European Commission

JRC TECHNICAL REPORTS

# Market Creating Innovations in the EU Framework Programme

*Methodology behind the Innovation Radar's Market Creation Potential Indicator*


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Editor: Eoghan O'Neill

2020

EUR 30273 EN

Joint Research Centre

**EU Science Hub**
https://ec.europa.eu/jrc

JRC121066
EUR 30273 EN

PDF ISBN 978-92-76-19938-0 ISSN 1831-9424 doi:10.2760/077836

Luxembourg: Publications Office of the European Union, 2020



How to cite this report: Daniel Nepelski. Market Creating Innovations in the EU Framework Programme. Methodology behind the Innovation Radar's Market Creation Potential Indicator. Eoghan O'Neill (ed.), EUR 30273 EN, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-19938-0, doi:10.2760/077836, JRC121066

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## Acknowledgments

This report is prepared in the context of the three-year research project on Research on Innovation, Start-up Europe and Standardisation (RISES), jointly launched in 2017 by JRC and DG CONNECT of the European Commission.

The analysis in Section 6 and 7 is based on contributions by Uroš Kostić, DG JRC, Ispra.

# Foreword

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

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

The current report belongs to the series of *Advancing the Innovation Radar* studies. It describes the construction methodology of a Market Creation Potential Indicator, a new Innovation Radar indicator. Previous reports in this series described the following steps of developing and applying the Innovation Radar as a tool for monitoring and assessing innovation in EU funded research and innovation programmes:

- Identifying the maturity of innovations (2018)
- Validation of the Innovation Radar assessment framework (2018)
- Enhancing Innovation Radar data with financial, patent and Venture Capital data (2019)
- The Role of Project Coordinators in EC FP Projects (2020)

This research builds on the work and expertise gathered within the European Policies for the Digital Shift EURIPIDIS project which produced the following reports relating to defining the Innovation Radar methodology and leveraging its intelligence:

- Innovation Radar methodology and frameworks for assessing innovation potential and innovator capacity (2015)
- The role of universities in collaborative research (2016)

## Executive summary

The European Commission's (EC) Framework Programme (FP) constitutes an important share of R&D expenditures in Europe. Many EC-funded research projects produce cutting-edge technologies. In order to get a better understanding of the potential for the project's results to succeed in the market, the Innovation Radar (IR), a joint DG CNECT-JRC initiative, was launched in 2014 to identify high-potential innovations and innovators in EC-funded research projects. Its objective is to maximise the outcomes of public money spent on research. Today, the IR provides up-to-date intelligence on the innovative output of EU-funded research projects and guidance on how to leverage this by suggesting a range of targeted actions that can help these innovations to fulfil their potential in the market place.

Recognizing the fact that the support of the public sector of research and innovation lays the foundations for new technologies, industries and markets, this report presents the Market Creation Potential Indicator (MCPI) and applies it to the innovations coming out of the EC-funded FP research projects. This way, it contributes to the creation of a toolset to measure and assess the market-creating effects of public R&I policies.

The results of applying the MCPI to FP innovations identified by the Innovation Radar show that:

- **35% of FP innovations have Market Creation Potential**. They represent new or significantly improved products, processes or services targeting emerging or not yet existing markets and new group of customers. 14% of innovations with Market Creation Potential show high or very high levels of novelty.
- **SMEs have the highest share of market creating innovations**. This is in line with earlier observations suggesting that small, resource-constrained companies that often struggle to to compete with larger rivals firms, choose instead to target unserved market niches. This way, they expand the scope of existing - or create new - markets. The second group in the ranking are **research organizations**. 35% of innovations to which they contribute have Market Creation Potential.
- FP participants from **Member States who joined the EU since 2004** have a higher than average share of innovations with Market Creation Potential among innovations they contribute to, compared to pre-2004 member states.
- Innovations in **FET-Open&Proactive** projects score higher on the MCPI than innovations in projects funded under other Strategic Objectives of the FP. Targeting new customers in existing markets, they can be considered as disruptive innovations. However, a relative lack of plans for commercial exploitation of innovations in FET-Open&Proactive projects is a contributing factor as to why their Market Creation Potential may in some cases remain unexploited.
- Innovations in **eHealth or Medical diagnostics** have the highest MCPI score.
- Other **high-tech** domains where FP innovations demonstrate Market Creation Potential include Robotics, AI, Micro- & nanoelectronics, Biotech, Advanced materials, Energy storage & management and Network architecture.

The current report focuses on the potential for public R&I policies to deliver economic effects by creating new markets. It provides a new first-of-a-kind indicator that is expected to identify innovations well placed to deliver such effects. By casting light on the Market Creation Potential of FP project outputs across multiple technological domains, the results are expected to contribute to policy discussion on optimal design of large collaborative projects. The MCPI also offers a novel way for stakeholders in the public and private spheres to navigate the outputs of the EU's Framework Programme and identify opportunities it presents to create new markets.

# 1. Introduction

Private levels of investments in research and innovation (R&I) activities are frequently lower than socially optimal due to market failures including limited appropriability of the results or insufficient supply of capital for risky projects (Martin & Scott, 2000). Public support for R&I has been seen as a remedy for market failures. Recently, however, it has been recognised that public policy does not only fix markets, but often creates them (Mazzucato, 2013, 2016; NIST, 2019). For example, Silicon Valley, the cradle of digital innovation, benefited from considerable public support. In Europe, since its launch in the 80s, the Framework Programme (FP) for R&I extended its scope from supporting pre-competitive research to cover the entire innovation value chain from the lab to market. This way, the FP plays an important role in transforming the results of basic research into new technologies that form new industries and markets. By taking the lead role in providing 'patient capital' and orchestrating the innovation ecosystems, the public sector takes risks and roles that private actors are not able to assume. Efforts of the public sector to stimulate and direct scientific and technological trajectories underpins a vision to create new industries and markets motivate investments.

This new perspective of the role of the public sector in the R&I process calls for ways of assessing public policies that go beyond the cost/benefit analysis and the assessment of crowding in or out private investments by public subsidies that stem directly from the market failure perspective (Mazzucato, 2016). It requires a new toolset to measure and assess the market-creating effect of public R&I policies.

This report describes the development of a new indicator assessing Market Creation Potential of innovations developed within the projects funded by the EU's Framework Programmes. The new Market Creation Potential Indicator (MCPI) is then used to evaluate Market Creation Potential of FP innovations identified by the Innovation Radar (see Box 1).

The current attempt to capture an innovation's potential to expand the market scope rests on two main concepts of market creating innovations. The first one is disruptive innovation (Christensen, 1997). The second one is blue ocean innovation (Kim & Mauborgne, 1999, 2004). A newcomer introduces a disruptive innovation in a market niche that incumbent firms do not serve. The new product is typically of inferior quality and the challenger offers it at a lower price compared to the existing products. By attracting a group of customers that were previously excluded from the market, the disruptive innovation extends the market scope. In contrast to a disruptive innovation, a blue ocean innovation does not displace an existing product. Rather than targeting customers who accept inferior quality, it combines features that were not present before. This way, the innovation creates new demand and defines a new market.

Building on the notions of disruptive and blue ocean innovation, the current methodology assumes that for an innovation to have a Market Creation Potential it has to fulfil three conditions: First, the market targeted by this innovation is emerging or not yet existing, but there are chances that an innovation can create it. Second, organizations developing such innovations need to have plans to exploit them commercially. Third, they need to target new customers. Innovations identified by the Innovation Radar that fulfil these conditions are subsequently assessed with respect to the level of their Market Creation Potential.

Using a sample of 6352 innovations identified by the Innovation Radar across 1704 FP projects in the period January 2016 and March 2020, the current report shows that 35% of the innovations have some potential to create new markets or extend the scope of the existing ones. Fourteen percent of innovations have very high or high Market Creation Potential. In other words, these innovations are a new or significantly improved product, process or service of high novelty level that are targeting emerging or not yet existing markets and new customers.

Overall, this report aims at illustrating the level and character of creating and/or increasing the scope of the existing markets through publically funded research projects. By recognising the contribution of the public sector as a lead investor providing funding to uncertain projects, it is expected to help acknowledge the contribution of public support to creating new markets.

The current report is structured as follows: Section 2 introduces the concept of market creating innovations. Section 3 presents the Market Creation Potential Indicator framework. Section 4 describes the Innovation Radar data on which the new indicator was applied. Section 5 presents the analysis of Market Creation Potential of FP innovations and key innovators behind them. Section 6 reports the topic modelling analysis classifying the FP market creating innovations into 10 groups by their technological and market domain. Section 7 provides one example of innovations with Market Creation Potential for each of the 10 topics. Section 8 presents the report's conclusions.

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

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

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

Innovation surveys, such as the IRS, suffer from the abundance of scattered information based on responses to individual questions. Simple indicators do not capture the complex reality of the dynamics innovation processes and the linkages between the actors. They have limited application in the policy making process. One way of addressing this limitation is to develop complex indicators (Arundel, 2007; Arundel & Hollanders, 2005). Such indicators can reveal significantly more about innovation activities, models and strategies than simple indicators relying on the frequency of responses to single questions (OECD, 2009). Therefore, the IR methodology includes the Innovation Potential and Innovator Capacity Assessment Frameworks (De Prato, et al., 2015a). Whereas the first one makes use of composite indicators to capture the complexity of innovation development and commercialisation process, the second one profiles the innovators behind these innovations. Another IR indicator categorises market maturity of innovations (Nepelski, Van Roy, & O'Neill, 2018). The current report presents the methodology of constructing the Market Creation Potential Indicator.

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

# 2. Market creating innovations

An innovator has a choice between introducing a product that will compete with existing offerings or address an unserved market niche (Abernathy & Clark, 1985). These strategies define the two main concepts of market creating innovations. One is disruptive innovation (Christensen, 1997). Another one is blue ocean innovation (Kim & Mauborgne, 1999, 2004). The current attempt to develop an indicator aiming at assessing Market Creation Potential of innovations in the EU Framework Programme builds on these two notions.

**Disruptive innovation**

The idea of disruptive innovation was first presented by Christensen (1997). Disruptive innovation is typically introduced by a small, resource-constrained company that is not able to directly challenge larger, established rivals. The challenger starts by serving a market niche with an inferior product compared to existing offerings. Sold at a lower price, it attracts customers that were not served by the incumbents, because the existing products were too expensive for them. Having the opportunity to buy a product at a lower price, the new customers are also ready to compromise on quality. As the newcomer's position strengthens, it further improves its product. This way it becomes a close substitute of existing offerings. By eroding the incumbents' market share, the new entrant crowds the incumbents out of the market.

Disruptive innovations may be introduced in any industry. The most recent wave of digital innovations includes a number of examples of digital products that displaced their analogue counterparts. Digital photography, digital media and VoIP calls and messaging are among the key examples of products and technologies that disrupted markets that were static before their emergence. In most of the cases, incumbent firms were challenged by start-ups that introduced inferior products compared to existing ones. Over time, however, the newcomers displaced the existing firms or considerably eroded their market share.

Considering the case of digital innovations, one can observe that the effects of their introduction was much larger than displacing existing products and disrupting existing markets. In a number of cases, digital disruptive innovations extended the scope of the traditional markets to levels that were impossible to achieve with products based on analogue technologies. The impact of the Internet and its disruptive effect on the broadly understood information and communication markets is illustrative.

**Blue ocean innovation**

In contrast to disruptive innovation, blue ocean innovation does not displace existing products or services but rather complements them (Kim & Mauborgne, 1999, 2004). By combining a new set of product features, a firm introducing a blue ocean innovation redefines a customer problem and addresses untapped demand. Innovators following a blue ocean strategy tend to look for a new category of products while not maintaining linkages with existing markets. This way, their innovations create new markets or market segments.

Cutting-edge technology is not a defining characteristic of blue ocean innovations. In many cases, the underlying technology of blue ocean innovations existed before the innovation was introduced to the market. This type of innovation is also not a domain of certain industries. Kim et al. (2004) show that companies in various types of sectors, ranging from ICT through to automotive (e.g. Ford Model T, GM's car for every purse and purpose' or Chrysler minivan) and the entertainment sectors (e.g. AMC multi- and megaplex or Cirque du Soleil) were successful in creating new markets with blue ocean innovations. The main feature of such innovations is that they depart from trading off between quality and cost. Rather than making a choice between quality and price, blue ocean innovators differentiate their offerings from the existing ones and seek ways to reduce the cost at the same time. By tapping on unserved demand, they create a new uncontested market and make competition irrelevant.

Again, the wave of digital innovations provides an abundance of examples of digital firms and products that opened up markets that did not exist before. The unique features of digitally enabled products allowed firms to enter into market niches without facing competition from any existing firms. For example, although companies such as eBay or Amazon had their analogue counterparts, they were hardly contested by them. Companies in the traditional industries and markets were not able to reply to the unique combination of innovative features of digitally enabled products and services.

# 3. Market Creation Potential Indicator framework

Learning about the characteristics of market creating innovations and the conditions in which they emerge requires formal ways of capturing and analysing them. Although the notion of market creating innovations has been introduced over two decades ago, there are not many empirical attempts to assess Market Creation Potential of innovations. Among few examples is the analysis of Govindarajan et al. (2006) who developed a measurement scale for the disruptiveness of innovations and use it to analyse innovations identified in a survey of 38 Fortune 500 corporations. Similarly, a study of the content of Horizon 2020 project proposals includes, among others, an innovation's impact on market scope (Christoph, Wolfgang, & Distel, 2017). To determine the Market Creation Potential level of innovations it performs content analysis of the project proposals.

The current approach to determine the level of Market Creation Potential of innovations builds on the notions of disruptive and blue ocean innovation discussed in Section 2. It proposes a Market Creation Potential Indicator (MCPI) that is constructed using questions from the Innovation Radar Survey. Annex 9 presents the list of the IRS questions and replies that were selected for the construction of the MCPI. Table 1 illustrates the decision rules used in the Market Creation Potential Indicator framework.

According to Table 1, in order to be considered to have any Market Creation Potential, an innovation has to fulfil three conditions:

1. The market targeted by this innovation is emerging or there are chances that an innovation can create it,
2. Organizations developing them need to have plans to exploit it commercially,
3. An innovation needs to target a new group of customers.[1]

The Market Creation Potential of innovations that fulfil the first three conditions is subsequently assessed based on their innovation level and type. The innovation level ranges from minor improvements over existing products to very innovative offerings. The type of innovation filter differentiates between new and improved offerings and includes products, processes and services. Depending on these two criteria, an innovation is assigned one out of five Market Creation Potential levels ranging from one (minor) to five (very high).

[1] The question on what group of customers an innovation is targeting is available from April 2018 only.

**Table 1: Market Creation Potential Indicator decision rules**

| What is the maturity of the market targeted by the innovation? | How will the innovation be exploited? | Who will use the innovation? | What is the level of innovation? | What is the type of innovation? | Market Creation Potential level |
|---|---|---|---|---|---|
| Emerging or there are chances that an innovation can create it. | The innovation will be introduced as new to the market. | New customers | Very innovative | New product, process or service | (5) Very high |
| | | | | Significantly improved product, process or service | (4) High |
| | | | Obviously innovative and easily appreciated advantages to customer | New product, process or service | |
| | | | | Significantly improved product, process or service | (3) Noteworthy |
| | | | Innovative but could be difficult to convert customers | New product, process or service | |
| | | | | Significantly improved product, process or service | (2) Moderate |
| | | | Minor improvements over existing products | New or significantly improved | (1) Minor |

Source: DG CNECT and DG JRC.

Note: The table presents the decision rules used to determine the level of Market Creation Potential of innovations identified by the Innovation Radar. The framework is based on the Innovation Radar Survey. Annex 9 presents the list of the IRS questions and replies that were selected for the construction of the MCPI.

# 4. Data

The Innovation Radar initiative is an ongoing process that was launched by the European Commission in 2014 (De Prato, Nepelski, & Piroli, 2015b). The data collection started in May 2014. The data used in the current report was collected during periodic reviews of 1704 FP7 and H2020 projects between January 2016 and March 2020 (see Table 2).

According to Table 2, the sample includes 6352 unique innovations co-developed by 3263 organizations. Out of the innovations, 2228 show some level of Market Creation Potential as defined in Section 3.

**Table 2: Number of projects, innovations and innovators reviewed by Innovation Radar**

| | |
|---|---|
| Data collection period | January 2016 and March 2020 |
| Number of reviewed projects | 1704 |
| Number of identified innovations | 6352 |
| Number of innovations with Market Creation Potential level | 2228 |
| Number of distinct key innovators | 3263 |
| SMEs | 1,368 |
| Large firms | 797 |
| Universities | 521 |
| Research organisations | 395 |
| Other entities | 110 |
| Public bodes | 88 |
| Source: Innovation Radar; Calculations: JRC. | |

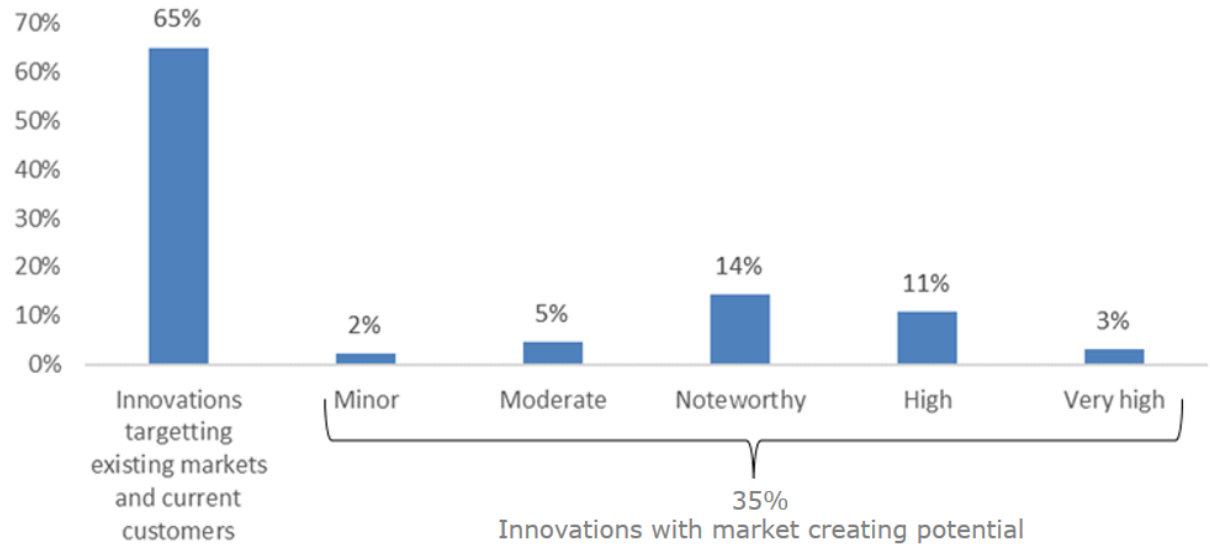
# 5. Market Creation Potential of FP innovations and key innovators behind them

The current section starts by looking at the innovations identified by the Innovation Radar through the perspective of their market creation potential as defined in Section 3. In addition, it provides information about the country and type of project participants defined as key organizations in bringing these innovations to the market.

## 5.1. FP innovations with Market Creation Potential

Figure 1 presents the main results of the analysis of the FP innovations with respect to their Market Creation Potential. Thirty five percent of innovations identified by the Innovation Radar show some level of Market Creation Potential as defined in Section 3. In other words, this group of innovations represent new or significantly improved products, processes or services that target emerging or not yet existing markets and new group of customers. Fourteen percent of all innovations have very high or high Market Creation Potential, which means that in addition to targeting non-existing or emerging markets, they show very high levels of novelty.

**Figure 1: Distribution of innovations by their Market Creation Potential**




Source: Innovation Radar; Calculations: JRC.

Note: The figure presents the distribution of innovations by their Market Creation Potential levels as defined in Section 3.

Total number of innovations assessed using the MCP framework: 6352. Total number of innovations with Market Creation Potential: 2228.

## 5.2. Market Creation Potential of innovations by FP projects: Focus on FET

Innovations analysed in the current report originate from over 1700 EU-funded research and innovation projects. These projects were launched under nearly 400 different calls with various Strategic Objectives (SOs) of the 7$^{th}$ and 8$^{th}$ Framework Programme. The topics of the SOs range from cybersecurity to digital technologies for wellbeing and health. The pool of SOs includes also Future and Emerging Technologies (FET) actions, which are expected to initiate radically new lines of technology through unexplored collaborations

between advanced multidisciplinary science and cutting-edge engineering.[2] FET-Open and FET-Proactive actions now form the European Innovation Council (EIC) Pathfinder pilot. This pilot aims to support top-class innovators, start-ups, small companies and researchers with bright ideas that are radically different from existing products, services or business models, are highly risky and have the potential to scale up internationally.[3]

Because of the heterogeneity of SOs to which the innovations identified by the Innovation Radar belong to, this section analyses Market Creation Potential of innovatons by SO groupings. Given the market-creation aim of the FET-Open and FET-Proactive actions, the following analysis distinguishes between two groups:

- FET-Open&Proactive group (including FET-Open and FET-Proactive actions);
- Other SO group (all remaning FP7 and H2020 Strategic Objectives whose projects were scanned by the Innovation Radar).

Table 3 presents the distribution of projects and innovations by SOs. Nearly 96% of the projects scanned by the Innovation Radar belong to the 'Other SO' group. The remaining 4% are projects launched under the FET-Open and FET-Proactive actions.

Regarding the number of innovations, FET-Open and -Proactive projects account for altogether 14,6% of all innovations identified by the Innovation Radar and 11,09% of innovations with Market Creation Potential.

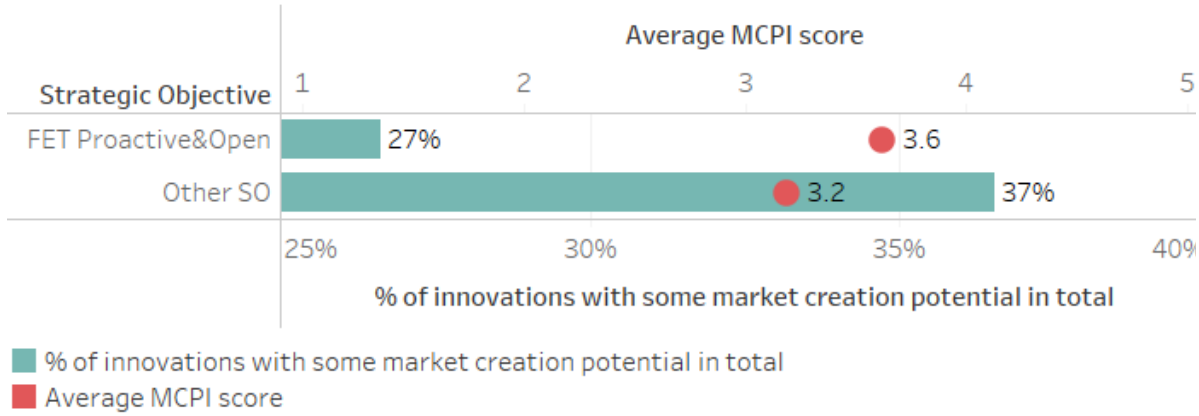
**Table 3: Distribution of projects and innovations by Strategic Objectives**

| **Strategic Objective** | **% of projects** | **% of all innovations** | **% of innovations with Market Creation Potential** |
|---|---|---|---|
| FET Proactive&Open | 4,2% | 14,6% | 11,09% |
| Other SO | 95,8% | 85,4% | 88,91% |
| **Total** | **100%** | **100%** | **100%** |
| Source: Innovation Radar; Calculations: JRC.<br>Total number of Strategic Objectives: 429. Total number of innovations (with Market Creation Potential): 6352 (2228). | | | |

Figure 2 presents the shares of innovations with Market Creation Potential and average MCPI score for innovations in FET-Open and FET-Proactive and 'other SO' projects. According to the figure, 27% of innovations identified in FET-Open&Proactive projects have some Market Creation Potential. The same value for innovations in projects belonging to other SOs is 37%. Regarding the score of MCPI, the opposite trend can be observed. Innovations in FET-Open&Proactive projects score on average 3.6. Innovations in other SOs projects score 3.2. According to a T-test of the mean scores in both gropus, the difference in innovations' MCPI score between FET-Open&Proactive and Other SOs projects is statistically significant. In order to understand the drivers of the differences in the share of innovations with Market Creation Potential and average MCPI score by Strategic Objective group, the reply frequencies to the questions underlying the MCPI are analysed below.

[2] See: https://ec.europa.eu/programmes/horizon2020/en/h2020-section/future-and-emerging-technologies
[3] See: https://ec.europa.eu/programmes/horizon2020/en/h2020-section/european-innovation-council-eic-pilot

**Figure 2: The share of innovations with Market Creation Potential and average MCPI score by Strategic Objective**




Source: Innovation Radar; Calculations: JRC.

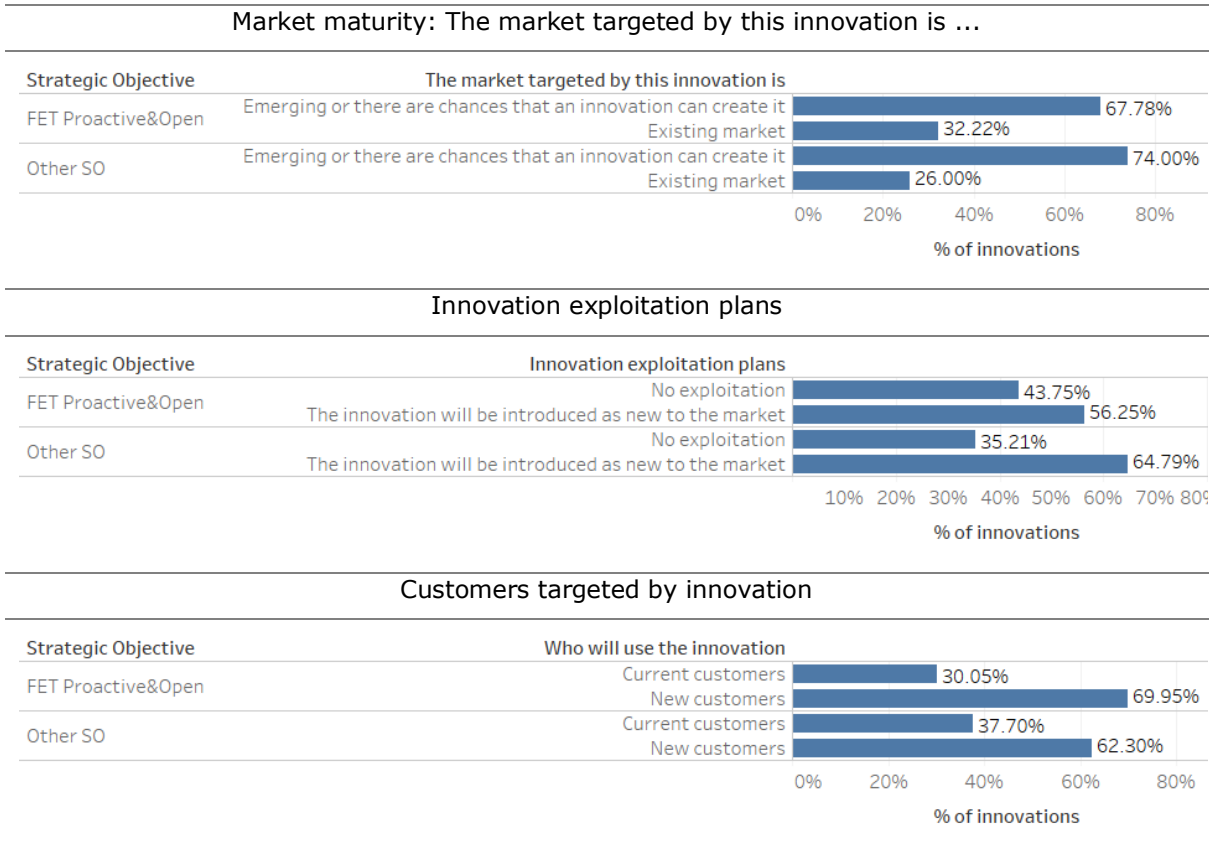
Note: The figure presents the distribution of innovations by their Market Creation Potential levels as defined in Section 3.

Total number of innovations assessed using the MCP framework: 6352. Total number of innovations with Market Creation Potential: 2228.

As explained in Section 3, in order to be considered to have any Market Creation Potential, an innovation has to fulfil three conditions. First, the innovation must target an emerging market or there are chances that it can create one. Second, the organizations developing the innovation must have plans to exploit it commercially. Third, the innovation needs to target a new group of customers. Figure 3 presents reply frequencies to the filter questions of the MCPI.

According to Figure 3, 68% of innovations in FET-Open&Proactive projects target an emerging market or there are chances that it can create one. The remaining innovations address needs of existing markets. In contrast, 74% of innovations in Other SOs projects target an emerging market. Regarding the second filter questions of the MCPI, innovations in Other SOs projects are more likely to be introduced as new to the market than innovations in FET-Open&Proactive projects. Just over 56% of innovations in FET-Open&Proactive projects have exploitation plans, compared to almost 65% of innovations in Other SOs projects. Concerning the final filter question of the MCPI, nearly 70% of innovations in FET-Open&Proactive projects target new customers. This is the case for 62% innovations in Other SOs projects.

**Figure 3: Distribution of replies to MCPI filter questions by Strategic Objective**



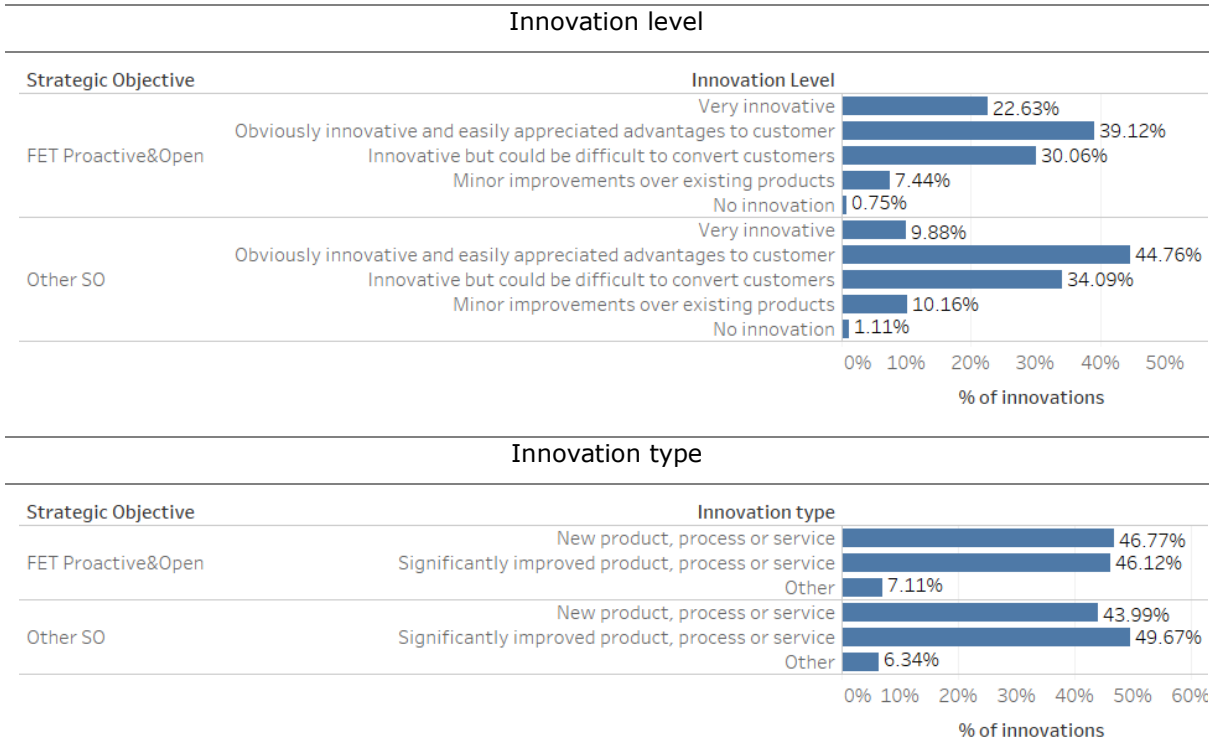

Source: Innovation Radar; Calculations: JRC.

Note: The figure presents the replies to filter questions of the MCPI framework described in Section 3. Total number of replies to the question on market maturity and innovation exploitation plans is 6352. The question on what group of customers an innovation is targeting is available from April 2018 only. Total number of replies to this question is 3135.

As indicated in Section 3, Market Creation Potential of innovations that fulfil all three conditions concerning the market and customers they target and the exploitation plans, gone on to be assessed based on their innovation level and type. According to Figure 4, 22,6% of innovations in FET-Open&Proactive projects are very innovative and over 39% are obviously innovative and offer easily appreciated advantages to customers. Nearly 10% and 45% of innovations in Other SOs projects meet the same level of innovativeness. Concerning the type of innovation, 46,8% of innovations in FET-Open&Proactive projects are new products, processes or services. This is nearly 3% more than innovations in Other SOs projects. Both the level and type of innovations in innovations in FET-Open&Proactive projects contribute to their higher MCPI score, compared to innovations in Other SOs projects.

Summing up, there are some clear differences between innovations in FET-Open&Proactive and in Other SOs projects. FET-Open&Proactive innovations are more likely to address new customers in existing markets than innovations in Other SOs projects. As such, according to the discussion in Section 2, they can be considered as disruptive innovations. Judging by the level and type of FET-Open&Proactive innovations, they have also higher Market Creation Potential than innovations in Other SOs projects. A relative lack of plans to commercially exploit FET-Open&Proactive innovations can be expected to result in market creation potetial remaining unfulfilled for a greater proportion of innovations in this cohort.

**Figure 4: Distribution of replies to the determinants of the Market Creation Potential level questions by Strategic Objective**




Source: Innovation Radar; Calculations: JRC.

Note: The figure presents the replies to filter questions of the MCPI framework described in Section 3. Total number of replies to the question on market maturity and innovation exploitation plans is 6352. The question on what group of customers an innovation is targeting is available from April 2018 only. Total number of replies to this question is 3135.

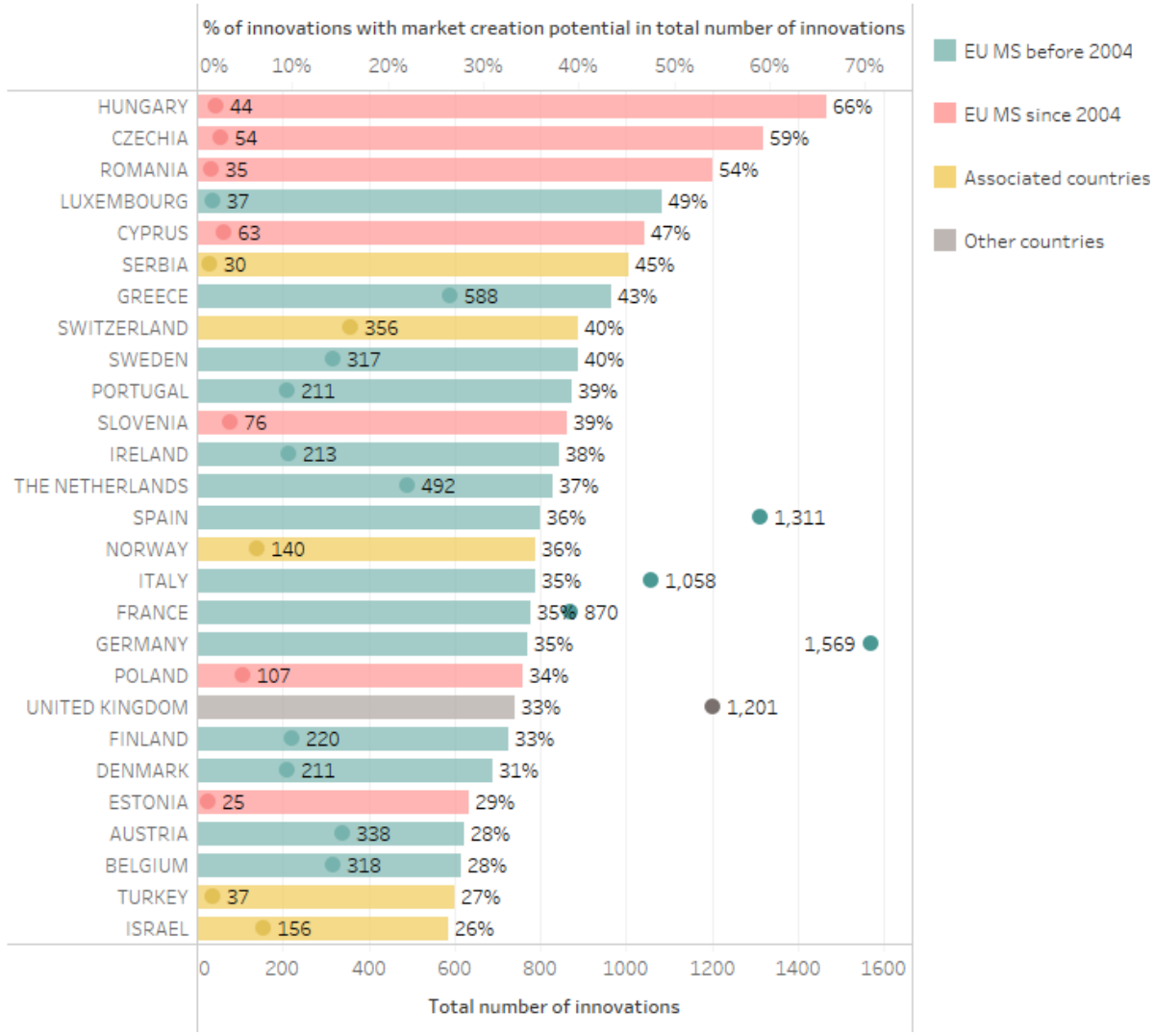
## 5.3. Origin and type of key innovators behind market creating innovations

Figure 5 presents the number of innovations and the share of innovations with Market Creation Potential to which organizations identified by the IR as key innovators contributed by their origin. Regarding the total number of innovations, organizations from Germany, Spain, the UK and Italy contributed to over 1000 innovations identified by the IR in the period between January 2016 and March 2020. These high numbers reflect the high share of participations of organizations from these countries in the FP projects.

Considering the share of innovations with Market Creation Potential in the total number of innovations by country, it ranges from 26% (Israel) to 66% (Hungary). In other words, there are considerable deviations from the average for the group of countries displayed in Figure 5 (39%).

It can be noted that the share of market creating innovations is negatively correlated with the overall number of innovations attributed to a country. There are some noteworthy differences across the countries. For example, key innovators from Greece, Switzerland and Sweden more frequently contribute to innovations that target non-existing or emerging markets and new customers. Similarly, with the exception of Poland and Estonia, EU Member States who have joined since 2004 have a higher than average share of innovations with Market Creation Potential among innovations they contribute to. Some associated countries (Turkey and Israel) show the opposite trend: key innovators from these countries contribute less frequently to innovations showing some Market Creation Potential. However, because of small overall number of observations for some countries, the findings need to be interpreted with caution.

**Figure 5: Total number of innovations and the share of innovations with Market Creation Potential by country of origin of key innovators**




Source: Innovation Radar; Calculations: JRC.

Note: The figure presents the number of innovations and the share of innovations with Market Creation Potential as defined in Section 3 in the total number of innovations to which organizations contributed by country. Countries whose organizations contributed to at least 25 innovations are included.

Total number of innovations assessed using the MCP framework: 6352. Total number of innovations with Market Creation Potential: 2228.

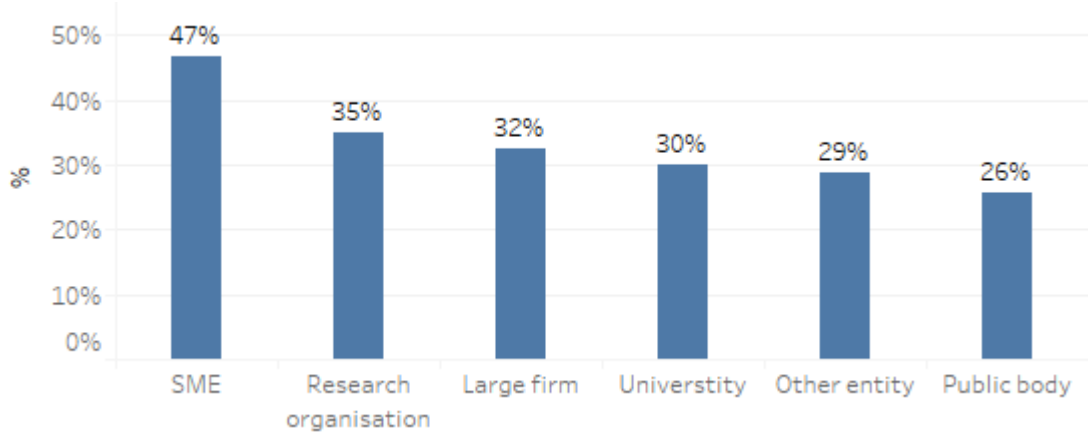
Figure 6 presents the share of innovations with Market Creation Potential in the total number of innovations by organization type of key organizations behind these innovations.

47% of all innovations to which SMEs contributed demonstrate some Market Creation Potential. This value is considerably higher than that of large firms for whom the share of innovations with Market Creation Potential is 32%. It also higher than the average (35%). Second in the ranking are research organizations: 35% of all innovations in which research organizations were identified as key innovators have some Market Creation Potential. Market Creation Potential. For universities the corresponding figure is 30%.

The above findings show that SMEs play an important role in the EU FP projects. Not only are they significantly more often identified as key organizations in delivering innovations to the market (De Prato, et al., 2015a), but their share of innovations with market potential is significantly higher than the average. This is in line with observations suggesting that small and resource-constrained firms that are unable to compete with

larger rivals firms target unserved market niches (see Section 2). This way, they expand the scope of existing markets or create new ones.

**Figure 6: The share of innovations with Market Creation Potential in the total number of innovations by organization type of key innovators**




Source: Innovation Radar; Calculations: JRC.

Note: The figure presents the share of innovations with Market Creation Potential as defined in Section 3 in the total number of innovations by organization type of key innovators.

Total number of innovations assessed using the MCP framework: 6352. Total number of innovations with Market Creation Potential: 2228.

# 6. The nature of FP market creating innovations[4]

The vast number of FP innovations with Market Creation Potential identified by the Innovation Radar makes it extremely difficult to analyse their nature and content. An entry point to the breadth and depth of novel innovations delivered by the FP projects are their descriptions collected by the Innovation Radar Survey. This information allows grouping innovations based on their commonalities, e.g. technological domains or market. Using this textual data, a topic modelling analysis was applied. Topic modelling is a statistical approach for discovering the abstract "topics" that occur in a collection of documents. Similar to other studies analysing the content of technological and innovative activity, e.g. Di Minin et al. (2019), this study uses the Latent Dirichlet Allocation (LDA) model. The final output of the model is the classification of each innovation into one (or more than one) topic according to the words used in the innovation description. The number of topics was reduced to 10 after doing some analysis of the coherence value. Table 4 presents the list of the 10 topics resulting from the analysis and the representative keywords for each topic.

**Table 4: Overview of topics and representative keywords of innovations with Market Creation Potential**

| Topic id | Topic | Representative keywords |
|---|---|---|
| 1 | eHealth | patient, system, support, data, health, provide, person, game, monitor, user |
| 2 | Medical diagnostics | image, system, detect, base, optic, sample, allow, measure, method, sensor |
| 3 | Data & digital platforms | data, tool, platform, user, create, service, learn, knowledge, support, allow |
| 4 | Robotics | robot, system, control, sensor, human, environ, base, monitor, interact, detect |
| 5 | Artificial Intelligence | model, system, simul, tool, predict, design, algorithm, machine, optimal, energy |
| 6 | Micro- & nanoelectronics | device, sensor, optic, quantum, laser, applic, technology, source, integr, include |
| 7 | Biotech | cell, potential, target, specify, drug, active, applic, acid, allow, clinic |
| 8 | Advanced materials | material, base, property, surface, coat, manufacture, improve, composite, metal, applic |
| 9 | Energy storage & management | energy, system, heat, water, cost, power, integr, oper, industry, effici |
| 10 | Network architecture | data, service, platform, network, provide, manage, secure, cloud, support, enable |

Source: Innovation Radar; Calculations: JRC.

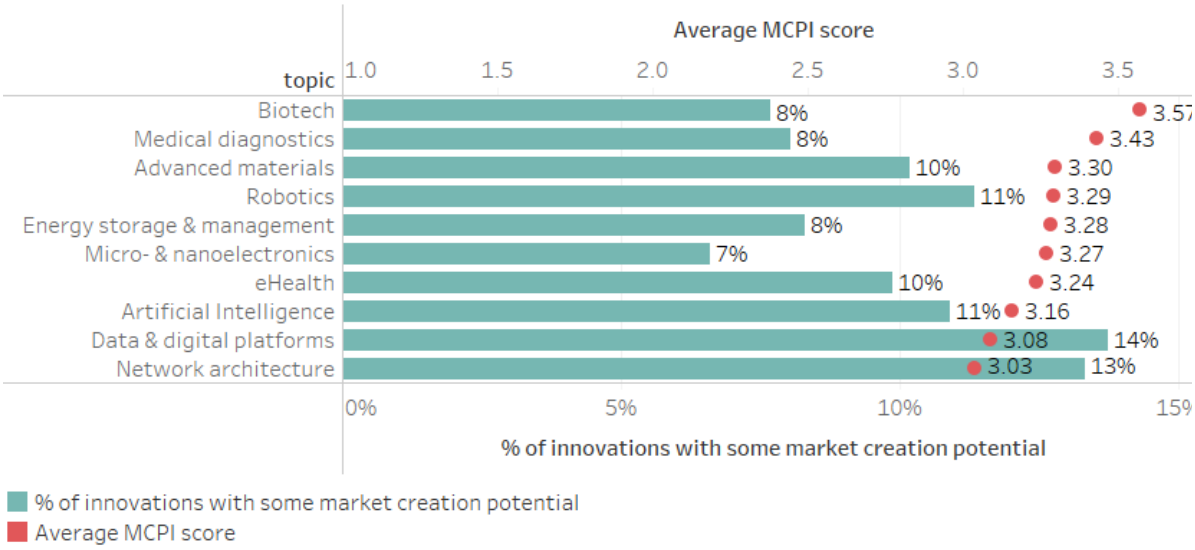
Note: Table presents an overview of topics of innovations with Market Creation Potential as defined in Section 3. Topic definition is based on the LDA algorithm. Total number of innovations with Market Creation Potential: 2228.

[4] Based on contributions by Uroš Kostić, JRC Ispra.

Figure 7 presents the shares of innovations in the total number of innovations with Market Creation Potential and their average MCPI score by the 10 innovation topics. With the share of 7% of all innovations with Market Creation Potential, innovations in Micro- & nanoelectronics represent the smallest group. At the other extreme are innovations in Data & digital platforms, accounting for 14% of all innovations with Market Creation Potential.

Regarding the average MCPI score, Figure 7 shows that there are considerable differences between the 10 innovation topics and the average MCPI score (3,24). The highest result across the 10 innovation topics is Biotech whose innovations score 3,57 on the MCPI scale. With the MCPI score of 3,03, innovations in Network architecture have the lowest score.

**Figure 7: The average MCPI and the share of innovations in the total number of innovations with Market Creation Potential by innovation topic**




Source: Innovation Radar; Calculations: JRC.

Note: The figure presents the shares of innovations in the total number of innovations with Market Creation Potential as defined in Section 3 by innovation topic. The 10 topics were identified using the LDA algorithm to analyse innovation descriptions collected by the Innovation Radar questionnaire. Total number of innovations with Market Creation Potential: 2228.

# 7. Examples of innovations with Market Creation Potential

In order to provide a glimpse into the nature of FP innovations with Market Creation Potential, this section shows one example for each innovation topic identified with topic modelling described in Section 6. Based on information collected by the Innovation Radar Survey, each example includes:

**Key characteristics of innovations with Market Creation Potential in its domain:**

- Relevant keywords in the topic to which an innovation belongs to,
- Average MCPI score of innovations in the topic of an innovation and the average MCPI score of all innovations,
- Share of innovations in the topic of an innovation that originates from FET-Open & Proactive and the same value for all innovations with Market Creation Potential.

**Innovation details:**

- Innovation Title,
- Innovation description,
- Market Creation Potential,
- Time to market,
- Innovation Maturity[5]
- Market Competition,
- Project Acronym and URL,
- Innovation Potential based on four Innovation Radar Indicators describing Market Readiness, Innovation Management, Market Potential & overall Innovation Potential.

**Details about Key Innovator(s) in delivering the innovation to the market:**

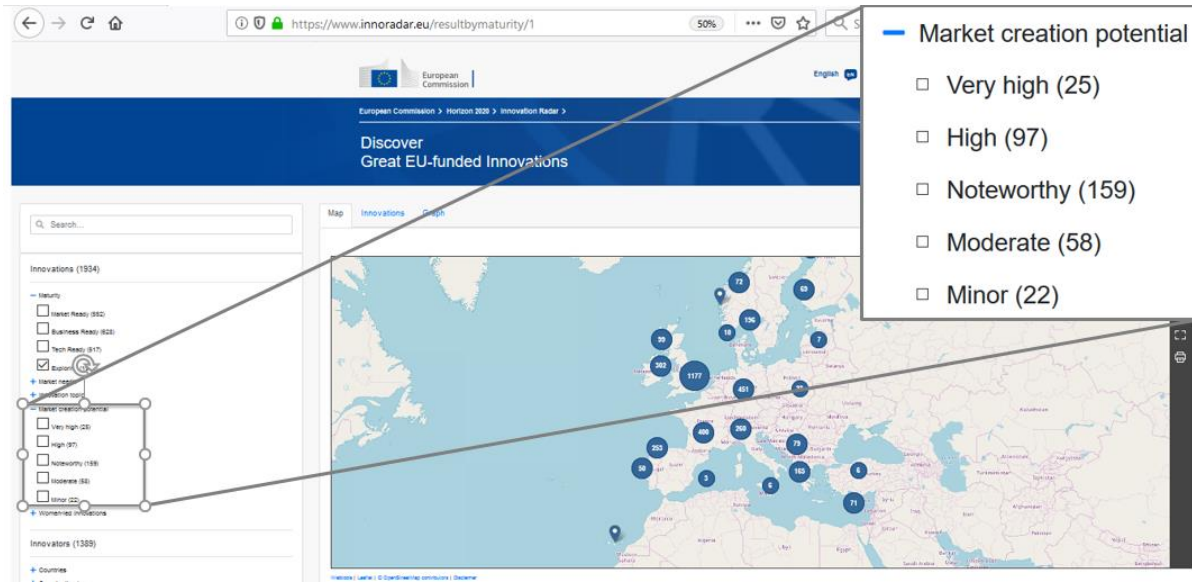
- Name and country
- Organisation Type

The details concerning innovations and the key innovators behind them, in particular the methodology behind individual indicators are described in the first Innovation Radar methodology report (De Prato, Nepelski, & Piroli, 2015a) and the report documenting the framework for assessing innovation maturity level (Nepelski, Van Roy, & O'Neill, 2018).

These and other EU-funded innovations with market creation potential can be discovered via the Commission's Innovation Radar platform (web and smartphone apps for Apple & Android) where a filter for MCPI was put in place (see Figure 8).

[5] Based on system outlined in https://ec.europa.eu/jrc/sites/jrcsh/files/booklet-a4_innovation_radar.pdf

**Figure 8: Filter for MCPI on Innovation Radar platform**




Source: https://www.innoradar.eu/

## 7.1. eHealth

**Table 5: Key characteristics of innovations with Market Creation Potential in eHealth**

| | |
|---|---|
| Keywords | patient, system, support, data, health, provide, person, game, monitor, user |
| Average MCPI of eHealth (all) innovations | 3,24 (3,24) |
| % of eHealth (all) innovations with Market Creation Potential from FET-Open&Proactive projects | 3,18% (11,09%) |

**Table 6: An example of innovation in eHealth and key innovator(s) in delivering it to the market**

| **Innovation details** | | | |
|---|---|---|---|
| Innovation Title | Automated and accurate characterization of clinical workflows using real-time location systems | | |
| Innovation description | Accurate characterization of clinical workflows helps hospitals shorten treatment time thus leading to better outcomes and lower costs. However, the lack of accurate data makes this challenging. Timestamps from electronic medical records are unreliable and shadowing exercises are labour-intensive. The innovation describes how Big Data generated by Real-Time Location Systems helps accurately characterize clinical workflows automatically thus enabling sustainable workflow improvements in hospitals. | | |
| Market Creation Potential | High | | |
| Time to market | Between 1 and 3 years | | |
| Innovation Maturity | Market Ready | | |
| Market Competition | Established competition but none with a proposition like the one under investigation | | |
| Project Acronym and URL | BigMedilytics, https://www.bigmedilytics.eu/ | | |
| **Innovation potential based on the Innovation Radar Indicators** | | | |
| Innovation Readiness | Innovation Management | Market Potential | Innovation Potential |
| 57 | 61 | 85 | 68 |
| **Key Innovator(s)** | | | |
| Name and country | PHILIPS ELECTRONICS NEDERLAND BV, NL | | |
| Organisation Type | Large firm | | |

## 7.2. Medical diagnostics

**Table 7: Key characteristics of innovations with Market Creation Potential in Medical diagnostics**

| | |
|---|---|
| Keywords | image, system, detect, base, optic, sample, allow, measure, method, sensor |
| Average MCPI of Medical diagnostics (all) innovations | 3,43 (3,24) |
| % of Medical diagnostics (all) innovations with Market Creation Potential from FET-Open&Proactive projects | 38,55% (11,09%) |

**Table 8: An example of innovation in Medical diagnostics and key innovator(s) in delivering it to the market**

| **Innovation details** | | | |
|---|---|---|---|
| Innovation Title | High resolution multimodal Hybrid Raman and scattering microscope combined to an endoscope | | |
| Innovation description | An endoscope combined to a hybrid Raman and scattering microscope, capable of detecting early stage cancers in human. The first applications targeted, are the colorectal cancer and esophageal cancer. Thanks to the combined hybrid microscope, the endoscope will be able to analyse highly reliable patterns at the organ level, allowing therefore to predict early enough the recurrence in patients, in a minimally invasive manner, without the need to take biopsies. | | |
| Market Creation Potential | Very high | | |
| Time to market | Between 5 and 10 years | | |
| Innovation Maturity | Exploring | | |
| Market Competition | Patchy, no major players | | |
| Project Acronym and URL | SENSITIVE, https://www.sensitiveproject.eu/ | | |
| **Innovation potential based on the Innovation Radar Indicators** | | | |
| Innovation Readiness | Innovation Management | Market Potential | Innovation Potential |
| 20 | 27 | 68 | 38 |
| **Key Innovator(s)** | | | |
| Name and country | HELMHOLTZ ZENTRUM MUENCHEN DEUTSCHES FORSCHUNGSZENTRUM FUER GESUNDHEIT UND UMWELT GMBH, DE | UNIVERSIDAD CARLOS III DE MADRID, ES | RIVERD INTERNATIONAL BV, NL |
| Organisation Type | Research organization | University | SME |

## 7.3. Data & digital platforms

**Table 9: Key characteristics of innovations with Market Creation Potential in Data & digital platforms**

| | |
|---|---|
| Keywords | data, tool, platform, user, create, service, learn, knowledge, support, allow |
| Average MCPI of Data & digital platforms (all) innovations | 3,08 (3,24) |
| % of Data & digital platforms (all) innovations with Market Creation Potential from FET-Open&Proactive projects | 0,98% (11,09%) |

**Table 10: An example of innovation in Data & digital platforms and key innovator(s) in delivering it to the market**

| **Innovation details** | | | |
|---|---|---|---|
| Innovation Title | COMPOSITION Agent Marketplace Framework | | |
| Innovation description | A framework for agent-based collaboration and interaction on a market place. Market actors can develop agents to represent their interest and deploy them through a market place portal. Individual trading strategies for buying and selling of goods and services can be developed. The framework supports smart matchmaking to find best suitable suppliers based on a manufacturing ontology. The framework supports automatic procurement and negotiation for efficient deal making. | | |
| Market Creation Potential | High | | |
| Time to market | Between 1 and 3 years | | |
| Innovation Maturity | Tech-Ready | | |
| Market Competition | Patchy, no major players | | |
| Project Acronym and URL | COMPOSITION, https://www.composition-project.eu/ | | |
| **Innovation potential based on the Innovation Radar Indicators** | | | |
| Innovation Readiness | Innovation Management | Market Potential | Innovation Potential |
| 80 | 34 | 68 | 60 |
| **Key Innovator(s)** | | | |
| Name and country | ETHNIKO KENTRO EREVNAS KAI TECHNOLOGIKIS ANAPTYXIS, GR | CNET SVENSKA AB, SE | |
| Organisation Type | Research organization | SME | |

## 7.4. Robotics

**Table 11: Key characteristics of innovations with Market Creation Potential in Robotics**

| | |
|---|---|
| Keywords | robot, system, control, sensor, human, environ, base, monitor, interact, detect |
| Average MCPI of Robotics (all) innovations | 3,29 (3,24) |
| % of Robotics (all) innovations with Market Creation Potential from FET-Open&Proactive projects | 5,93% (11,09%) |

**Table 12: An example of innovation in Robotics and key innovator(s) in delivering it to the market**

| **Innovation details** | | | |
|---|---|---|---|
| Innovation Title | Smart Grasping System | | |
| Innovation description | The system is an intelligent robotic grasper for manufacturing and industrial purposes. The existing robotic systems don't have the technology needed to grasp unknown objects successfully. The Smart Grasping System offers a solution by providing a three-fingered system with embedded force sensors for grasping control and companion software to automatically simulate and calculate by artificial intelligence the most effective way of grasping with no need for physical trial and error tests. | | |
| Market Creation Potential | High | | |
| Time to market | Between 1 and 3 years | | |
| Innovation Maturity | Tech-Ready | | |
| Market Competition | Established competition but none with a proposition like the one under investigation | | |
| Project Acronym and URL | COROMA, https://www.coroma-project.eu/ | | |
| **Innovation potential based on the Innovation Radar Indicators** | | | |
| Innovation Readiness | Innovation Management | Market Potential | Innovation Potential |
| 61 | 43 | 55 | 53 |
| **Key Innovator(s)** | | | |
| Name and country | DEUTSCHES FORSCHUNGSZENTRUM FUR KUNSTLICHE INTELLIGENZ GMBH, DE | THE SHADOW ROBOT COMPANY LIMITED, UK | |
| Organisation Type | Research organization | Large firm | |

## 7.5. Artificial Intelligence

**Table 13: Key characteristics of innovations with Market Creation Potential in Artificial Intelligence**

| | |
|---|---|
| Keywords | model, system, simul, tool, predict, design, algorithm, machine, optimal, energy |
| Average MCPI of Artificial Intelligence (all) innovations | 3,16 (3,24) |
| % of Artificial Intelligence (all) innovations with Market Creation Potential from FET-Open&Proactive projects | 6.58% (11,09%) |

**Table 14: An example of innovation in Artificial Intelligence and key innovator(s) in delivering it to the market**

| **Innovation details** | | | |
|---|---|---|---|
| Innovation Title | Uncertainty Quantification and Optimization Under Uncertainties within and of numerical models | | |
| Innovation description | Contemporary numerical modelling efforts provide in general satisfactory results. That, however, is when speaking about exact modelling. Optimizing a design or a multi-physics problem when there are uncertainties in the model parameters or quantitatively estimating the possible deviations from the ideal model simulation is an emerging and challenging area in numerical computing algorithms and high-scale HPC clusters. | | |
| Market Creation Potential | Very high | | |
| Time to market | Between 3 and 5 years | | |
| Innovation Maturity | Exploring | | |
| Market Competition | Established competition but none with a proposition like the one under investigation | | |
| Project Acronym and URL | ExaQUte, http://exaqute.eu/ | | |
| **Innovation potential based on the Innovation Radar Indicators** | | | |
| Innovation Readiness | Innovation Management | Market Potential | Innovation Potential |
| 36 | 25 | 58 | 40 |
| **Key Innovator(s)** | | | |
| Name and country | CENTRE INTERNACIONAL DE METODES NUMERICS EN ENGINYERIA, ES | TECHNISCHE UNIVERSITAET MUENCHEN, DE | STR.UCTURE GMBH, DE |
| Organisation Type | Research organization | University | SME |

## 7.6. Micro- & nanoelectronics

**Table 15: Key characteristics of innovations with Market Creation Potential in Micro- & nanoelectronics**

| | |
|---|---|
| Keywords | device, sensor, optic, quantum, laser, applic, technology, source, integr, include |
| Average MCPI of Micro- & nanoelectronics (all) innovations | 3,27 (3,24) |
| % of Micro- & nanoelectronics (all) innovations with Market Creation Potential from FET-Open&Proactive projects | 31,29% (11,09%) |

**Table 16: An example of innovation in Micro- & nanoelectronics and key innovator(s) in delivering it to the market**

| **Innovation details** | | | |
|---|---|---|---|
| Innovation Title | Super radiant (SR) source with very high optical peak power and very low pulse duration for quantum imaging | | |
| Innovation description | The GaAS epitaxial wafers have been produced and initially validated during the project, with very promising results. Target use: applications which require very high peak optical power and very low pulse duration, like precise Time of Flight (ToF) LIDARs. As a source of entangled photons, this SR source could also be used as a building block for many applications in quantum physics, especially in quantum communication and quantum imaging. | | |
| Market Creation Potential | High | | |
| Time to market | Between 3 and 5 years | | |
| Innovation Maturity | Exploring | | |
| Market Competition | Patchy, no major players | | |
| Project Acronym and URL | SUPERTWIN, http://www.supertwin.eu/ | | |
| **Innovation potential based on the Innovation Radar Indicators** | | | |
| Innovation Readiness | Innovation Management | Market Potential | Innovation Potential |
| 32 | 23 | 63 | 39 |
| **Key Innovator(s)** | | | |
| Name and country | CSEM CENTRE SUISSE D'ELECTRONIQUE ET DE MICROTECHNIQUE SA - RECHERCHE ET DEVELOPPEMENT, CH | III-V LAB, FR | |
| Organisation Type | Research organization | OTH | |

## 7.7. Biotech

**Table 17: Key characteristics of innovations with Market Creation Potential in Biotech**

| | |
|---|---|
| Keywords | cell, potential, target, specify, drug, active, applic, acid, allow, clinic |
| Average MCPI of Biotech (all) innovations | 3,57 (3,24) |
| % of Biotech (all) innovations with Market Creation Potential from FET-Open&Proactive projects | 23.39% (11,09%) |

**Table 18: An example of innovation in Biotech and key innovator(s) in delivering it to the market**

| **Innovation details** | | | |
|---|---|---|---|
| Innovation Title | Gibson Wizzard Tool for seamless DNA cloning without restriction enzymes | | |
| Innovation description | The tool provides the customer with a service design of the best fragments to be produced recombined DNA molecules to be used in research and development. It can serve e.g. for easy and fast preparation of the recombinant DNA molecules for heterologous production of bioactive compounds and many other applications. The service includes in silico design and upon request also synthesis of the DNA constructs. | | |
| Market Creation Potential | High | | |
| Time to market | Less than 1 year | | |
| Innovation Maturity | Market Ready | | |
| Market Competition | Patchy, no major players | | |
| Project Acronym and URL | TOPCAPI, http://topcapi.eu/ | | |
| **Innovation potential based on the Innovation Radar Indicators** | | | |
| Innovation Readiness | Innovation Management | Market Potential | Innovation Potential |
| 91 | 64 | 63 | 72 |
| **Key Innovator(s)** | | | |
| Name and country | EXPLORA SRL, IT | | |
| Organisation Type | SME | | |

## 7.8. Advanced materials

**Table 19: Key characteristics of innovations with Market Creation Potential in Advanced materials**

| | |
|---|---|
| Keywords | material, base, property, surface, coat, manufacture, improve, composite, metal, applic |
| Average MCPI of Advanced materials (all) innovations | 3,30 (3,24) |
| % of Advanced materials (all) innovations with Market Creation Potential from FET-Open&Proactive projects | 11.89% (11,09%) |

**Table 20: An example of innovation in Advanced materials and key innovator(s) in delivering it to the market**

| **Innovation details** | | | |
|---|---|---|---|
| Innovation Title | A Novel Method for Producing Solar Fuels and Industrial Feedstock using Artificial Photosynthesis on Custom Soap Films | | |
| Innovation description | An economically viable solar fuel production technology, exploiting the surfactant self-assembly & proton transport properties of soap films, was developed. It is based on an economic artificial photosynthetic membrane in form of soap film with photo-catalytic functional surfaces. The technology is made scalable by the design concept of a dynamic stream of regenerative soap bubbles capable of handling large volumes of gas, continuously flowing through a light exposed conduit. | | |
| Market Creation Potential | Very high | | |
| Time to market | Between 5 and 10 years | | |
| Innovation Maturity | Business Ready | | |
| Market Competition | Patchy, no major players | | |
| Project Acronym and URL | SoFiA, http://sofiaproject.eu/ | | |
| **Innovation potential based on the Innovation Radar Indicators** | | | |
| Innovation Readiness | Innovation Management | Market Potential | Innovation Potential |
| 34 | 55 | 65 | 51 |
| **Key Innovator(s)** | | | |
| Name and country | MICROFLUIDIC CHIPSHOP GMBH, DE | TECLIS INSTRUMENTS, FR | |
| Organisation Type | SME | SME | |

## 7.9. Energy storage & management

**Table 21: Key characteristics of innovations with Market Creation Potential in Energy storage & management**

| | |
|---|---|
| Keywords | energy, system, heat, water, cost, power, integr, oper, industry, effici |
| Average MCPI of Energy storage & management (all) innovations | 3,28 (3,24) |
| % of Energy storage & management (all) innovations with Market Creation Potential from FET-Open&Proactive projects | 8,65% (11,09%) |

**Table 22: An example of innovation in Energy storage & management and key innovator(s) in delivering it to the market**

| **Innovation details** | | | |
|---|---|---|---|
| Innovation Title | MICROBIAL FUEL CELLS (MFCs) FOR TOPSOIL ENERGY HARVESTING | | |
| Innovation description | This technology explores the harvesting of bio-based electricity generated by the underground structure of plants. The innovation is based on MFCs, which are bio-electrochemical systems that drive an electrical current by using specific bacteria contained in the fuel cell. Such specific bacteria colonies, which can be naturally found in the soil, metabolize organic carbon-based substances, released by plants roots, while releasing electrons during such reaction. | | |
| Market Creation Potential | Very high | | |
| Time to market | Between 5 and 10 years | | |
| Innovation Maturity | Business Ready | | |
| Market Competition | Patchy, no major players | | |
| Project Acronym and URL | GrowBot, https://www.growbot.eu/ | | |
| **Innovation potential based on the Innovation Radar Indicators** | | | |
| Innovation Readiness | Innovation Management | Market Potential | Innovation Potential |
| 34 | 41 | 58 | 44 |
| **Key Innovator(s)** | | | |
| Name and country | ARKYNE TECHNOLOGIES SL, ES | | |
| Organisation Type | SME | | |

## 7.10. Network architecture

**Table 23: Key characteristics of innovations with Market Creation Potential in Network architecture**

| | |
|---|---|
| Keywords | data, service, platform, network, provide, manage, secure, cloud, support, enable |
| Average MCPI of Network architecture (all) innovations | 3,03 (3,24) |
| % of Network architecture (all) innovations with Market Creation Potential from FET-Open&Proactive projects | 2,69% (11,09%) |

**Table 24: An example of innovation in Network architecture and key innovator(s) in delivering it to the market**

| **Innovation details** | | | |
|---|---|---|---|
| Innovation Title | Context-aware Access Control tool for IoT | | |
| Innovation description | The Context-aware Access Control tool for IoT is a solution for dynamic authorization based on context for both IT and OT (operational technologies) domains. It provides Context-aware risk and trust-based dynamic authorization mechanisms ensuring (i) that an authenticated IoT node accesses only what it is authorized to and (ii) that an IoT node can only be accessed by authorized software components. Access authorizations will be automatically adapted according to contextual information. | | |
| Market Creation Potential | High | | |
| Time to market | Between 1 and 3 years | | |
| Innovation Maturity | Market Ready | | |
| Market Competition | Established competition but none with a proposition like the one under investigation | | |
| Project Acronym and URL | ENACT, https://www.enact-project.eu/ | | |
| **Innovation potential based on the Innovation Radar Indicators** | | | |
| Innovation Readiness | Innovation Management | Market Potential | Innovation Potential |
| 61 | 48 | 63 | 57 |
| **Key Innovator(s)** | | | |
| Name and country | EVIDIAN SA, FR | | |
| Organisation Type | Large firm | | |

# 8. Conclusions

This report is an attempt to quantify the market creating effect of public R&I policies. It presents the methodology behind the Market Creation Potential Indicator, a novel indicator aiming at capturing innovations that target non-existing or emerging markets and new customers. The MCPI is then applied to analyse over 6000 FP innovations identified by the Innovation Radar.

The results show that 35% of innovations show some level of Market Creation Potential. Moreover, 14% of all innovations not only create new or enlarge existing markets, but also show very high levels of novelty.

Regarding the key innovators behind the innovations with Market Creation Potential, the results confirm that SMEs play an important role in EU FP projects. Not only are they significantly more often identified as key organizations in delivering innovations to the market, but also their share of innovations with market potential is significantly higher than the average. This is in line with earlier observations suggesting that, being small and resource-constrained, SMEs often target unserved market niches due to difficulties in competing with larger rival firms.

The breakdown of FP projects by different Strategic Objectives shows that there differences in terms of Market Creation Potential across the SOs. Innovations in FET-Open&Proactive projects are more likely to address new customers in existing markets than innovations from projects launched under other Strategic Objectives. Hence, they can be also considered to have disruptive effect on existing markets. Innovations with Market Creation Potential in FET-Open&Proactive projects seem to be also more novel than innovations in Other SOs projects. However, their ability to capitalise on market potential can be compromised by a releative lack of commercial exploitation plans. This calls for an analysis of the reasons why a lower proportion of 'key innovators' in FET-Open&Proactive projects plan to commercialise the results.

The analysis of the nature of FP innovations shows that their Market Creation Potential depends also on their technological domain. For example, innovations in eHealth or Medical diagnostics have, on average, the highest MCPI score. At the same time, however, their share of FP innovations with some Market Creation Potential is among the lowest in the overall portfolio.

Summing up, the current report attempts to assess the level and character of Market Creation Potential of innovations from publically funded research projects. By recognising the contribution of the public sector as a lead investor providing funding to uncertain projects, it is expected to help demonstrate the contribution of public support to creating new markets.

The MCPI also offers a novel way for stakeholders in the public and private spheres to navigate the outputs of the EU's Framework Programme and identify the opportunities it presents to create new markets.

Taking into account the results concerning: (a) the role of SMEs; (b) the above average Market Creation Potential of innovations in FET-Open&Proactive projects; and, (c) the diversity of market ceration potential across technological domains, the current analysis also provides some input for discussion on the design of future Framework Programmes.

# 9. Appendix: Innovation Radar Survey questions in the Market Creation Potential Indicator

As explained in Section 3, the Market Creation Potential Indicator (MCPI) is constructed using questions from the Innovation Radar Survey (IRS; see Box 1). There are two types of questions used in the MCPI. Type one are Filter questions (FQ). Type two are questions that are used as determinants of the Market Creation Potential level (DQ). Below the list of the IRS questions and replies that were selected.

### Filter questions

In order to be considered to have any Market Creation Potential, an innovation has to fulfil three conditions:

1. The market targeted by this innovation is emerging or there are chances that an innovation can create it (Answer b or c to FQ1), AND
2. The organizations developing it need to have plans to exploit it commercially (Answer a to FQ2), AND
3. The innovation needs to target a new group of customers (Answer b to FQ3).[6]

The three filter questions and replies are presented below. Replies that are struck through exclude innovations from further assessment of their Market Creation Potential.

**FQ1. Market maturity: The market targeted by this innovation is ...**

~~a. not yet existing and it is not yet clear that the innovation can create it~~

b. not yet existing but the innovation can create it (market-creating)

c. emerging: there is a growing demand and few offerings are available

~~d. mature: the market is already supplied with many products of the type proposed~~

**FQ2. How will the innovation be exploited?**

a. Introduced as new to the market (commercial exploitation)

~~b. Only new to the organisation~~

~~c. No exploitation~~

**FQ3. Who will use the innovation? (available from April 2018 only)**

~~a. Current customers~~

b. New customers

### Determinants of the Market Creation Potential level

Innovations that fulfil the first three conditions are subsequently assessed with respect to their Market Creation Potential. Two IRS questions determine the Market Creation Potential level of an innovation. The first one concerns the innovation level of innovation (DQ1). The second one addresses the type of innovation (DQ2). Replies to both questions are presented below. The innovation level ranges from minor improvements over existing products to very innovative offerings (Answer a to c to DQ1). Regarding the type of innovation, the framework for Market Creation Potential of innovations considers only new or improved products, processes and services (Answer a to c to and g to i to DQ2). Depending on the level and type of innovation, it is assigned one out of five Market Creation Potential levels ranging from one (minor) to five (very high). Table 1 in Section 3 illustrates the decision rules used in the Market Creation Potential Indicator framework.

[6] The question on what group of customers an innovation is targeting is available from April 2018 only.

**DQ1. What is the level of innovation?**

a. Some distinct, probably minor, improvements over existing products

b. Innovative but could be difficult to convert customers

c. Obviously innovative and easily appreciated advantages to customer

d. Very innovative

**DQ2. Characterise the type of innovation.**

a. Significantly improved product

b. Significantly improved service (except consulting services)

c. Significantly improved process

~~d. Significantly improved marketing method~~

~~e. Significantly improved organisational method~~

~~f. Consulting services~~

g. New product

h. New service (except consulting services)

i. New process

~~j. New marketing method~~

~~k. New organisational method~~

~~l. Other~~

# 10. Appendix II: FET-Open and FET-Proactive projects scanned by the Innovation Radar

**Table 25: List of FET-Open and FET-Proactive projects and innovations**

| Strategic Objective | Strategic Objective description | Number of projects scanned by Innovation Radar | Number of innovations |
|---|---|---|---|
| FETOPEN-01-2016-2017 | FET-Open research and innovation actions | 76 | 249 |
| FETOPEN-01-2018-2019-2020 | FET-Open Challenging Current Thinking | 14 | 37 |
| FETOPEN-03-2018-2019-2020 | FET Innovation Launchpad | 18 | 18 |
| FETOPEN-04-2016-2017 | FET Innovation Launchpad | 33 | 55 |
| FETOPEN-RIA-2014-2015 | FET-Open research projects | 45 | 294 |
| FETPROACT-01-2016 | FET Proactive: emerging themes and communities | 12 | 68 |
| FETPROACT-01-2018 | FET Proactive: emerging paradigms and communities | 5 | 20 |
| FETPROACT-1-2014 | Global Systems Science (GSS) | 3 | 21 |
| FETPROACT-2-2014 | Knowing, doing, being: cognition beyond problem solving | 5 | 38 |
| FETPROACT-3-2014 | Quantum simulation | 4 | 10 |
| ICT-2011.9.11 | FET Proactive: Neuro-Bio-Inspired Systems (NBIS) | 7 | 26 |
| ICT-2011.9.6 | FET Proactive: Unconventional Computation (UCOMP) | 2 | 4 |
| ICT-2011.9.7 | FET Proactive: Dynamics of Multi-Level Complex Systems (DyM-CS) | 4 | 11 |
| ICT-2011.9.8 | FET Proactive: Minimising Energy Consumption of Computing to the Limit (MINECC) | 3 | 6 |
| ICT-2011.9.9 | FET Proactive: Quantum ICT (QICT) | 6 | 11 |
| ICT-2013.9.5 | FET-Open Xtrack | 8 | 21 |
| ICT-2013.9.6 | FET Proactive: Evolving Living Technologies (EVLIT) | 4 | 19 |
| ICT-2013.9.7 | FET Proactive: Atomic and Molecular Scale Devices and Systems | 4 | 20 |
| | Total | 253 | 928 |

Source: Innovation Radar; Calculations: JRC.

Note: Total number of Strategic Objectives: 429. Total number of projects scanned by the Innovation Radar: 1704. Total number of innovations: 6352.

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KJ-NA-30273-EN-N

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doi:10.2760/077836

ISBN 978-92-76-19938-0