are being pursued intensively. Here, EIT InnoEnergy Iberia provides input into the regional policy. For example, it has been running for around five years a joint programme with Barcelona City Hall for entrepreneurs to develop initial ideas in sustainable energy. To date, 12-15 ventures from the Barcelona area have developed sustainable energy-related products, delivering tangible results from the KIC's intervention. Furthermore, around 80 MSc and PhD students are part of the educational programmes taking part in Lisbon and Barcelona. Many of them, collaborate as interns with InnoEnergy supported start-ups and partners, thus contributing to the knowledge triangle integration.

In Spain and Portugal there is quite a significant gap between research and business. In the light of this, and the economic crisis, the EIT InnoEnergy Iberia CEO believes that over the past five to six years it has been quite successful in establishing itself as a key player to bridge this gap. He points out that EIT InnoEnergy Iberia has provided support to entrepreneurs and relevant players in Spain and Portugal. However, considering other voices and information, more needs to be done; and, as noted above, there are few examples of close contacts and lasting relationships between the KIC and regional or national institutions in Iberia.

Conclusions and reflections

EIT InnoEnergy Iberia has never prioritized collaboration with the national and regional public institutions of Spain and Portugal due to the perceived low value from such collaboration. The target is to attract the best industries, SMEs and entrepreneurs. Collaboration with public institutions may be a means to achieve this objective, but is otherwise not perceived as central. To a large extent, this also explains why EIT InnoEnergy Iberia as yet appears to have had a limited impact on national, regional and local innovation systems. This situation may well improve over time, especially as the KIC manages to demonstrate success stories resulting from the investments done during the previous years and better explain to stakeholders the value added that it can bring to commercial operations through joint innovation projects.

EIT InnoEnergy as a whole, together with its operations in Iberia, is still not seen as a natural player in national or regional systems, but rather as an external player which is less obvious and necessary to interact with. EIT InnoEnergy Iberia needs to continue communicating and fine-tuning its service offer to associates and prospective collaboration partners in order to demonstrate what it is that makes EIT InnoEnergy an indispensable partner – and one that can bring substantial benefits.

That said, it is clear that the EIT InnoEnergy Iberia value proposition should be of great interest to policy makers because it is well aligned with what local and regional governments are aiming to achieve. The efforts of explaining and bringing added value – a specialisation in sustainable energy, connections with business experts and end-users, as well as the European dimension – will continue. *"We need some revenues resulting from commercialisation of innovative products, some good examples to show"*, says EIT InnoEnergy Iberia. This is the challenge in the short

term; and there are signs that this is starting to happen, as for example in the city of Barcelona, where a stable collaboration is now taking place.

A limited number of stable contacts at regional and national institutional level has until now impeded more lasting relationships or initiatives. However, the KIC's efforts to foster collaboration with key local stakeholders in the innovation ecosystems of Spain and Portugal show that efforts are being made. However, these will need to be monitored and evaluated in time to determine overall impacts. It also appears necessary to continue to increase awareness and knowledge of the EIT InnoEnergy Iberia value proposition, in order to overcome perception challenges and/or to build confidence in the brand.

EIT Climate-KIC: Innovation and Naked Energy

Purpose of the case study

Naked Energy is a EIT Climate-KIC start-up which is regarded as successful and promising. This case study explores the conditions that helped Naked Energy succeed. In particular, two innovation projects which had Naked Energy participation are explored, with a particular focus on the synergies and spillover effects resulting through Naked Energy's engagement with EIT Climate-KIC. A final section highlights factors, external to the EIT Climate-KIC, which have also been key to Naked Energy's success so far.

Background to Naked Energy

Naked Energy is an intellectual property developer, which created Virtu™, a hybrid solar panel that generates both heat and electricity. Between 2009 (when it was founded) and 2016, the start-up has raised €3.8 million in grants and equity (including EIT Climate-KIC's grant and equity funds); inaugurated Virtu's first application for a commercial client; partnered with an exclusive manufacturer for Virtu; and is preparing to run its first large scale project, encompassing a total of 120 Virtu tubes.



Naked Energy joined EIT Climate-KIC in 2012 as an affiliate partner. As part of EIT Climate-KIC, Naked Energy had progressed through Accelerator stages 1 to 3, which helped them improve their approach to pitching their product and, consequently, their ability to attract further funding. Via EIT Climate-KIC, Naked Energy was also introduced to their first commercial client, a prominent supermarket chain in the UK, who hired Naked Energy to implement a Virtu™ solar panel on one of their shops. The panel was installed on September 2016 and is regarded as a key milestone for the start-up.

Within EIT Climate-KIC, Naked Energy has also engaged with other EIT Climate-KIC partners (in particular TNO and Deltaris), with which they developed two innovation projects: WE4CC and E-USE (the latter is on-going). These two projects are described below, and insights into the added value of them being developed under EIT Climate-KIC, are highlighted.

The WE4CC Project

Waste Energy for Climate Change II project (WE4CC II) is a partnership between TNO and Naked Energy, plus TU Berlin and GDF Suez. The project aims to use solar energy to run a high quality water production and air conditioning system. The water purification system, named Memstill®, consists of a membrane distillation technology which delivers high quality water for a range of applications. Under WE4CC, TNO's

Memstill® was combined with Naked Energy's Virtu™ on a hotel in Malta to produce purified water.

For TNO, a research institution employing scientists and engineers, working in a partnership with a fresh start-up helped bring a commercial and sales angle to their business. This helped them to look at fundamental questions facing their business idea. What products are competitors offering and at what price? To which consumers is high purity water most valuable? The project was also useful as a real-world pilot of their technology, and helped TNO understand that the right niche for Memstill® still had to be identified.

For Naked Energy this project was a milestone in many senses. Firstly, it represented the first field trial of Virtu™, allowing the start-up to collect for the first time real-world data for the operation of their solar panels. Until then, all data collected on the solar panel had been generated through laboratory experiments. The exposition and reassurance granted by the pilot also led to a contract with Jabil, a leading solar products manufacturer (with a US\$20 billion turnover), granting them the rights to manufacture Virtu™. Finally, according to Naked Energy, working with TNO was "very educational" and helped "open our eyes to the market", i.e. to the possibilities for combining their technology with several other clean technologies. Knowing that it was possible to adapt the product specification to match a particular clean technology highlighted the potential broader opportunities for Naked Energy, which contributed to their participation in the second innovation project, E-USE.

The E-USE Project

The E-USE project is being implemented under a partnership among Deltares, Naked Energy and six other partners including research institutions and private sector players. Deltares is a water treatment company that has been exploring applications of aquifer thermal energy storage (ATES). As part of this project, Naked Energy's Virtu™ tubes will be applied to heat water which will then be stored in an underground aquifer in the Netherlands. This system allows the storing of heat during the summer time, when sun is abundant, and using it during winter, when the demand for heat is high. The electricity generated by the tubes can also be applied to run the pumps needed for the ATES.

From the point of view of Deltares, the project is interesting as it helps them explore opportunities for making their ATES cleaner, by switching from fossil fuel to clean energy in the operation of the pumps. Furthermore, through their interaction with Naked Energy, Deltares was able to identify key specialists in the application of their technologies who can help improve their ATES system.

The project is also key to Naked Energy. Under WE4CC just eight Virtu™ tubes were installed; E-USE on the other hand will require the installation of 120 Virtu™ tubes, constituting the first large scale application of Naked Energy's technology. Naked Energy believes this is a 'very important stepping stone' in the implementation of their business plan, which envisions applying Virtu™ for large scale solar district heating (hot water and electricity). The fact that the project is located in the Netherlands is also an advantage. With 1,000 ATES systems running, the Netherlands is one of the leading countries in the application of this technology. Furthermore, studies point to a potential of 20,000 ATES to be established by 2020, making this pilot a significant step forward for Naked Energy.

Other sources of support accessed by Naked Energy

It is important to acknowledge that support from other sources have been key for the progress made by Naked Energy, especially in terms of further funds and access to facilities. Naked Energy has also benefited from other sources of support. Just before joining EIT Climate-KIC (in 2011), the start-up was awarded the Shell Springboard prize of €40,000 which helped raise their profile and attract business angels who

provided them €500,000 in seed funding to further develop the technology. A partnership with the Imperial College also allowed Naked Energy to develop three research projects within the university facilities, which allowed Virtu™ to be tested and validated, and provided valuable operational data. Imperial College was also Naked Energy's link with EIT Climate-KIC. Finally, Naked Energy was also awarded around £1 million from the UK's Department of Business, Energy and Industry Strategy (BEIS), through its Energy Entrepreneurs Fund.

Conclusion

Since its foundation, Naked Energy has managed to raise €3.8 million in grants and equity (including EIT Climate-KIC's grant and equity funds) and, among other achievements, it is preparing to run the first large scale installation of Virtu™, a hybrid solar panel developed by the start-up.

Having joined EIT Climate-KIC as an affiliate partner in 2012, Naked Energy benefited from coaching and guidance which helped them shape their approach to selling their product and presenting their company. The case study also shows that EIT Climate-KIC has been key in helping Naked Energy engage with potential partners and clients. In particular, their engagement with TNO and Deltares under WE4CC and E-USE have been instrumental in widening Naked Energy's horizons to the possibilities of combining Virtu™ with other clean technologies. These projects are also regarded as key to demonstrate the feasibility of the technology and to showcase it, which could ultimately lead to an increased ability to raise funds and scale Virtu™.

It should be noted that other sources of support have also underpinned Naked Energy success. In particular, seed funding, grants and equity from different sources have helped the business keep running, while the partnership with Imperial College has allowed Naked Energy to further test and validate its technology before bringing it to the market.

This case study provides an example of EIT Climate-KIC's role in developing innovations and the spillovers that have taken place as different types of partners collaborate. In the case of Naked Energy, the connections established seem to have been particularly serendipitous, i.e. having the right people, in the right place, at the right time.

EIT Climate-KIC: Pioneers into Practice

Context of Pioneers into Practice

Pioneers into Practice (PiP) is a professional placement programme aimed at climate change professionals from industry, SMEs, universities, research institutes, and public and non-for-profit organisations. The objective of PiP is to contribute to the development of entrepreneurs and 'intrapreneurs'⁵⁶, by changing the 'practices of climate professionals with current responsibilities in business, government and research'⁵⁷. The programme consists of a four to six week placement in a partner's institution, where the participants ("pioneers") work on 'real-world challenges to develop innovative low carbon ideas', such as the development of apps to improve traffic management in highways. This is complemented by mentoring, training and workshops on transitions thinking and systems innovation. Besides working on a specific project on their host institutions' projects, pioneers are also assigned a group project. Placements can be either domestic or international^{58,59,60}. In 2016, hosts from the following EIT Climate-KIC locations⁶¹ participated in PiP:

- Spain
- Poland
- Germany
- Helsinki-Uusimaa region
- Italy
- Hungary
- Netherlands

Participants in PiP are encouraged to take placements in sectors different from their own – e.g. a PhD candidate will be encouraged to take a placement in a private company. As such, the underlying idea is that PiP works as a means to support the knowledge triangle, by 'integrating business, education, research and public bodies at regional and European levels'.

PiP has been in place since 2010, and originally sat under the Entrepreneurship pillar of EIT Climate-KIC. In 2015, the programme was transferred to the Education pillar⁶². The 2015 edition of PiP reached 269 participants who took a total of 238 placements (including domestic and international)⁶³. Overall, between 2010 and 2014, the PiP has engaged 659 pioneers in 1,158 domestic and international placements⁶⁴.

Programme impacts

In order to tease out insights into the impacts driven by PiP from 2010 until 2015, the study team conducted six interviews with stakeholders from the programme (including hosts, pioneers and individuals responsible for the programme implementation) and complemented these insights with hard data gathered from existing literature

⁵⁶ An individual working within a large firm who are assigned to work on a special idea or project, and develop the project like an entrepreneur would.

⁵⁷ Climate KIC 2014 GA Report, p. 61.

⁵⁸ Until 2015, participants took part in both a domestic and an international placement, each lasting 4-6 weeks and encompassing the development of their host's project and the complementary mentoring.

⁵⁹ Climate KIC 2015 GA Report

⁶⁰ Leaflet: Pioneers into Practice 2016

⁶¹ Where CLCs and RICs are located.

⁶² Climate KIC 2014 GA Report; Stakeholder interviews

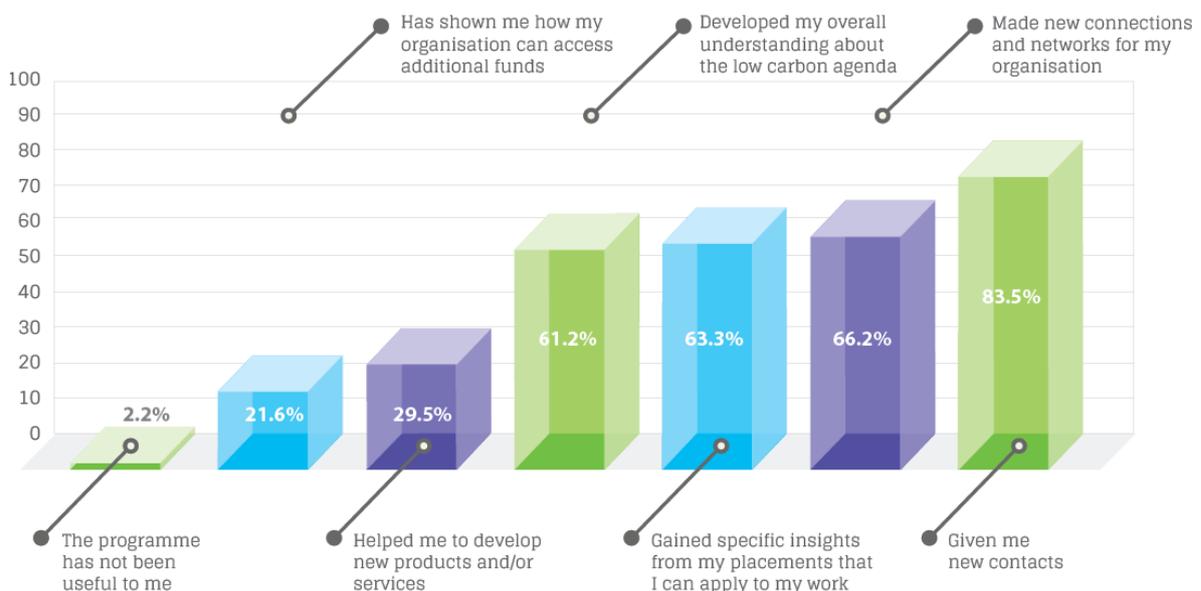
⁶³ Climate KIC 2015 GA Report

⁶⁴ KADA, 2015. Evaluation of Climate KIC's Pioneers into Practice Programme – A Final Report.

(including Grant Agreement Reports, PiP webpages and information packs, and the Evaluation of Climate KIC's Pioneers into Practice Programme – hereafter referred to as the PiP 2015 Evaluation).

One of the primary impacts driven by PiP to date has been improved networking opportunities. According to the PiP 2015 Evaluation (KADA, 2015), there was 'a high degree of satisfaction with networking opportunities from hosts and pioneers', with 75% of the pioneers and 42% of the hosts claiming that 'PiP has had a significant impact on developing new contacts'. Furthermore, just over two-thirds of pioneers (68%) and over half of hosts (58%) have highlighted that they feel 'genuinely embedded in an international community of low carbon innovators through PiP'. This is further corroborated by the interviews with participants in the programme (hereafter referred to as 'pioneers'); for example, one pioneer noted that, two years after his participation in the programme, he is still being contacted by people who found him through PiP. The figure below offers a snapshot of the impacts as perceived by hosts and pioneers, revealing the importance of networking as the top benefit arising from PiP.

Responses to the survey question 'how the programme has been useful to you?'



Source: Climate KIC, Europe's New Mobility Programme: Pioneers into Practice Off to a Great Start

Another interviewee also highlighted that, besides the establishment of partnerships (reflected in the preparation of project proposals, articles published and collaboration agreements), PiP contributes to the development of new innovative ideas that feed into the EIT Climate-KIC innovation pipeline. As shown by the PiP 2015 Evaluation (KADA, 2015), 57% of pioneers reported that the programme has had 'a significant impact on developing new knowledge and competences', while three-quarters of pioneers (76%) agreed that 'PiP has had a significant or moderate impact on achieving new innovation projects'.

Evidence indicates that most hosts are satisfied with their participation in PiP. Interviewees highlighted that PiP enabled their institutions to refresh their processes and knowledge. This aligns with findings from the PiP 2015 Evaluation, where 93% of

hosts claimed they experienced *'a significant or moderate knowledge transfer impact'*⁶⁵. Furthermore, 63% of hosts thought PiP enabled them to achieve novel advances in their organisation, services or business plan, while just over half (54%) verified positive impacts in the creation of new business cases, ventures or products. Evidence of impacts related to expanded/new services and products, new clients, new processes, etc., could not be identified from the interviews; however, PiP 2015 Evaluation indicated that 18% of hosts expect or have achieved an increase in sales or turnover as a result of PiP.

Evidence indicates that participants from universities and research institutions – graduates in particular – tend to receive a greater benefit, as they are able to obtain professional experience that makes them well placed to integrate into the market. At least one interviewee claimed that the work he developed under his placements played a notable role in him being hired by his current company: *'It has boosted my CV'*. This aligns with observations from the PiP 2015 Evaluation, which noted that 83% of pioneers reported having been able to apply the learning gained from their placement.

Professionals from the private sector tend to be less inclined to join the programme, and most pioneers are from governments, NGOs and academia. This is due to PiP placements requiring four to six weeks off work, which, as interviewees note, is normally not feasible in a business, unless a concrete payoff – e.g. clear enhanced capacities in a certain field, certification in a certain skill, etc. – is offered. As such, suggestions to make PiP more attractive to private sector professionals include:

- Offering a programme certificate recognised by the market (e.g. with more clarity about the capacity / skill gained); and,
- Splitting the programme over a longer, less intensive, period of time, with greater flexibility to pioneers.

Additionally, in some cases there is a lack of commitment from hosts and pioneers, which hinders the effectiveness of the programme. One interviewee reported that there are cases where the pioneers are simply treated as *'cheap work force'*, and cited a case of a micro enterprise, with two only full-time employees (FTEs), which was hosting 20+ pioneers at once.⁶⁶ Another interviewee highlighted that in a few cases, the hosts are not well organised to host the pioneers, and as such pioneers may end up not being able to effectively learn from, nor contribute to, the hosting institution. According to interviewees, pioneer feedback is not always provided, as information is not typically anonymised. As such, it is likely difficult for EIT Climate-KIC to capture and respond to such issues.

In order to increase the level of commitment, two stakeholders suggested that the selection processes should be improved, with hosts required to offer a detailed description of the work that they are intending to develop, so that the pioneer may know what to expect from the placement. Furthermore, an interviewee suggested that, if the host was required to provide some contribution (potentially in the form of a partial salary) in order to host the pioneer it would incentivise / create a greater sense of commitment from both the host and the pioneer.

Conclusions

In the six years since the programme started, the benefits of PiP are reflected in the process improvements and knowledge delivered:

- 119 business cases, new projects proposals, models (2013-2014);

⁶⁵ KADA, 2015. *Evaluation of Climate KIC's Pioneers into Practice Programme – A Final Report*.

⁶⁶ Although this situation was cited, the specific organisation involved, including the period when this occurred could not be verified.

- 101 new knowledge transfer activities;
- 92 novel advances in organisations, services and business plans.

Furthermore, evidence suggests that PiP has improved the networking opportunities of its pioneers, although the most significant impact, career-wise, has been for entry-level graduates, who have been able to directly translate their professional experience into job placements.

Nonetheless, there are adjustments that PiP could make in order to further its outcomes by, for instance, making the programme more attractive to private sector professionals, improving the host selection process, and feedback loops. For example, in order to attract more pioneers from the private sector, greater timeline flexibility and the development of a certification system that is recognized by the market, is recommended.

EIT Climate-KIC: Accelerator Programme

Purpose of the case study

This case study aims to explore the results achieved by the EIT Climate-KIC Accelerator programme so far, and the key areas to be tackled to foster impacts. Start-ups can play a major role in driving innovation. However, scaling-up innovation is often one of the main barriers for start-ups to deliver large-scale impacts, and the purpose of this case study was to investigate if and how the Accelerator supports the scaling-up of innovation within promising start-ups.

The context of the EIT Climate-KIC Accelerator

The Accelerator was launched in 2013, as a replacement for the previous Incubation Programme, initiated in 2011. The programme aims to help start-ups develop, fund and implement business plans. It is organised into three stages:

- Stage 1: Define the business model
- Stage 2: Speak with a significant number of potential customers and get a contract
- Stage 3: Deliver to your first customer and scale up

Since 2011, the Accelerator (formerly Incubation Programme) has incubated 759 business ideas and led to the creation of 186 new start-ups. Between 2012 and 2015, the start-ups supported under the programme raised nearly €200 million in financing and grants. In 2015, the Accelerator introduced service-equity agreements with successful start-ups. This aims to contribute to the financial sustainability of EIT Climate-KIC, and provides increased credibility to these start-ups⁶⁷.

Pool of partners and missing links – the case of three start-ups

As part of this case study, three start-ups which participated in the EIT Climate-KIC's Accelerator have been interviewed:

- **Sampson** offers to the construction market *biobitumen* products, with embedded organic carbon capture and storage (CCS), contributing to a lower carbon footprint of buildings. The start-up has been through stages 1 and 2 of the Accelerator, and has left the programme in late 2016. Currently, Sampson is liaising with potential partners and clients to commercialise its products.
- **Coolar** has developed an off-grid refrigerator which runs on solar thermal power, to cool vaccines medicines and food on regions with difficult or expensive access to the electricity. Having participated in several Climate KIC programmes, the start-up has just finished going through Stages 1-3 of the Accelerator. Currently Coolar is fine tuning its product to align it with the need of its potential clients.
- **SustAnalyse** offers a software tool that aims to speed up the commercialisation process for chemicals, and make sure sustainability is considered at the earlier stage. The start-ups is currently under Stage 3 of the Accelerator, after having passed through Stages 1 and 2. Under Stage 3, SustAnalyse will test its product with some clients and get it ready for the market.

The interviews show that the start-ups have all experienced positive impacts from their involvement with the Accelerator. In general, the interviewees agreed that the greatest added value of taking part in the Accelerator was the opportunity to improve

⁶⁷ It should be noted that some start-ups raised some discontentment with the requirement to give-up share to the Climate-KIC as part of the Stage 3 support. On the other hand, the start-ups interviewed have expressed not seeing major issues with this requirement, as long as it was well communicated to Stage 3 candidates, and that there was some room for negotiation.

their business plans, identifying a niche and making their products more aligned with market needs. Additionally, the credibility granted by the simple fact of being selected to Climate KIC was highlighted as a valuable asset for the start-ups, granting them enhanced ability to raise funds. According to Coolar founders, 'If it hadn't been for Climate KIC's support, we wouldn't be where we are right now and perhaps we would not even exist', whereas the founders of SustAnalyse believed that they would have taken longer to reach the point that they have now reached if they had not received support from the Accelerator.

These insights are echoed by the results of a Survey of Accelerator participants. As shown in the table below, improved business model and market strategy are among the top benefits reported by start-ups which have participated into EIT Climate-KIC's Accelerator, together with the opportunity to engage with potential partners. On the other hand, start-ups have highlighted that the programme does not favour an increased technical understanding of issues pertinent to their business. Further networking opportunities, either with potential customers or employees (through the pool of EIT Graduates) are seen as benefits which Accelerator is still lacking.

The impacts of the EIT Climate-KIC Accelerator: % of businesses reporting that they had gained selected impacts

My participation in the accelerator/ incubator programme produced the following benefits/ results:	Strongly agree	Agree	Disagree	Strongly disagree
Better understanding of the market	23%	44%	17%	4%
Better knowledge about competitors	8%	38%	36%	6%
Better understanding of IPR issues	6%	43%	32%	5%
Better understanding of technical issues	4%	23%	46%	14%
Better business model	35%	46%	5%	1%
Helped convert business idea into a viable business proposition	24%	52%	10%	2%
Reduced time to market	16%	43%	25%	4%
Access to our first customer	10%	26%	42%	10%
Access to potential partners	12%	50%	21%	4%
Access to seed / growth funding	16%	35%	26%	9%
Access to pool of EIT graduates	8%	28%	37%	12%

Base: all respondents (n=219); excludes 'no response' so does not sum to 100%

The interviews with the three start-ups further showed that, even though EIT Climate-KIC is often praised for their efforts to engage start-ups with potential clients, there lacks a clear framework or process to incentivise collaboration across the EIT Climate-KIC network, and further, the EIT network as a whole. For instance, in the case of SustAnalyse, the interviewee highlighted that EIT Climate-KIC staff were committed to connect them to partners who might be able to engage the start-up with prospective clients, even though that was not part of the staff role. However, the lack of an appropriate framework – e.g. dedicated events, an online platform – meant that the start-up founders chose to dedicate their time and resources to less uncertain sales efforts "outside Climate KIC".

In a similar situation, during their participation under the Accelerator, Sampson was encouraged to engage with the EIT Raw Materials, but could not find an appropriate channel to contact them. The start-up is currently developing partnerships with the CENER in Spain and with I-TECH, but their engagement with these institutions was through their participation in the European Enterprise Network (EEN), not EIT Climate-KIC.

In the case of Coolar, at the time of their participation, EIT Climate-KIC's pool of investment angels was not yet fully established. Furthermore, other EIT Climate-KIC backed start-ups were focused on different fields from Coolar's, and the EIT Climate-KIC partners did not have the ideal profile to act as their partners or potential clients. The interviewees reported having met the representatives of EIT InnoEnergy (who offered a possibility of collaboration) and EIT Health (which at the time was very nascent). Whilst this engagement did not lead to collaboration, the interviewees expressed interest to work with EIT Health and their partners in the future. However, as in the case of Sampson, they were not able to find an appropriate channel to do so.

On the other hand, start-ups interviewed expressed view that EIT Climate-KIC has contributed indirectly to some of their partnerships. For instance, after Sampson won a competition organised by EIT Climate-KIC, in association with Encraft and the city council of Birmingham, it managed to establish further partnerships with Encraft and with Skanska. Furthermore, Coolar highlighted that EIT Climate-KIC has indirectly helped their start-up with establishing their partnerships, by providing exposure to their business, through published articles and their inclusion in relevant competitions and prizes. For instance, Coolar is displayed in several articles on the EIT Climate-KIC website, and their inclusion in the Forbes' 30 under 30 is believed to have come through a suggestion from EIT Climate-KIC (given the high number of entrepreneurs from EIT Climate-KIC who won it). According to interviewees from the business, *"being listed under Forbes' 30 under 30 has opened many doors"*.

Conclusions

Five years into the Accelerator programme, positive impacts have been generated through improved marketing strategies and products/services, and the enhanced credibility gained by the start-ups. These have led to an increased ability for start-ups to access further funding sources (including grants and equity), while heightened exposure (through articles and appointment to competitions and prizes) has helped them indirectly engage with potential clients. However, the structure of the EIT Climate-KIC network and the existing processes to integrate its members still need to be improved in order to help start-ups establish fruitful partnerships within EIT Climate-KIC that can enable their businesses to be scaled-up.

The development of a dedicated platform to improve the visibility and access of the whole EIT Climate-KIC community – including a short description of projects led by members and their topics of interest – could help address this issue⁶⁸. Furthermore, having dedicated staff responsible for identifying opportunities for collaboration and liaising the relevant parties (in a model similar to EEN's advisors) would further contribute to fostering collaboration; however, this option could involve higher costs to the EIT Climate-KIC.

Existing initiatives from EIT Climate-KIC, such as promoting competitions in association with private sector players (regardless of them being partners or not) should be continued. Besides favouring partnerships with private players (as the case with Sampson), such competitions help raise the profile of participants. Furthermore,

⁶⁸ As of 31 January 2017, the Climate KIC website displays only the core partners and clicking on a specific core partner name do lead the user to the project with that partner has been involved.

networking events, involving different members of the community tackling related issues could be promoted.

The lack of balance in the partners' pool, especially the participation of private sector businesses, has also been raised as a key issue which could be hindering start-ups' ability to establish the right partnerships to scale-up their businesses. On this matter, interviews with other EIT Climate-KIC stakeholders pointed out that EIT Climate-KIC is working on recruiting partners that fit their needs and is assessing the possibility of creating a new category of partners that would be connected to the EIT Climate-KIC network, but would not have access to the grants. The expectation is that more business can be attracted by the opportunities for working with innovative business, without having the administrative commitment of reporting on KPIs and how the grant money is spent.

In summary, the Accelerator has been successful in many senses. However, evidence indicates that improving the composition of the EIT Climate-KIC network, as well as the connections within the community, could help foster more impacts. In time, it must be acknowledged that the Accelerator has been running in its current format for three years only, and most stakeholders agree that the process of scaling up innovation is a long one.

Annex 9: Patent landscaping case results

Case study: Backhaul Solutions for Heterogeneous Networks

Project: INDEPENDENT EVALUATION OF THE EUROPEAN
INSTITUTE OF INNOVATION AND TECHNOLOGY

Patent-based Analysis of KIC Innovation Impact – Case Study of the Backhaul Solutions for Heterogeneous Networks

Analysis and Conclusions

Author: Dr. Ilian Iliev, CambridgeIP

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Executive Summary 1

CAMBRIDGE IP

Project objectives: A study to help analyse the innovative impact of KIC-funded projects on the basis of patent analytics.

Case study chosen: The application we've selected from Future Networking Solutions Action Line (now Digital Infrastructure) registered as part of the Backhaul Solutions for Heterogeneous Networks Activity in 2014 with Ericsson as the application assignee.

Patent document: This Patent Family 1 contains 1 patent application (application WO2014SE51029) The patent was filed as a WIPO application, which could be later be sent to different national offices. The patent application has not yet entered national phase.

However, an international search report has been completed, with initial comments judging there to be only two of the 10 claims having all three patenting requirements:

1. Novelty
2. Inventive step
3. Industrial applicability

Within the patenting process it is common for changes to be implemented to satisfy examiner concerns, such as exhibited by this patent application.

Collaborations: Ericsson has partnerships in the private sector with Cisco, Ooredoo Oman, and Acreo (in conjunction with KTH) with respect to backhaul solutions. However, no joint-IP has yet been developed from these recent collaboration agreements. KTH is also involved in the Greenhaul project in collaboration with TeliaSonera and Transmode

3

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Executive Summary 2

CAMBRIDGE IP

The dataset contains 103 different inventions related to the Digital Infrastructure technology, concerning Passive Optical Network systems. Patenting in this industry experienced a significant peak in 2012, in part due to 5 patent family applications being filed by NTT Docomo Inc. However, there has been no continuation of this upward trend, with patent applications stabilising back to pre-2012 levels in 2013

Technologies relating to wavelength division multiplex systems and selecting arrangements for multiplex systems dominate the related field. This is closely related to the Digital Infrastructure backhaul technology - however the wavelength division system, although included within the Ericsson patent, it is not the main focus of their technology.

Assignees leading in this space with the highest number of individual inventions are the University of Shanghai Jiaotong and Samsung Electronics.

There is a strong representation of patent filing by non-corporate entities, with 6 of the top 16 patenting entities in this space Universities or Research Institutes.



4

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Executive Summary 3

Research limitations and further research:

The methodology for the case study was based on desktop qualitative and quantitative analysis of key IP aspects of a KIC company. Therefore the analysis outcomes are necessarily limited by the methodology and limited resources available. In particular there was no scope to conduct:

- Comparisons between different technology areas and the outcomes of different KIC centres
- Analysis of factors that can increase the impact of the technologies
- Systematic analysis of the total patent/IP impact of the KIC centres

Methodology and Data Constraints

The methodology for the case study is based on desktop qualitative and quantitative analysis of key IP aspects of a KIC company. Therefore the analysis outcomes are necessarily limited by the methodology and limited resources available.

Case study selection: We were provided with a single patent filing from the Future Networking Solutions Action Line (now Digital Infrastructure)

Overall analysis: research on the company and broader developments in the relevant G.fast, insights relating the patent and technology analysis to the overall company's development

Company patent portfolio analysis, including patent family size analysis, patent citation analysis, geographic distribution of patent protection, key technology applications of the company's patents

Industry patent analysis: Using IPC code analysis, building of some top-level patenting trends in the technology fields relevant to the company, identifying patenting trends and key patents in the field

Other IP analysis: Commercialization evidence, such as licensing or spin-offs

Analysis> Patent Portfolio

CAMBRIDGE IP

Company patent portfolio analysis:

Patent families: This study considers a single patent family currently under application through the PCT process.

Technology Influence (proxied by Patent Forward Citations): There are currently no forward citations for this publication, as the application has not even been sent to national offices for filing under the PCT system, and so is very early within the patent application lifecycle.

Prior Art (proxied by backward citations): Three technologies have been cited by this Digital Infrastructure patent application, and represent prior art in this field. All three of these documents have been published since 2010, which is very recent for prior art citations. This may indicate that this particular technology focus is a very new area of research, and consequently there have not been a great number of publications within the prior art.

The three cited publications are:

EP2510707A1 (2012-10-17) Assigned to Nokia Siemens Networks

EP2475121A1 (2012-07-11) Assigned to NTT Docomo, Inc.

EP2573967A1 (2013-03-27) Assigned to NTT Docomo, Inc.

This portfolio is in early stages of application, and so analysis considers the related space to which this invention contributes.

7

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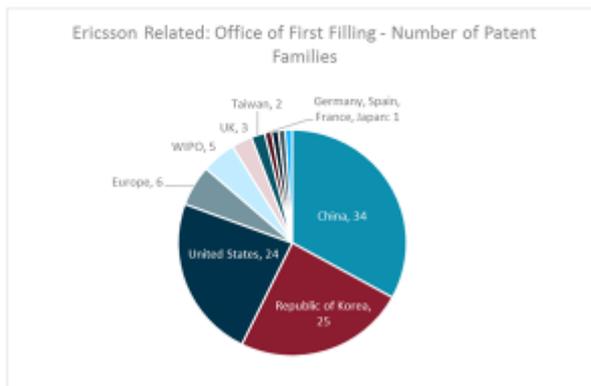
Analysis> Geographic Distribution of Patent family

CAMBRIDGE IP

Patent Filings Geography

As this Digital Infrastructure patent family application from Ericsson is still in the International phase, it has not been distributed for examination at the National phase at this stage. As such, it is not yet known which jurisdictions Ericsson will decide to invest in patent protection for this technology.

Currently the related technology space exhibits strong innovation from China, South Korea, and the US.



8

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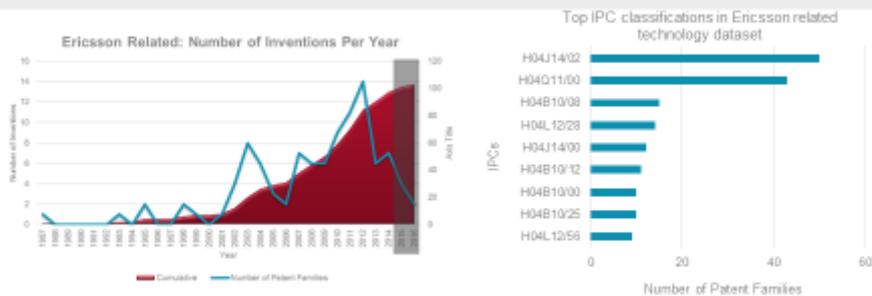
Analysis> Industry Patent Trends

CAMBRIDGE IP

The dataset contains 103 different inventions related to the Digital Infrastructure technology; concerning Passive Optical Network systems. Patenting in this industry experienced a significant peak in 2012, in part due to 5 patent family applications being filed by NTT Docomo Inc. However, there has been no continuation of this upward trend, with patent applications stabilising back to pre-2012 levels in 2013

Technologies relating to wavelength division multiplex systems and selecting arrangements for multiplex systems dominate the related field. This is closely related to the Digital Infrastructure backhaul technology - however the wavelength division system, although included within the Digital Infrastructure patent, it is not the main focus of their technology.

Further analysis could be undertaken to investigate the reasons behind the 2012 peak, what industry movements resulted in the decrease in patent filing after such a dramatic peak, and how this is relevant for the Digital Infrastructure technology in this space.



9

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Analysis> Collaborations

CAMBRIDGE IP

Ericsson Collaboration

- Ericsson have been shown to operate with numerous partnerships in collaboration with both competitors, research institutes, and large corporate entities in related fields of technology in order to enhance their solutions for mobile backhaul networks.
- It is unclear from the public information how IP is shared between the parties and scale of deployment for these solutions, and what IP licensing arrangements there. We did not identify any joint-IP filed between Ericsson and its collaborators within this field.
- As many of the partnerships in this space have been created over the last three years, it could be that intellectual property evidence from these collaborations is still to come.
- Interestingly Ericsson have collaborated on projects with both groups of research institutes, including KTH and Lund University, and with Cisco in a general technology strategic partnership where the two corporations could otherwise be seen to be major competitors in this field.
- Our analysis has also shown that Ericsson is also collaborating with Ooredoo Oman on non-optical, microwave backhaul networks.

KTH Collaboration

- KTH have collaborated with Ericsson with regards to the Digital Infrastructure patent under review in this case study.
- KTH are also involved in a partnership under the Greenhaul project, with research collaboration with two private companies: TellaSonera and Transmode. The objective of this project was to better understand the role played by different backhaul architectures in terms of energy consumption and cost.

10

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Ericsson Backhaul IP – Background

CAMBRIDGE IP

Future Networking Solutions Action Line (now Digital Infrastructure) has a patent application. As anticipated, patents were registered by the Partners (Ericsson), but the support from EIT Digital was important to achieve this result.

The application we've selected from Ericsson was registered as part of the Backhaul Solutions for Heterogeneous Networks Activity in 2014. The objective of the Activity was to economize 5G telecom network architecture and transport to facilitate increased investments in dense heterogeneous networks. This was done through the development of a set of technologies and mobile backhaul solutions to achieve faster and more stable broadband services, paving the way to 5G telecom network infrastructures deployment.

Involved partners were: Ericsson, British Telecom, KTH, Lund University, TNO, Orange, JCP



11

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Ericsson Backhaul IP – Background

CAMBRIDGE IP

The broadband technology research area at Ericsson Research and the Optical Networks Lab (ONLab) at KTH Royal Institute of Technology have been in close cooperation. The main output from the cooperation is one patent application filed through Ericsson as well as an increase in research visibility.

Prior to this, Lund University transferred knowledge to Ericsson on two subjects:

1. Know-how on fault localization, network management technical business modelling.
2. Know-how in the area of G.fast and small cell technology.

In January 2015 BT, as a result of EIT ICT Labs activity Backhaul Solutions for Heterogeneous Networks, announced plans to deliver ultrafast speeds of up to 500Mbps to most of the homes and small businesses in the UK within a decade via a widespread deployment of 'G.fast'.



12

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Ericsson patent technology

CAMBRIDGE IP

The problem:

In the recent years the exponential growth of number of mobile devices and mobile traffic, mainly driven by an increase in the demand for video services, brings new challenges for mobile network operators in terms of providing high capacity solutions with a good quality of service.

The quality of the user signal, especially in the cell edges, is highly dependent on the CoMP backhauling solutions. The most important barrier for the large scale implementation of CoMP is the strict latency constraint and high capacity requirements.

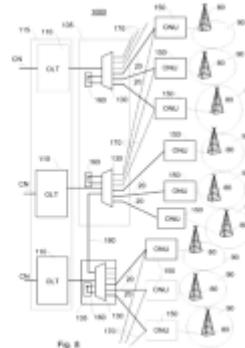
The limited capacity and latency issue of the available backhaul networks might act as the bottleneck for the CoMP implementations.

Key features of Solution:

- A Passive Optical Network, PON, structure and a remote node.
- The idea is to use a modified splitter, i.e. a power splitter, in a remote node.

Key benefits:

- More flexibility regarding scalability and cell clustering.
- Minimizing latency and cost.
- Can support any cluster size and covering areas with various cell densities.



13

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Commercialisation Evidence: Ericsson Partnerships

CAMBRIDGE IP

We identified several commercial partners in collaboration with Ericsson on mobile backhaul solutions:

Cisco In November 2015, Ericsson and Cisco announced a strategic partnership across multiple technology areas in their respective fields. One of the six strategic areas pursued within the partnership agreement is for mobile backhaul solutions. Cisco has a wealth of technical knowledge within optical networking, the transfer of which clearly benefits Ericsson in their patent application's technology field.

Ooredoo Oman Ericsson and Ooredoo Oman have collaborated within mobile backhaul solutions, but instead of Passive optical networking their partnership has been concentrated on Microwave based backhaul systems.

Acreo has entered into a partnership with Ericsson and KTH to develop Kisco 5G Transport Lab with an aim to optimise solutions for backhaul networking.

We have not found any evidence of these commercial partnerships having generated any jointly assigned intellectual property at this stage – however, as these collaborations are from publicly available press-releases, the details of partnership arrangements are not necessarily presented, so intellectual property ownership and licensing deals are not publicly available.



Cisco Dense Wavelength Division multiplexing system



14

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Commercialisation Evidence: KTH partnerships

CAMBRIDGE IP

We identified partners in collaboration with KTH on mobile backhaul solutions:

Acree has entered into a partnership with Ericsson and KTH to develop Kisco 5G Transport Lab with an aim to optimise solutions for backhaul networking.

TeliaSonera and **Transmode** are in a collaborative partnership with KTH within the project "Greenhaul."

The Greenhaul project is not a technical research partnership, but a project to better understand the role played by different backhaul architectures in terms of energy consumption and cost. With this objective in mind, various backhaul technologies and architectures were studied and assessed.

However, within such a project, technical knowledge in this technology space is highly likely to have formed part of the discussion.

We have not found any evidence of these commercial partnerships having generated any jointly assigned intellectual property at this stage – however, as these collaborations are from publicly available press-releases, the details of partnership arrangements are not necessarily presented, so intellectual property ownership and licensing deals are not publicly available.



15

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Ericsson – Patent Families Summary

CAMBRIDGE IP

Our research has investigated one Digital Infrastructure patent family filed by Ericsson, representing Backhaul Solutions for Heterogeneous Networks Activity

Publication Number	Patent Title	Publication Date
	PATENT FAMILY 1	
WO2016039670A2	A PASSIVE OPTICAL NETWORKS STRUCTURE AND A REMOTE NODE IN A BACKHAUL COMMUNICATION NETWORK	2016-03-17
WO2016039670A3	A PASSIVE OPTICAL NETWORKS STRUCTURE AND A REMOTE NODE IN A BACKHAUL COMMUNICATION NETWORK	2016-05-06

A2 INTERNATIONAL APPLICATION (PUBLISHED WITHOUT THE INTERNATIONAL SEARCH REPORT)

A3 INTERNATIONAL SEARCH REPORT (LATER PUBLICATION WITH REVISED FRONT PAGE)

16

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Ericsson – Patent Family Tree - Patent Family 1

CAMBRIDGE IP



Patent Family 1 contains 1 patent application.

This is filed as a WIPO application and will later be sent to different national offices. This is a cheaper route for multiple territories.

This has not yet entered national phase.

However, an international search report has been completed, with initial comments judging there to be only two of the 10 claims having all three patenting requirements:

1. Novelty
2. Inventive step
3. Industrial applicability

1. Statement		
Novelty (N)	Yes: Claims	1-10
	No: Claims	
Inventive step (IS)	Yes: Claims	6,9
	No: Claims	1-5, 8, 10
Industrial applicability (IA)	Yes: Claims	1-10
	No: Claims	

17

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Ericsson – Patent application claims

CAMBRIDGE IP

1. A Passive Optical Networks, PONs, structure (1000) constituting at least a part of a backhaul network for supporting a Radio Access Network, in which a number of radio base stations (RBSs) are connected to optical network units, ONUs, (150) of said PONs structure, wherein the ONUs of said PONs structure are grouped between separate PONs of said PONs structure, wherein ONUs of a separate PON are interconnected passively through a remote node (135) of the PON in order to separate inter base station traffic of X2 interfaces from uplink and downlink data traffic of S1 interface heading from/to a core network via an optical line terminal, OLT, (110) the PONs structure is characterized in that the remote node (130) comprises of power splitters (130) for enabling interconnection between ONUs of different PONs of said PONs structure.
2. The PONs structure according to claim 1, wherein the power splitter is adapted to broadcast uplink inter base station traffic from one or more ONUs to one or more ONUs of the PONs structure.
3. The PONs structure according to claim 2, wherein the power splitter has one uplink side and one downlink side, wherein ports of the downlink side is connected to ONUs of the RBSs and ports of the uplink side are at least connected to the OLT of its own PON and an isolator (160) for enabling broadcasting of said uplink inter base station traffic from one or more ONU of the PONs structure.
4. The PONs structure according to claim 2 or 3, wherein the power splitter has one uplink side and one downlink side, wherein ports of the downlink side is connected to ONUs of the one or more PONs and ports of the uplink side are at least connected to the OLT of its own PON wherein the power splitter of the PON is physically connected (180) to a power splitter of at least one other PON via fibre for enabling broadcasting of said uplink inter base station traffic between one or more ONUs of said PON and at least one other PON of the PONs structure.
5. The PON structure according to one of claims 1 - 4, wherein the power splitter (130) of the PON belongs to a splitter arrangement (133) in a remote node of the PONs structure.
6. A remote node (130) of a Passive Optical Networks, PONs, structure (1000) constituting at least a part of a backhaul network for supporting a Radio Access Network, in which a number of radio base stations, RBSs, (80) are connected to optical network units, ONUs, (150) of said PONs structure, wherein the ONUs of said PONs structure are grouped between separate PONs of said PONs structure, wherein ONUs of a separate PON are interconnected passively through the remote node of the PON in order to separate inter base station traffic of X2 interfaces from uplink and downlink data traffic of S1 interface heading from/to a core network via an optical line terminal, OLT, (110), wherein the remote node comprises of power splitters (130) for enabling connection of the remote node to ONUs of at least one other PON of said PONs structure.
7. The remote node according to claim 6, wherein the power splitter is adapted to broadcast uplink inter base station traffic from one or more ONUs to one or more ONUs of the PONs structure.
8. The remote node according to claim 7, wherein the power splitter has one uplink side and one downlink side, wherein ports of the downlink side is connected to ONUs of one or more PONs of said PONs structure and ports of the uplink side are at least connected to the OLT of its own PON and an isolator (160) for enabling broadcasting of said uplink inter base station traffic from one or more ONUs of the PONs structure.
9. The remote node according to claim 7 or 8, wherein the power splitter has one uplink side and one downlink side, wherein ports of the downlink side is connected to ONUs of its own PON and maybe neighbouring PONs and ports of the uplink side are at least connected to the OLT of its own PON the power splitter of the PON is physically connected (180) via fibre to a power splitter of at least one other PON for enabling broadcasting of said uplink inter base station traffic between one or more ONUs of said PON and at least one other PON of the PONs structure.
10. The remote node according to one of claims 6 - 9, wherein the power splitter (130) of the PON belongs to a splitter arrangement (133) of the PONs structure.

18

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Ericsson – Backward Citations – Patent Family 1 CAMBRIDGE IP

Our analysis identified 3 cited patents which provide prior art cited by the author or patent examiner

Note: further research can be conducted on prior art based on patent and non-patent data that can illustrate the evolution of technology and field

Publication Number	Publication Date	Title	Applicant/Assignee	Cited By
EP2510707A1	2012-10-17	METHOD AND DEVICE FOR DATA PROCESSING IN A PASSIVE OPTICAL NETWORK	Nokia Siemens Networks Oy	(I)
EP2475121A1	2012-07-11	Communication system and method for directly transmitting signals between nodes of a communication system	NTT DOCOMO, INC.	(A)
EP2573967A1	2013-03-27	System for interconnecting nodes attached to a passive optical network	NTT DoCoMo, Inc.	(A)

Backward Citations give an indication of likely prior art underpinning the company's innovation

19

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Ericsson – IPC Codes – Patent Family 1 CAMBRIDGE IP

The IPC classifications illustrate the relevance of the technology in the broad area of 'Electricity' with specific reference to:

- Transmission systems employing electromagnetic waves other than radio-waves, e.g. infrared, visible or ultraviolet light, or employing corpuscular radiation, e.g. quantum communication
- Radio-over-fibre, e.g. radio frequency signal modulated onto an optical carrier
- Selecting arrangements for multiplex systems

IPCs	Definition					
H04B19/02575	H Electricity	H04 Electric communication technique	H04B Transmission	H04B10/00 Transmission systems employing electromagnetic waves other than radio-waves, e.g. infrared, visible or ultraviolet light, or employing corpuscular radiation, e.g. quantum communication	H04B 10/25 Arrangements specific to fibre transmission	H04B 10/2875 Radio-over-fibre, e.g. radio frequency signal modulated onto an optical carrier
H04B19/027	H Electricity	H04 Electric communication technique	H04B Transmission	H04B10/00 Transmission systems employing electromagnetic waves other than radio-waves, e.g. infrared, visible or ultraviolet light, or employing corpuscular radiation, e.g. quantum communication	H04B 10/27 Arrangements for retransmitting	
H04Q11/00	H Electricity	H04 Electric communication technique	H04Q Selecting	H04Q 11/00 Selecting arrangements for multiplex systems		

*The International Patent Classification (IPC) is a hierarchical patent classification system used in over 100 countries to classify the content of patents in a uniform manner.

20

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Ericsson – Inventors – Patent Family 1

CAMBRIDGE IP

The Digital Infrastructure application lists three Inventors:

- Mahloo, Mozghan – This application is her only patent publication. Having completed her PhD at KTH, she is now a researcher for Ericsson. This is an important input from KTH to Ericsson.
- Chen, Jijia - Associate Professor, KTH Royal Institute of Technology Optical Networking (ONLab)
- Wosinska, Lena - Lena is the head of ONLab at KTH. Lena is listed as inventor on two patent families.

Jijia Chen is listed as an inventor on 9 patent applications. She has the majority of applications with Ericsson as assignee, and 3 with the assignee as 江苏艾思特信息技术有限公司 (Jiangsu Aisite Technology Co Ltd).

Listed adjacent are her patent applications.

Patent applications:

- [115] Jijia Chen and Lena Wosinska, "Improvements in optical communications networks: Reliable PON architecture supporting Ultra-large number of Users", worldwide patent Pub. No. WO2011053200 A1.
- [116] Jijia Chen and Patryk Urban, "An arrangement at a remote node, a remote node, a central office and respective methods therein for supervision of a wavelength division multiplexed passive optical network", worldwide patent Pub. No. WO2013147655 A1.
- [117] Jijia Chen and Patryk Urban, "Routing in a WDM-based pon", worldwide patent Pub. No. WO2014088480 A1.
- [118] Jijia Chen and Yanpeng Yang, "Hybrid Fiber/Microwave Protection for Mobile Backhauling", filed US provisional patent, Aug. 2013.
- [119] Patryk Urban, Renan de Almeida and Jijia Chen, "Supervision of SCM transmission line using carrier baseband", filed worldwide patent, Feb. 2014.
- [120] Jijia Chen and Weiquan Mei, "Fast Fiber Fault Monitoring System", filed Chinese patent, Apr. 2014. Application No. 201410159847.4
- [121] Jijia Chen, Yu Gong and Weiquan Mei, "Passive Optical Interconnect Architecture", filed Chinese patent, Apr. 2014. Application No. 201410159689.2
- [122] Jijia Chen, Yu Gong and Weiquan Mei, "Optical Communication Networks for Mobile Backhauling", filed Chinese patent, Apr. 2014. Application No. 201410159848.9
- [123] Mozghan Mahloo, Jijia Chen and Lena Wosinska, "CoMP backhauling solutions via PON", filed worldwide patent, Sept. 2014

21

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Patent status analysis

CAMBRIDGE IP

A supplementary examination of the patent's 'EPO global dossier' provides the following additional status information:

- The patent was assigned to Ericsson in 2014
- A 2016 international search report identified an NTT Docomo patent as relevant to the patent's claims – indicating other telcom players are potentially working on similar solutions
- A written opinion by the international searching authority from 8 March 17 notes that a core inventive claim of the application does not constitute an inventive step, and references prior art patents by NTT Docomo (2012, 2013) and Nokia Siemens (2012)
- A preliminary report on patentability from 14 March 17 (based on above) suggests that the prior art identified means that a number of the inventive steps in the patent may not be valid

This could be potentially used to invalidate the patent or substantially weaken it. However it is also possible that the Applicant will defend the application

It is key to note that the prior art all occurred around the time of the patent filing – indicating that multiple global players were working on a similar problem. From a business perspective it could be argued that this confirms the team was working on a cutting edge problem for the industry. Within the patenting process it is common for changes to be implemented to satisfy examiner concerns, such as exhibited by this patent application.

<https://register.epo.org/ipf/retrieve?apn=SE.2014051029.W&lng=en>

22

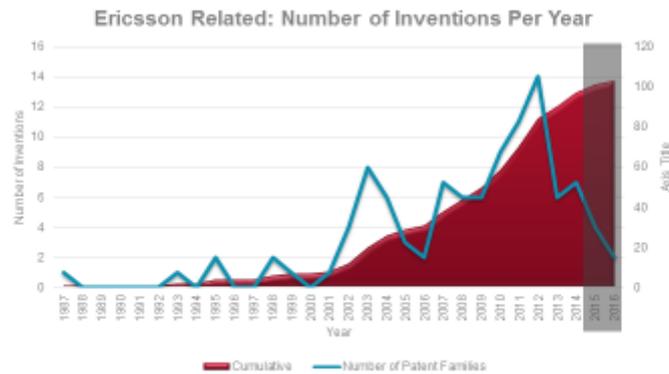
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Patent priority timeline – by patent family

CAMBRIDGE IP

The dataset contains 103 different inventions related to the Digital Infrastructure technology, concerning Passive Optical Network systems. The number of inventions peaked significantly in 2012, but returned to a lower rate in 2013. The Digital Infrastructure patent was filed in 2014. There is only a slight increase in filing activity from 2013 to 2014, showing the filing trend stabilising since the 2012 peak. This could indicate that a particular innovation came to significance in 2012: NTT Docomo Inc filed 5 of the 14 patent families in this year. This could be an important time for this technology.

Note that patent applications can remain unpublished for up to 18 months and so the data for 2015 and 2016 is incomplete, and should not be considered an accurate representation of patent family filing in these years.



23 Note that applications can remain unpublished for up to 18 months after application ©2017 London Innovation Partners Ltd. All rights reserved

Office Of First Filing

CAMBRIDGE IP

The majority of new innovation in this space is happening in China followed by Korea and the US. These two jurisdictions frequently feature heavily in the electronics space; China and Korea have strong innovation in these areas.

A surprising result from this analysis is the relatively low position for Japanese filings, as Japanese corporations, such as NTT Docomo and NEC, have shown recent interest in this space.



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Top Assignees in overall space

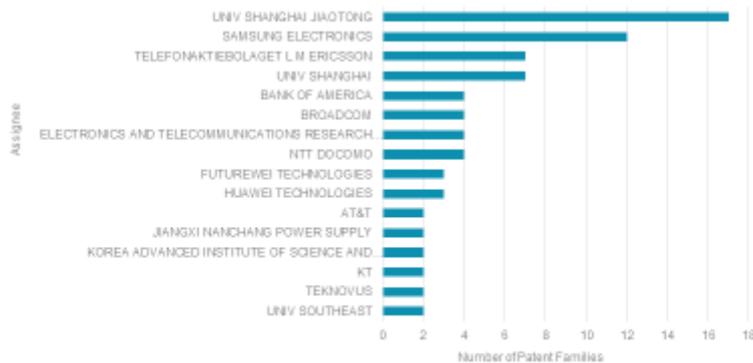
CAMBRIDGE IP

Assignees leading in this space with the highest number of individual inventions are the University of Shanghai Jiaotong and Samsung Electronics.

There is a strong representation of patent filing by non-corporate entities, with 6 of the top 16 patenting entities in this space Universities or Research Institutes.

Ericsson have 6 further patent families which relate to Passive Optical Networks, and as such are related technologies for the focus patent family within this case-study.

Ericsson Related: Top Assignee - Number of Patent Families



25

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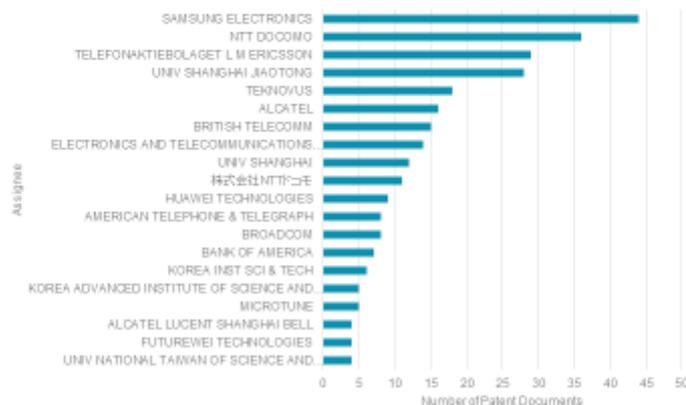
Top Assignees in overall space

CAMBRIDGE IP

Assignees leading in this space with the highest number of individual documents are Samsung, NTT Docomo and Ericsson. These are the assignees who are actively seeking a broad filing strategy for their innovations pursuing protection in many different territories.

Non-corporate entities reduce in strength when we look at patent documents filed in multiple jurisdictions, as the extra cost of investing in more filings is not as easy to justify as for large corporations.

Ericsson Related: Top Assignee - Number of Patent Documents



26

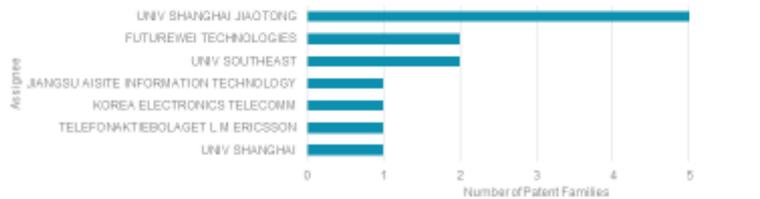
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Top Assignees in overall space (last 3yrs)

CAMBRIDGE IP

In the last three years it seems that the major innovators are the Asian universities. This could be representative of the space undergoing a transformation, with new innovation breaking away from previous, less radical, incremental research and development more often characteristic of corporate patenting.

Ericsson Related: Top Assignee - Number of Patent Families - Last 3 Yrs



Ericsson Related: Top Assignee - Number of Patent Documents - Last 3 Yrs



27

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Top Assignees per Territory

CAMBRIDGE IP

The distribution of patent families from the top patenting jurisdictions shows whether the patent filing is representative of a small number of dominant innovators from that region, or whether many

assignees contribute to the progression of the technology area.

As seen here, both for China and South Korea, a single entity dominates the country's innovation in this area - University of Shanghai Jiaotong and Samsung Electronics respectively.

The US however does not reflect this trend, with a broad range of companies innovating in this technology space.

CN Assignee	Number of Patents
UNIV SHANGHAI JIAOTONG	17
UNIV SHANGHAI	7
JIANGXI NANCHANG POWER SUPPLY	2
UNIV SOUTHEAST	2
ALCATEL LUCENT SHANGHAI BELL	1
JIANGSU AISITE INFORMATION TECHNOLOGY	1
SICHUAN JIUZHOU ELECTRONIC TECHNOLOGY	1
UNIV BEIJING POSTS & TELECOMM	1
UNIV HUNAN	1
UNIV ZHEJIANG OF TECHNOLOGY	1

KR Assignee	Number of Patents
SAMSUNG ELECTRONICS	12
ELECTRONICS AND TELECOMMUNICATIONS RESEARCH INSTITUTE	4
KOREA ADVANCED INSTITUTE OF SCIENCE AND TECHNOLOGY	2
KT	2
KOREA ELECTRONICS TELECOMM	1
KOREA INST SCI & TECH	1
SEOHWA TELECOM	1
SK BROADBAND	1
UNIV KOREA RESEARCH AND BUSINESS FOUNDATION	1

US Assignee	Number of Patents
BANK OF AMERICA	4
BROADCOM	3
FUTUREWEI TECHNOLOGIES	3
AT&T	2
HUAWEI TECHNOLOGIES	2
TEKNOVUS	2
TELEFONAKTIEBOLAGET L M ERICSSON	2
AMERICAN TELEPHONE & TELEGRAPH	1
MICROTUNE	1
NEC LABORATORIES AMERICA	1
SOTO ALEXANDER I	1
TELLABS VIENNA	1
THE CHASE MANHATTAN BANK	1

28

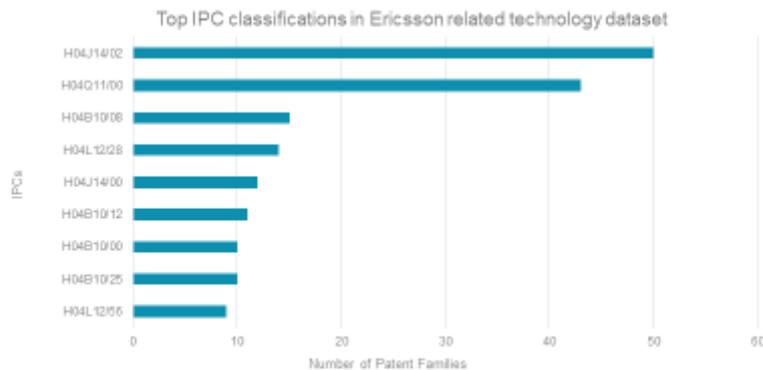
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Ericsson Related Tech – Patent Dataset and IPCs

The top two classification codes dominate the surrounding technology, with 50 and 43 (out of 103) patent families respectively for H04J14/02 and H04Q11/00.

These correspond to technologies relating to **wavelength division multiplex systems and selecting arrangements for multiplex systems**. This is closely related to the Digital Infrastructure backhaul technology - however the wavelength division system, although included within the Digital Infrastructure patent, it is not the main focus of their technology.

Full IPC Classification descriptions are presented on the following slide.



29

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Ericsson Related Tech – Patent Dataset and IPCs

IPCs	Description	H	H04	H04J	H04L14/00	H04J14/02
H04J14/02	Electricity	H	H04	H04J	H04L14/00	H04J14/02
				Multiplex communication	Optical multiplex systems	Wavelength-division multiplex systems
H04Q11/00	Electricity	H	H04	H04Q	H04Q11/00	
				Selecting	Selecting arrangements for multiplex systems	
H04B10/08	Electricity	H	H04	H04B10/00		
				Transmission systems employing electromagnetic waves other than radio-waves, e.g. infrared, visible or ultraviolet light, or employing corpuscular radiation, e.g. quantum communication		
H04L12/28	Electricity	H	H04	H04L	H04L12/00	H04L12/28
				Transmission of digital information, e.g. Telegraphic communication	Data switching networks	characterised by path configuration, e.g. LAN [Local Area Networks] or WAN [Wide Area Networks] [wireless communication networks]
H04J14/00	Electricity	H	H04	H04J	H04J14/00	
				Multiplex communication	Optical multiplex systems	
H04B10/12	Electricity	H	H04	H04B10/00		
				Transmission systems employing electromagnetic waves other than radio-waves, e.g. infrared, visible or ultraviolet light, or employing corpuscular radiation, e.g. quantum communication		
H04B10/00	Electricity	H	H04	H04B10/00		
				Transmission systems employing electromagnetic waves other than radio-waves, e.g. infrared, visible or ultraviolet light, or employing corpuscular radiation, e.g. quantum communication		
H04B10/25	Electricity	H	H04	H04B10/00	H04B10/25	
				Transmission systems employing electromagnetic waves other than radio-waves, e.g. infrared, visible or ultraviolet light, or employing corpuscular radiation, e.g. quantum communication	Arrangements specific to fibre transmission	
H04L12/56	Electricity	H	H04	H04L	H04L12/00	
				Transmission of digital information, e.g. Telegraphic communication	Data switching networks	

30

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Ericsson Related Tech – Biggest Families

CAMBRIDGE IP

Alcatel has the largest patent family in this space with 16 members for a single innovation followed by NTT Docomo with 15 members and BT with also 15 members for a single innovation. This means that these single innovations are worth protecting and have a broad filing strategy seeking patents in many territories.

NTT Docomo hold four of the top 10 largest families in this space, suggesting significant investment into innovation for this technology area.

Publication Number	Assignee - Normalised	Number of Family Members (individual documents)
EP781069B1	ALCATEL	16
US8837943B2	NTT DOCOMO	15
WO8809093A1	BRITISH TELECOMM	15
JP5509388B2	NTT DOCOMO	11
WO2008145464A1	TELEFONAKTIEBOLAGET L M ERICSSON	11
KR1020080053273A	TEKNOVUS	11
EP2670210B1	NTT DOCOMO	9
KR101600014B1	ELECTRONICS AND TELECOMMUNICATIONS RESEARCH INSTITUTE	8
WO2013045499A1	NTT DOCOMO	8
JP06350566A	AMERICAN TELEPHONE & TELEGRAPH	8

31

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Ericsson Related Tech – Most Influential Patents

CAMBRIDGE IP

Forward citations represent the number of documents which consider the technology to be prior art for their own invention. As citations accrue over time, older fundamental patents show the highest volume of citation.

Due to this age factor in citations, the later publications with a high number of citations may indicate recent breakthrough inventions in the space. The University of Shanghai Jiaotong patent could be one such example.

A single innovation from BT has 69 individual forward citations. As forward citations indicate that an invention has been highly influential, this invention could be a key piece of foundation technology in this industry.

Publication Number	Assignee - Normalised	Filing Date	Number of Forward Citations
WO8809093A1	BRITISH TELECOMM	1988-05-06	69
US20060045525A1	SAMSUNG ELECTRONICS	2005-08-08	49
US20030152389A1	BANK OF AMERICA	2003-01-29	46
US5699176A	THE CHASE MANHATTAN BANK	1995-11-06	45
US6577422B1	AT&T	1988-02-18	32
US20030137962A1	BANK OF AMERICA	2003-01-29	19
CN102036135A	UNIV SHANGHAI JIAOTONG	2011-01-25	16
US20110150475A1	SOTO ALEXANDER I	2010-12-30	12
CN101924963A	UNIV SHANGHAI JIAOTONG	2010-09-21	11
CN101848054A	UNIV SHANGHAI	2010-05-06	10
US20090238561A1	TELLABS VIENNA	1994-03-11	9
JP06350566A	AMERICAN TELEPHONE & TELEGRAPH	2008-03-19	9
US20140219651A1	TELEFONAKTIEBOLAGET L M ERICSSON	2003-01-29	8
CN101741468A	UNIV SHANGHAI JIAOTONG	2008-07-10	8
CN101351055A	UNIV SHANGHAI JIAOTONG	2009-12-17	8
US7349394B2	BANK OF AMERICA	2011-12-15	8

32

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Ericsson Related Tech – Example Recent Patents in the space

CAMBRIDGE IP

Publication Number	Title
US20160142151A1	Wavelength Stabilizer For TWDM-PON Burst Mode DBR Laser
WO2016039670A3	A passive optical networks structure and A remote node in A backhaul communication network
US9281898B2	Wavelength stabilizer for TWDM-PON burst mode DBR laser
GB2520766A	Mirrored passive optical access network
WO2016057709A1	Wavelength stabilizer for TWDM-PON burst mode DBR laser
US20130343761A1	Access Equipment that Runs Ethernet Passive Optical Network (PON) or Ethernet PON Over Coax Network
US9020349B2	Arrangement at a remote node, a remote node, a central office and respective methods therein for supervision of a wavelength division multiplexed passive optical network
EP2670210B1	System for implementing a radio transmission via a fiber optic transmission in a passive optical network
WO2014004714A1	Access equipment that runs ethernet passive optical network (pon) or ethernet pon over coax network
WO2013147655A1	An arrangement at a remote node, a remote node, a central office and respective methods therein for supervision of a wavelength division multiplexed passive optical network

33

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Summary of Findings

CAMBRIDGE IP

- Ericsson holds a patent application (application WO2014SE51029) resulting from Future Networking Solutions Action Line (now Digital Infrastructure) registered as part of the Backhaul Solutions for Heterogeneous Networks Activity in 2014.
- The patent was filed as a WIPO application, which could be later be sent to different national offices. The patent application has not yet entered national phase.
- However, an international search report has been completed, with initial comments judging there to be only two of the 10 claims having all three patenting requirements.
- Ericsson has partnerships in the private sector with Cisco, Ooredoo Oman, and Acreo (in conjunction with KTH) with respect to backhaul solutions. However, no joint-IP has yet been developed from these recent collaboration agreements.
- Patenting in this industry experienced a significant peak in 2012, in part due to 5 patent family applications being filed by NTT Docomo Inc. However, there has been no continuation of this upward trend, with patent applications stabilising back to pre-2012 levels in 2013.
- There is a strong representation of patent filing by non-corporate entities, with 6 of the top 16 patenting entities in this space Universities or Research Institutes.
- Prior art highlighted in examination reports occurred around the time of the patent filing – indicating that multiple global players were working on a similar problem. From a business perspective it could be argued that this confirms the team was working on a cutting edge problem for the industry.

34

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Case study: CorPower

Project: INDEPENDENT EVALUATION OF THE EUROPEAN
INSITUTE OF INNOVATION AND TECHNOLOGY

Patent-based Analysis of KIC Innovation Impact – Case Study of CorPower

Analysis and Conclusions – Final

Author: Dr. Ilian Iliev, CambridgeIP



CAMBRIDGE *IP*

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Executive Summary 1

CAMBRIDGE IP

Project objectives: a study to help analyse the innovative impact of KIC-funded projects on the basis of patent analytics

Case study chosen: CorPower Ocean AB, a company developing a compact high-efficiency Wave Energy Converter, inspired by the pumping principles of the human heart

Patent documents:

The company has a patent portfolio commensurate with the stage of development, with 2 core patent families covering many geographies including US, EU, China, Japan

The patents were filed as a WIPO application, which could be later be sent to different national offices.

Analysis of the international search reports on the two patent families indicates that:

- Many of the novelty and inventive steps are being challenged
- There is prior art going back to the 1970s, 1980s and 1990s

Within the patenting process it is common for changes to be implemented to satisfy examiner concerns, such as exhibited by this patent application.

Prior Art and Citations:

The analysis identified only 1 forward patent citation. It is possible over time the patents may attract more citations. The patent data suggests a lot of prior art going back to the 1970s

3

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Executive Summary 2

CAMBRIDGE IP

Collaborations:

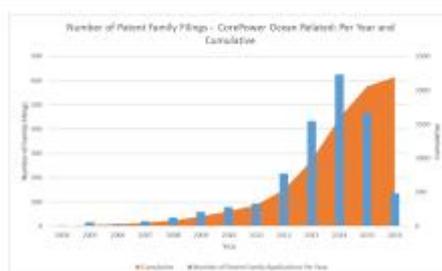
The company is using collaborations with several private and public sector players to pilot and mature the technology, as well as to help build the support systems around it

Patent-based industry analysis:

There is a rapidly accelerating level of patenting activity in the related space – with more than 2,000 patent families in the overall space, and a patent high of 600+ patent families in 2014

The patent study also identified several competitors that are already on the market with alternative technologies that claim similar benefits.

Note that It is beyond the scope of the project to ascertain the relative superiority of any one technology.



4

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Executive Summary 3 – Research Limitations

Research limitations:

The methodology for the case study was based on desktop qualitative and quantitative analysis of key IP aspects of a KIC company. Therefore the analysis outcomes are necessarily limited by the methodology and limited resources available.

In particular, there was **no scope to conduct**

- Comparisons between different technology areas and the outcomes of different KIC centers
- Analysis of factors that can increase the impact of the technologies
- Systematic analysis of the total patent/IP impact of the KIC centers
- Analyse the relative superiority of any one technology compared to the market
- Identify licensing partners/targets from patent data

Methodology and Data Constraints

The methodology for the case study is based on desktop qualitative and quantitative analysis of key IP aspects of a KIC company. Therefore the analysis outcomes are necessarily limited by the methodology and limited resources available.

Case study selection: We were provided with a list of companies with key IP registered in the area. The choice of a case study was driven by looking for a more mature patent portfolio to identify a high impact case from the KIC activity. The company chosen was CorPower, which had one of the more mature patent portfolios from the dataset.

Overall analysis: research on the company and broader developments in the relevant energy, insights relating the patent and technology analysis to the overall company's development

Company patent portfolio analysis, including patent family size analysis, patent citation analysis, geographic distribution of patent protection, key technology applications of the company's patents

Industry patent analysis: Using IPC code analysis, building of some top-level patenting trends in the technology fields relevant to the company, identifying patenting trends and key patents in the field

Other IP analysis: Commercialization evidence, such as licensing or spin-offs

Conclusions and suggestions for further research

Analysis> Patent Portfolio

CAMBRIDGE IP

Company patent portfolio analysis:

Patent families: The company has a well developed patent portfolio – consisting of up to 4 patent families* representing different technological innovations. Given that the company has been under development since 2009, the patent portfolio seems commensurate with the level of technology development

Technology Influence (proxied by Patent Forward Citations): We identified only 1 forward patent citation – coming from a Russia-based Assignee, for a 'device for conversion of water energy into mechanical power of rotation'. This is not surprising, given that the patents were only recently filed. It is possible that further citations will accumulate over time, as knowledge and use of the technology expands.

Prior Art (proxied by backward citations): The various patent families cite a range of prior art. The relatively large number of prior art documents, and long timespan (with some going back to **1970s and 1980s**) illustrate that knowledge/awareness of the problems related to wave power go back a long time. The bulk of patents are in the 1990s and 2000s – again intuitively as expected, as that is when investor interest increased in renewable energy sources.

Hence the CorPower's innovation is residing in a highly populated space

7

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Analysis> Geographic Distribution of Patents

CAMBRIDGE IP

Patent Filings Geography

Key territories in which a patent application has been filed are EU, US, China, Japan, South Korea, Australia.

Broadly the company has a fairly wide geographic distribution that reflects a company with an international growth focus. Key territories reflect both potential locations of competitors, acquirers as well as markets for deployment.

Patent filings in US, EU, Japan and South Korea are particularly important, as these geographies have potential OEM acquirers/manufacturers of the technology

Patent filings in China are also important both as a destination of the technology, but also given the very high number of patent filings in China by Universities and other organisations, and growing number of M&A from Chinese corporations

Patent filings in Australia and other countries may be targeted at geographic market protection – potential markets for the technology where there is high levels of wave energy resource

8

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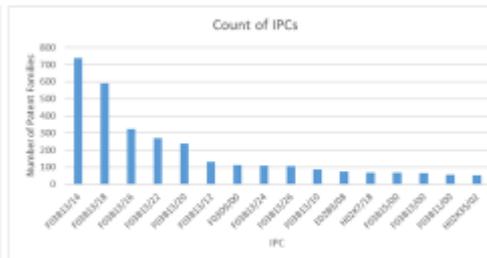
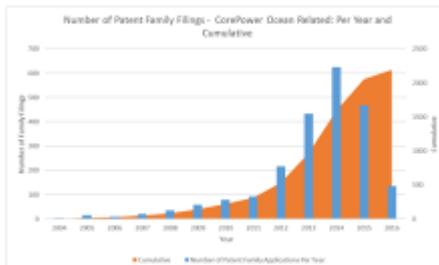
Analysis> Industry Patent Trends

CAMBRIDGE IP

The IPC-based analysis shows rapidly accelerating levels of patenting activity in the related space– with more than 2,000 patent families in the overall space, and a patent high of 600+ patent families in 2014

This of course does provide per se evidence regarding the level of innovativeness of the technology. Rather it illustrates that the space has seen significant research and innovation.

Further analysis would have to look at both direct competing technologies, and substitute technologies that may have similar/equivalent/better techno-economic characteristics



9

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Example competitors from patent analysis

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The patent dataset revealed several competitors to CorPower that already have products on the market and are deployed – including Ocean Power Technologies, Seabased AB, AW Energy. In addition, the analysis shows a heavy presence by Chinese Universities and China-based assignees

It is worth noting that each of these technology approaches deal with similar deployment challenges as those targeted by CorPower – so it maybe that they are solving a similar problem with different technologies.

Further analysis would be needed to identify whether CorPower has a superior technology.



10

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Analysis> Collaborations

CAMBRIDGE IP

Like many other high-tech SMEs, CorPower is using industry partnerships to accelerate the technology development cycle, open routes to market, attract investment and other channels for accelerating commercialisation

Our analysis identified several technology development partners from the private sector. These collaborations are broadly focused on

- Scale-up challenges of deploying the product in mass scale (with Spanish company Iberdrola and Portuguese testing facility WavEc)
- Development of the company's complex transmission systems (with Swedish company SwePart Transmission AB)

The collaboration strategy shows the company has been able to build a complex pan-European collaboration chain. It is likely that the collaborators will build shared and proprietary IP which can help with other areas of their business.

It is unclear from the public information how IP is shared between the parties and scale of deployment farm, and what IP licensing arrangements there.

We did not identify any joint-IP filed between CorPower and its collaborators

It is notable however that the commercial relationships do not include any of the majors around turbine development technology that are active in other wave & tidal projects

11

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CorPower – Company Background

CAMBRIDGE IP

CorPower Ocean AB was founded in 2009 to develop Wave Energy Converters (WEC).

CorPower Ocean AB has developed a compact high-efficiency Wave Energy Converter, inspired by the pumping principles of the human heart.

Using a new phase control method, the Wave Energy Converters always oscillate in resonance with the incoming waves, strongly amplifying their motion and power capture. Phase controlled oscillation offers an exceptionally high energy density, 5 times higher than conventional Wave Energy Converters without phase control. The technology allows a large amount of energy to be harvested using a small device.



12

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Company technology

CAMBRIDGE IP

The problem: The challenge in wave power is to design a device that is robust enough to survive the toughest storms, at the same time produce enough energy to make it a viable business case. Common problems include complexity, breakage in storms, rusting, and large/costly capex – with insufficient commercial returns

Key features of Oceanor Solution

- Lightweight system with high natural frequency of oscillation
- A unique cascade gearbox converting linear into rotating motion - using flywheels and generators to generate and store energy
- Detuned in storms, strongly reducing the loads providing good survivability up to 32m waves



Light units,
Low inertia
Energized by
small waves



Phase control
High capacity factor,
High energy density



Small units
in array
Mass production,
reduced CAPEX cost



Quick replace
scheme
Effective service,
reduced O&M cost

Key benefits:

- 5 times higher Annual Energy / mass compared to conventional point absorbers without phase control. [MWh/ton]
- 3 times higher Annual Energy / PTO Force compared to conventional point absorbers without phase control. [MWh / kN]
- Low CAPEX per kW, and effective service and maintenance using a replacement scheme

13

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Commercialisation Evidence: Partnerships

CAMBRIDGE IP

We identified several technology development partners from the private sector:

- **Iberdrola:** most likely focused on scale-up challenges of deploying a farm of CorPower units – such as mooring systems, interconnectors
- **SwePart Transmission AB:** focused on the development of the company's complex transmission systems
- **WavEc:** Portuguese marine research center – focused on testing and scale up of marine energy technologies

Analysis:

- Note that our analysis is based on publicly available information, so private or unannounced transactions may not be captured
- The commercial relationships do not include any of the majors around turbine development technology
- Also notable is the absence of any investors in the energy/cleantech space – potentially related to the high capex of the project (further analysis needed)
- Unclear how IP is shared between the parties and scale of deployment farm

14

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CorPower – Patent Families Summary

CAMBRIDGE IP

Our research built a patent dataset based on 2 patent families by CorPower, representing broadly

- Gear box/transmission system innovation
- System level innovation for the whole product

Publication Number	Patent Title	Publication Date
PATENT FAMILY 1		
EP2921694A1	A gear arrangement	2015-09-23
WO2015140163A1	A GEAR ARRANGEMENT	2015-09-24
	Also patent family extension in Australia and other countries	
PATENT FAMILY 2		
EP2593666A1	Energy transforming unit and energy transforming system comprising such a unit	2013-05-22
US9441484B2	Energy transforming unit and energy transforming system comprising such a unit	2016-09-13
WO2012008896A1	ENERGY TRANSFORMING UNIT AND ENERGY TRANSFORMING SYSTEM COMPRISING SUCH A UNIT	2012-01-19
	Also patent filings in Canada, Japan, China and other locations	

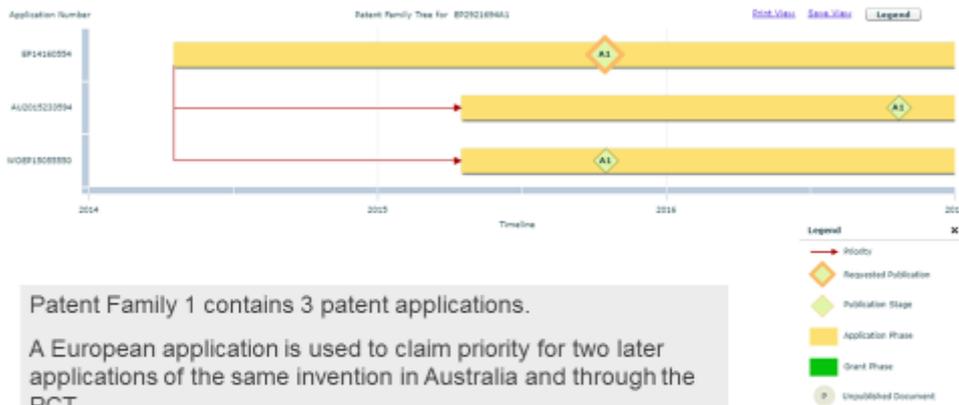
Note that for simplicity we have consolidated several patent applications into these 2 patent families, on the basis of shared priority applications and/or identical patent document title

15

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CorPower – Patent Family Tree - Patent Family 1

CAMBRIDGE IP



Patent Family 1 contains 3 patent applications.

A European application is used to claim priority for two later applications of the same invention in Australia and through the PCT

This is the most recent patent family application – representing innovations around the gearbox/transmissions system which is a key part of the innovation

16

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CorPower – Backward Citations – Patent Family 1 CAMBRIDGE IP

Our analysis identified 11 cited patents which provide prior art cited by the author or patent examiner

Note: further research can be conducted on prior art based on patent and non-patent data that can illustrate the evolution of technology and field

Publication Number	Publication Date	Title	Applicant/Assignee	Cited By
JP2003099407A	2003-03-20	SIMULTANEOUSLY GEARING STRUCTURE FOR TWO PINDONS AND RACK	OTA RYOZO	(X)
WO2011104561A2	2011-09-01	IMPROVEMENTS TO POWER GENERATING APPARATUS	HURT, David	(A)
DE1009390A1	2001-09-13	Rack-and-pinion mechanism for power tools, work bench, supports, or slides, has four or more multistage gearwheels arranged in matrix in two columns and two rows	INSTITUT FUER MIKROTECHNIK HAINZ GMBH	(A)
WO2012008894A1	2012-01-19	ENERGY TRANSFORMING UNIT AND ENERGY TRANSFORMING SYSTEM COMPRISING SUCH A UNIT	CORPOWER OCEAN AB	(A)
US5836205A	1998-11-17	Linear actuator mechanism	MEYER; STEVEN M.	(A)
FR2044489A5	1971-02-19	Linear actuator mechanism	LINE VECTOR ETS	(A)
WO2012008894A1	2012-01-19	ENERGY TRANSFORMING UNIT AND ENERGY TRANSFORMING SYSTEM COMPRISING SUCH A UNIT	CORPOWER OCEAN AB	
WO2011104561A2	2011-09-01	IMPROVEMENTS TO POWER GENERATING APPARATUS	HURT, David	
US5836205A	1998-11-17	Linear actuator mechanism	MEYER; STEVEN M.	
DE1009993B	1957-01-17	Procedure for the vulcanization of butyl rubber	US RUBBER CO	
WO2012008894A1	2012-01-19	SCALE MODEL COURSE	LUNDHARK, Torgrny	

Backward Citations give an indication of likely prior art underpinning the company's innovation

17

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CorPower – IPC Codes – Patent Family 1 CAMBRIDGE IP

The IPC classifications illustrate the relevance of the technology in the broad area of 'mechanical engineering, but with specific reference to:

- Machines/engines using wave energy using relative movement between wave-operated and non-wave operated member, fixed to seabed/shore (F03B13/18)
- Gearing systems with for interconverting rotary motion and reciprocating motion (F16H39/04)

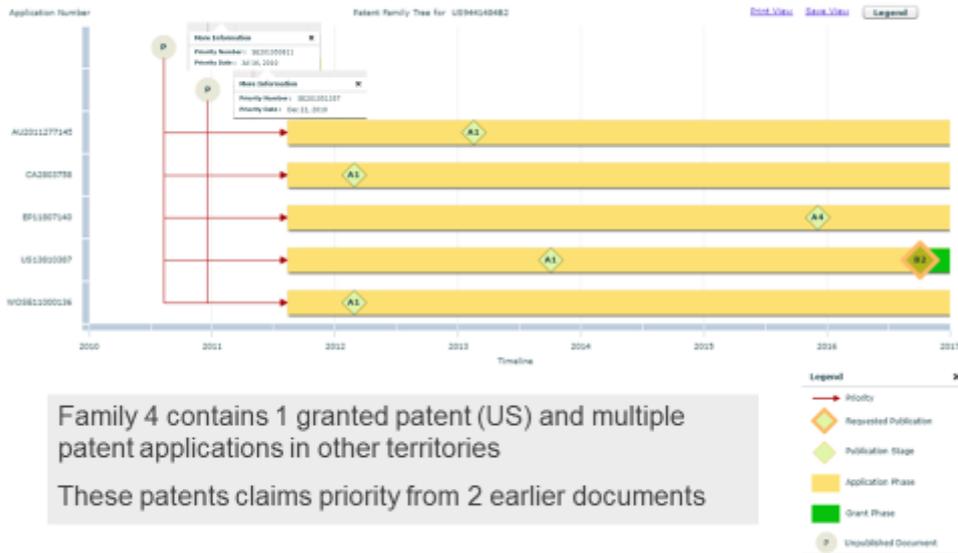
IPC's	Definition	F03	F03B	F03B13/00	F03B13/12	F03B13/14	F03B13/16	F03B13/18
F03B13/18	E MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING	F03 MACHINES OR ENGINES FOR LIQUIDS; WIND, SPRING, OR WEIGHT MOTORS, PRODUCING MECHANICAL POWER OR A REACTIVE PROPULSIVE THRUST, NOT OTHERWISE PROVIDED FOR	F03B MACHINES OR ENGINES FOR LIQUIDS	Adaptations of machines or engines for special use; Combinations of machines or engines with driving or driven apparatus (if the apparatus aspects are predominant, see the relevant places for such apparatus, e.g. H02K 7/18); Power stations or aggregates (hydraulic-engineering aspects E02B), incorporating tide machines or engines of positive-displacement type F23C)	using wave or tide energy	using wave energy	using the relative movement between a wave-operated member and another member	wherein the other member is fixed, at least at one point, with respect to the sea bed or shore
F16H19/04	E MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING	F16 ENGINEERING ELEMENTS OR UNITS; GENERAL MEASURES FOR PRODUCING AND MAINTAINING EFFECTIVE FUNCTIONING OF MACHINES OR INSTALLATIONS; THERMAL INSULATION IN GENERAL	F16H GEARING	F16H19/00 F16H19/02 Gearings comprising essentially only toothed gears or friction members and not capable of conveying indefinitely-continuing rotary motion	F16H19/02	F16H19/04	comprising a rack	

*The International Patent Classification (IPC) is a hierarchical patent classification system used in over 100 countries to classify the content of patents in a uniform manner.

18

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CorPower – Patent Family Tree - Patent Family 2 CAMBRIDGE IP



Family 4 contains 1 granted patent (US) and multiple patent applications in other territories

These patents claims priority from 2 earlier documents

19

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CorPower – Backward Citations – Patent Family 2 CAMBRIDGE IP

Larger number of backward citations indicates potentially higher level of prior art of this patent. Note most of the citations were cited by the applicant – possibly indicating awareness of the prior art

Publication Number	Publication Date	Title	Applicant/Assignee	Cited By
DE19633990A1	1999-03-11	Procedure and device for extracting wave energy	Wisseroth, Karl, Dorenrot.	Originates from the search report
US20070150958A1	2007-07-12	Hydroelectric Wave-Energy Conversion System	CRESPO JORGE R	Was cited by the applicant
US7385301B2	2008-06-10	Wave energy conversion system	HIRSCH WILLIAM WALTER	Was cited by the applicant
US648877A	1987-03-10	Blood pump	ASTRA TECH AB	Was cited by the applicant
US723997B2	2007-07-09	Computer based system adapted to create a representation of the pumping action of a heart	GrippingHeart AB	Was cited by the applicant
US1791239A	1931-02-03	Power-generating mechanism	BRAGELTON CHESTER H	Was cited by the applicant
US4355511A	1982-10-26	Wave energy conversion	JONES, DEDGER	Was cited by the applicant
US4172899A	1979-10-30	Wave power generator	THORSHEIM, IVAR	Was cited by the applicant
US4001597A	1977-01-04	Electric power generating system	GRAPP ALBERT L	Was cited by the applicant
US7131268B2	2006-11-07	Process and an apparatus for utilizing wave energy	AV-ENERGY Oy	Was cited by the applicant
US20060150626A1	2006-07-13	Production installation	KOTVUSAARI RAUNO	Was cited by the applicant
US398985A	1976-11-02	Wave energy power generating Breakwater	Westinghouse Electric Corporation	Was cited by the applicant
US6229225B1	2001-09-08	Surface wave energy capture system	Ocean Power Technologies, Inc.	Was cited by the applicant
US6392314B1	2002-05-21	Wave energy converter	DECK WILLIAM	Was cited by the applicant
US4062962A	1978-04-04	Dynamic wave energy extraction system	LIU, FRANCIS C.	Was cited by the applicant
US1318489A	1919-10-14	HILLINGDOL OF WOHCHENDOL, MASSACHUSETTS, WAVE POWER-STATION.		Was cited by the applicant
US626657A	1899-07-11	MOISTURE-CHAMBER FOR BLOTTER-BATHS.	GIFFORD HARRY E	Was cited by the applicant
US20080167988A1	2005-08-04	WAVE ENERGY CONVERSION SYSTEM	WOOD CHARLES	Was cited by the applicant

20

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CorPower – Forward Citations – Patent Family 2 CAMBRIDGE IP

The CorPower patent family has received 1 forward citation from a Russia-based Assignee, for a 'device for conversion of water energy into mechanical power of rotation'.

With time it can be expected that further citations will accumulate, as knowledge and use of the technology expands.

Publication Number	Publication Date	Title	Applicant/Assignee
 RU2570959C1	2015-12-20	DEVICE FOR CONVERSION OF WATER ENERGY INTO MECHANICAL POWER OF ROTATION	Stanovskoj Viktor Vladimirovich

In addition, Corpower's next patent family is referencing the 1st patent family - often the case when companies build on their existing technology.

Publication Number	Publication Date	Title	Applicant/Assignee
 WO2015140163A1	2015-09-24	A GEAR ARRANGEMENT	CORPOWER OCEAN AB
 EP2921694A1	2015-09-23	A gear arrangement	Corpower Ocean AB
 EP2921694A1	2015-09-23	A gear arrangement	Corpower Ocean AB

*Patent Forward Citations give an indication of how influential a patent document is – as future innovations take into account prior

art

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CorPower – Backward Citations – Patent Family 2 CAMBRIDGE IP

Patent family 2 is in a highly populated space with a large number of backward citations going back to 1978, around wave energy systems. The bulk of patents are in the 1990s and 2000s.

Publication Number	Publication Date	Title	Applicant/Assignee	Cited By
 US4118932A	1978-10-10	Energy conversion systems	Lucas Industries Limited	Was cited by the applicant
 US5176552A	1993-01-05	Luminous float	Ohumi Tensho Kabushiki Kaisha	Was cited by the applicant
 US5186823A	1993-02-16	Wave powered desalination apparatus with turbine-driven pressurization	Ocean Resources Engineering, Inc.	Cited by examiner
 US671728B2	2004-04-06	Power generating machine with a bellows adaptable to sea waves so as to drive a generator	LIN HING-HUNG	Cited by examiner
 US6833631B2	2004-12-21	Apparatus and methods for energy conversion in an ocean environment	VAN BREBENS MARTINUS	Cited by examiner
 US7245041B1	2007-07-17	Ocean wave energy converter	OLSON CHRIS F	Cited by examiner
 US7632041B2	2009-12-15	Wave power generator systems	Single Buoy Moorings, Inc.	Cited by examiner
 US8607252B2	2011-09-30	Wave powered pumping apparatus	WINDLE TOM J	Cited by examiner
 US20060099463A1	2006-05-04	Wave energy converter	BURNS ALAN R	Cited by examiner
 US20060202483A1	2006-09-14	Capturing energy from the rise and fall of the seas and waves of the ocean	GONZALEZ ENRIQUE J	Cited by examiner
 US20090229902A1	2009-09-17	REGENERATIVE SUSPENSION WITH ACCUMULATOR SYSTEMS AND METHODS	PHYSICS LAB OF LAKE HAWAII, LLC	Was cited by the applicant
 US20100308889A1	2010-12-09	Heaving ocean wave energy converter	Rohrer Technologies, Inc.	Cited by examiner
 DE19633990A1	1999-03-11	Procedure and device for extracting wave energy	Wasserth, Karl, Dr.rer.nat.	Cited by examiner
 WO03087570A2	2003-10-23	APPARATUS AND METHODS FOR ENERGY CONVERSION IN AN OCEAN ENVIRONMENT	VAN BREBENS, Marcus	Was cited by the applicant
 WO2009096795A2	2009-08-06	WAVE ENERGY DEVICE	TENKO	Was cited by the applicant
 WO2009152006A1	2009-12-23	WAVE ENERGY CONVERSION SYSTEM	STROHOTICH, Frank, Lexis	Was cited by the applicant

*Backward Patent Citations give an indication of likely prior art and similar technologies. One way to interpret backward citations is that a large number of backward citation shows a well developed technology body; and smaller number of backward citations shows relatively young space. However, this is open to significant differences between technologies and jurisdictions

22

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CorPower – IPC Codes- Patent Family 2 - 2

CAMBRIDGE IP

- c) Mech Engineering using rotary piston engines with toothed rotary pistons (F01C1/14)
- d) Mech Engineering for liquids with adaption for use of wave/tide energy wherein the unit is fixed to sea bed (F03B13/18)
- e) Mech Eng machines with spring and mech power producing mechanisms – recovering energy from swinging/rolling/pitching (F03G7/08)

IPC's	Definition	F01	F01C	F01C100	F01C108	F01C112	F01C114
F01C1/14	MACHINES OR ENGINES IN OSCILLATING-PISTON MACHINES OR ENGINES	MACHINES OR ENGINES IN GENERAL; STEAM ENGINES	ROTARY-PISTON OR OSCILLATING-PISTON MACHINES OR ENGINES	Rotary-piston machines or engines	of intermeshing-engagement type, i.e. with engagement of co-internal-operating members similar to that of toothed gearing		with toothed rotary pistons
F03B13/18	MACHINES OR ENGINES FOR LIQUIDS; WIND, SPRING, OR WEIGHT MOTORS; PRODUCING MECHANICAL POWER OR A REACTIVE PROPULSIVE THRUST, NOT OTHERWISE PROVIDED FOR	MACHINES OR ENGINES FOR LIQUIDS; WIND, SPRING, OR WEIGHT MOTORS; PRODUCING MECHANICAL POWER OR A REACTIVE PROPULSIVE THRUST, NOT OTHERWISE PROVIDED FOR	MACHINES OR ENGINES FOR LIQUIDS	Adaptations of machines or engines for special use; Combinations of machines or engines with driving or driven apparatus (if the apparatus aspects are predominant, see the relevant places for such apparatus, e.g. H02K 7/18); Power stations or aggregates (hydraulic-engineering aspects)E22; Incorporating only machines or engines of positive-displacement type (F03C)	characterised by using wave or tide energy	F03B13/18	F03B13/18
F03G7/08	MACHINES OR ENGINES FOR LIQUIDS; WIND, SPRING, OR WEIGHT MOTORS; PRODUCING MECHANICAL POWER OR A REACTIVE PROPULSIVE THRUST, NOT OTHERWISE PROVIDED FOR	MACHINES OR ENGINES FOR LIQUIDS; WIND, SPRING, OR WEIGHT MOTORS; PRODUCING MECHANICAL POWER OR A REACTIVE PROPULSIVE THRUST, NOT OTHERWISE PROVIDED FOR	F03G	F03G7/00	F03G7/08		
			SPRING, WEIGHT, INERTIA, OR LIKE MOTORS; MECHANICAL-POWER-PRODUCING DEVICES OR MECHANISMS, NOT OTHERWISE PROVIDED FOR OR USING ENERGY SOURCES NOT OTHERWISE PROVIDED FOR	Mechanical-power-producing mechanisms, not otherwise provided for or using energy sources not otherwise provided for	recovering energy derived from swinging, rolling, pitching, or like movements, e.g. from the vibrations of a machine		

Patent status analysis

CAMBRIDGE IP

A supplementary examination of the patent's 'EPO global dossier*' provides the following additional status information:

For the patent application WO2012008896A1 with priority date 16 July 2010:

- A 16 Jan 2013 written opinion of the international search authority notes that "due to the drafting of the claims with unclear terms and unclear relations between these terms, a large number of interpretations appear to be at hand. No clear limitation of scope of protection is defined. Therefore not all prior art which may effect[sic] inventive step has been searched". The search report notes that *all* inventive steps (1-25), and Claim 1 of novelty are under question. This finding may weaken the patent in future in case of challenge, and may significantly weaken the patent commercially.

For the patent application WO2015EP55550 with priority date 18 March 2014:

- A 17 March 2015 international preliminary report on patentability notes that *both* Novelty claims and inventive claim of the application are potentially invalid. Prior art stated in this statement includes patent documents from 1971, 1998, 2001, 2003 and 2011

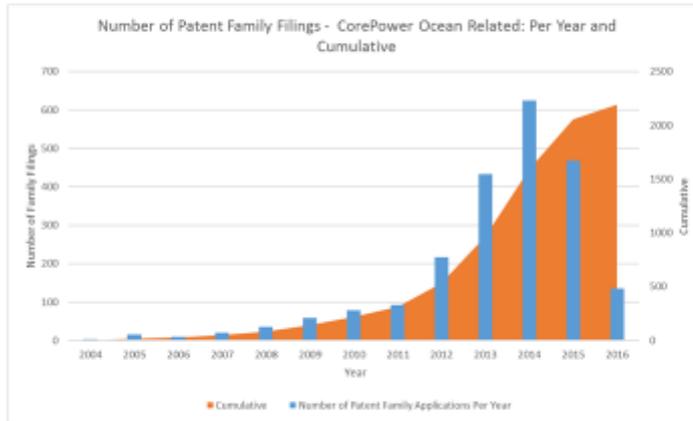
Within the patenting process it is common for changes to be implemented to satisfy examiner concerns, such as exhibited by this patent application.

<https://register.epo.org/ipfwretrieval?apn=SE.2011000136.W&lng=en>

Patent filings timeline – by patent family

CAMBRIDGE IP

The IPC-based analysis shows rapidly accelerating levels of patenting activity in the related space – with more than 2,000 patent families in the overall space, and a patent high of 600+ patent families in 2014



Note that applications can remain unpublished for up to 18 months after application – explaining the dip in 2015/16

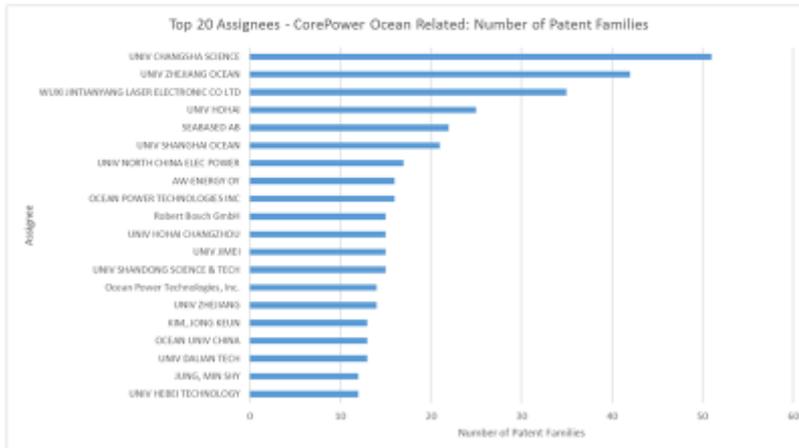
27

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Top Assignees in overall space

CAMBRIDGE IP

The patent analysis identifies also the presence of competitors such as Ocean Power Technologies, Seabased AB, AW Energy – each of which is already on the market and operational. In addition, the analysis shows a heavy presence by Chinese Universities and China-based assignees.



28

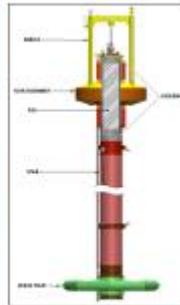
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Example competitors

CAMBRIDGE IP

- Analysis of top patent assignees helps identify competitors to CorPower that already have products on the market and are deployed – including Ocean Power Technologies, Seabased AB, AW Energy
- Further analysis would be needed to identify whether CorPower has a superior technology. But its worth noting that each of these technology approaches deal with similar deployment challenges as those targeted by CorPower

OPT OCEAN POWER TECHNOLOGIES



29



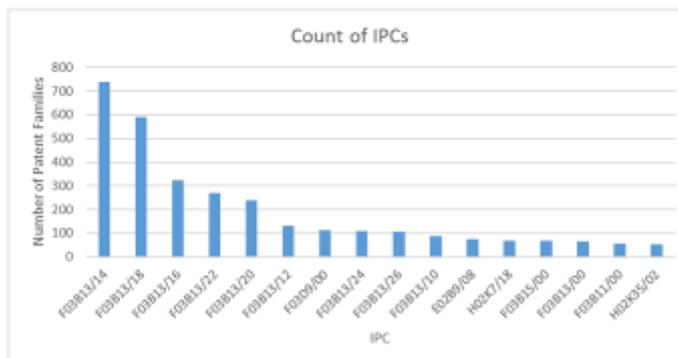
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CorPower Related Tech – Patent Dataset and IPCs

CAMBRIDGE IP

The analysis of the IPCs associated with the technology (as evidenced from the patent document) shows that while some subsets of the technology have as little as 50 patent families by other companies, overall in the space (as defined by the company's patents' IPC classifications) there are 800+ individual patent families. This potentially represents 800+ inventions or improvements on technologies.

This suggests that while some of the applications of CorPower's technology are less populated, overall the space has seen significant levels of innovation.



30

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CorPower Related Tech – Example Recent Patents in the space

CAMBRIDGE IP

Publication Number	Title
AU2016101520A1	A PORTABLE WAVE-SOLAR ENERGY HARVESTING DEVICE
AU2014384765A1	A wave energy conversion arrangement
WO2016149779A1	CONVERSOR DE ENERGIA DE ONDAS COM MOVIMENTO PENDULAR
WO2016149250A1	HINGE SYSTEM FOR AN ARTICULATED WAVE ENERGY CONVERSION SYSTEM
US20160273513A1	HINGE SYSTEM FOR AN ARTICULATED WAVE ENERGY CONVERSION SYSTEM
US20160272294A1	Watercraft and Electricity Generator System for Harvesting Electrical Power from Wave Motion
RU2597713C1	МОРСКАЯ ВОЛНОВАЯ УСТАНОВКА
WO2016144310A1	FLOATING MOON POOL HYDRAULIC PUMP
US20160265506A1	WAVE-POWER GENERATION SYSTEM, AND TRANSMISSION BODY AND ROTATION CONVERSION UNIT USED THEREFOR
EP3066334A1	ENERGIEERZEUGER ZUR AUSNUTZUNG VON GEZEITEN-/WELLENBEWEGUNGEN
CA2853057C	ENERGY COLLECTOR
RU2597342C1	ВОЛНОВОЙ НАСОС ДЛЯ ИСПОЛЬЗОВАНИЯ В МАЛЫХ ГИДРОТУРБИНАХ
WO2010011268A3	OPEN OCEAN WAVE ENERGY CONVERTER

31

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Summary of Findings

CAMBRIDGE IP

- The patent research on CorPower Ocean AB (a company developing a compact high-efficiency Wave Energy Converter) has a well developed patent portfolio commensurate with the stage of development
- The company has 2 core patent families covering many geographies including US, EU, China, Japan.
- Given the recent date of patent publication, it was not surprising that only 1 forward patent citation. It is possible over time the patents may attract more citations
- The company is using collaborations with several private and public sector players to pilot and mature the technology, as well as to help build the support systems around it
- The patent study also showed that there is a rapidly accelerating level of patenting activity in the related space, with more than 2,000 patent families in the overall space, and a patent high of 600+ patent families in 2014
- The patent study also identified several competitors that are already on the market with alternative technologies that claim similar benefits.
- Further research can be conducted to analyse the strength or weakness of the company's patent portfolio, specific comparisons to competitors, or to identify gaps in the patent landscape that can be exploited by the company

32

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Annex 10: Social Network Analysis Technical Report

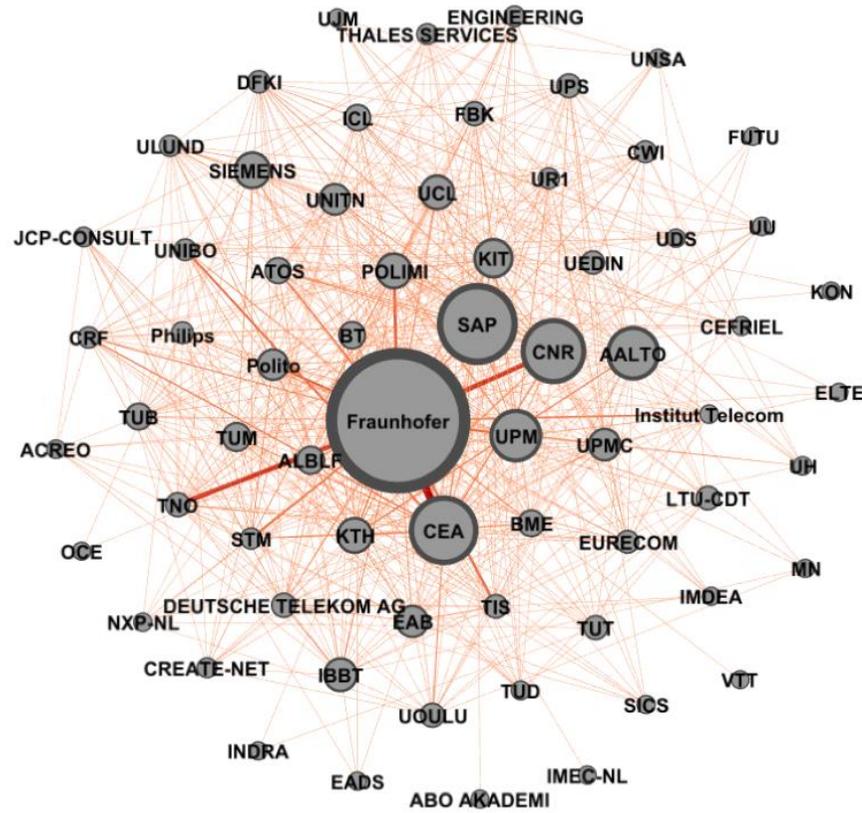
Summary of findings

Based on the findings presented in the technical annex below, we provide here the key messages emerging from the Social Network Analysis of the participation of KIC partners in FP7 and H2020 research networks:

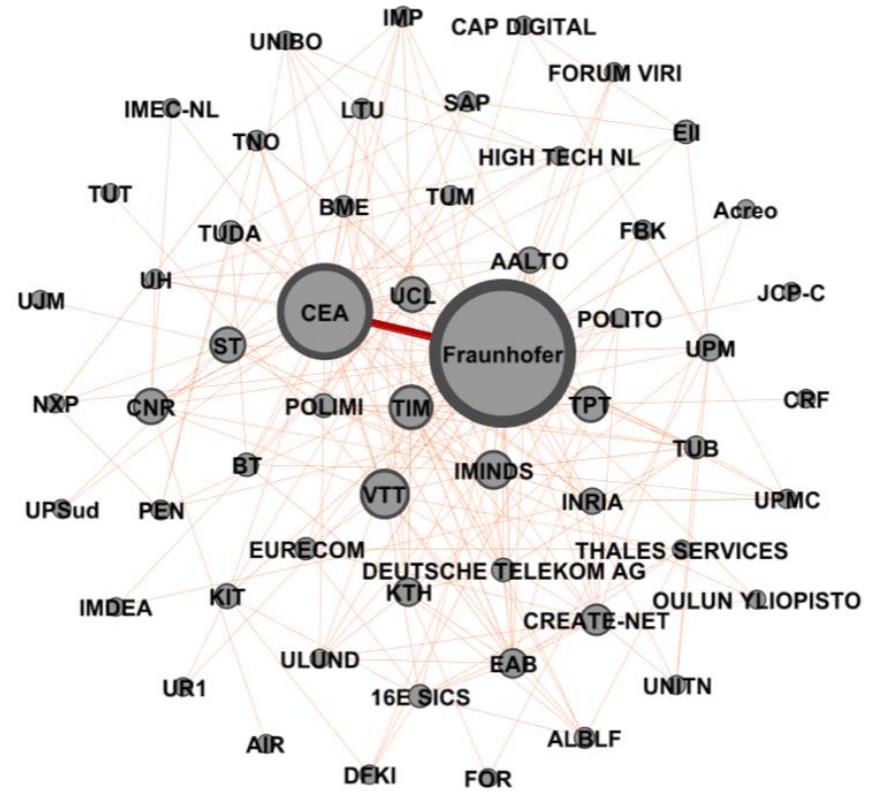
- **All KICs have very different network structure.** Even though, at organisational level all KICs networks are characterised by a core-periphery structure (or an unequally representation of organisations in the network, some of them taking part in many projects –the central players or hubs, while others participate rather infrequently), the network densities vary largely. There is more distributed knowledge and more actors involved for the EIT Climate-KIC partners/network than for the EIT Digital. The ICT network, involving EIT Digital partners has a very small ‘core’, with just a few organisations dominating the knowledge flows before and after the set-up of the KICs (“club of good friends”). This contrasts with research on environment and climate change, involving EIT Climate-KIC partners, which includes strong players in the field, but before the KIC was established, the collaboration density was lower than after the set-up of the KIC, suggesting that knowledge is better distributed. The distribution of knowledge for EIT InnoEnergy partners is somehow in between the EIT Digital case and the EIT Climate-KIC case. This profile is related to the fact that the FP has been funding technological/ICT research for a long time, favouring the establishment of ‘tight’/concentrated networks; while research collaboration around climate change has been intensified only in H2020, and is more of a ‘novelty’ in relative terms.
- The share of **private sector participation is the largest** in energy research and ICT research in KIC partners’ research networks. However, private sector participants (KIC partners and non-KIC partners) do not act as knowledge hubs, and are not overall part of the most central organisations in FP7/H2020 research networks. Even though collaborations between the private sector, research organisations and higher education account for more than 80% of all links in the FP/H2020 research networks of KIC partners, universities and research organisations are the most central in the networks.
- **The EIT initiative has been effective in integrating research groups and overcoming fragmentation in research as show in FP7/H2020 participation.** KIC partners have been successful in fostering cooperation with new organisations in FP7 and H2020 funded research. 88% of all inter-organisational collaboration pairs involving at least one KIC partner in energy research were new after the establishment of the KICs in FP7; and 89% of total were also new in H2020 relative to FP7. This is also true for environment and climate change research (78% of pairs were new in FP7 before and after the KICs vs. 81% between FP7 and H2020), and ICT research (76% and 77% respectively). Pairs of collaborators involving at least 1 KIC partner appear to be more ‘resilient’ to disintegration than all other collaborators. Only 17% of KIC partners in energy research, 13% in environment and climate change research and 10% of KIC partners in ICT research vanished in FP7 (before and after the KICs).

Social Networks of EIT Digital partners participating in FP7 and H2020

FP7 before KICs

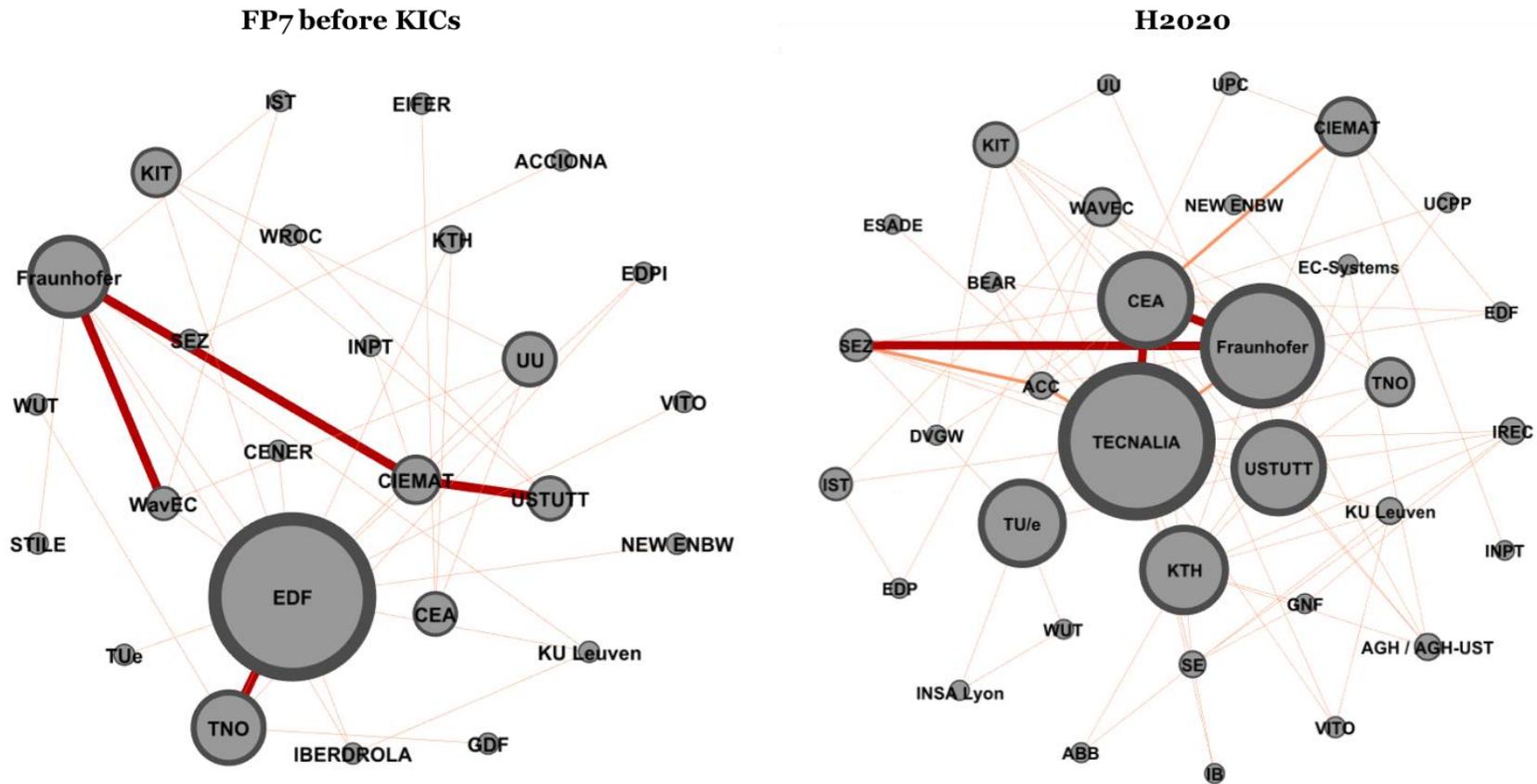


H2020



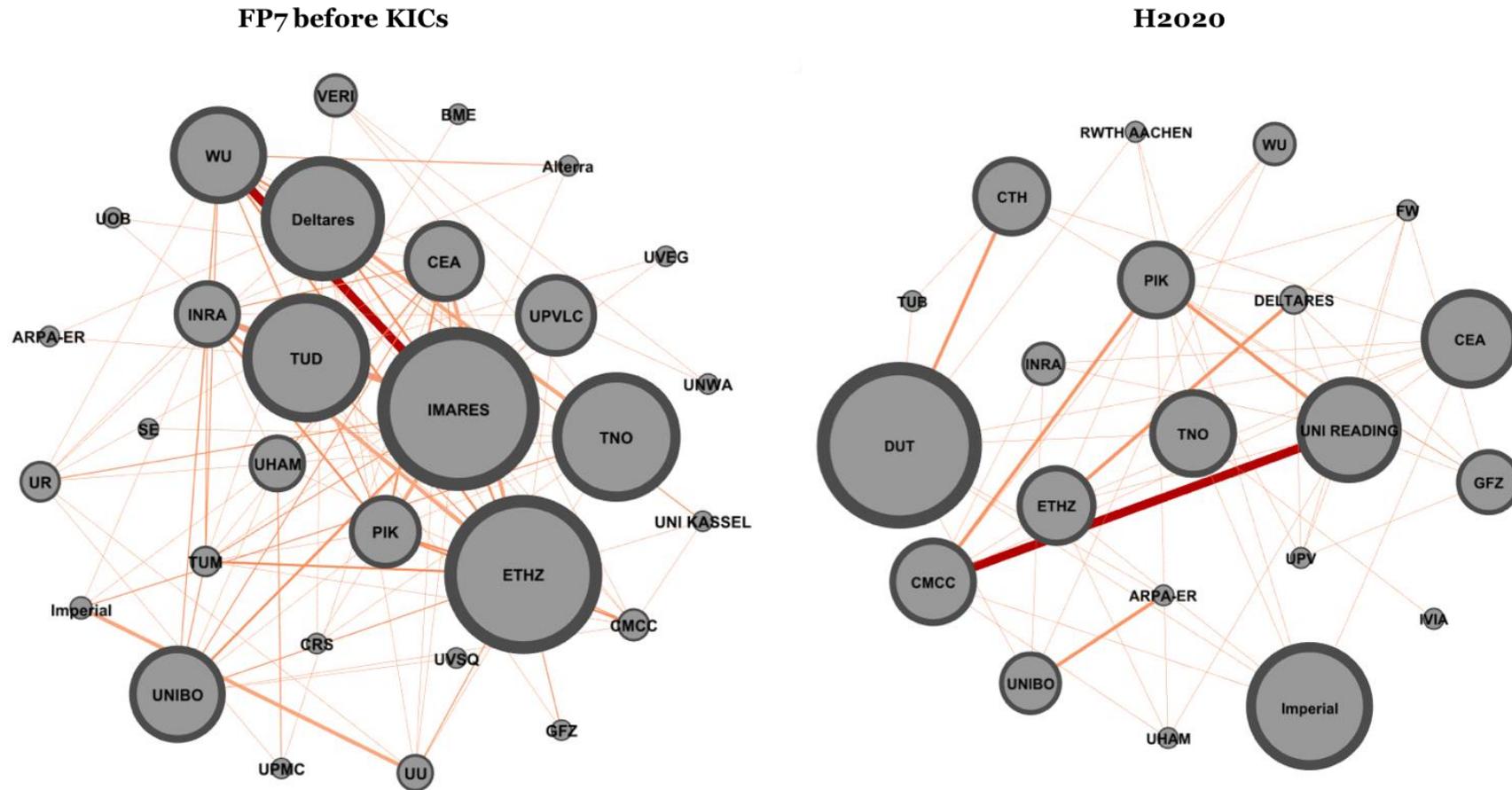
Source: Technopolis Group, based on CORDA data

Social Networks of EIT InnoEnergy partners participating in FP7 and H2020



Source: Technopolis Group, based on CORDA data

Social Networks of EIT Climate-KIC partners participating in FP7 and H2020



Source: Technopolis Group, based on CORDA data

Social Network Analysis

We use Social Network Analysis (SNA) to answer a key evaluation question: to what extent the EIT and its activities had an impact on strengthening the EU ecosystem in the KIC fields of research and innovation, thus reducing fragmentation. This is directly related to the effectiveness questions of the system innovation impacts of the EIT model.

The SNA allows us to collect evidence on the extent to which the KICs involved the key actors in their respective research communities and succeeded in integrating new partners in the EU community, which is one of the factors that influence effectiveness.

Data

The base for the SNA is the data in the FP7 and H2020 Community Research and Development Information Service (CORDIS) available from the EU Open Data Portal⁶⁹, focusing on the thematic areas of the three first-wave KICs, i.e. energy (EIT InnoEnergy), environment and climate change (EIT Climate-KIC), and ICT (EIT Digital). Under FP7 these programmes were centred in the Cooperation pillar; in H2020 they are spread over two pillars: Industrial leadership (LEIT) and Societal Challenges. The use of FP/H2020 data allows us to collect information on the strength of the KIC community beyond the context of the EIT.

We map the KIC core partners and associated/affiliated partners and their collaboration patterns in the FP-funded research over time, considering the collaborations both amongst themselves and with the other FP participants.

This requires linking the EIT databases containing all KIC partners with the CORDIS data. The approach we followed for matching the databases is the following:

1. Our start point was the lists of KIC partners provided by the EIT. We focus on eligible partners since 2013 or before, and that are still eligible.
2. We match this list of KIC partners with the Fp7 and H020 databases using the KIC partner full names, to obtain a list of FP/H2020 projects where there is at least one KIC beneficiary as participant and/or coordinator.
3. We subset the full list of FP7 and H2020 projects to include only those calls that are linked to the work programmes and sub-programmes that are in the scope of work of the KICs. This gives us a full list of KIC beneficiaries and other non-KIC beneficiaries that have collaborated jointly over time in FP7/H2020 research projects.
4. We divide our matched databases in three time periods: the FP7 period 2007-2010 (i.e. before the three KICs establishment), the FP7 period 2011-2013, and the H2020 period 2014-2015. This allows us to make analyses over time. These matched databases, divided by time periods are the basis for the SNA ("KICs databases"). We build separate KICs networks, one for each KIC, and one per period (i.e. 9 in total).
5. To provide a good indication of effectiveness, we also analyse the full networks of all FP7/H2020 participants in the relevant calls. Relative to the KICs networks, this allows us to identify if and to what extent, as well as which KIC partners have a strong/central position among other KIC partners, their collaboration partners as well as within the whole FP/H2020 research communities.

The FP7 and H2020 calls that were included in the analysis are presented in the following table.

⁶⁹ See: https://data.europa.eu/euodp/en/data/dataset?q=cordis&ext_boolean=all&sort=views_total+desc

FP7 and H2020 calls included in the SNA

		EIT Digital (ICT research)	EIT InnoEnergy (Energy research)	EIT Climate-KIC (Environment and Climate Change research)
FP7 KICs	pre-	FP7-ICT-2007-1	FP7-ENERGY-2007-1-RTD	
		FP7-ICT-2007-2	FP7-ENERGY-2007-2-TR	
		FP7-ICT-2007-3	FP7-ENERGY-2007-2-TREN	
		FP7-ICT-2007-C	FP7-ENERGY-2008-1	
		FP7-ICT-2009-4	FP7-ENERGY-2008-FET	FP7-ENV-2007-1
		FP7-ICT-2009-5	FP7-ENERGY-2008-RUSSIA	FP7-ENV-2008-1
		FP7-ICT-2009-6	FP7-ENERGY-2008-TREN-1	FP7-ENV-2009-1
		FP7-ICT-2009-C	FP7-ENERGY-2009-1	FP7-ENV-2010
		FP7-ICT-ENERGY-2009-1	FP7-ENERGY-2009-2	FP7-ENV-NMP-2008-2
		FP7-ICT-SEC-2007-1	FP7-ENERGY-2009-3	
			FP7-ENERGY-2009-BRAZIL	
			FP7-ENERGY-2010-1	
			FP7-ENERGY-2010-FET	
	FP7-ENERGY-2010-INDIA			
	FP7-ENERGY-NMP-2008-1			
FP7 KICs	post-	FP7-ICT-2009-4	FP7-ENERGY-2009-2	
		FP7-ICT-2009-5	FP7-ENERGY-2010-1	
		FP7-ICT-2009-6	FP7-ENERGY-2010-2	FP7-ENV-2010
		FP7-ICT-2009-C	FP7-ENERGY-2010-FET	FP7-ENV-2011
		FP7-ICT-2011-7	FP7-ENERGY-2011-1	FP7-ENV-2011-ECO-INNOVATION-OneStage
		FP7-ICT-2011-8	FP7-ENERGY-2011-2	FP7-ENV-2011-ECO-INNOVATION-TwoStage
		FP7-ICT-2011-9	FP7-ENERGY-2011-JAPAN	FP7-ENV-2012-one-stage
		FP7-ICT-2011-C	FP7-ENERGY-2012-1-1STAGE	FP7-ENV-2012-two-stage
		FP7-ICT-2011-EU-Brazil	FP7-ENERGY-2012-1-2STAGE	FP7-ENV-2013-one-stage
		FP7-ICT-2011-EU-Russia	FP7-ENERGY-2012-2	FP7-ENV-2013-two-stage
		FP7-ICT-2011-FET-F	FP7-ENERGY-2013-1	FP7-ENV-2013-WATER-INNO-DEMO
		FP7-ICT-2011-SME-DCL	FP7-ENERGY-2013-2	FP7-ENV-NMP-2011
		FP7-ICT-2013-10	FP7-ENERGY-2013-IRP	
		FP7-ICT-2013-11	FP7-ENERGY-SMARTCITIES-2012	
		FP7-ICT-2013-C		

	FP7-ICT-2013-EU-Brazil FP7-ICT-2013-EU-Japan FP7-ICT-2013-FET-F FP7-ICT-2013-SME-DCA FP7-ICT-2013-X		
H2020	H2020-EUJ-2014 H2020-ICT-2014-1 H2020-ICT-2014-2 H2020-ICT-2015	H2020-EE-2014-1-PPP H2020-EE-2014-2-RIA H2020-EE-2014-3-MarketUptake H2020-EE-2015-1-PPP H2020-EE-2015-2-RIA H2020-EE-2015-3-MarketUptake H2020-LCE-2014-1 H2020-LCE-2014-2 H2020-LCE-2014-3 H2020-LCE-2015-1-two-stage H2020-LCE-2015-2 H2020-LCE-2015-3 H2020-SCC-2014 H2020-SCC-2015	H2020-SC5-2014-one-stage H2020-SC5-2014-two-stage H2020-SC5-2015-one-stage H2020-SC5-2015-two-stage H2020-WASTE-2014-one-stage H2020-WASTE-2014-two-stage H2020-WASTE-2015-one-stage H2020-WASTE-2015-two-stage H2020-WATER-2014-one-stage H2020-WATER-2014-two-stage H2020-WATER-2015-one-stage H2020-WATER-2015-two-stage

Study questions

As mentioned before, the SNA mainly concerns in providing a better understanding of the effectiveness of the EIT. For this, a set of specific questions are answered:

SNA specific questions

Topic	Specific questions and hypothesis
Network structure and most influential organisations	<p>Are there some key actors, i.e., central connectors, knowledge brokers and peripheral specialists among KIC partners in FP7/H2020?</p> <p>Do the network structures differ by thematic KIC? How do they compare to each other in terms of presence of hubs and central connectors? Do too few actors dominate these networks? Are central actors more likely to be connected to a specific type of beneficiary?</p>

	The hypothesis is that network structure determines the influence that each participant has on the network, and the extent to which the most central actors in this network are KIC beneficiaries, this signals the influence that these beneficiaries have on EU-funded research networks.
Inter-sectoral collaboration	To what extent KIC partners in FP7/H2020 link different types of organisations (university, industry, etc.) and bridge the flow of innovation ideas between them? The main hypothesis is that links between different types of organisations foster success of innovation.
Effects on new organisations and new collaborations	To what extent has the EIT contributed to form a social network between KIC beneficiaries and other FP/H2020 grant holders? How do research networks supported through FP7 and H2020 integrated KIC partners, and how many new KIC partners have integrated these networks over time? The main hypothesis is that new networks involving new actors should lead to greater research integration in the short term and strengthened knowledge transfer in the intermediate term.

Profile of KIC partners' participation in FP7 and H2020

This section provides data on the number of total and KIC beneficiary organisations that have participated in FP7 and H2020 relevant calls. A recent European Commission study⁷⁰ on Network Analysis of FP7 found that new networks involving new actors lead to greater research integration in the short term and strengthened knowledge transfer in the intermediate term. Previous studies on the long-term impact of the FP model observed that networks formed through FP tend to evolve slowly, with new members being tested and admitted only once they have built trust⁷¹.

The data we have collected shows that several KIC partners have integrated FP and H2020 research networks over time, with increasing average numbers of partners after the establishment of the KICs (2011-2015). Out of the total 112 partners in EIT Climate-KIC, on average 30 of them were part in FP7 or H2020 (26.8%). About 38.4% (38 on average) of EIT InnoEnergy partners and 74.8% (64) of EIT Digital partners also participated in FP7 or H2020. As a share of all partners, EIT Digital partners are most represented in FP7 and H2020 relative to the other two KICs.

The number of participating organisations involved in FP7 and H2020 was counted for all participants in the relevant calls, and for only those projects where there was at least one KIC partner. While organisations could participate in more than one project, participating organisations were counted only once to avoid over-representation of more active organisations, which can skew the findings. This is especially important considering that many large-scale European organisations are involved in a high number of FP7 and H2020 projects.

⁷⁰ European Commission (2015), "Study on Network Analysis of the 7th Framework Programme Participation, Final Report", European Commission, Directorate General for Research and Innovation.

⁷¹ European Policy Evaluation Consortium (EPEC) (2011). "Understanding the long-term impact of the framework programme", Final Report to the European Commission DG Research, Brussels.

Number of KIC partners taking part in FP7 and H2020 research networks

	Total KIC partners	KIC partners in FP7 pre KICs period (2007-2010)	KIC partners in FP7 post KICs period (2011-2013)	KIC partners in H2020 (2014-2015)	Average
EIT Climate-KIC	112	33	34	23	30
EIT Digital	86	68	65	60	64
EIT InnoEnergy	98	35	41	37	38
Shares of total KIC partners taking part in FP7/H2020					
EIT Climate-KIC		29,5%	30,4%	20,5%	26,8%
EIT Digital		79,1%	75,6%	69,8%	74,8%
EIT InnoEnergy		35,7%	41,8%	37,8%	38,4%

Source: Technopolis Group, based on CORDA data

We proceed now to analyse the network structure of the research networks of KICs partners. We aim to understand whether actors are unequally represented in the network, some of them participating in many projects (i.e. the central players or hubs) while others are participating rather infrequently.

Various network statistics for each of the networks were computed (number of nodes, number of edges, number of network components, network density, clustering coefficient and betweenness centrality). In the network literature, there is a set of views that gives great value to the identification of the 'most important' actors; or those that have a strategic location in the network with many close relationships. The reasoning is that these actors have advantages because they can access and transmit new information sooner than others located on the periphery⁷². The indicator of betweenness centrality of participants is highly informative as it reflects the number of shortest paths from all actors to all others that pass-through a given actor normalised by the total number of shortest paths in a network. In other words, the higher the number of shortest paths on which an actor appears, the higher its centrality in the network as it falls between all others to the greatest extent.

At organisational level and for all research programmes analysed, networks are characterised by a core-periphery structure. This structure can be detected by looking at the betweenness centrality indicator and its distribution, whereby a few influential actors (i.e. hubs) located at the centre of network establish strong ties between themselves and weaker connections with the periphery where the density of ties –and consequently the flow of knowledge– is reduced between the peripheral players. This means that

⁷² Freeman, C. (1982). *The economics of industrial innovation*. Cambridge, MA: MIT Press.

organisations are unequally represented in the network, some of them taking part in many projects –the central players or hubs, while others participate rather infrequently. The betweenness centrality of actors is highly informative as it reflects the number of shortest paths from all actors to all others that pass-through a given actor. In other words, the higher the number of shortest paths on which an organisation appears, the higher its centrality in the network as it falls between all others to the greatest extent.

The table below presents a list of the most influential (knowledge hubs) organisations in the FP7/H2020 research networks of KIC partners, based on the normalised scores of betweenness centrality. Because KIC partners collaborate with non-KIC partners we also include an identifier.

In ICT research, among the research projects where there is at least 1 KIC partner, a majority of the central actors are also EIT Digital partners. The distribution of the betweenness centrality is also very skewed and consistent with a core-periphery network structure, with *Fraunhofer* being a key knowledge hub in the network. Most of the core actors in the network are either research organisations or universities, except for *ATOS Spain SA* (also KIC partner) that is also a knowledge hub in the network. Relative to the other two networks, the ICT research network has a tighter core of participants and largest periphery.

Top 15 most central organisations in FP7/H2020 research projects involving at least one KIC partner

Rank	Participant name	Country	Betweenness centrality score (normalised)	KIC partner (Yes/No)
ICT Research - EIT Digital				
1	Fraunhofer-Gesellschaft Zur Foerderung Der Angewandten Forschung E.V	DE	1	Yes
2	Commissariat A L Energie Atomique Et Aux Energies Alternatives	FR	0,2235	Yes
3	Consiglio Nazionale Delle Ricerche	IT	0.1785	Yes
4	Universidad Politecnica de Madrid	ES	0,1493	Yes
5	Centre National de la Recherche Scientifique	FR	0,1424	No
6	ATOS Spain SA	ES	0,1340	Yes
7	Politecnico di Milano	IT	0,1328	Yes
8	Nederlandse Organisatie Voor Toegepast Natuurwetenschappelijk Onderzoek TNO	NL	0,1310	Yes

Ran k	Participant name	Countr y	Betweenne s centrality score (normalised)	KIC partner (Yes/No)
9	Aalto-Korkeakoulusaatio	FI	0,1305	Yes
10	Kungliga Tekniska Hoegskolan	SE	0,1276	Yes
11	Institut National de Recherche en Informatique et Automatique	FR	0,1258	Yes
12	Teknologian Tutkimuskeskus VTT	FI	0,1238	No
13	Imperial College of Science, Technology and Medicine	UK	0,1127	Yes
14	Katholieke Universiteit Leuven	BE	0,1101	No
15	Karlsruher Institut fuer Technologie	DE	0,1019	Yes
Energy Research - EIT InnoEnergy				
1	Fraunhofer-Gesellschaft Zur Foerderung Der Angewandten Forschung E.V	DE	1	Yes
2	Fundacion Tecnalia Research & Innovation	ES	0,3597	No
3	Commissariat a l'Energie Atomique et aux Energies Alternatives	FR	0,2871	Yes
4	Danmarks Tekniske Universitet	DK	0,2165	No
5	Nederlandse Organisatie Voor Toegepast Natuurwetenschappelijk Onderzoek TNO	NL	0,2014	Yes
6	Karlsruher Institut Fuer Technologie	DE	0,1976	Yes
7	Universitaet Stuttgart	DE	0,1767	Yes
8	Stichting Energieonderzoek Centrum Nederland	NL	0,1614	No
9	Vlaamse Intelling Voor Technologisch Onderzoek N.V.	BE	0,1542	Yes

Rank	Participant name	Country	Betweenness centrality score (normalised)	KIC partner (Yes/No)
10	Consiglio Nazionale delle Ricerche	IT	0,1481	No
11	Imperial College of Science, Technology and Medicine	UK	0,1449	No
12	Kungliga Tekniska Hoegskolan	SE	0,1430	Yes
13	Acciona Infraestructuras S.A.	ES	0,1285	Yes
14	Ecole Polytechnique Federale de Lausanne	CH	0,1234	No
15	Centre National de la Recherche Scientifique	FR	0,1230	No
Environment and Climate Change Research - EIT Climate-KIC				
1	JRC -Joint Research Centre- European Commission	EU	1	No
2	Technische Universiteit Delft	NL	0,8877	Yes
3	Nederlandse Organisatie Voor Toegepast Natuurwetenschappelijk Onderzoek TNO	NL	0,8321	Yes
4	Wageningen University	NL	0,7611	Yes
5	Stichting Dienst Landbouwkundig Onderzoek	NL	0,7547	Yes
6	Consiglio Nazionale delle Ricerche	IT	0,5505	No
7	Fraunhofer-Gesellschaft Zur Foerderung Der Angewandten Forschung E.V	DE	0,4278	No
8	Alma Mater Studiorum – Universita’ di Bologna	IT	0,4078	Yes
9	Eidgenoessische Technische Hochschule Zurich	CH	0,3990	Yes
10	Agencia Estatal Consejo Superior de Investigaciones Cientificas	ES	0,3793	No
11	Stichting Deltares	NL	0,3773	Yes

Rank	Participant name	Country	Betweenness centrality score (normalised)	KIC partner (Yes/No)
12	Chalmers Tekniska Hogskola AB	SE	0,3747	Yes
13	Vlaamse Intelling Voor Technologisch Onderzoek N.V.	BE	0,3631	No
14	Imperial College of Science, Technology and Medicine	UK	0,3382	Yes
15	Natural Environment Research Council	UK	0,3302	No

Source: Technopolis Group, based on CORDA data

The most central actor of the energy research network is also *Fraunhofer*. The core of the network is also dominated by research centres and universities, despite the dominance in terms of participations of the private sector. Among the most central participants, only 40% of them are EIT InnoEnergy partners, which is the lowest compared to the other two research networks.

A similar pattern can be observed in the environment and climate change research network in terms of the core participation of universities and research centres. Two distinct features are also observed for this network: the centrality distribution is less skewed than for the other two networks, showing that the knowledge is more evenly distributed among participants (1); and among the top knowledge hubs, an important share are from the Netherlands, indicating a relative country dominance in the network (2).

Even though the share of private sector participation is high, private companies are not the most central actors in the networks (Table below).

Top 15 most central private organisations in FP7/H2020 research projects involving at least one KIC partner

Rank	Participant name	Country	Betweenness centrality score (normalised)	KIC partner (Yes/No)
ICT Research - EIT Digital				
6	ATOS Spain SA	ES	0,1340	Yes
31	Telefonica Investigacion y Desarrollo SA	ES	0,0626	No

Rank	Participant name	Country	Betweenness centrality score (normalised)	KIC partner (Yes/No)
37	Telecom Italia Spa	IT	0,0541	Yes
44	Stmicroelectronics Srl	IT	0,0477	Yes
55	Philips Electronics Nederland B.V.	NL	0,0431	Yes
66	Thales Communications & Security SAS	FR	0,0370	No
81	British Telecommunications Plc	UK	0,0298	Yes
94	Athens Technology Center SA	EL	0,0233	No
100	Robert Bosch GmbH	DE	0,0220	No
101	NEC Europe Ltd	UK	0,0219	No
111	Orange SA	FR	0,0201	No
122	Alcatel – Lucent Deutschland AG	DE	0,0172	No
123	IBM Research GmbH	CH	0,0170	No
126	Ericsson AB	SE	0,0168	Yes
144	Indra Sistemas SA	ES	0,0147	Yes
Energy Research - EIT InnoEnergy				
13	Acciona Infraestructuras SA	ES	0,1285	Yes
18	Electricite de France SA	FR	0,1155	Yes
31	Wirtschaft und Infrastruktur GmbH & Co Planungs KG	DE	0,0728	No
36	Siemens Aktiengesellschaft	DE	0,0606	No
43	Iberdrola Ingenieria y Construccion SA	ES	0,0533	No

Rank	Participant name	Country	Betweenness centrality score (normalised)	KIC partner (Yes/No)
50	Bios Bioenergiesysteme GmbH	AT	0,0441	No
53	Kema Netherland BV	NL	0,0412	No
57	D'Appolonia Spa	IT	0,0388	No
62	Enel Ingegneria e Innovazione Spa	IT	0,0329	No
65	RTE Reseau de Transport d'Electricite SA	FR	0,3011	No
67	E.On Technologies (Ratcliffe) Ltd	UK	0,0301	No
70	Elia System Operator	BE	0,0276	No
74	Enel Distribuzione Spa	IT	0,0245	No
75	Statoil Petroleum AS	NO	0,0243	No
80	Schneider Electric Industries SAS	FR	0,0213	Yes
Environment and Climate Change Research - EIT Climate-KIC				
42	Hydrologic Research BV	HR	0,1232	No
70	Acciona Infraestructuras SA	ES	0,0788	No
75	Veolia Environment Recherche et Innovation Snc	FR	0,0746	Yes
85	SERI - Nachhaltigkeitsforschungs und Kommunikations GmbH	AT	0,0672	No
86	Waterwatch BV	NL	0,0649	No
100	Electricite de France SA	FR	0,0513	No
109	Vermicon Aktiengesellschaft	DE	0,0467	No
145	INRA Trasnfert SA	FR	0,0337	No

Rank	Participant name	Country	Betweenness centrality score (normalised)	KIC partner (Yes/No)
165	Stiftelsen Norges Geotekniskeinstitutt	NO	0,0249	No
178	Uniresearch BV	NL	0,0228	No
198	Acteon Sarl	FR	0,0193	No
199	Amphos 21 Consulting SL	ES	0,0187	No
202	Provalor BV	NL	0,0177	No
221	Mostostal Warszawa SA	PL	0,0157	No
245	Bioazul	ES	0,0126	No

Source: Technopolis Group, based on CORDA data

Based on the assumption that success of innovation depends on the link between basic research, applied research and business/industry, this section aims to understand to what extent KIC partners in FP/H2020 link different types of organisations (university, industry, etc.) and bridge the flow of innovation ideas between them. The main hypothesis is that links between different types of organisations foster success of innovation.

Organisations from a diverse set of activity sectors participate(d) in FP7 and H2020. These sectors include:

- Higher education (HES);
- Research organisations (excluding education) (REC);
- Public body (excluding research and education) (PUB);
- Private for profit (excluding education) (PRC); and
- Others (OTH).

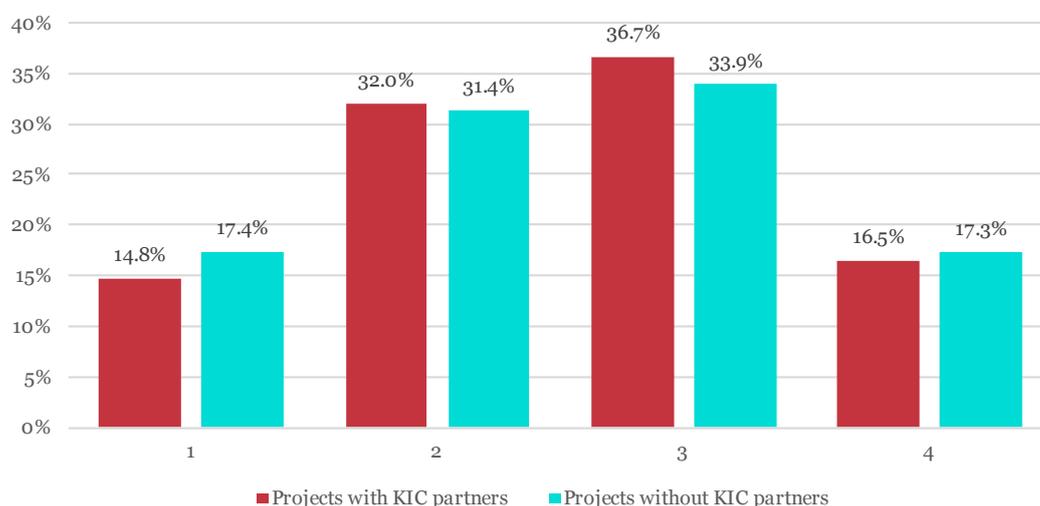
FP7 and H2020 aim to link these types of organisations with the idea that innovation is facilitated by the interactions taking place between the actors along the whole route from knowledge creation to the production of marketable inventions⁷³.

To characterise the extent to which research projects involving KIC partners successfully integrate different sectors of activity, and how their characteristics compare to projects in FP/H2020 not involving KIC partners, data on the sectoral affiliation of project participants in all periods were extracted from CORDA to count the number of distinct

⁷³ Etzkowitz, H. (2003). *Innovation in innovation: The triple helix of university-industry-government relations*. *Social Science Information*, 42(3), 293–337.

sectors per project in all projects involving at least one KIC partner and all other projects. The figure below presents the frequency distribution of projects according to their number of participating sectors in both FP7 and H2020 (for ease, we have aggregated all periods).

Frequency distribution of projects, all and those involving at least one KIC partner, by number of sectors



Source: Technopolis Group, based on CORDA data

The results show that a higher number of projects without KIC partners (than with) do not have any intersectoral collaboration. In contrast, a (slightly) larger share of FP7/H2020 projects with KIC partners involve 2 or 3 activity sectors than those without KIC partners.

The extent to which organisations agglomerate according to a shared characteristic (i.e. their corresponding sector of activity) in the co-participation network of FP7/H2020 reflects, to some degree, the ease with which information can flow between sectors. In a network where organisations group almost exclusively with actors from the same sector with a low density of ties between sectors (i.e. a homophilic network), information produced in any one sector can reach an actor outside that sector with difficulty. Whereas in a network where organisations do not seem to cluster preferentially with actors from the same sector (i.e. a heterophilic network), information produced in any one sector can more easily reach an actor outside the given sector. To understand the extent in which information has the potential to flow easily in a network, we have calculated the share of homophilic links in each of the networks. An homophilic link is one that takes place between organisations collaborating based on a shared interest, which in this case is their respective sector of activity. The results are presented in the following table.

Share of homophilic links in all links per programme/research network for intersectoral networking

Programme/Network	FP7 2007-2010 (before KICs)	FP7 2011-2013 (after KICs)	H2020 (2014-2015)	Change
ICT research (all)	5%	12%	36%	629%

ICT research involving KIC partners	5%	12%	37%	640%
Energy research (all)	36%	30%	35%	-3%
Energy research involving KIC partners	32%	32%	33%	4%
Environment and climate change research (all)	36%	36%	33%	-11%
Environment and climate change research involving KIC partners	39%	36%	32%	-17%

Source: Technopolis Group, based on CORDA data

The results show that there are no marked differences in terms of intersectoral networking between the research networks of KIC partners and those of the FP7/H2020 programmes overall. Inter-sectoral networking seems to be decreasing in ICT research over time, while it increases in environment and climate change research and remains relatively stable in energy research.

The table below compares the observed occurrences of each pair of sectors for all heterophilic pairs within the research networks of KIC partners. The results show that networking affinity varies slightly depending on the research programme. Most of the research pairs happen between Higher Education and the private sector, and between the private sector and research organisations in ICT research and energy research. In contrast, for environment and climate change research most of the research pairs happen between higher education and research organisations., even if the importance of this type of collaborations has been decreasing over time in favour of research collaboration with the private sector. On average, collaborations between the private sector, research organisations and higher education account for more than 80% of all links in the FP/H2020 research networks of KIC partners. This contrasts with the findings of a recent study on network analysis for FP7 that found that the higher education sector, research organisations and public bodies dominated all co-participation heterophilic ties between themselves in the FP7 network, having the strongest ratios among all pairs⁷⁴.

There are however, two exceptions to this pattern. The research links between the private sector and Other type of organisations, and between the private sector and public bodies, have an increased importance in energy research networks over time; while public bodies and research organisations are the fourth most frequent type of link in environment and climate change research networks of KIC partners in H2020.

The importance of the private sector in KIC partners' research networks is not surprising since they participate much more frequently on a recurring basis in energy research and ICT research. In contrast, for environment and climate change research, higher education represents the largest share of participations (32% of total), followed by research organisations (28%) and the private for profit sector (27%).

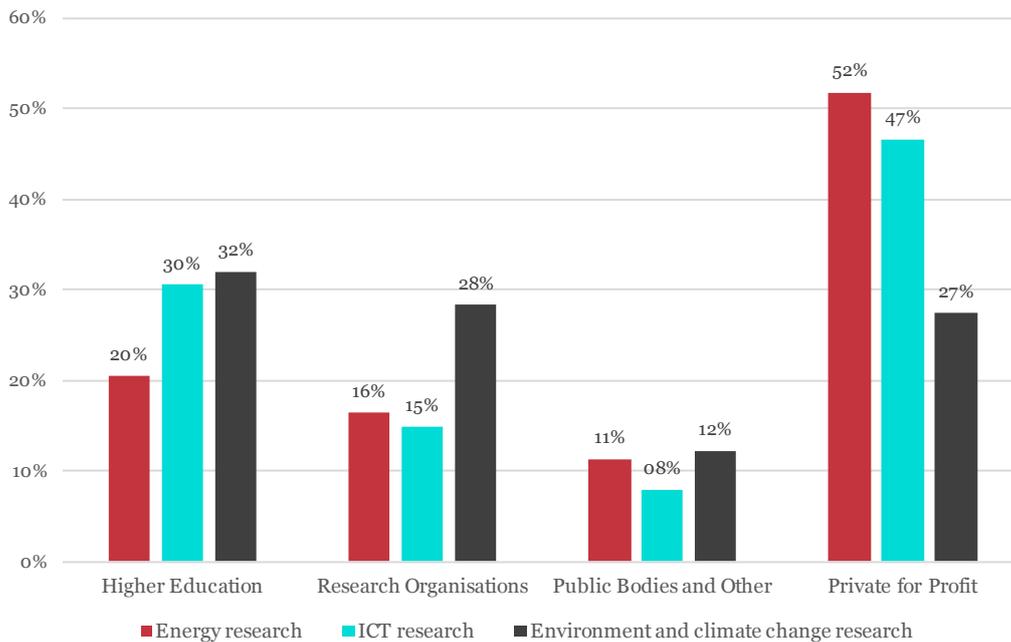
⁷⁴ European Commission (2015), *Study on Network Analysis of the 7th Framework Programme Participation. Final Report*, Directorate General for Research and Innovation, available at: https://ec.europa.eu/research/evaluations/pdf/archive/other_reports_studies_and_documents/network_analysis_of_fp7_participation_-_final_report.pdf

Observed occurrences (share of total) of heterophilic pairs between sectors in KIC partners' research networks

Pairs		FP7 2007-2010 (before KICs)			FP7 2011-2013 (after KICs)			H2020 (2014-2015)		
		ICT research	Energy research	Environment and climate change research	ICT research	Energy research	Environment and climate change research	ICT research	Energy research	Environment and climate change research
Higher Education	Private	36,9%	33,0%	13,0%	28,5%	32,1%	18,6%	38,8%	22,4%	16,6%
Private	Research Organisations	17,4%	31,3%	12,5%	15,5%	30,9%	19,1%	26,3%	19,2%	16,5%
Higher Education	Research Organisations	33,6%	20,2%	53,4%	43,9%	23,8%	41,5%	14,5%	8,9%	19,3%
Others	Private	1,9%	3,5%	1,3%	1,3%	3,1%	1,5%	5,3%	13,2%	7,2%
Private	Public Body	2,0%	3,2%	1,5%	1,1%	2,1%	3,0%	4,2%	11,0%	6,9%
Higher Education	Others	1,8%	2,2%	2,0%	2,7%	1,8%	2,1%	3,4%	4,2%	5,6%
Others	Research Organisations	1,3%	1,7%	2,0%	1,6%	2,5%	1,8%	2,6%	6,6%	7,2%
Higher Education	Public Body	3,1%	2,0%	6,8%	3,2%	1,9%	5,9%	2,5%	3,0%	6,4%
Public Body	Research Organisations	1,6%	2,9%	7,2%	1,8%	1,7%	6,1%	1,9%	5,9%	10,2%
Others	Public Body	0,2%	0,1%	0,4%	0,4%	0,2%	0,5%	0,5%	5,6%	4,2%

Source: Technopolis Group, based on CORDA data

Share of participations by activity sector, period and specific programmes



Source: Technopolis Group, based on CORDA data

Observed network trends

The number of pairs of distinct organisations collaborating on the same project, which are referred to as dyads, was also analysed to address the question of new collaborations made across periods. As was the case for the count of organisations, dyads were counted only once even if pairs of organisations collaborated on more than one project, basing the analysis on the presence of absence of cooperation between organisations.

Network density indicators were used to examine periods and programmes. This indicator considers the number of potential collaborations in a network (i.e. theoretical maximum number of dyads if all participants were directly linked together), using this value to normalise the number of actual collaboration in the network (i.e. actual dyads). This indicator helps to understand if the number of new collaboration pairs has grown as fast as the number of new participants (i.e. organisations). This indicator is not totally scale-independent, as it is easier to achieve high network densities for low numbers of participants in networks because connecting with participants is more and more difficult as the number of organisations increases. However, it remains helpful for cross-network analyses of network density as it is much less scale-dependent than the number of dyads.

A compilation of CORDA data is presented in the table below. It presents the total number of single organisations and dyads by programme and period, and distinguishing between all participants funded and only for those projects where at least one participant was a KIC partner. The data shows that **KIC partners represent broadly the same share of total participants in FP7 and in H2020 before and after the establishment of the KICs**. The number of dyads involving at least one KIC partner as a share of total has also decreased over time for all relevant calls. This is true for all projects and for projects involving at least one KIC partner, except for ICT research, where the share of dyads involving at least one KIC partner has increased from 29% in FP7 2007-2010 to 34% in H2020.

Number of organisations and dyads per framework period and programme, all participants and networks involving at least one KIC partner

	ICT research						Energy research						Environment and Climate Change research					
	FP7 2007-2010 (before KICs)		FP7 2011-2013 (after KICs)		H2020 (2014-2015)		FP7 2007-2010 (before KICs)		FP7 2011-2013 (after KICs)		H2020 (2014-2015)		FP7 2007-2010 (before KICs)		FP7 2011-2013 (after KICs)		H2020 (2014-2015)	
	All	Involving KIC partners	All	Involving KIC partners	All	Involving KIC partners	All	Involving KIC partners	All	Involving KIC partners	All	Involving KIC partners	All	Involving KIC partners	All	Involving KIC partners	All	Involving KIC partners
Total Organisations	3323	2542	3684	2674	1936	1223	1342	797	1081	822	1863	983	1670	1012	1871	1134	1349	612
Organisations per year	831	636	1228	891	968	612	336	199	360	274	932	492	418	253	624	378	675	306
Share of KIC partners	2%	3%	2%	2%	3%	5%	3%	4%	4%	5%	2%	4%	2%	3%	2%	3%	2%	4%
Dyads	50874	42230	51713	42177	15181	9887	13034	8243	12362	10239	17680	10781	25786	17292	26187	18462	17736	8892
Dyads per year	12719	10558	17238	14059	7591	4944	3259	2061	4121	3413	8840	5391	6447	4323	8729	6154	8868	4446
Share of dyads involving at least one KIC partner	24%	29%	24%	28%	20%	34%	9%	18%	18%	22%	3%	16%	12%	18%	12%	17%	7%	3%
Density	0,92%	1,31%	0,76%	1,18%	0,81%	1,32%	1,45%	2,60%	2,12%	3,03%	1,02%	2,23%	1,85%	3,38%	1,50%	2,87%	1,95%	4,76%

Source: Technopolis Group, based on CORDA data

The network density of all relevant programmes has been relatively steady across periods, except for the network of projects involving at least one KIC partner in environment and climate change research that has increased from 3.4% in FP7 (2007-2010) to 4.8% in H2020. This reflects that the number of new collaboration pairs has grown as fast as the number of new participants (i.e. organisations).

Among the work programmes analysed, FP7 ICT research in the period 2011-2013 is the one that fostered the most inter-organisational collaboration with an average of 14,059 dyads formed per year and 891 participating organisations. The other two thematic areas yield a different finding, where the correlation between number of organisations and dyads is not as strong, indicating more diversified collaboration patterns (relative to ICT research). For instance, energy research yields a relatively lower number of dyads per year and organisations per year. While environment and climate change research show a greater number of dyads with a relatively lower number of organisations. This is also reflected in the network density indicators, which are higher for environment research.

To address whether new collaborations were created, as opposed to only increasing the number of collaborations, one must compare organisations and dyads that took part and already existed (or not) in FP7 and H2020 projects in the different periods. This analysis is detailed in the table below. It shows that KIC partners have had a continuous and sustained participation in FP7 and H2020. About 29% of KIC partners in energy research networks were new to FP7 after the establishment of the KICs (2011-2013); compared to 21% new KIC partners in environment and climate change research and only 10% (new to FP7 in the period 2011-2013) in ICT research. Most importantly, KIC partners have been successful in fostering cooperation with new organisations in FP7 and H2020 funded research. Indeed, 88% of all inter-organisational collaboration pairs involving at least one KIC partner in energy research were new after the establishment of the KICs in FP7; and 89% of total were also new in H2020 relative to FP7. This is also true for environment and climate change research (78% of pairs were new in FP7 before and after the KICs vs. 81% between FP7 and H2020), and ICT research (76% and 77% respectively). This estimate is a floor value because organisations are considered as one. However, conceptually, large organisations are not homogenous and are themselves composed of individuals with little or no connection between each other. For example, if Fraunhofer and TNO collaborated in energy research in both FP7 periods (before and after the KICs), then their relationship would not be considered as a new dyad. However, given that these organisations are so large it is likely that at the individual researcher level, the collaborations could in fact be new.

It is also important to note that while many new partner pairs appeared across periods, the overall turnover was also very high. Indeed, 91% of all dyads in energy research (87% in environment and climate change research, and 86% in ICT research) were lost during the FP7 transition before and after the KICs. Dyads involving at least 1 KIC partner appear to be more 'resilient' to disintegration: these tend to disappear less on average than all dyads (involving or not a KIC partner). Most interesting to highlight is that the turnover of all participants across periods is also high (see Rows "Vanishing entities" in the table below), except for KIC partners, whose turnover is considerably lower in FP7. Indeed, only 17% of KIC partners in energy research, 13% in environment and climate change research and 10% of KIC partners in ICT research vanished in FP7 (before and after the KICs). However, this turnover among KIC partners increased considerably between the FP7 after KICs period and H2020, and particularly in environment and climate change research, where 56% of KIC partners vanished from the

Comparison between the number of organisations and dyads in FP7 and H2020 research projects involving at least one KIC partner

	ICT research				Energy research				Environment and Climate Change research			
	All in KIC networks	KIC beneficiaries	All dyads in KICs networks	Dyads with least one KIC beneficiary	All in KIC networks	KIC beneficiaries	All dyads in KICs networks	Dyads with least one KIC beneficiary	All in KIC networks	KIC beneficiaries	All dyads in KICs networks	Dyads with least one KIC beneficiary
Status FP7 pre-KIC to FP7 post-KIC												
New	1663	7	36440	8400	586	12	9448	1888	738	7	16289	2425
Vanishing	1531	7	36493	8609	561	6	7492	1168	616	4	15119	2292
Present in both	1011	61	5737	2664	236	29	751	251	392	27	2173	668
New entity in FP7 post-KIC (%)	62%	10%	86%	76%	71%	29%	93%	88%	65%	21%	88%	78%
Continued entity in FP7 post-KIC (%)	38%	90%	14%	24%	29%	71%	7%	12%	35%	79%	12%	22%
Vanishing entity from FP7 pre-KIC (%)	60%	10%	86%	76%	70%	17%	91%	82%	61%	13%	87%	77%
Status FP7 post-KIC to H2020												
New	743	5	8724	2408	794	10	10284	1809	394	7	8040	1067
Vanishing	2194	11	41014	10329	633	15	9742	1926	912	19	17610	2832
Present in both	480	54	1163	735	189	26	497	213	218	15	852	255
New entity in H2020 (%)	61%	8%	88%	77%	81%	28%	95%	89%	64%	32%	90%	81%
Continued entity in H2020 (%)	39%	92%	12%	23%	19%	72%	5%	11%	36%	68%	10%	19%
Vanishing entity from FP7 post-KIC (%)	82%	17%	97%	93%	77%	37%	95%	90%	81%	56%	95%	92%

Source: Technopolis Group, based on CODA data

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