

URL: <http://digital.staatsbibliothek-berlin.de/werkansicht/?PPN=PPN767804333>

OAI: digital.staatsbibliothek-berlin.de/PPN767804333

Joel Gustavo Silva Ribeiro

EUROPEAN HETEROGENEITY IN HORIZON 2020

Traineeship Report to the Faculty of Economics of the University of Coimbra to obtain the Master degree in Economics

Advisor: Pedro Godinho

Coimbra, 2016



UNIVERSIDADE DE COIMBRA



FEUC FACULDADE DE ECONOMIA
UNIVERSIDADE DE COIMBRA

Joel Gustavo Silva Ribeiro

European Heterogeneity in Horizon 2020

Traineeship Report for the Master degree in Economics, in the Structural Policies and Growth Economics area of specialisation, present to the Faculty of Economics of the University of Coimbra to obtain the Master degree

Advisor: Pedro Godinho

Coimbra, 2016

Acknowledgments

I would like to express the deepest appreciation to my advisor Professor Pedro Godinho for his guidance and mentorship during this long writing process.

To ISA, where I was received with open arms. To all ISA staff, in particular to my Innovation boss Inês and also Mariana for all the advices and support given.

I am also truly indebted to Christopher for all the help given. I also extend my thanks to all my friends *"in altera vita sunt, frates sumus"*.

A la caotica Italia, tra Firenze e Lecce; Auch der Donau und Prag; Et toute l'Europe qui m'a appris ce que veut dire être européen.

For all the support and for being always there, I cannot pass without express my utter gratitude to my girlfriend Andreia.

Last but not least, for my family who paved the path before me upon whose shoulders I stand.

三日坊主

(Mikka bouzu)

猫に小判

(Neko ni koban)

Abstract

This traineeship report, undertaken in ISA – Intelligent Sensing Anywhere, where we worked closely with the European funding programmes, discusses the European heterogeneity in R&D and Innovation, namely in the Horizon 2020 programme (*via* the SME instrument proxy). This issue becomes relevant as Europe struggles to face the emerging Asian competition while, inside the union, new-members seems to be unable to converge towards the innovation vanguard. We analyse the data of the SME instrument (a SME-exclusive channel) participation to expose the countries participation patterns and current trends. The results chiefly corroborate the hypothesis of non-convergence between EU15 and EU13, but despite this fact there were discordant cases, such as Estonia and Slovenia, here further studied in two case studies. New issues also emerged such as the opening of a South periphery in Europe and indicators of apathy in Europe core countries. We conclude by recommending a set of policies to reverse the situation and bring convergence towards excellence, thus reinforcing the role of Europe in the world R&D and Innovation system.

Riassunto

Questo rapporto di stage, fatto in ISA – Intelligent Sensing Anywhere, dove abbiamo lavorato con gli programmi europei, discute l'eterogeneità europea in Ricerca & Sviluppo e Innovazione, in particolare programma Orizzonte 2020 (via proxy 'SME instrument'). Questa questione è rilevante, perché L'Europa sembra incapace di competere con la competizione asiatica, mentre, all'interno dell'unione, i nuovi membri sembrano essere incapaci di convergere nella direzione dell'avanguardia. Noi analizziamo i dati della partecipazione nell'SME instrument (un canale esclusivo PMI - piccole e medie imprese) per esporre i modelli di partecipazione dei Paesi e delle tendenze attuali. I risultati sostengono fortemente l'ipotesi di non-convergenza tra EU15 ed EU13, tuttavia, nonostante questo, ci sono casi discordanti, come l'Estonia e la Slovenia, sviluppati qui in due casi di studio. Nuovi problemi sono emersi anche come la comparsa di una periferia a sud d'Europa ed indicatori d'apatia nei Paesi del cuore europeo. Concludiamo con alcune raccomandazioni politiche per invertire lo scenario e condurre la convergenza verso

l'eccellenza, rafforzando in tal modo il ruolo d'Europa nel sistema di R&S e Innovazione mondiale.

Resumo

Este relatório de estágio, efetuado na ISA – Intelligent Sensing Anywhere, onde trabalhamos de perto com os programas de incentivos europeus, discute a heterogeneidade europeia em Investigação & Desenvolvimento e na Inovação, nomeadamente no programa Horizonte 2020 (*via proxy* “SME instrument”). Esta questão torna-se relevante com a dificuldade da Europa em competir com a concorrência asiática enquanto, dentro da união, os novos membros aparentam ser incapazes de convergir na direção da vanguarda em inovação. Nós analisamos os dados da participação no “SME instrument” (um canal exclusivo a PMEs – Pequenas e médias empresas) para expor os padrões de participação dos países e as tendências atuais. Os resultados corroboram firmemente a hipótese de não-convergência entre EU15 e EU13, no entanto, apesar disto, existem casos discordantes, como a Estónia e a Eslovénia, casos aqui desenvolvidos em dois casos de estudos. Novas questões também emergiram como o aparecimento de uma periferia Sul na Europa e indicadores de apatia nos países do ‘coração’ europeu. Concluímos com uma serie de recomendações de politicas para reverter o atual cenário e trazer convergência para a excelência, reforçando assim o papel da Europa no sistema de I&D e Inovação mundial.

Index

1. Introduction	1
2. Literature Contextualisation	2
2.1 R&D Worldwide Status	2
2.2 Horizon 2020 Funding Programme	3
3. SME Instrument.....	9
3.1. Rationale.....	9
3.2. How it works.....	12
3.3. Phase 1 – Proof of Concept	14
3.4. Phase 2 – Demonstration, Market Replication, Innovation Activities	20
3.5 Estonia	26
3.6 Slovenia	30
4. Traineeship Analysis.....	33
4.1 Company Description	33
4.2 Performed Functions	34
4.3 Traineeship Critical Analysis	37
5. Conclusions	39
6. Bibliography	41

List of Acronyms

AT – Austria
BE – Belgium
BG – Bulgaria
BGI – Building Global Innovators
CaaS – Country as a Service
CY – Cyprus
CZ – Czech Republic
DE – Germany
DK – Denmark
ECB – European Central Bank
EE – Estonia
EL – Greece
ES – Spain
ESA – European Space Agency
Estonian SSR – Estonian Soviet Socialist Republic
EU – European Union
EU12 – equal to EU13 minus Croatia
EU13 – BG; HR; CY; CZ; EE; HU; LV; LT; PL; RO; SK; SI; and Malta
EU15 – AT; BE; DK; FI; FR; DE; EL; IE; IT; NL; PT; ES; SE; UK; and Luxembourg
FFG – Österreichische Forschungsförderungsgesellschaft
FI – Finland
FP4 – Framework Programme Four
FP& – Framework Programme Six
FP7 – Framework Programme Seven
FR – France
GDP – Gross Domestic Product
H2020 – Horizon 2020
HR – Croatia
HU – Hungary
I3H – Incubating Internet Innovation Hubs
IE – Ireland
IPN – Instituto Pedro Nunes
ISA – Intelligent Sensing Anywhere
ISR – Israel
IT – Italy
LT – Lithuania
LV – Latvia
NATO – North Atlantic Treaty Organisation
NL – Netherland
NOR – Norway
ODI – Open Disruptive Innovation
OECD – Organisation for the Economic Co-operation and Development
PaaS – Platform as a Service

PL – Poland
PT – Portugal
Q1 – First Quartile
Q4 – Fourth Quartile
R&D – Research and Development
RISS – the Research and Innovation Strategy of Slovenia
RO – Romania
RS – Serbia
S&T – Science and Technology
SaaS – Software as a Service
SE – Sweden
SI – Slovenia
SK – Slovakia
SMEs – Small and Medium Enterprises
TR – Turkey
TRL – Technology Readiness Level
UK – United Kingdom
UKR – Ukraine
UN – United Nations
US – United States
USSR – Union of Soviet Socialist Republics
WTO – World Trade Organisation

List of Figures, Tables and Annexes

Figures

1. Annual change in employment of SMEs and large enterprises (in %)
2. Change in EU28 employment by SMEs and large enterprises, 2008-2013 and 2013-2014
3. Valley of death in the research to market process
4. Technology readiness level template

Tables

1. SME European characterisation
2. % of applications above the thresholds *per* total submissions (top-performers – Phase 1)
3. % of applications above the thresholds *per* total submissions (bottom-performers – Phase 1)
4. % of funded applications *per* total submissions (top-performers – Phase 1)
5. % of funded applications *per* total submissions (bottom-performers – Phase 1)
6. Total submissions *per* million inhabitants (top-performers – Phase 1)
7. Total submissions *per* million inhabitants (bottom-performers – Phase 1)
8. Funded projects *per* million inhabitants (outperformers – Phase 1)
9. Funded projects *per* million inhabitants (underperformers – Phase 1)
10. % of applications above the thresholds *per* total submissions (top-performers – Phase 2)
11. % of applications above the thresholds *per* total submissions (bottom-performers – Phase 2)
12. % of funded application *per* total submissions (top-performers – Phase 2)
13. % of funded application *per* total submissions (bottom-performers – Phase 2)
14. Total submissions *per* million inhabitants (top-performers – Phase 2)
15. Total submissions *per* million inhabitants (bottom-performers – Phase 2)
16. Average project size *per* country (top-performers – Phase 2)
17. Average project size *per* country (bottom-performers – Phase 2)
18. Funded projects *per* million inhabitants (top-performers – Phase 2)
19. Funded projects *per* million inhabitants (bottom-performers – Phase 2)
20. Chronogram with the established functions presented at the Protocol Minute

Annexes

1. Thematic evolution of the Framework Programme
2. Calculation formula of the indicators
3. Template for a SME instrument phase 1 application
4. Evaluation form for a SME instrument phase 1 proposal
5. Template for a SME instrument phase 2 application

1. Introduction

Horizon 2020, with 80 Billion EUR, is the largest European Research and Development (R&D) and Innovation funding programme ever made. Implemented over 7 years it aims at bringing breakthroughs, discoveries and success, from the lab to the market, from Europe to Europe, and to the world.

Born from the Framework Programmes, Horizon 2020 is the European arena where researchers and innovators present their best ideas to reach the necessary funds to implement the projects. The funding criterion is simple: «Excellence». This allows free competition; it also allows to measure each country's ability to innovate on an unbiased environment. Is this fair fighting?

In the previous programme, Framework Programme 7 (FP7), 85% of the European Commission funding was allocated to the 'old' European Union Members - the EU15. The remaining EU countries, the 'new-members' - the EU13-, received just 4% of the funding.

One can wonder: is there a heterogeneity problem in the European Union? And is this problem a concern? Since, in the latter years, and with the emergency of the sovereign debt crisis, Europe has faced many competition issues, namely in the R&D transition to the market, it is our belief that yes, there is a problem and that it constitutes a serious concern.

The present traineeship report tackles this problem through the study of the brand new Horizon 2020 and its participation patterns. This will allow to assess if in fact there is a heterogeneity problem, what causes the issue, and critically analyse it, in order to contribute to a solution.

The assessment will be made through an intra-channel proxy, the "Small and Medium Enterprises (SME) instrument", in order to make sure that the results will have adequate relevance.

This report was produced within the scope of a traineeship in ISA – Intelligent Sensing Anywhere – undertaken between the 16th of February and the 25th of May and whose job description is almost entirely related to the Horizon 2020 and the SME instrument, granting *in loco* expertise and data.

2. Literature Contextualisation

2.1 R&D Worldwide Status

In order to understand the current Framework Programme in Europe, Horizon 2020, we need first to comprehend the root of its existence, which is Research and Development (R&D) and Innovation.

It is consensual in the academic *fora* that the “linear model” of innovation, *i.e.* basic science leads to applied science which causes innovation and thereby wealth, is dead (Arnold 2011). Innovation systems are becoming increasingly complex and the innovation source is gradually becoming more blurred (Arnold 2011).

In response to this phenomenon, Innovation stakeholders, particularly Horizon 2020 stakeholders, are demanding an increasingly wider cover of the programmes and support throughout the entire innovation cycle, in order to foster and shelter any innovation, without regard from where it springs (Austrian Research Promotion Agency 2011; Young 2013; Young 2015; Fresco et al. 2015).

The global trend in research and innovation is currently moving away from the old triad United States (US) - Japan - European Union (EU). Nowadays, Korea has assumed the leadership in many high-tech sectors. China is swiftly catching-up Europe with high-tech components not only made but also designed in China (and India). “Emerging countries have shown a remarkable capacity in moving upstream in the value chain...” (Soete 2013).

Europe’s position becomes more concerning when we take in account what has already been named the “European Paradox”, defined as “Europe’s comparatively limited capacity to convert scientific breakthroughs and technological achievements into industrial and commercial successes” (European Commission ,1995, *apud* Arnold ,2012). “This disconnection between knowledge creation and actual production” (Sabadie 2014) is critical, and even more dreadful when compared to Asia performance. For example, although Europe still possesses the technological leadership in terms of patents, Asia has already become the main producer of high- and medium-tech products (Sabadie 2014).

Inside the EU, the motto is “convergence” as the heterogeneity gap between R&D systems in the core and periphery (South and East Europe) demands a solution to balance the overall European innovation environment, under the threat of lagging behind the rest of the world (Reinhilde et al. 2015).

To overcome this difficulty, EU has established several R&D programmes in the most diverse areas, from investigation to innovation or market finance instruments. One of these programmes is Horizon 2020 (H2020).

2.2 Horizon 2020 Funding Programme

Horizon 2020 is by definition an R&D funding programme, thus its rationale is the same as that of other R&D funding programmes. As knowledge is a public good, firms cannot internalise wholly the effect of R&D activity, leading to a sub-optimal private R&D investment (Bronzini and Iachini 2014). In other words, R&D subsidies should lower the marginal cost of R&D, increasing R&D investments and thereby firm profits and spillovers; in exchange, the burden of this operation falls on the public apparatus (Takalo, Tanayama, and Toivanen 2013).

Certain issues need to be taken into account here. The first one regards the complementarity, or substitution, relation between this genre of programmes and privately funded R&D. The importance of this debate lies on the eventuality of a crowding out effect of privately funded R&D due to the public programmes. We believe that the conclusion of complementarity prevalence by David, Hall, and Toole (2000) is satisfactory and we will address the forthcoming topics based on it.

The second issue is that the allocation of the funds cannot be neglected and must be targeted to projects that would not be undertaken without the grants, in order to be effective (Bronzini and Iachini 2014).

The historical context of Horizon 2020 is substantially different from the precedent programmes, due to the sovereign debt crisis of 2008; the presence of the new EU12 countries in the negotiation phase (only the EU12 because Croatia only joined the EU in the 1st of July 2013, thus not being part of the negotiation committee at the time); the evolution of the innovation system; and the global position of Europe.

The first novelty in Horizon 2020 creation is, thus, the contribution of the new EU members, EU12, in the negotiation phase. Despite those countries participation in FP7, their contribution to the programme development process was clearly neglected, resulting in low participation rates and low funding to the participants from these countries (EU12 Member States 2011). In Horizon 2020 the reality is other, the EU12 are now well established in the European Community and their participation is now documented and can be properly addressed. As a result, a joint common position was taken in 2011 to endorse a set of policies to be implemented in Horizon 2020, directed to further integrate the “new Member States”.

This set of policies endorsed in the “Common Position Paper of the EU12” demanded, among others: more support to small and medium enterprises (SME); complementarity with the Structural Funds; simplification of the bureaucratic processes; empowerment of the knowledge triangle; and to maintain excellence as the main cornerstone of the programme but also to include new principles, such as inclusiveness (EU12 Member States 2011).

Later in the same year, another rallying cry was taken, this time in Austria (Austrian Research Promotion Agency 2011). The Österreichische Forschungsförderungsgesellschaft (FFG) set of recommendations shares some features with the EU12 common position, such as SME support and coordination with Structural Funds and other EU funding programmes. The FFG establishes as pre-requisites to success three features: complementarity among EU, national and regional funding; shelter the entire innovation cycle; and having a common set of rules to all instruments.

FFG also lists 13 recommendations to be undertaken in H2020. We emphasise: significantly raising of the budget; merging of all relevant funding schemes under the same “flag”; tackling Societal Challenges; establishing a recognisable set of common rules for all instruments of the programme; empowering the EU agencies to foster cooperation both intra-EU and with outside countries (Austrian Research Promotion Agency 2011).

Additionally, we should expect an intensification in both participation and competition, as consequence of the now reduced national budget for funding programmes throughout Europe, *via* fiscal austerity policies (Young 2015; Schuch 2014).

Regarding the Horizon 2020 structure, it is based on three pillars:

Scientific Excellence

Industrial Leadership

Societal Challenges

Therefore, to obtain a holistic portrait of the Horizon 2020 reality, it's important to confront the "design flaws" pointed by the literature, including those in the pillars.

Regarding **Scientific Excellence**, even if there is a consensus that it should be the cornerstone of the programme (EU12 Member States 2011), it did not achieve the same consensus to be used as the measure to funds allocation. The criterion rationale is that research excellence is a requisite to compete and perform successfully inside the programme (Schuch 2014), even if it leads to augmented heterogeneity among the "Innovation Union" (Reinhilde et al. 2015). The same line of reasoning is not shared by Pelle, 2015 (*in* Reinhilde et al. 2015), for whom the "merit-based" criteria without any regard for geographical distributions nullifies "widening participation" as a necessary feature of Horizon 2020.

In fact, the current heterogeneity of innovation systems in Europe is not an immediate concern of Horizon 2020, and this programme may even contribute to increase the discrepancy (Reinhilde et al. 2015). The participation of the EU13 is a particularly good indicator of this concern, e.g. in "Framework Programme 7" (FP7), EU15 organisations were ten times more awarded with funding than EU13 (Schuch 2014). However, a literature trend argues that the heterogeneity gap should be addressed by the Structural Funds and the Cohesion Fund, and not by Horizon 2020 or other R&D funding programmes (Schuch 2014; Reinhilde et al. 2015). In the other hand, some authors argue that Horizon 2020 should address this problem since the solution lies within EU15 and EU13 cooperation and not solely in infrastructure investments, as is the case of the Structural Funds (Young 2013).

Within the **Industrial Leadership**, the most striking, and thereby the most addressed issue is the access obstacles to SME inside the programme channels. These

obstacles can go from absence of matching platforms, to unawareness of the system's complexity, and the demand of unavailable resources (e.g. time and skill) to draft successful proposals (Simonelli 2016).

The lack of innovative SMEs in Europe is a problem for policy makers, mainly because of their importance on the economy, and the low participation in the R&D mechanisms led to several warning for more "SME-friendly calls" (Gilmore, Galbraith, and Mulvenna 2013). Many of the solutions to overcome the perceived barriers to SMEs, such as the simplification of the processes, were called out and incorporated in the Horizon 2020; however, some flaws persist, e.g. participation limits inside the specific SME instrument (Simonelli 2016).

A welcome novelty introduced in Horizon 2020 was the pillar **Societal Challenges**, aimed at incorporating social innovations. The goal of this pillar is to tackle Societal Challenges with a bottom-up approach (Sabadie 2014).

This new pillar brings to the table a new channel to stimulate innovation, by creating a kind of "Grand Challenge" that, hopefully, will bring demand-driven innovation to several societal challenges, taking into account not only present but also future European problems, e.g. "health, demographic change and wellbeing" targeted at the "greying of Europe" (Reinhilde et al. 2015; Sabadie 2014).

The big hope for the pillar is, in this way, the creation of society-oriented markets. Now, the creation of such a market, based on the society welfare instead of individual self-interest, has several limitations and constraints, but it is feasible. The major example is climate-change driven market (Reinhilde et al. 2015), based on positive environment externalities, which would not provide a high enough individual benefit to match the personal investment, unless it is operated together with the rest of the community and society.

The climate-change market has thrived, but in order to do so it has consumed decades of public funded programmes to raise awareness and the education of generations until the critical mass could be reached. The ability to nurture a market with these characteristics within the timeframe of an R&D programme may be limited and, in order to

be successful, those societal-oriented markets must be continually supported by EU budgets.

At last, it is important to notice that the constant widening of the Framework Programmes' thematic (Horizon 2020 is the continuity of this "denomination"), while merging the intra-programme channels, it's not only remarkable but also encouraged to be continuously pursued (Arnold 2011; Fresco et al. 2015). Annex 1 provides the thematic evolution in the Framework Programmes, Horizon 2020 included.

After presenting the novelties of Horizon 2020 programme, it becomes necessary to assess if the core problems were impacted, in particular the intra-EU heterogeneity. Moreover, since the 'European Paradox' presents a relevant issue to the European R&D status we will also address it.

Taking Brian Loasby observation about the Boeing 737, "Nobody knows how a Boeing 737 works", the same can be said about the Framework Programme (Loasby, 2005, *apud* Arnold ,2011). It is due to this complexity that a complete analysis of the programme becomes difficult within the timeframe of a traineeship report. Thus, we decided to proceed with a proxy within the programme, which could, on the one hand provide information about the actuation over the «paradox» and on the other hand measure the EU «heterogeneity».

Among the various funding channels of Horizon 2020, the **SME Instrument** was the one that provided the best proxy for these outputs.

Firstly, it is a SME-exclusive channel, therefore excluding large companies and institutions, that tend to have a long accumulated expertise and resources, which could bias the participation trends, (e.g. Oxford university or Siemens whose participation in FP7 accounted for 719 and 132 funded projects respectively (DG Research and Innovation - Evaluation Unit (A.5) 2015)). SMEs constitute fresh players, usually with low background and low bias factors, thus providing a good indicator of each country profile and economics trends in the moment.

Secondly, to receive funding from this channel the applicant must present a technology between the research level and the market uptake, *i.e.* the critical point of the 'European Paradox'. Even if the participation *per se* does not demonstrate the progression of the idea until it reaches the market, it still gives the information about the efforts made in that direction by the applicants. So this channel can provide indications about the ability of each country SMEs to overcome the business development stage.

3. SME Instrument

3.1. Rationale

The SME instrument was created with the intent to facilitate the participation of this kind of enterprises in the Horizon 2020 programmes, thus opening the door to new participants, and new solutions, which without this dedicated instrument would not have the necessary tools to compete.

By Europe standards, SMEs are Small and Medium Enterprises with no more than 250 staff headcount and either a turnover lower, or equal, to 50 M or a Balance sheet total equal, or lower, than 43 M (Table 1 provides the ceilings for Medium- Small- and Micro-sized categories).

Company Category	Staff Headcount	Turnover	or	Balance sheet total
<i>Medium-sized</i>	< 250	≤ 50M		≤ 43M
<i>Small-</i>	< 50	≤ 10M		≤ 10M
<i>Micro-</i>	< 10	≤ 2M		≤ 2M

Table 1 – SME European Characterisation

Source: Commission Recommendation of 6 May 2003 concerning the definition of micro, small, and medium-sized enterprises. (2003/361/EC), Official Journal of the European Union, L 124/36, 20 May 2003

Why a SME instrument?, *i.e.*, why does Europe need a SME-exclusive channel?

More than a trend, SMEs are being the focus of the spotlight due to their relevance in European economies, especially those who have passed through tempestuous crises. SMEs account for 99% of all European enterprises, while 9 in 10 SMEs are in fact micro (less than 10 employees). They employ two thirds of European workers and are responsible for 58 cents in every euro of value added, according to the “Annual Report on European SMEs 2014/2015” by Muller et al. (2015)

Additionally, non-large enterprises tend to be more resilient to economic crashes, suffering lower employment drops, as shown in figures 1 and 2. However, they are also slower to rebound from the economic shocks, perpetuating the pain for several years, whereas large enterprises are struck heavily by the shock but have a fast rebound to previous levels.

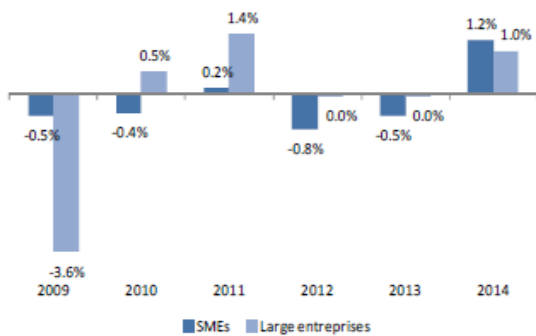


Figure 1 - Annual Change in employment of SMEs and large enterprises (in %).

Note: the EU28 aggregate does not include Slovakia due to a break in the series.

Source: Eurostat, National Statistical Offices, DIW econ, apud "Annual Report on European SMEs 2014/2015"

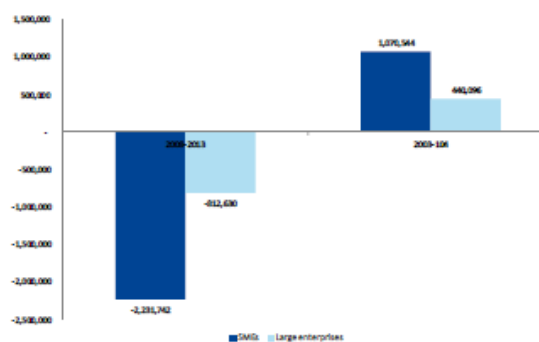


Figure 2 - Change in EU28 employment by SMEs and large enterprises, 2008-2013 and 2013-2014

Note: the EU28 aggregate does not include Slovakia due to a break in the series.

Source: Eurostat, National Statistical Offices, DIW econ apud "Annual Report on European SMEs 2014/2015"

In line with the 'Small Business Act' for Europe of the European Commission (2008), Horizon 2020 has also adopted a set of guidelines in the creation of SME instrument such as:

- a) Promoting entrepreneurship
- b) Lowering administrative burden
- c) Granting access to finance
- d) Easing access to markets and internationalisation

These guidelines, together with the Societal Challenges society-oriented innovation and Industrial leadership, make the foundations of the SME instrument. The foundations' intentions are aligned with the specific needs pointed by SMEs, namely regulation, finding customers or access to finance.

The SME instrument also intends to confront the 'European Paradox', particularly the so call 'valley of death' of business development, illustrated in figure 3. By filling the gap between R&D and Market uptake, the SME instrument aims to help high-risk, high-innovation projects to cross a crucial step of business development, which is the validation of the concept in the market, to then properly enter as a mature solution and successfully compete. This stage tends to be neglected both by public funds, since it is out-of-scope, *i.e.* the research *per se* has ended, and by private investors since a business was not created yet, thus becoming a high-risk investment. With no capital to proceed, the valley of death is regularly the end of a fairly large number of European ideas.

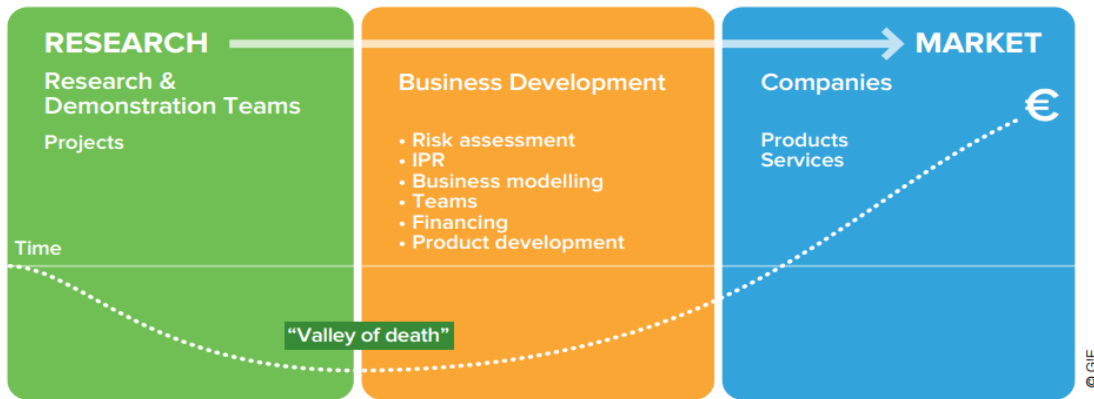


Figure 3 – Valley of Death in the Research to Market process

Source : <http://www.greenovate-europe.eu/sites/default/files/u25/Valley%20of%20Death.png>

To fill this gap and construct a bridge over the valley, the SME instrument was design to consider only propositions with a Technological Readiness Level 6 (TRL – figure 4 provides the template). Level 6 is the minimum required TRL to enter SME instrument, and the upwards levels until market entry are fully covered by the Phase 1, 2 and 3 mechanisms. Beneath this TRL level, other funding channels of Horizon 2020 can be used more adequately.

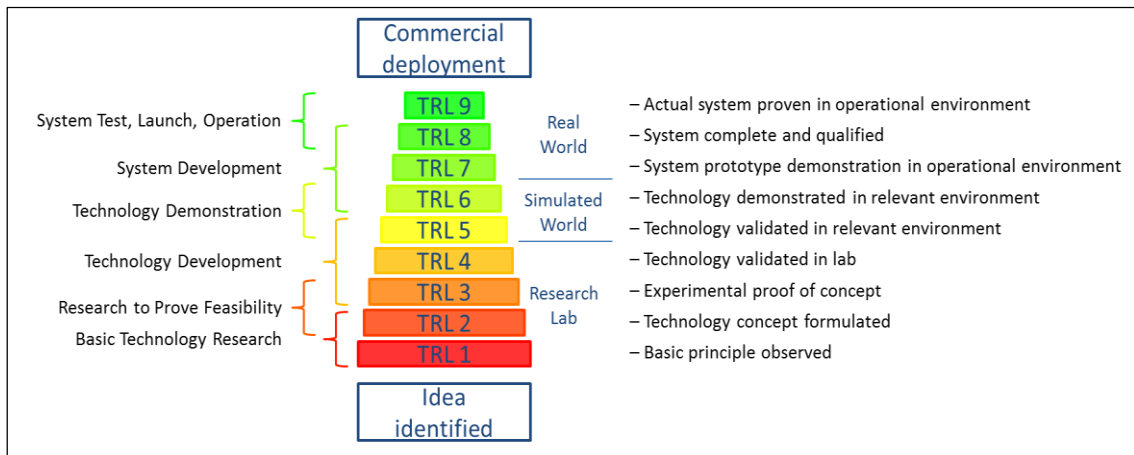


Figure 4 – Technology Readiness Level Template

Source : http://www.odobreno.si/wp-content/uploads/2015/06/trl_3.png

For clarity purposes, below TRL 4 is considered the Research stage, levels from TRL 5 to the TRL 8 constitute the Business Development stage, and only after TRL 9 the technology is mature enough to be fully implemented in the market.

Therefore, a SME-exclusive Instrument was designed and implemented to directly encourage and support SMEs to put forward their disruptive projects with European dimension, particularly those projects which, due to their high-risk character, could not find

financing in the market. This goal does not restrict itself to a specific sector of companies, *e.g.* very-high tech manufacturers, but instead it is open to all kind of SMEs, from research-driven SMEs to social business model SMEs.

3.2. How it works

The SME instrument is sub-divided into 3 phases:

1. Phase 1 – Proof of Concept
2. Phase 2 – Innovation Activities
3. Phase 3 - Commercialisation

The logic is that a project should proceed through the 3 phases, transforming the idea into a market success. This is not mandatory, though. A project can apply independently to the desired phase, without having participated in the previous, or decide not to follow the normal order, for example jumping from phase 1 to 3.

The propensity to cooperate of each country can here be analysed through consortia arranged, as in the SME instrument the consortia are not mandatory, despite being appreciated. One should point that SMEs are reduced to one project participation in the SME instrument, *i.e.* if they choose to cooperate with another SME application they will no longer be eligible to submit one project of their own. This is a strong limitation, both in our opinion and in the opinion of others (*e.g.* Simonelli ,2016).

As for the funding schemes, they are personalised for each phase characteristics, and will be addressed further ahead. A note here to say that in phases 1 and 2 the grantee will receive a 'free coaching service' to help fulfil the deliverables and advise on the business and innovation components.

The projects can apply in regard to the following societal challenges:

- Open Disruptive Innovation (ODI)
- Accelerating the uptake of nanotechnologies advanced materials or advanced manufacturing and processing technologies by SMEs
- Dedicated support to biotechnology SMEs closing the gap from lab to market
- Engaging SMEs in space research and development
- Supporting innovative SMEs in the healthcare biotechnology sector

- Accelerating market introduction of ICT solutions for Health, Well-Being and Ageing Well
- Stimulating the innovation potential of SMEs for sustainable and competitive agriculture, forestry, agri-food and bio-based sectors
- Supporting SMEs efforts for the development - deployment and market replication of innovative solutions for blue growth
- Stimulating the innovation potential of SMEs for a low carbon and efficient energy system
- Small business innovation research for Transport and Smart Cities Mobility
- Boosting the potential of small businesses in the areas of climate action, environment, resource efficiency and raw materials
- New business models for inclusive, innovative and reflective societies
- Engaging SMEs in security research and development

A note concerning the Open Disruptive Innovation (ODI) call: this call is meant to be an appendix of the SME instrument, *i.e.* any proposal which fulfils the programme spirit but does not directly address any of the proposed 'challenges' can be submitted under the ODI. This implies that the programme covers any kind of application, as an Open Disruptive Innovation, but, on the other hand, this also makes the ODI call the most competitive and crowded flow channel in the SME instrument.

Another note, this time concerning phase 3: this phase is meant to facilitate the exploitation of the results of previous phases, and it works by linking the applicants with business angels and by granting special access to EU risk finance. We will not evaluate the participation in this phase due to the scarce information, because of the subtleties of this sort of mechanisms.

As for phase 1 and phase 2, we will assess the participation patterns in a country-wide perspective. The considered indicators will be (formulae in annex 2):

- a) Percentage of funded projects per total submissions – Provides us with the effectiveness of the applications coming from a given country;
- b) Percentage of applications above the establish thresholds – Gives the percentage of High-quality applications, *i.e.* good enough to be considered for funding;

- c) Total submissions per million inhabitants – Assesses country appetite and also mitigates size factors;
- d) Funded projects per million inhabitants – Evaluates the overall effectiveness of a country participants, taking into account country size;
- e) Average project size per country – Constitutes a proxy for the country ambition and desire for high-risk/high-reward projects.

To grant more relevance to the analysis, we will separate the data in 2 focus groups. To create these groups, we will divide the indicators' results in quantiles of 25% and then focus the analysis in Q1 (top 25%) and Q4 (bottom 25%). Q1 will henceforth be called the «top-performers or outperformers», whereas Q4 are the «bottom-performers or underperformers».

Nonetheless, we point three necessary notes: First, since the phases are distinct, the analysis will be made separately to accomplish a clearer understanding of the results, consequences and causes.

Secondly, Luxembourg and Malta were excluded from the sample due to their small population, under 1 million inhabitants, which could influence disproportionately the indicators' results.

And the third one, the participation of non-EU members, which through agreements with the European Union managed to participate in the Horizon 2020, will not be assessed, therefore these countries were excluded from the sample.

3.3. Phase 1 – Proof of Concept

The purpose of phase one is to create a Concept & Feasibility assessment, *i.e.* to carry out a feasibility study in order to verify the viability of the proposed disruptive innovation/concept, over a period of 6 months.

To do so, enterprises must fill a document (template of the document in annex 3), with a 10 pages maximum, concerning the following rubrics:

- Objective
- Relation to the Work Programme
- Concept
- Ambition
- User Needs
- Main Economic Benefits
- Market Description
- Competition and Stakeholders
- IPR and Regulatory Issues
- Relation with Company Strategy
- Rationale of the project team
- Economic Impact in the Company
- Work Plan
- Project Team/ Consortium Structure
- Company Description
- Dissemination and Exploitation of Results

In order to be considered for funding the application must reach a threshold score of 13, out of 15, in regard to three sub-divisions: a) Excellence; b) Impact; c) Implementation; with a minimum score of 4, in 5, in all the three sub-divisions. The template of an evaluation form is presented in annex 4.

In Phase 1, the funding scheme is equal for all grantees, a 50.000 EUR lump sum.

The simplified process and reduced size of the application, as well as the information required, which even if the submission is not successful can be used as internal data for the company, have led the majority of applicants to submit their candidatures to Phase 1. In fact, the application form is a preparation test for the final deliverable «Feasibility Report» which is in turn an input necessary for the second phase.

16.480 applications were submitted to SME Instrument Phase 1, until the 24th February 2016. Of those only 1.340 were funded, an equivalent to 67 million EUR and a success rate slightly above 8%.

If we analyse the effectiveness of countries' applications, here measured as the percentage of funded projects per total amount of submissions, and the high quality of the same, here measure as applications above the established thresholds per total amount of submissions, certain patterns emerge.

Top-Performers	High-Quality
DK	25,53 %
UK	23,93 %
IE	21,52 %
AT	20,69 %
ES	19,88 %
SE	19,38 %
EE	18,48 %

Tables 2 - % of applications above the thresholds per total submissions (top-performers – Phase 1).

Bottom-Performers	High-Quality
RO	1,75 %
BG	2,78 %
HR	5,38 %
PL	6,74 %
HU	7,07 %
SK	7,22 %
LV	7,41 %

Tables 3 - % of applications above the thresholds per total submissions (bottom-performers – Phase 1).

On the top-performers group of quality, we can see that, apart from Estonia, all of them are part of the pre-millennium group (EU15). On the other hand, the bottom-performers are composed by the great majority of EU-13, the new-millennium members.

This result is somewhat confirmed when we consider the percentage of funded applications. In fact, there are only some minor changes in the top- and bottom-performers groups.

Top-Performers	Effectiveness
DK	14,89 %
IE	14,77 %
EE	13,59 %
SE	13,54 %
UK	12,50 %
AT	11,49 %
ES	10,64 %

Tables 4 - % of funded applications per total submissions (top-performers – Phase 1).

Bottom-Performers	Effectiveness
RO	0,58 %
BG	1,01 %
LV	2,22 %
CZ	2,76 %
HR	3,08 %
SK	3,09 %
HU	3,40 %

Tables 5 - % of funded applications per total submissions (bottom-performers – Phase 1)

Comparing both indicators, the differences lie basically in the replacement of Poland by Czech Republic on the bottom group and the redistribution of the top-performers relative positioning. This redistribution comes from the assessment of

characteristics other than project quality, such as ambition or alignment with the EU agenda.

As mentioned above the EU15/EU13 discrepancy was clear, however, Estonia, a EU13 country, shown up for the better reasons with good quality and even greater effectiveness.

The lack of ‘quality’ and effectiveness of EU13 members (8 out of the 13 were bottom-performers) can be explained either by the competitiveness gap between the east periphery and the EU core, Central and Nordic Europe, or due to lack of attractiveness of national funding programmes (particularly since 2008 crisis), which makes SMEs redirect all the projects to European programmes, flooding those.

The latter cause would reflect in more Eastern applications submitted, *per* inhabitant, compared to the other countries SMES, where national programmes can better rival with the European-wide programme.

<i>Top-Performers</i>	Submissions per capita	<i>Bottom-Performers</i>	Submissions per capita
<i>SI</i>	226,97	<i>RO</i>	8,59
<i>EE</i>	139,97	<i>FR</i>	10,99
<i>HU</i>	74,52	<i>DE</i>	12,30
<i>FI</i>	70,49	<i>CZ</i>	17,20
<i>LV</i>	67,71	<i>BE</i>	18,43
<i>CY</i>	61,54	<i>AT</i>	20,36
<i>DK</i>	58,35	<i>PL</i>	21,07

Tables 6 - Total submissions per million inhabitants (top-performers – Phase 1)

Tables 7 - Total submissions per million inhabitants (bottom-performers – Phase 1)

A first impression on the submission data *per* million inhabitants of the countries reveals us that 5 of the 7 top performers are indeed EU13 countries, which may corroborate that Horizon 2020 may be more attractive to the new members than to older ones, *i.e.* H2020 is a better alternative to national R&D funding programmes on the east periphery than on the ‘core’.

One should also point out the fact that core countries (France/ Germany/ Belgium/ Austria) are listed as bottom performers in terms of submissions *per capita*. Once again this may be due good internal programmes capable of rivalling with H2020 resources, with the advantage of a reduced competition.

Czech Republic, Poland and Romania have shown poor appetite also, but the most concerning case is the one of Romania. In the specific case of Romania, the underlying problem may be mainly a weak Science & Technology (S&T) system. Romania has the second lowest amount of researchers per million inhabitants (945/million inhabitants), the lowest R&D expenditure as percentage of GDP (0,39%), lowest Expenditure on Education as percentage of total Government expenditure (8,3%) and as percentage of GDP (3,1%)¹. Therefore, the weak Romanian S&T system may present a plausible reason for the apparent lack of capacity to even present applications, particularly high-quality ones.

Lastly, we grouped the aforementioned indicators to achieve a holistic portrait of the outperformers and underperformers. To do so we used the total amount of funded applications per million inhabitants, in order to include effectiveness and minimise size effects.

<i>Outperformers</i>	<i>Overall Effectiveness</i>
<i>EE</i>	19,02
<i>SI</i>	12,12
<i>DK</i>	8,69
<i>IE</i>	7,58
<i>FI</i>	6,41
<i>ES</i>	5,92
<i>SE</i>	4,54

Tables 8 – Funded projects per million inhabitants (outperformers – Phase 1).

<i>Underperformers</i>	<i>Overall Effectiveness</i>
<i>RO</i>	0,05
<i>CZ</i>	0,48
<i>BG</i>	0,55
<i>PL</i>	0,74
<i>HR</i>	0,94
<i>EL</i>	1,01
<i>FR</i>	1,03

Tables 9 – Funded projects per million inhabitants (underperformers – Phase 1).

¹ Greece data was not available for the latter indicators.

The highlight here undoubtedly belongs to Estonia and Slovenia, two small countries with a population of 1,3 and 2 million respectively, with a significant large amount of funded projects.

Estonia has a high performance both in submissions, *per* inhabitant, and effectiveness of the applications, resulting in the prime position on the presented indicator. In the case of Slovenia, the flood of applications may explain the second position since neither the quality nor the effectiveness of the applications are above the sample mean.

Denmark was in the podium in every indicator, only in the submissions *per* inhabitant did DK fall behind, thus Danish may be considered true outperformers, only matched by the Estonians. Ireland, in his turn, is a good overall player performing well throughout all indicators.

As for Finland and Sweden, they present us with two distinct cases. While the former has a massive participation for a 'core' country, with a high quality indicator that has shown to be, oddly, below the participants mean, Swedish made the opposite having good quality, and even great effectiveness, but presenting a fairly mediocre appetite.

The Spanish result is not a surprise since it is the second major participant on the programme, with 2.585 application submitted, and the country with most funded projects (275) despite not being a top performer in submissions *per* inhabitant (55,62). We do not expect a breakdown in Spain performance since the Spanish applications have shown high-quality with 19,88%, above the established thresholds.

Analysing the underperformers, the group belongs mostly to EU13, meaning that, at least in terms of ability to compete for R&D funding, the EU13 countries are still lagging behind, and the expertise gained from the fail and learn experience may not be enough to surpass the chasm in a near future. The results of Estonia and Slovenia are however a good signal that the chasm is not unsurpassable and convergence can be a reality. Nonetheless the Romanian case is a worrying example of a country in a non-convergence status.

The presence of Greece in the underperformers may point out the materialisation of a new fear: a South periphery creation in EU after the 2008 crisis, which may be a long-

term concern to Europe. As for France, their underperformance may be linked more with a relative lack of appetite for the programme than lack of effectiveness.

3.4. Phase 2 – Demonstration, Market Replication, Innovation Activities

Phase 2 is not necessarily in the sequence of a phase 1 project. The phase 2 is designed to provide funding to innovation activities underpinned by a strategic business plan, including a feasibility study. Those innovation activities could consist in activities such as demonstration; prototyping; piloting; miniaturisation; market replication; and any activity which matures the technology readiness closer to the market introduction. Likewise phase 1, the minimum TRL level is the 6th.

The execution of the innovation activities must be made between 12 and 24 months, and the funding scheme usually ranges from 0,5 and 2,5 million EUR, however other funding sums can be considered, if duly justified.

A phase 2 application is more complex than a phase 1 application. In fact, the structure of a phase 2 application should consist in the arrangement of, essentially, the same rubrics as phase 1 but with a much deeper detail. Thus the page limit is no longer 10 but 30 pages. A template of phase 2 proposal presented at annex 5.

The increased complexity of the application, as well as the commitment required to fulfil the deliverables, have led to a much smaller participation in phase 2 relatively to phase 1: 325 was the total number of funded proposals for this phase, almost a quarter of the total funded applications in phase 1.

The total submitted applications were 5.388 to Phase 2, until the 3rd of February 2016, out of which 325 were funded, with a funding of 542M EUR and a success rate of roughly 6%. The numbers show that this phase of the SME instrument is marked on one hand by a stricter set of funded projects, plus a higher challenge to be successful, and on the other hand, by higher rewards to the beneficiaries.

A primary sub-analysis of the participant countries reveals that out of the EU28 only 21 managed to at least have 1 funded project: Luxembourg, Cyprus, Latvia, Slovakia, Bulgaria, Romania, and Croatia did not have any winning application in phase 2. Since only

7 of the EU13 countries managed to successfully pass the EU criteria this can again show a technical chasm between new and old members of EU.

Replicating the same indicators used for Phase 1 into the Phase 2 the following results emerged:

Top-Performers	High-Quality	Bottom-Performers	High-Quality
<i>LT</i>	53,33 %	<i>BG</i>	8,33 %
<i>IE</i>	47,06 %	<i>EL</i>	13,18 %
<i>EE</i>	46,38 %	<i>HR</i>	13,33 %
<i>FI</i>	44,17 %	<i>CZ</i>	13,33 %
<i>ES</i>	44,03 %	<i>SK</i>	17,74 %
<i>SE</i>	40,40 %	<i>PL</i>	23,64 %

Tables 10 - % of applications above the thresholds per total submissions (top-performers – Phase 2).

Tables 11 - % of applications above the thresholds per total submissions (bottom-performers – Phase 2).

A welcome surprise is the appearance of Lithuania, in the prime position of the quality indicator (with Estonia in 3rd) which can reinforce the convergence possibility for the new-members.

Not so welcome is the low quality of Bulgarian, Croatian, Slovakian, and Romanian applications (RO did not even have one high-quality proposal), which was reflected in no funded proposals to these countries.

Top-Performers	Effectiveness	Bottom-Performers	Effectiveness
<i>IE</i>	11,76 %	<i>PT</i>	1,16 %
<i>SI</i>	9,52 %	<i>BE</i>	1,43 %
<i>ES</i>	9,06 %	<i>PL</i>	1,82 %
<i>FI</i>	8,74 %	<i>EL</i>	3,10 %
<i>EE</i>	8,70 %	<i>HU</i>	4,06 %

Tables 12 - % of funded applications per total submissions (top-performers – Phase 2).

Tables 13 - % of funded applications per total submissions (top-performers – Phase 2).

Before going forward a note must be issued, the case of Latvia: this Baltic country, similarly to his neighbours, showed above-average quality (39,13%). Notwithstanding, this was not materialised in awarded applications, as Latvia did not have a single funded

project. This concern, applicable also to Lithuania (8 high-quality proposals and 1 funded) deserves to be further studied in the future.

Belgium and Slovenia are antipode cases, on BE side is a country with above-average quality applications (35,71%) and a shocking low effectiveness of the same, 25 high-quality proposals and only 1 was approved for funding. While Slovenia, who has an under the mean percentage of quality proposals (30,95%), is the 2nd most effective country, with 26 high-quality proposals and 8 approved. The reason for such Slovenian results is for now unknown but it's definitively worthy of further attention.

Ireland fulfils a podium position both in quality and effectiveness reassuring the good results already shown on the phase 1 by the Celtic Tiger. Spain, a phase 1 outperformer, keeps a spot in the high-quality and effectiveness top-performers, thus leveraging the good results of phase 1. Finland makes his debut at quality and effectiveness top groups which can point a better ability to execute bigger projects.

On the bottom, Poland reappears as bottom-performer in quality and effectiveness. Since Poland is the sixth largest country, in population, of EU and a geographically neighbour to the Europe 'core', the development of Poland technical tools could be a necessary strategic bridge for EU15 and EU13 convergence.

Portugal and Greece present a caveat for Europe. Since the 2008 crisis that the opening of a new periphery, the South periphery – PT; ES; EL; IT – has being discussed in the European *fora*. With the vanishing of EU13 majority and consequent appearance of Portugal as a bottom performer, this warning should be taken more serious. However, the great performance of Spain, Portuguese neighbour, and the coexistence with Belgium, also as a bottom-performer, could minimise these worries. Notwithstanding, an eye should be kept on the southern countries performance.

In terms of participations per capita the results are *quasi* similar Phase 1.

<i>Top-Performers</i>	Submissions per capita	<i>Bottom-Performers</i>	Submissions per capita
<i>EE</i>	52,49	<i>RO</i>	0,75
<i>SI</i>	40,74	<i>CZ</i>	1,43
<i>FI</i>	37,72	<i>PL</i>	2,89
<i>DK</i>	26,60	<i>HR</i>	3,54
<i>IE</i>	22,10	<i>DE</i>	5,10
<i>SE</i>	20,42	<i>LT</i>	5,12
<i>HU</i>	19,97	<i>BE</i>	6,23

Tables 13 - Total submissions per million inhabitants (top-performers – Phase 2).

Tables 15 - Total submissions per million inhabitants (bottom-performers – Phase 2).

Estonia, Slovenia, Hungary and Finland remain with a great appetite for the programme with Ireland and Sweden replacing Latvia and Cyprus (both with no funded projects in this phase) relatively to the phase 1. One should note that, in comparison to phase 1, phase 2 requires much more technical and technological ability since not only a feasibility study has to be made but also the innovation activities must be carried out, in order to comply with the rules of the programme, assuring the project's funding. This fact is a great inhibitor to those who want to participate but do not have the capacity to do so.

The appearance of CZ, HR, LT and PL in the group which submits less applications *per* inhabitant is alarming for two reasons. One is that may be another signal of an apparent lack of arms to fight the innovation war, at least intra-EU. The other is that bigger innovation projects are not as appealing for these countries as other smaller funding schemes with smaller rewards such as the Phase 1.

Regarding Belgium and Germany, they maintain the same apathy for the SME instrument, which again may indicate good internal alternatives. To the EU's policy makers, the reversion of this situation could be in their interest, particularly if central European participation was converted in consortia with other regions namely the East Front, thus redistributing knowledge towards the peripheries.

An indicator applicable in the phase 2 is the amount of distributed funds *per* country, since the funds granted vary with the proposals. The total granted budget divided

per the total funded proposals should give us the average size of a project in a given country. In this particular indicator we will present the results without countries who had only 1 or 2 funded, in order to achieve more reliable results. The excluded countries were PL, BE, CZ, LT and PT.

Top-Performers	Average project size
NL	2.361.245
EL	2.090.415
IE	2.045.671
UK	2.023.423

Table 16 - Average Project Size per Country (top-performers – Phase 2).

Bottom-Performers	Average project size
HU	1.267.664
SI	1.288.557
ES	1.299.295
DK	1.465.229

Table 17 - Average Project Size per Country (bottom-performers – Phase 2).

Netherlands achieved a near the ‘limit’ size, circa 2,3 million EUR size, which is noteworthy even for a central European country. The spotlight is even more adequate due to achieve this average size with 19 funded projects demonstrating a great capacity to systematically execute big projects and successfully apply for new ones.

Greece has also shown great ambition, with a total grant received of 8,361 million EUR across 4 projects. Greece has been in a stormy government environment since 2008, Greek’s average project size can be an indicator of the search for funding alternatives, to finance projects which would not be undertaken with national funds nor by accessing the financial market. Nonetheless, Greek ambition provides a good signal of a positive counter-cycle attitude which *per se* must be seen with good eyes.

The British Isles, UK and IE, are the remaining two on the top-performers and their project sizes go in line with the performance demonstrated throughout phase 1 and 2 indicators. However, this may be particularly more relevant to the Celtic Tiger since Ireland tend to be relatively more participative in this programme channel.

On the negative window, Spain has a low average projects’ size (alongside with Portugal, here excluded but whose only project received under 1M grant). This may show that for Iberian countries the SME instrument phase is more attractive to fund smaller

projects, or at least the bigger projects may have a better alternative financing source. Other plausible reason may be a lack of ambition or disbelief in their own capacity to execute big, EU dimension, projects.

Slovenia and Hungary have also shown low project funding. The interpretation made for the Iberian Peninsula may also be applicable here: either lack of ambition, lack of appeal of bigger projects or better alternative financing source for bigger projects can be the reason for the beneath the mean results.

Concluding with the effectiveness *per* inhabitant to assess overall performance.

<i>Outperformers</i>	<i>Overall Effectiveness</i>	<i>Underperformers</i>	<i>Overall Effectiveness</i>
<i>EE</i>	4,56	<i>PL</i>	0,05
<i>SI</i>	3,88	<i>BE</i>	0,09
<i>FI</i>	3,30	<i>CZ</i>	0,10
<i>IE</i>	2,60	<i>PT</i>	0,10
<i>DK</i>	1,95	<i>LT</i>	0,34

Table 18 - Funded projects per million inhabitants (outperformers – Phase 2).

Table 19 - Funded projects per million inhabitants (underperformers – Phase 2).

The outperformers in phase 2 are the same of phase 1, with Spain and Sweden right after Denmark.

Estonia and Slovenia keep outperforming the rest of the countries with Finland and Ireland following closely and demonstrating also great interest and effectiveness in this programme. After those the pack is led by Denmark, whose performance fell with phase 2; Spain, still a major participant responsible for 19% of total applications; and Sweden.

On the underperformers group with 6 funded projects, the story is very different.

Poland, the 6th largest country, was, again, an underperformer as 2 funded projects *per* 38 million people is manifestly low. In here one should reinforce the aforementioned recommendation, being Poland a key geographically-located country it should implement measures to improve its ability to compete in R&D and Innovation programmes such as Horizon 2020. It is our opinion that by doing so Poland can work as a bridge for knowledge flow between Central and East Europe.

Both Belgium and Portugal had only 1 funded project, a disappointingly low number. While in the case of Belgium the reason may be linked to better alternatives or disinterest for the SME instrument, since BE tends to present good quality indicators and on phase 2 their project went almost to the funding limit (2,3 M), *i.e.* it was a big project. In the Portuguese case the concern should not be in the interest for participation but in a disbelief or lack of projects' ambition, as the Portuguese project funded received under a million EUR (one should note that European-wide ambition is a critical criterion to be funded, small ambition tends not to be selected for funding).

Czech Republic and Lithuania results are better understood if we take in consideration that the total amount of applications of these countries were 15 each. Therefore, and reminding the overall 6% success rate of Phase 2, the fact that both managed to have 1 funded project gives an average effectiveness result. However, it is our opinion that a 10 million population country as Czech Republic cannot be satisfied with 15 applications. As for the Lithuanian case, the example of Estonia should be better taken into account due to geographic, demographic and political background similitudes.

Due to the great results of two EU13 countries, Estonia and Slovenia, we decided to draft primary case studies of the two countries to assess the reasons behind the success of these distinct participants.

3.5 Estonia

Estonia is a Baltic country with capital in Tallinn. Independent since 1991, has a population of 1.314.545 inhabitants², making the country the 4th smallest within the European Union. According to World Bank, Estonia presents a GDP per capita of \$20.147³,



² World Bank "Total Population" 2014 - <http://data.worldbank.org/indicator/SP.POP.TOTL>

³ World Bank "GDP per capita (current US\$)" 2014 - <http://data.worldbank.org/indicator/NY.GDP.PCAP.CD>

and according to UN, Estonia ranks as 30th worldwide in the Human Development Index (with a score of 0.861⁴). Additionally, it joined the EU in 2004, the Eurozone in 2011, and is part of OCDE, NATO, WTO, Nordic Investment Bank and the Digital 5 Alliance.

In 1991, after regaining independence from the USSR less than half Estonians had a telephone line, an example of the scarce of Soviet institutions and infrastructures left behind (A.A.K. 2013). This inherited empty sheet, usually perceived as a roadblock for economic growth, later became, in our opinion, the basis for Estonian success. The Estonian clean sheet was not seen as an economic gap versus the world but as an opportunity to adopt the most vanguard technology/policies which, while briefly overlooked by the rest of world, transformed Estonian SSR into E-stonia “Tech Start-Up Nation” (Rooney 2012).

One could wonder though: Why set a digital-based country as the goal for an infant country?

For Toomas Hendrik Ilves, current Estonian president, the answer was pretty simple, and it sprung from Marx’s reserve army of labour theory. This economic cycle theory which relates Technologic advance with (Un)employment (Roncaglia 2006), is usually faced with caution, since the theory states that a technologic advance will make the reserve army bigger, *i.e.* cause more unemployment. Notwithstanding, to the Estonian government, this theory was seen as the possibility of having a highly functioning economy with a lower overall labour demand, which is exactly what a 1,3 million inhabitants’ country needs. Thereby, achieving technologic breakthroughs was a state priority.

The education reform was the first step to transform Estonia into a digital-based country, shortly after the independence, Estonia has put forward a nation-wide project to equip all classrooms with computers.

By 1996 computer programming was part of the primary school curriculum (starting at age 7) and by 1998 all schools were online (Mansel 2013) (Andersh 2015). In

⁴ United Nations Development Programme. 2015 “2015 Human Development Report” - http://hdr.undp.org/sites/default/files/2015_human_development_report.pdf

fact, in 2000 the internet access was declared a human right by the government (Anderssh 2015).

As mentioned before, education was the first step but hardly the only one. The Government also made efforts to metamorphose itself into an E-Government. The undertaken policies list includes:

- Online Voting
- Unique identifier ID
- e-Health system
- Digital Signature
- Company creation in 20 minutes
- e-School (eKool)
- Pay taxes online

The most recent novelty is e-residency, *i.e.* be an Estonian digital resident while sitting in our house, outside Estonia. It came of a new concept “CaaS –Country as a Service” likewise other entrepreneurial concepts such as PaaS or SaaS – Platform and Software as a Service respectively (Williams-Grut 2016).

This Tech-savvy government has three direct effects: first, it has an expeditious, paperless and less bureaucratic public apparatus (Metzler 2016); secondly, due to the high standard, the private sector has also implemented advanced digital systems in their business to keep up with the public “competition”; and lastly high-tech companies can find in this digital society a vast number of clients hungering for their new solutions.

This net-demand created an ideal environment to the appearance of several technological start-ups. However, to be truly successful, those could not rely on the Estonian small internal market. On the other hand, to be competitive in the international scene, Estonia needed first to be known, and be known as a high-quality producer.

This would happen in 2011 with Skype being bought by Microsoft for \$8,5 Billion. Since then it is almost impossible to speak about Estonia without referring their champion, Skype gave to Estonian start-ups a second wind, and most of all it gave Estonian solutions worldwide credibility, ramping the way for Estonia to compete with other start-up countries, such as Israel for the title of “Tech Start-Up Nation”.

This phenomenon, named technological “leapfrogging”, is defined by the skipping of contemporary technology adoption in sake of new, vanguard technology, which may not be fully productive yet, *e.g.* the internet “business” back at 1995.

Leapfrogging potential was described by Brezis, Krugman and Tsiddon (1993), as the following:

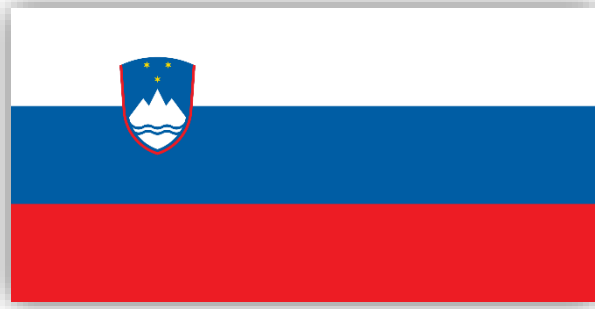
“When such a change [major changes in technology] occurs, the new technology does not initially seem to be an improvement for leading nations, given their extensive experience with older technologies. Lagging nations have less experience; the new technique allows them to use their lower wages to enter the market. If the new technique proves more productive than the old, leapfrogging of leadership occurs.”.

Summing up, a threefold explanation can be drafted to explain Estonian success in the SME instrument. Firstly, the emergent “computer expert” generation, in a sense the output of the Estonian educational system, implemented in the 90’s. Secondly, the Tech-savvy government, which fuelled high-tech enterprises through systematic digitalisation of Public Administration. And lastly, the “leapfrogging” made by the Estonian start-ups, becoming experts in the new technologies way before the rest of the world, and thus surpassing them in technological leadership.

All the three are plausible reasons for the Estonian success in this particular channel of Horizon 2020, however other agendas can also be accounted, for instance some authors (Tvaronavičiene, Grybaite, and Tvaronavičiene 2009) suggest that Estonia is experiencing an economic development sustain by above the average institutional performance when compared to Latvia and Lithuania, its neighbours and most related countries. Moreover, the Swedish and Finnish shares, 16,42% and 13,96% respectively, of the Estonian total export may constitute a path for knowledge exchange, an appreciated one since Sweden and Finland are also good performers in the SME instrument.

3.6 Slovenia

Slovenia is a country in between the South, Central and Eastern Europe (neighbour of Italy, Austria, Croatia and Hungary) with Ljubljana as the capital. Seceded from Yugoslavia in 1991, Slovenia is since then an independent



country. With 2.061.980 inhabitants⁵, Slovenia is the 6th smallest country in EU. After the collapse of Yugoslavia, Slovenia experienced a fast paced convergence towards Europe levels, currently Slovenian GDP per capita is \$24.001⁶ and, according to UN data, its Human Development Index score is 0.880⁷. Moreover, Slovenia joined the EU in 2004, and the Eurozone by 2007, is also member of OECD, NATO, and WTO.

Unlike other ex-Yugoslavian countries, Slovenia cannot say that its innovation system began after 1991, as it inherited a strong university base in technical sciences; robust public research organisations; high share of researchers; and a strong core of industrial R&D (OECD 2012). Nowadays, Slovenia is leader, within the OECD, in innovation indicators such as: a) Business R&D expenditure as % of GDP; b) Researchers and other R&D personnel as % of employment; c) Top 500 Universities as % of GDP; and d) Publications in top journals as % of GDP (OECD 2015).

As a matter of fact, after independence Slovenia rapidly grew to EU levels with the support of the pre-existent relatively skilled labour force and modern industrial base, *e.g.* pharmaceutical, while being also a major supplier to the Balkans. Alongside with trade reforms and financial liberalisation, Slovenia gained access to EU and OECD, surpassing several of the latter's standards (OECD 2015).

⁵ World Bank "Total Population" 2014 - <http://data.worldbank.org/indicator/SP.POP.TOTL>

⁶ World Bank "GDP per capita (current US\$)" 2014 - <http://data.worldbank.org/indicator/NY.GDP.PCAP.CD>

⁷ United Nations Development Programme. 2015 "2015 Human Development Report" - http://hdr.undp.org/sites/default/files/2015_human_development_report.pdf

Notwithstanding, Slovenian momentum was halted in 2008 with the international crisis. The country suffered more than a few setbacks, due to the 90's overlooked structural weakness, *e.g.* unsustainable investment boom in construction. Being Slovenia a small exporting country, this shock has struck heavily the Slovenian economy (OECD 2015).

Despite the shock having spared the R&D intensity of the country, when compared to other eastern countries (R&D intensity has even raised after 2008) (OECD 2012), Slovenia government has legislated a document, "Research and Innovation Strategy of Slovenia" (henceforth, RISS), meant to orient the Innovation policies of the country, streamlining a set of innovation policies, until then often overlapped, while honing Slovenia innovative companies' competitiveness and ability to solve 21st century challenges (Official Gazette of the Republic of Slovenia 2011).

Reading RISS (Official Gazette of the Republic of Slovenia 2011), we see that it proposes itself to achieve a set of pre-determined goals with the utter objective of improving the R&D and Innovation system of Slovenia, to name some of these goals we have:

- Accelerate private investment in R&D
- Have more start-up companies
- Foster the growth of innovative companies
- Strengthen companies' innovative capabilities
- More autonomy and responsibility to public research
- Enhance transfer of knowledge
- Co-operate in R&D within EU and rest of the World
- Increase public finding of R&D towards Barcelona 3% GDP goal
- Develop research infrastructures and human resources
- Get critical mass and specialise

RISS objectives allied with Slovenian successful record in the Framework Programmes, may be key to the maintenance of Slovenian enterprises competitiveness, particularly in SMEs, because of the current liquidities constrains, among other issues that may inhibit the Business investment in R&D and innovation activities.

One should note that Slovenia participation is noteworthy since the FP4 (1994-1998), long before their entrance in the EU, which may reinforce the hypothesis of a

cumulative expertise of participation in European R&D and Innovation programmes in the Slovenian business environment. In FP6, Slovenia reaped in grants twice the value of its contribution (OECD 2012).

Slovenian success did not go unnoticed but it would be wise to assess the data with caution as there is a set of caveats that both our results and the literature point out. Firstly, the Slovenia low effectiveness, or the success rate, which is by its turn a consequence of its relatively mediocre quality. This weakness is fought back by an apparent good capacity to align the Slovenian projects with the European challenges, and the preference given by Slovenian researchers to specific targeted research projects.

This leads to the second caveat, the high share of applied research and specifically targeted projects, which may indicate a catch-up strategy, not sustainable in the long-run and potential neglectful of the overall S&T if not properly steered.

Thirdly, the tendency to construct small, isolated projects instead of bigger, more ambitious ones, potentially through cooperation with neighbour countries (an asset not properly exploited nowadays by Slovenian companies according to OECD (2012)).

In this case study we have seen that Slovenia experienced a fast growth after the secession, halted in 2008 due to the structural flaws overlooked during the “good times”. We also found that Slovenia is a top-performer in several Innovation measures, even within the OECD, which may be related to the Yugoslavian R&D inheritance. After the crisis, Slovenia managed to maintain indicators such as R&D intensity, even so it decided to streamline their innovation policies in a single document to serve as a guideline, RISS, we argue that this document may be key to the Slovenian enterprises competitive when allied to the accumulated expertise in participation of European programmes.

We conclude that Slovenian great performance is explained by four factors: a) great appetite for European programmes; b) great focus in specific targeted projects and applied research; c) industry cluster of technical science; d) streamlining of the innovation policies, and alignment with the European challenges and standards.

4. Traineeship Analysis

Our traineeship took place in ISA – Intelligent Sensing Anywhere S.A. – with the rationale of performing a set of relevant functions to the development of professional skills, while promoting the reciprocal scientific, ‘soft’ and organisational skills. In few words, the goal of the traineeship was to develop relevant abilities both in the academic and in the business perspectives, by allying the labour experience in a professional environment and the research pursuit for the present report. The traineeship had the duration of 560 hours, in the period of 16th of February until 25th of May.

4.1 Company Description

As mentioned before, the traineeship was sponsored by ISA, an international company, with offices in Portugal, Brazil and the US, specialised in Telemetry, Machine2Machine and Remote Asset Management solutions, particularly in the Oil&Gas market. Founded in 1990, as a spin-off of the University of Coimbra, ISA has a staff of 50 personnel with over 110.000⁸ installed devices in more than 30 countries (ISA plans to achieve 200.000 by 2020). The R&D centre is located in Portugal, where about half of the team is fully dedicated to daily innovation and to the development of ground-breaking products and solutions.

ISA has created a set of solutions wholly dedicated to **smart logistics, energy efficiency and multi-commodity remote metering**. It comprises hardware, such as home-designed flagship devices capable of remotely sensing parameters (*e.g.* air quality), data logging, establishing mesh networks, and enduring extreme weather conditions, and vanguard software so information data is processed, made available, and promptly delivered to the client.

Innovation is one of ISA’s main pillars. In order to be in constant technological update, ISA maintains a close relationship with high-technology partners, such as centres of knowledge (the proximity with the academic communities has always been one of ISA priorities), but also with strategical business partners, both at national and international

⁸ ISA only started accounting the installed devices by 2007, so it is 110k since 2007.

level. ISA participation in R&D projects, which design and create products and services, is of the utmost importance to reinforce the company business capacity and increase its flexibility and responsiveness to the global market. To accomplish daily innovation and deliver reliable products to its partners, ISA centre its culture in values such as:

- Work with passion
- Competence
- Open Innovation
- Humility
- Ambition

Before 2014, ISA was divided in two business units, the *Oil&Gas* business and the *Energy* one (smart cities and smart home solutions). However, since the two units were in very distinct stages of maturity the board took the measure of splitting the company.

From this process resulted a new company (with the *energy* core business), and ISA, which retained the *Oil&Gas* core business. This sector was neglected, before 2014, in ISA and therefore to fully exploit the now reduced company, it was decided to move the company headquarters to a business accelerator.

ISA is currently working in the Instituto Pedro Nunes (IPN) Business Accelerator which is a business support infrastructure that aims to meet specific need of companies that are already established in the market and want to foster their growth and internationalisation. This Accelerator fosters innovative tech-based firms with high growth potential by offering a set of diversified services focused on improving their internationalisation capabilities and increasing their technological intensity through cooperation with the national and international scientific and technological system. Additionally, IPN is part of several networks such the I3H – Incubating Internet Innovation Hubs.

4.2 Performed Functions

Inside ISA organigram, we were placed in the **Innovation department**, and we were responsible for the analysis of European programmes for R&D projects, as well as the identification of possible consortia to co-promote projects at the European level.

The established functions were subdivided in 5 tasks to be performed during the traineeship:

- **Task 1** – Integration in the company; Analysis of the company solutions and products; Study of the business model, ISA strategy and culture.
- **Task 2** – Analysis of structural funds and SMES European investment funds.
- **Task 3** – Analysis of European programmes – Horizon 2020, in particular SME channels.
- **Task 4** – Identification of potential partners for collaboration in European projects.
- **Task 5** – Writing of the traineeship report.

Tasks	Month 1	Month 2	Month 3	Month 4	Month 5
Task 1 (T1)					
Task 2 (T2)					
Task 3 (T3)					
Task 4 (T4)					
Task 5 (T5)					

Table 20 - Chronogram with the established functions presented at the Protocol Minute
Free-translation of the author

Task 1 was entirely fulfilled within the planned timeframe, and by the end of February, we were integrated and fully aware of ISA business actuation, products, solutions, strategies, culture, *et cetera*. This was eased by the creation of material to define ISA, and its procedures; the analysis of previous ISA works similar to our planned functions; the attendance of departmental meetings; and the personal presentation made to us of the company organisms, functions, among others.

Task 2 was undertaken mainly during months 1 and 2, but it was faced as a permanent function to keep assessing alternative funding programmes, mostly on R&D. This task consisted in the constant study of funding, and investment, programmes, sponsored or not by European institutions. Examples of the signalled programmes are the “BGI – Building Global Innovators”; “ESA Small ARTES (European Space Agency)”; “ECB’s SME Finance Facility”; and others. The study reports included information regarding: deadlines, scope description, funding scheme, application process, deliverables required, IPR issues, sponsor entities, consortium necessity/availability, and other relevant information.

Task 3’s goal was to collect information, properly analyse and produce documentation concerning the Horizon 2020 programme, with emphasis on the SME channels. The data collection was made through legislation interpretation, evaluation of

templates, reading of successful applications, follow-up of call updates, communication with others programme stakeholders, study of H2020 training workshops materials or searching for info-days. The most addressed mechanisms were the “SME Instrument” and the “INNOSUP – H2020 SME Innovation Associate”. The task was executed by the mid-term of month 2 and the results were the input for the tasks performed latter in the traineeship.

Task 4, similarly to task 2, was accomplished by the end of March but it was kept as a responsibility to continually search for potential partners and consortia for collaboration in international projects. The research was undertaken *via* an old partners database investigation, the active pursuit of consortia declarations in several websites (*e.g.* www.ideal-ist.eu), investigation of related conferences participants profile and proposals, the information collection of H2020-interested companies and the study of their business ideas. Additionally, the composition of a new database of old partners, potential consortia portfolio, draft consortia proposals, and the establishment of contact with potential partners were implemented in the task 4 spirit, although they were not foreseen in the traineeship protocol.

Task 5 was executed in collaboration with the Investigation Seminar lectures, which provided time-relevant milestones to be accomplished. Task 5 was facilitated due to the topic resemblance of other tasks, such as T2, T3, T4. Moreover, the recommendations made by my advisors, in the academy and in the enterprise, were an appreciated input.

The settled tasks were swiftly completed, therefore in cooperation with ISA, we delineated a new set of tasks (tasks 6 and 7) to be implemented until the end of the traineeship, as additional challenges. Those tasks were most welcome at a personal level, since they were handled as an opportunity to further develop professional abilities.

- **Task 6** – Writing the applications for international and European funding programmes
- **Task 7** – Minor support collaborations with other departments.

Task 6 became the main task performed in the traineeship. Its goal was the submission of a SME instrument application to the 3rd of May phase 1 call. To do so we were responsible for the elaboration, redaction, collection of data, text revisit procedures,

and other procedures to the production of an eligible application to the SME instrument. Primarily the objective was to write an application for a “smart home” solution, with predefined inputs. However, later in the time it was proposed the creation of another parallel application regarding a “vertical cloud platform” solution. Both documents were produced, revised, and delivered within the deadlines. From the 3rd of May onwards, this task consisted in the production of primary application for a “satellite communications” solution to ESA’s “Small ARTES SatCom”. This third document was completed and sent for revision but due to timeframe reasons (our traineeship ended at the 25th of May and the submission deadline was at the 21st of June), we were not able to follow-up the application process until the end.

Task 7. It was given to us the opportunity to collaborate in minor assignments with other departments, namely Marketing and the Sales departments. Although minor sized and limited in time they were a great way to get in touch with the work made in other departments granting us a more holistic perspective of the company operations/projects. In these minor assignments we account: establishment of initial contact with clients, market prospection, business development brainstorming, among many others.

One final note should be made, regarding not a task performed but formation received within ISA environment, during the traineeship we had the opportunity to participate in training sessions, workshops, etc... in different fields as Project Management and New technologies (SIGFOX). These training sessions were, in our opinion, of the utmost importance as they provided us knowledge that we would not have access without the traineeship.

4.3 Traineeship Critical Analysis

The traineeship was for us an utmost opportunity to develop numerous professional skills, as mentioned above, however we felt that some issues could be fixed to further improve the experience to the future trainees. The first note regards the company horizontal structure which, despite being great to introduce newcomers to the overall system of a company, is not so great when it comes to place the trainee in a specific function, or role, in the company. Therefore, the trainee may sometimes feel that he is

doing everything while doing nothing. This leads to the second issue, which is the lack of specialised insight gained. This may not be true to the Tech department, but to the rest it may be a reality since the trainee is busy fulfilling a variety of different tasks while not focusing in a single process or project from the beginning to the end of the traineeship, particularly in small departments such as the Innovation where we were placed. Nonetheless, the duration of the traineeship may be an important constraint to be taken in account on this matter.

Thus we recommend, for future traineeships, the placement of the trainees in projects so that they can gain specialised insight in a specific thematic or function, which in the end is the trainee's goal. This, alongside with a more vertical supervision of the traineeships, can prove critical to improve ISA's future traineeships.

5. Conclusions

In the present traineeship report, we studied the heterogeneity issue, particularly in the Horizon 2020 programme. To do so we exploited the data available concerning the SME-Instrument proxy. By evaluating the SMEs, and minimising path dependence effects, we aimed to assess if the nowadays trends pointed to convergence. However, the heterogeneity between the east front and the core emerged systematically in the results. Thus, to the initial question “is there a heterogeneity problem in the European Union?” the answer must be **«yes»**.

The fragility of eastern R&D and Innovation systems is reflected in the outputs presented by their SMEs and is most concerning since the study sample was in an unbiased environment. In other channels, where big European institutions with long innovation background are present (for example the Centre National de la Recherche Scientifique with 1500 funded projects and 800 million EUR received), the ability to compete should be even lower for the peripheries. We did not find evidence of convergence in the EU13 besides the situations of Estonia and Slovenia. These two case studies provided some hints which could be used as guidelines by other similar countries, particularly because they show a strong governmental component as explanatory factor of their success. We found, however, an overall bigger appetite of EU13 than EU15 for this programme. We believe that, in the long term, this bigger participation can be transformed in increased expertise, and under this light some convergence can be achieved.

“Is this problem a concern?”. More than economic, this can quickly become a major political concern. Furthermore, with the possibility of a new front in the South, which is also concerning since it involves not only 2 of the big 5 countries (Spain and Italy), but also 2 of the most heavily hit countries in the 2008 crisis (Portugal and Greece). For now, our results point to good performance both by Spanish and Italian SMEs, with Portugal and Greece falling to the bottom when part of the EU13 group was excluded (on phase 2, due to the absence of funded projects). Notwithstanding, the small size of the Portuguese participation in phase 2 should be properly investigated with a bigger sample, further ahead in time.

On the other hand, Germany, France and Belgium have shown little appetite, with relatively small share of participations. It seems safe to declare that these countries have funding alternatives that can rival with Horizon 2020, in particular when compared to the option pool of the other countries. Due to this fact we respond to the latter question with **«yes, it is a concern, but there are also some good results»**.

There seems to be space for the eastern countries if those implement structural changes and attitudes to explore it. The proof are countries such as the 'South front' Italy and Spain, Ireland (also heavily hit in 2008), and Estonia and Slovenia, our case studies. These countries have successfully applied for the programme, with more or less quality, and they differentiate from the rest by the high submission ratio and high effectiveness.

We would recommend as future policies to be implemented, in order to improve the programme vicissitudes: a) the creation of an official database for consortia formation; b) the promotion of Horizon 2020 in the East Europe (South and North have a fair amount of conferences and workshops, unlike the East); c) the negotiation with the Structural fund programme designers to create synergy channels; d) reduce the limitation of 1 project participation to 1 project as coordinator; e) and create an evaluation committee to further investigate the S&T deficiencies in countries such as Romania.

Summarising, this report aimed for the study of the heterogeneity issue in Europe and used the SME instrument, within the Horizon 2020, to assess it. Our results corroborated the thesis of an absence of convergence, but it also found discordant observations which gives a light in the end the tunnel for convergence enthusiasts. Nonetheless, the caveat raised for south Europe can be alarming in the future if neglected in this primary stage. We recommended a set of policies which in our opinion can help mitigate the heterogeneity issue by raising everyone to the excellence, thus helping Europe surpass the so-called valley of death.

6. Bibliography

- A.A.K. 2013. "How Did Estonia Become a Leader in Technology?" *The Economist*. <http://www.economist.com/blogs/economist-explains/2013/07/economist-explains-21>.
- Andersh, Caitlin. 2015. "The Developing Economy of Technology and E-Governance in Moldova: A Comparative Case Study to Estonia and Analysis of Geopolitical Relations on Moldova's Move into the 21st Century." *The Massachusetts Undergraduate Journal of Economics* 3: 99–128.
- Arnold, Erik. 2011. "Understanding the Long-Term Impacts of the EU Framework Programme of Research and Technological Development." University of Twente. <http://doc.utwente.nl/79860/1/oratieboekjeArnold.pdf>.
- . 2012. "Understanding Long-Term Impacts of R&D Funding: The EU Framework Programme." *Research Evaluation* 21: 332–43. doi:10.1093/reseval/rvs025.
- Austrian Research Promotion Agency. 2011. "Green Paper 'From Challenges to Opportunities: Towards a Common Strategic Framework for EU Research and Innovation Funding'." http://ec.europa.eu/research/horizon2020/pdf/contributions/post/austria/austrian_research_promotion_agency_ffg.pdf.
- Brezis, Elise S, Paul R Krugman, and Daniel Tsiddon. 1993. "Leapfrogging in International Competition: A Theory of Cycles in National Technological Leadership." *The American Economic Review* 83 (5): 1211–19. <http://www.jstor.org/stable/2117557>.
- Bronzini, Raffaello, and Eleonora Iachini. 2014. "Are Incentives for R&D Effective? Evidence from a Regression Discontinuity Approach." *American Economic Journal* 6 (4): 100–134. doi:<http://dx.doi.org/10.1257/pol.6.4.100>.
- David, Paul A, Bronwyn H Hall, and Andrew A Toole. 2000. "Is Public R & D a Complement or Substitute for Private R & D? A Review of the Econometric Evidence." *Research Policy* 29: 497–529.
- DG Research and Innovation - Evaluation Unit (A.5). 2015. "Seventh FP7 Monitoring Report." doi:10.2777/5745.
- EU12 Member States. 2011. "Common Position Paper of the EU-12 Member States for the next Framework Programme." http://ec.europa.eu/research/horizon2020/pdf/contributions/prior/common_position_paper_of_the_eu-12_member_states.pdf.
- European Commission. 1995. "Green Paper on Innovation." http://europa.eu/documents/comm/green_papers/pdf/com95_688_en.pdf.
- . 2008. "A 'Small Business Act' for Europe." <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52008DC0394&from=EN>.
- Fresco, Louise O., André Martinuzzi, Maria Anvret, María Bustelo, Eugenijus Butkus, Michel

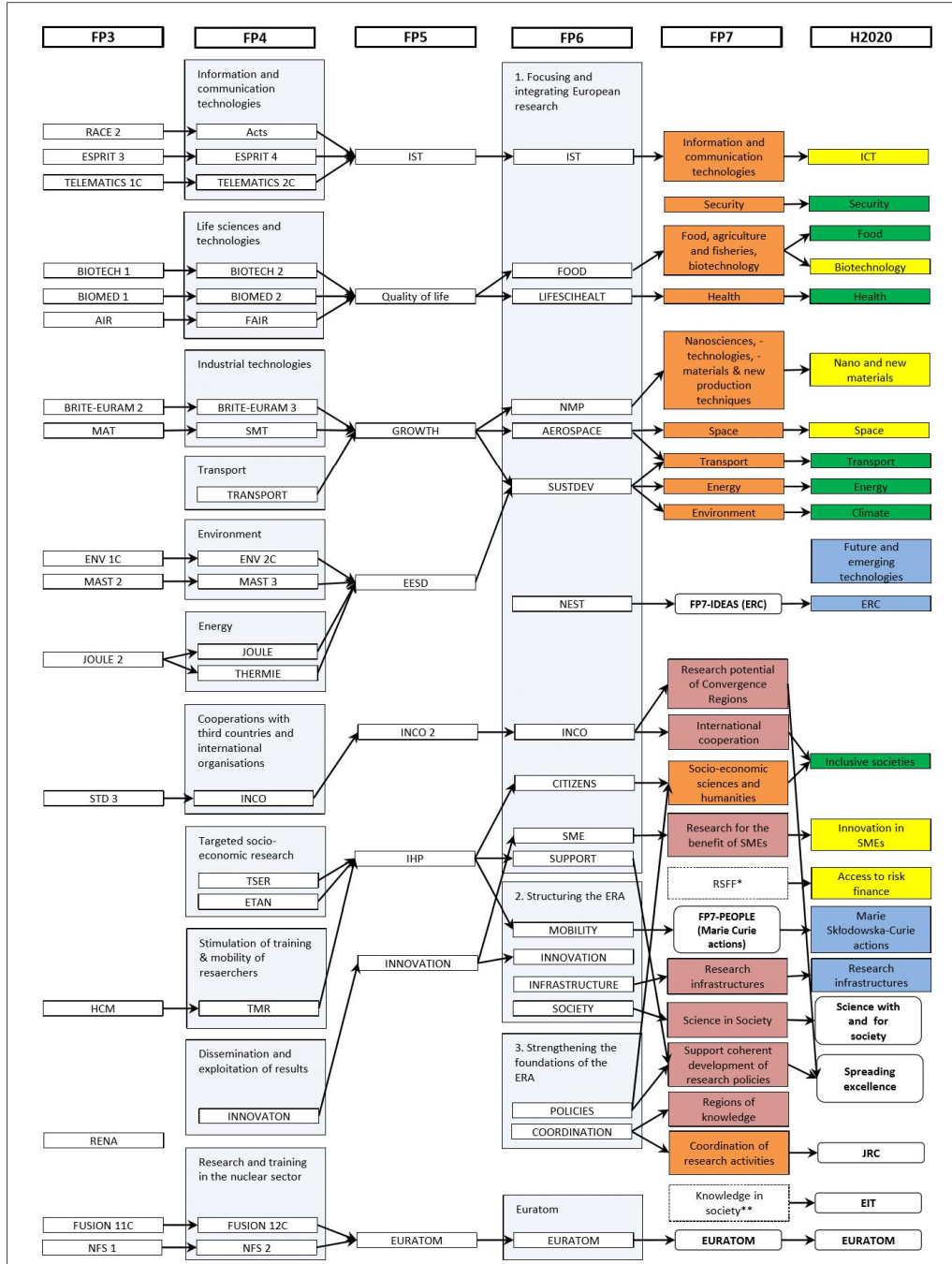
- Cosnard, Arvid Hallen, et al. 2015. "Commitment and Coherence. Essential Ingredients for Success in Science and Innovation." https://www.ffg.at/sites/default/files/downloads/page/fp7_final_evaluation_expert_group_report.pdf.
- Gilmore, Audrey, Brendan Galbraith, and Maurice Mulvenna. 2013. "Perceived Barriers to Participation in R&D Programmes for SMEs within the European Union." *Technology Analysis & Strategic Management* 25:3: 329–39. doi:10.1080/09537325.2013.764987.
- Loasby, Brian J. 2005. "'Making Connections' Symposium: Information and Knowledge in Economics." *Econ Journal Watch* 2 (1): 56–66. http://econjwatch.org/file_download/74/2005-04-loasby-sympos.pdf.
- Mansel, Tim. 2013. "How Estonia Became E--stonia." *BBC*. <http://www.bbc.com/news/business-22317297>.
- Metzler, John J. 2016. "In Super Free Estonia, You Can Start a New Company in 20 Minutes, Online." *World Tribune*. <http://www.worldtribune.com/in-super-free-estonia-you-can-start-a-new-company-in-20-minutes-online/>.
- Muller, Patrice, Cecilia Caliandro, Viktoriya Peycheva, Dimitri Gagliardi, Chiara Marzocchi, Ronald Ramlogan, and Deborah Cox. 2015. "Annual Report on European SMEs 2014/2015." doi:10.2873/886211.
- OECD. 2012. "OECD Reviews of Innovation Policy: Slovenia 2012." doi:10.1787/9789264167407-en.
- . 2015. "OECD Economic Surveys: Slovenia 2015." doi:10.1787/eco_surveys-svn-2015-en.
- Official Gazette of the Republic of Slovenia. 2011. *Research and Innovation Strategy of Slovenia 2011-2020*. Slovenia. http://www.arhiv.mvzt.gov.si/fileadmin/mvzt.gov.si/pageuploads/pdf/odnosi_z_javnostmi/01.06.2011_dalje/01.06._RISSdz_ENG.pdf.
- Reinhilde, Veugelers, Michele Cincera, Rainer Frietsch, Christian Rammer, Torben Schubert, Anita Pelle, Andrea Renda, Carlos Montalvo, and Jos Leijten. 2015. "The Impact of Horizon 2020 on Innovation in The Europe." *Intereconomics* 50 (1): 4–30. doi:10.1007/s10272-015-0521-7.
- Roncaglia, Alessandro. 2006. *The Wealth of Ideas: A History of Economic Thought*. Cambridge University Press.
- Rooney, Ben. 2012. "The Many Reasons Estonia Is a Tech Start-up Nation." *The Wall Street Journal*. <http://www.wsj.com/articles/SB10001424052702303734204577464343888754210>.
- Sabadie, Jesús Alquézar. 2014. "Technological Innovation , Human Capital and Social Change for Sustainability . Lessons Learnt from the Industrial Technologies Theme of the EU ' S Research Framework Programme." *Science of the Total Environment* 481: 668–73. <http://dx.doi.org/10.1016/j.scitotenv.2013.09.082>.

- Schuch, Klaus. 2014. "Participation of the 'New' EU Member States in the European Research Programmes — A Long Way to Go." *Foresight-Russia* 8: 6–17.
- Simonelli, Felice. 2016. "Is Horizon 2020 Really More SME-Friendly? A Look at Figures." *CEPS - Centre for European Policy Studies*. https://www.ceps.eu/system/files/Horizon2020andSMEs_0.pdf.
- Soete, Luc. 2013. "From Lisbon 2000 to Horizon 2020 : Reflections on the Demand for Non-Routine Skills and Entrepreneurial Qualifications." http://www.iza.org/conference_files/EULaMaFuEm_2013/soete_l8929.pdf.
- Takalo, Tuomas, Tanja Tanayama, and Otto Toivanen. 2013. "Estimating the Benefits of Targeted R&D Subsidies." *The Review of Economics and Statistics* 95: 255–72. http://feb.kuleuven.be/public/N10076/Takalo_Tanayama_Toivanen_REStat13.pdf.
- Tvaronavičiene, Manuela, Virginija Grybaite, and Agne Tvaronavičiene. 2009. "If Institutional Performance Matters : Development Comparisons of Lithuania, Latvia and Estonia." *Journal of Business Economics and Management* 10 (3): 271–78. doi:10.3846/1611-1699.2009.10.271-278.
- Williams-Grut, Oscar. 2016. "Estonia Wants to Become a 'Country as a Service' and Already Has 10,000 Virtual Residents." *Business Insider UK*. <http://uk.businessinsider.com/interview-with-estonia-cio-taavi-kotka-2016-4>.
- Young, Mitchell. 2013. "Shifting Policy Discourses in FP7 and Horizon 2020." <http://ecpr.eu/Filestore/PaperProposal/7da0ac1c-0ce7-4574-9714-09977538c8d1.pdf>.
- . 2015. "Shifting Policy Narratives in Horizon 2020." *Journal of Contemporary European Research* 11 (1): 16–30. <http://www.jcer.net/index.php/jcer/article/download/634/509>.

7. Annexes

Annex 1 - Thematic evolution of the Framework Programmes

Thematic continuity between FP3 and HORIZON 2020



■ FP7 COOPERATION ■ H2020 Societal challenges
■ FP7 CAPACITIES ■ H2020 Industrial leadership
■ H2020 Excellent science

*RSFF: developed by the European Commission (EC) and the European Investment Bank (EIB), succeeded by H2020 specific objective "Access to Risk Finance"

Annex 2 – Calculation formula of the indicators

Taking: A = Total proposals submissions
B = Proposals above thresholds
C = Funded projects
D = Country population in million
E = Country total received funding

- 1) High-quality = $[B/A] * 100$
- 2) Effectiveness = $[C/A] * 100$
- 3) Submissions per capita = A/D
- 4) Overall effectiveness = $[C/D] * 100$
- 5) Average project size = E/C

Annex 3 - Template for a SME instrument phase 1 application



**Proposal template
(technical annex)**

SME instrument – phase 1

The application shall provide

- 1) an outline of the envisaged overall innovation project, its intended scope, merits, risks and state of development to allow for an assessment of the business idea as well as an initial business plan based on the proposed idea/concept
- 2) a description of the activities to be undertaken during phase 1 that shall result in a comprehensive feasibility report, including the specifications of the elaborated business plan, which is to be the outcome of the project (for more details refer to the Work Programme and the Guidance documentation).

Please follow the structure of this template when preparing your proposal. It has been designed to ensure that the important aspects of your planned work are presented in a way that will enable the experts to make an effective assessment against the evaluation criteria. Sections 1, 2 and 3 each correspond to an evaluation criterion for a full proposal.

Please be aware that proposals will be evaluated as they were submitted, rather than on their potential if certain changes were to be made. This means that only proposals that successfully address all the required aspects will have a chance of being funded. There will be no possibility for significant changes to content, budget and consortium composition during grant preparation.

⚠ Page limit: The cover page, and sections 1, 2 and 3, together should not be longer than 10 pages. The two tables in these sections must be included within this limit. The minimum font size allowed is 11 points. The page size is A4, and all margins (top, bottom, left, right) should be at least 15 mm (not including any footers or headers).

The page limit will be applied automatically, therefore you must remove this instruction page before submitting.

If you attempt to upload a proposal longer than the specified limit, you will receive an automatic warning and will be advised to shorten and re-upload the proposal. Any excess pages will be overprinted with a 'watermark', indicating to evaluators that these pages must be disregarded.

Please do not consider the page limit as a target! It is in your interest to keep your text as concise as possible, since experts rarely view unnecessarily long proposals in a positive light.

1. Excellence

Your proposal must address a work programme topic for this call for proposals.

A This section of your proposal will be assessed only to the extent that it is relevant to that topic.

A Applicants are expected to address the points relevant to their overall innovation project and to provide information available at this stage. They should clearly explain which aspects will be further explored in the feasibility study.

Title of Proposal

List of participants

Participant No *	Participant organisation name	Country
1 (Coordinator)		
2		
3		

* Please use the same participant numbering as that used in the administrative proposal forms.

Table of Contents

1.1 Objectives

- Describe the objectives of your overall innovation project and the subsequently expected outcome. Describe the industrial/economic/social problem to be solved and/or business opportunity you intend to address.
- Describe the specific objectives for the feasibility study, including the elaboration of a business plan, which should be clear, measurable, realistic and achievable within the duration of the project. Objectives should be consistent with the expected exploitation and impact of the project (see section 2).

1.2 Relation to the work programme

- Indicate the work programme topic to which your proposal relates.

1.3 Concept and methodology

(a) concept

- Explain how your innovative solution will solve the problem and/or use the business opportunity.
- Describe the current stage of development of the innovation. Where appropriate, mention key milestones that led to the current stage (e.g. prototype, field trials, pilot studies with intended end-users and/or potential clients).
- Describe the positioning of the business innovation project, e.g. where it is situated in the spectrum from 'idea to application', or from 'lab to market'. Refer to Technology Readiness Levels where relevant. (See [General Annex G of the work programme](#)).

(b) methodology

- Describe what you want to achieve in the feasibility assessment. Explain the methodology, distinguishing as appropriate, activities linked to assess the technological/technical/practical feasibility and economic viability (e.g. market studies, customer survey, etc.).
- Describe how your project intends to develop something new to Europe that addresses EU-wide/global challenges
- Where relevant, describe how sex and/or gender analysis is taken into account in the project's content.

[Proposal Acronym]

[Proposal Acronym]



▲ Set and gender refer to biological characteristics and social/cultural factors respectively. For guidance on methods of sex / gender analysis and the issues to be taken into account, please refer to http://ec.europa.eu/research/science-society/gendered-innovations/index_en.cfm

1.4 Ambition

- Explain the novelty of your innovation business project. What do you envisage as key market application of the innovation project result?
- Explain the envisaged solution (products, processes, services etc.) and highlight the advantage of your (expected) solution with respect to competing solutions; how does it provide more added value to potential customers? Provide a preliminary comparison with alternatives solving the same or similar problems. If appropriate, compare to state-of-the-art research and known commercial initiatives. This could include costs, environmental benefits, ease-of-use or other features.
- Describe intended improvement potential over time – also compared to existing solutions. Why is it worth to develop / or to invest in it?

2. Impact

▲ Applicants are expected to address the points relevant to their overall innovation project and to provide information available at this stage. They should clearly explain which aspects will be further explored in the feasibility study.

2.1 Expected Impacts

a) Users/Market

- Which user needs have been identified and will be met upon completion of the project?
 - Describe the main economic benefits for the users that, compared to current state of the art, will make the users buy or invest in the innovation. What are you planning to use as unique selling points?
 - Describe the type of market, e.g. a niche market or high volume market. What is the estimation of total available market size and growth rate (mature or growing market)? What are the market trends? Describe it and how your project addresses European and/or global markets.
 - List main competitors and competitive solutions.
 - Indicate the most relevant market segments for initial introduction of the new solution.
 - Indicate the most important market barriers to be overcome to realise commercialization.
 - Describe the targeted users of the final solution, in which market segment/geographical areas do you see these potential users, and how do you intend to reach them?
 - List key stakeholders to get involved for making a successful commercial exploitation.
- b) Company
- How does the innovation project fit with the strategy of the participating SME(s)

[Proposal Acronym]

3

template v20160120

- What is the relevance and rationale of the innovation project for the management team of the SME (or lead SME(s) in a consortium)

- What is the expected growth potential of your solution in terms of turnover, employment, market seize, IP management, sales, return on investment and profit etc.

2.2 Measures to maximise impact

a) Dissemination and exploitation of results

- Explain an initial plan for full commercialisation of the project results, i.e. own commercialisation or licensing? Need of cooperation with third parties for own commercialisation? Estimate of the total funding requirements? Approximate time to first sales/employment?
- How does the proposed work in Phase 1 of the SME instrument fit into the overall plan to reach market?

b) Intellectual Property, knowledge protection and regulatory issues

- Explain key knowledge (IPR) items and who owns them. Refer to the results of any patent search carried out. Have you conducted a "freedom to operate analysis", and if yes what has been the result?
- Outline the status and the strategy for knowledge protection. If by patent, has a patent application already been filed or is there potential for patent application?
- If regulatory and/or standard requirements are to be fulfilled for the exploitation of the innovation, please list them, and what are the plans to meet these regulatory and/or standard requirements? Indicate if and how they will be addressed in the feasibility assessment. Are you seeing any new market opportunity through regulatory requirements?

3. Implementation

3.1 Work plan – Work package and deliverable

Please provide the project plan comprising one work package with one deliverable (i.e. elaboration of the feasibility report including a business plan) – see Table 3.1 a

Definitions:

'Work package' means a major sub-division of the proposed project. In the case of the SME instrument – phase 1, there is only one work package describing the work to be done for the feasibility assessment.

'Deliverable' means a distinct output of the project. In the case of the SME instrument – phase 1 the output is the feasibility report, including a business plan.

[Proposal Acronym]

4

template v20160120

3.2 Management structure and procedures (only to the extent relevant in single entity proposals)

- Describe the organisational structure and the decision-making

3.3 Consortium as a whole (if applicable)

⚠ *The individual members of the consortium are described in a separate section 4. There is no need to repeat that information here.*

- Describe the consortium. How will it match the project's objectives? How do the members complement one another (and cover the value chain, where appropriate)? In what way does each of them contribute to the project? How will they be able to work effectively together?

3.4 Resources to be committed

⚠ *Include the following budget table; no modification is possible¹. The description of work (feasibility study) in table 3.1 a must demonstrate that it corresponds to the total costs (in EUR).*

Form of costs	A Costs of the feasibility study/Direct and indirect costs of the action	Total costs	Reimbursement rate %	Maximum EU contribution	Maximum grant amount
Lump sum	50 000	71 429	70 %	50 000	50 000

Table 3.1 a: Work package description

Work Package Title	Feasibility Study
Objectives	
Description of work (where appropriate, broken down into tasks), lead partner and role of participants	

Deliverable:
Feasibility report, including a business plan (brief description and month of delivery)

¹ Commission Decision C(2013)8198 authorising the reimbursement on the basis of a lump sum for SME instrument phase 1 actions under the Horizon 2020



Section 4: Members of the consortium

▲ This section is not covered by the page limit.

▲ The information provided here will be used to judge the operational capacity.

Please provide for each participant, the following (if available), please provide:

- a **description of the legal entity** and, in case of consortia, its main tasks, with an explanation of how its profile matches the tasks in the proposal;
- a **curriculum vitae or description of the profile of the persons**, including their gender, who will be primarily responsible for carrying out the proposed activities;
- a **list of up to 5 relevant publications**, and/or products, services (including widely-used datasets or software), or other achievements relevant to the call content;
- a list of **up to 5 relevant previous projects** or activities, connected to the subject of this proposal;
- a description of any significant infrastructure and/or any major items of technical equipment relevant to the proposed work;
- in case of a newly created company, explain the purpose of the company creation.

4.2. Third parties involved in the project

Please complete, for each participant, the following table (or simply state "No third parties involved", if applicable):

Does the participant plan to subcontract certain tasks	Y/N
<i>If yes, describe and justify the tasks to be subcontracted</i>	

Section 5: Ethics and security

▲ This section is not covered by the page limit.

5.1 Ethics

If you have entered any ethics issues in the ethical issue table in the administrative proposal forms, you must

- submit an ethics self-assessment, which
 - describes how the proposal meets the national legal and ethical requirements of the country or countries where the tasks raising ethical issues are to be carried out;
 - explains in detail how you intend to address the issues in the ethical issues table, in particular as regards:
 - research objectives (e.g. study of vulnerable populations, dual use, etc.)
 - research methodology (e.g. clinical trials, involvement of children and related consent procedures, protection of any data collected, etc.)
 - the potential impact of the research (e.g. dual use issues, environmental damage, stigmatisation of particular social groups, political or financial retaliation, benefit-sharing, malevolent use, etc.).
 - provide the documents that you need under national law (if you already have them) e.g.
 - an ethics committee opinion;
 - the document notifying activities raising ethical issues or authorising such activities

▲ If these documents are not in English, you must also submit an English summary of them (containing, if available, the conclusions of the committee or authority concerned).

▲ If you plan to request these documents specifically for the project you are proposing, your request must contain an explicit reference to the project title.


5.2 Security¹

Please indicate if your project will involve:

- activities or results raising security issues: (YES/NO)
- EU-classified information as background or results: (YES/NO)

¹ Article 37.1 of Model Grant Agreement. Before disclosing results of activities raising security issues to a third party (including affiliated entities), a beneficiary must inform the coordinator — which must request written approval from the Commission/Agency; Article 37. Activities related to 'classified deliverables' must comply with the security requirements until they are declassified. Action tasks related to classified deliverables may not be subcontracted without prior explicit written approval from the Commission/Agency. The beneficiaries must inform the coordinator — which must immediately inform the Commission/Agency — of any changes in the security context and — if necessary — request for Annex 1 to be amended (see Article 55)

Annex 4 - Evaluation Form for a SME instrument phase 1 proposal

Proposal Evaluation Form				Evaluation Summary Report	
		EUROPEAN COMMISSION		EUROPEAN COMMISSION	
Horizon 2020 - Research and Innovation Framework Programme					
<p>Call: H2020-SMENS1-1-2015 Funding scheme: SME Instrument phase 1 Proposal acronym: Z20076 Duration (months): 6 Proposal title: SIE-01-2015-1-P Activity: SIE-01-2015-1-P</p>					
N		Proposer name	Country	Total Cost	Grant Requested
1		ISA - Intelligent Sensing Anywhere S.A.	PT		
Total					
Abstract:					

Evaluation Summary Report

Evaluation Result
Total score: [REDACTED] (Threshold: 13)

Form Information

Indicative Appraisal Scale per Sub-Criterion:
 - Very Good to Excellent (4,5 - 5)
 - Good to Very Good (3,5 - 4,49)
 - Fair to Good (2,5 - 3,49)
 - Insufficient to Fair (1,5 - 2,49)
 - Insufficient (0-1,49)

Criterion 1 - Impact

Score: [REDACTED] (Threshold: 4,5 00 , Weight: 100,00%)

Indicative Appraisal Scale per Sub-Criterion:
 - Very Good to Excellent (4,5 - 5)
 - Good to Very Good (3,5 - 4,49)
 - Fair to Good (2,5 - 3,49)
 - Insufficient to Fair (1,5 - 2,49)
 - Insufficient (0-1,49)

The proposal indicates in a convincing way that there will be demand/market (willing to pay) for the innovation when the product solution is introduced into the market

The targeted users or user groups of the final product/application, and their needs, are well described and the proposal provides a realistic description why the identified groups will have an interest in using/buying the product/application, compared to current solutions available

The proposal demonstrates very good understanding of the needs for a realistic and relevant analysis of market conditions, total available market size and growth rate, competitors and competitive solutions and key stakeholders, or includes a plan for achieving this information

It is described in a realistic and relevant way how the innovation has the potential to boost the growth of the applying company

The proposal demonstrates the alignment with the overall strategy of the participating SME(s) and the need for commercial and management experience, including understanding of the financial and organizational requirements for commercial exploitation. The initial commercialisation plan is outlined and explains how will be further developed (in-house development, licensing strategy, etc)

Criterion 2 - Excellence

Score: [REDACTED] (Threshold: 4,5 00 , Weight: 100,00%)

Indicative Appraisal Scale per Sub-Criterion:
 - Very Good to Excellent (4,5 - 5)
 - Good to Very Good (3,5 - 4,49)
 - Fair to Good (2,5 - 3,49)
 - Insufficient to Fair (1,5 - 2,49)
 - Insufficient (0-1,49)

The innovation aims at exploring new market opportunities addressing EU/global challenges

The proposal provides a realistic description of the current stage of development and added value of its innovation as well as an understanding of the competing solutions. Includes good comparison with state-of-the-art, known commercial solutions, including costs, environmental benefits, gender dimension , ease-of-use and other features, or includes plans for achieving this. Note in relation to the project content, e.g. gendered studies, clinical trials, etc.

The objectives for the feasibility study and the approach and activities to be developed are consistent with the expected impact of the project

The expected performances of the innovation are convincing and have the potential to be relevant from a commercial point of view (Value for money). It is potentially better than alternatives

The proposal reflects a very good understanding of both risks and opportunities related to a successful market introduction of the innovation, both from a technical, commercial point of view

Overall perception including other pertinent factors not covered by the above questions (25% weight in the assessment of this criterion)

Criterion 3 - Quality and efficiency of implementation

Score: [REDACTED] (Threshold: 4,5 00 , Weight: 100,00%)

Indicative Appraisal Scale per Sub-Criterion:
 - Very Good to Excellent (4,5 - 5)
 - Good to Very Good (3,5 - 4,49)
 - Fair to Good (2,5 - 3,49)
 - Insufficient to Fair (1,5 - 2,49)
 - Insufficient (0-1,49)

The proposal demonstrates that the project has the relevant resources (personal, facilities, networks, etc.) to develop its activities in the most suitable conditions. If relevant, describes in a realistic way how key stakeholders' partners' subcontractors could be involved

Taking the project's ambition and objectives into account, the proposal includes a realistic time frame and a comprehensive description of work

The team has relevant technical/scientific knowledge/management experience, including a good understanding of the relevant market aspects for the particular innovation. If relevant the proposal includes a plan to acquire missing competences

Overall perception including other pertinent factors not covered by the above questions (25% weight in the assessment of this criterion)

Scope of the proposal

Status: **Yes**
Comments (in case the proposal is out of scope):
Not provided



Proposal template (technical annex)

SME instrument – phase 2

Proposals shall be based on a feasibility assessment and contain an elaborated business plan, either developed through SME instrument phase 1 support of other means.

Proposals should contain a specification for the outcome of the project, including a first commercialisation plan, and criteria for success.

Please follow the structure of this template when preparing your proposal. It has been designed to ensure that the important aspects of your planned work are presented in a way that will enable the experts to make an effective assessment against the evaluation criteria. Sections 1, 2 and 3 each correspond to an evaluation criterion for a full proposal.

Please be aware that proposals will be evaluated as they were submitted, rather than on their potential if certain changes were to be made. This means that only proposals that successfully address all the required aspects will have a chance of being funded. There will be no possibility for significant changes to content, budget and consortium composition during grant preparation.

⚠ Page limit: For full proposals, the cover page, and sections 1, 2 and 3, together should not be longer than 30 pages. All tables in these sections must be included within this limit. The minimum font size allowed is 11 points. The page size is A4, and all margins (top, bottom, left, right) should be at least 15 mm (not including any footers or headers).

The page limit will be applied automatically; therefore you must remove this instruction page before submitting.

If you attempt to upload a proposal longer than the specified limit, you will receive an automatic warning and will be advised to shorten and re-upload the proposal. Any excess pages will be overprinted with a 'watermark', indicating to evaluators that these pages must be disregarded.

Please do not consider the page limit as a target! It is in your interest to keep your text as concise as possible, since experts rarely view unnecessarily long proposals in a positive light.

Annex 5 – Template for a SME instrument phase 2 application

COVER PAGE

Title of Proposal

List of participants

Participant No *	Participant or organisation name	Country
1 (Coordinator)		
2		
3		

* Please use the same participant numbering as that used in the administrative proposal forms.

Table of Contents

1. Excellence

Your proposal must address a work programme topic for this call for proposals.

▲ This section of your proposal will be assessed only to the extent that it is relevant to that topic.

1.1 Objectives

- Describe the specific objectives for the project¹, which should be clear, measurable, realistic and achievable within the duration of the project. Objectives should be consistent with the expected exploitation and impact of the project (see section 2);
 - Explain the industrial/economic/social problem to overcome, or the business opportunity to be taken advantage of, that has not yet been solved / offered and can be solved / offered through your innovation business project and how this relates to the work programme topic;
 - Explain also how your solution solves the stated problem or avails of the business opportunity;
 - Describe the objectives and expected outcome of your innovation business project.
- #### 1.2 Relation to the work programme
- Indicate the work programme topic to which your proposal relates.

1.3 Concept and methodology

(a) concept

- Explain the current stage of development of the business innovation project and the key milestones that have led to it (e.g. proof of concept completed, early field trials under way), or similar indications of results. The description shall refer to the results obtained in the feasibility analysis carried out in Phase 1, or through other means, in case of direct application to Phase 2;
- Describe the positioning of the business innovation project, e.g. where it is situated in the spectrum from 'idea to application', or from 'lab to market'. Refer to Technology Readiness Levels where relevant (see [General Annex G of the work programme](#)).

(b) methodology

- Describe and explain the concept and the activities that you will implement during this project (e.g. demonstration, testing, prototyping, pilot lines, scale-up studies, maintenance, design, performance verification, market replication encouraging the involvement of end users and potential clients, research etc.);
- Explain how the concept and objectives for the project fit into the overall plan to reach the market;
- Describe how your project intends to develop something new to Europe that addresses EU-wide challenges;

¹ The term 'project' used in this template equates to an 'action' in certain Horizon 2020 documentation.

- Where relevant, describe how sex and/or gender analysis is taken into account in the project's content.

A Sex and gender refer to biological characteristics and social/cultural factors respectively. For guidance on methods of sex / gender analysis and the issues to be taken into account, please refer to http://ec.europa.eu/research/science-society/gendered-innovation/index_en.cfm

1.4 Ambition

- Explain the novelty of your innovation business project;
- Describe the expected key market application(s) extracted from the results already achieved, that differentiates your project and provides the highest added value for potential customers;
- Describe the expected performance/impact on defined needs, when in use, including improvement potential over time, regarding costs, environmental benefits, ease-of-use and any other relevant benefit and/or added value for end users and/or potential clients compared to alternatives solving the same or similar problems. Main advantages of your solution with respect to competing solutions.

2. Impact

2.1 Expected Impacts

a) Users / Market

- Explain which user needs have been identified and will be met upon completion of the project;
- Describe the main economic benefits for the users that compared to current state-of-the-art will make the users buy or invest in the innovation. What are you planning to use as unique selling points?
- Describe the type of market (e.g. a niche market or high volume market). What is the estimation of total available market size and growth rate? What are the market trends? Describe if and how your project addresses European and/or global markets;
- List main competitors and describe their competitive solutions;
- Describe the most relevant market segments for initial introduction of the new solution;
- Describe the most important market barriers to be overcome to realise the commercialization strategy;
- Describe the targeted users of the final solution, in which market segment/geographical areas do you see these potential users, and how do you intend to reach them?

b) Company

- Describe the relevance, rationale and alignment of the innovation business project with regard to the business strategy of the participating SME(s);
- Indicate the growth potential of your solution (Turnover, market share, employment creation, sales, return on investment and profit);

3

[Proposal Acronym]

template v20160120

- Explain if and how you will use the offered coaching services for SME instrument beneficiaries (of up to 12 days) to fully exploit the project result in your company based on the gaps and feasibility assessment developed under phase 1 or through other means;
- Indicate the estimated funding requirements to reach the commercialisation stage. Envisaged financial mix: percentage or relevance of own funds, SME instrument funding, other external funding.

2.2 Measures to maximise impact

a) Dissemination and exploitation of results

- Explain which stakeholders are key to get involved for making a successful commercial exploitation;
- Describe briefly, apart from the activities planned to be developed during phase 2, further steps needed to be taken before the results/ applications /products are fully ready for the market;
- Describe the strategy plan for commercialisation of your business innovation project, including own commercialisation means or/and cooperation(s) needed with key third parties. Approximate time to market/deployment. Provide a draft plan for commercialisation. Add further measures for dissemination and exploitation as appropriate.

A Consider the full range of potential users and uses including research, commercial, investment, social, environmental, policy making, setting standards, skills and educational training, where relevant.

b) Intellectual Property, knowledge protection and regulatory issues

- Industrial Property Rights assets: describe the key knowledge (IPR) items and who owns them; patents (filed and/or granted) or other ways of protection; ownership;
- Describe the measures to ensure the possibility of commercial exploitation ('Freedom to operate');
- Outline the strategy for knowledge management and protection as well as current IPR status;
- Explain the regulatory and/or standard requirements to be fulfilled for the exploitation of the technology/product/solution or concept: how they are to be met;
- If you will take part in the pilot Open Research Data² include information on how the participants will manage the research data generated and/or collected during the project, in particular addressing the following issues:³

² Certain actions under Horizon 2020 participate in the 'Pilot on Open Research Data in Horizon 2020'. All other actions can participate on a voluntary basis to this pilot. Further guidance is available in the H2020 Online Manual on the Participant Portal.

³ For further guidance on research data management, please refer to the H2020 Online Manual on the Participant Portal.

4

[Proposal Acronym]

template v20160120

○ What types of data will the project generate/collect?

○ What standards will be used?

○ How will this data be exploited and/or shared/made accessible for verification and re-use? If data cannot be made available, explain why.

○ How will this data be curated and preserved?

▲ You will need an appropriate consortium agreement to manage (amongst other things) the ownership and access to key knowledge (IPR, data etc.). Where relevant, these will allow you, collectively and individually, to pursue market opportunities arising from the project's results.

▲ The appropriate structure of the consortium to support exploitation is addressed in section 3.3.

• Where relevant include measures to provide open access (free on-line access, such as the 'green' or 'gold' model) to peer-reviewed scientific publications which might result from the project⁴.

▲ Open access publishing (also called 'gold' open access) means that an article is immediately provided in open access mode by the scientific publisher. The associated costs are usually shifted away from readers, and instead (for example) to the university or research institute to which the researcher is affiliated, or to the funding agency supporting the research.

▲ Self-archiving (also called 'green' open access) means that the published article or the final peer-reviewed manuscript is archived by the researcher - or a representative - in an online repository before, after or alongside its publication. Access to this article is often - but not necessarily - delayed ('embargo period'), as some scientific publishers may wish to recoup their investment by selling subscriptions and charging pay-per-download/view fees during an exclusivity period.

c) Communication

• Describe the proposed communication measures for promoting the product or service during the period of the grant. Measures should be proportionate to the scale of the project, with clear objectives. Commercially confidential data or any data that could compromise the business success of the proposed business or service does not require dissemination. Activities should be tailored to the needs of different target audiences, including groups beyond the project's own community. Where relevant, include measures for public/societal engagement on issues related to the project.

⁴ Open access must be granted to all scientific publications resulting from Horizon 2020 actions. Further guidance on open access is available in the H2020 Online Manual on the Participant Portal.

3. Implementation

3.1 Work plan – Work packages, deliverables and milestones

Please provide the following:

i) brief presentation of the overall structure of the work plan

ii) timing of the different work packages and their components (Gantt chart or similar)

iii) detailed work description i.e.

- a description of each work package (please use table 3.1a)
- a list of work packages (table 3.1b);
- a list of major deliverables (table 3.1c);

iv) Graphical presentation of the components showing how they inter-relate (Part chart or similar)

▲ Give full details. Base your account on the logical structure of the project and the stages in which it is to be carried out. Include details of the resources to be allocated to each work package. The number of work packages should be proportionate to the scale and complexity of the project.

▲ You should give enough detail in each work package to justify the proposed resources to be allocated and also quantified information so that progress can be monitored, including by the Commission.

▲ Resources assigned to work packages should be in line with their objectives and deliverables. You are advised to include a distinct work package on 'management' (see section 3.2) and to give due visibility in the work plan to commercialization (dissemination and exploitation) and communication activities, either with distinct tasks or distinct work packages.

▲ You will be required to include an updated (or confirmed) 'commercialization plan' in both the periodic and final reports. This should include, where applicable, a record of activities related to dissemination and exploitation that have been undertaken and those still planned. A report of completed and planned communication activities will also be required.

▲ If your project is taking part in the Pilot on Open Research Data, you must include a 'data management plan' as a distinct deliverable within the first 6 months of the project. A template for such a plan is given in the guidelines on data management in the H2020 Online Manual. This deliverable will evolve during the lifetime of the project in order to present the status of the project's reflections on data management.

Definitions:

'Work package' means a major sub-division of the proposed project.

'Deliverable' means a distinct output of the project, meaningful in terms of the project's overall objectives and constituted by a report, a document, a technical diagram, a software etc.

3.2 Management structure, milestones and procedures (only to the extent relevant in single entry proposals)

- Describe the organisational structure and the decision-making (including a list of milestones (table 3.2a));
 - Explain why the organisational structure and decision-making mechanisms are appropriate to the complexity and scale of the project;
 - Describe, where relevant, how effective innovation management will be addressed in the management structure and project plan.
- A** Innovation management is a process which requires an understanding of both market and technical problems, with a goal of successfully implementing appropriate creative ideas. A new or improved product, service or process is its typical output. It also allows a consortium to respond to an external or internal opportunity.
- Describe any critical risks, relating to project implementation, that the stated project objectives may not be achieved. Detail any risk mitigation measures. Please provide a table with critical risks identified and mitigating actions (table 3.2b).

Definitions:

Milestones: means control points in the project that help to chart progress. Milestones may correspond to the completion of a key deliverable, allowing the next phase of the work to begin. They may also be needed at intermediary points so that, if problems have arisen, corrective measures can be taken. A milestone may be a critical decision point in the project where, for example, the consortium must decide which of several technologies to adopt for further development.

3.3 Consortium as a whole (if applicable)

A The individual members of the consortium are described in a separate section 4. There is no need to repeat that information here.

- Describe the consortium. How will it match the project's objectives and bring together the necessary expertise? How do the members complement one another (and cover the value chain, where appropriate)? In what way does each of them contribute to the project? Show that each has a valid role and adequate resources in the project to fulfil that role.

3.4 Resources to be committed

A Please make sure the information in this section matches the costs as stated in the budget table in section 3 of the administrative proposal forms, and the number of person/months, shown in the detailed work package descriptions.

Please provide the following:

- a table showing number of person/months required (table 3.4a)
- a table showing 'other direct costs' (table 3.4b) for participants where those costs exceed 15% of personnel costs (according to the budget table in section 3 of the proposal administrative forms)

Table 3.1 a: Work package description

For each work package:

Work package number	Lead beneficiary			
Work package title				
Participant number				
Short name of participant				
Person/months per participant:				
Start month			End month	

Objectives

Description of work (where appropriate, broken down into tasks), lead partner and role of participants

Deliverables (brief description and month of delivery)

--

Table 3.2 a: List of milestones

Milestone number	Milestone name	Related work package(s)	Due date (in month)	Means of verification

KEY

Due date

Measured in months from the project start date (month 1)

Means of verification

Show how you will confirm that the milestone has been attained. Refer to indicators if appropriate. For example: a laboratory prototype that is 'up and running'; software released and validated by a user group; field survey complete and data quality validated.

Table 3.4a: Summary of staff effort

Number of person/months over the whole duration of the planned work, for each work package, for each participant. Identify the work-package leader for each WP by showing the relevant person-month figure in bold.

	WPn	WPn+1	WPn+2	Total Person/ Months per Participant
Participant Number/Short Name				
Participant Number/Short Name				
Participant Number/Short Name				
Total Person/Months				

Table 3.2b: Critical risks for implementation

Description of risk (indicate level: Low/Medium/High)	Work package(s) involved	Proposed risk-mitigation measures

Definition critical risk:

Any major event or issue that could occur and adversely impact the achievement of the project's objectives. A critical risk has a high level of impact associated to a credible likelihood of occurrence.

Level of impact (impact on project's objectives if it occurred): Low/medium/high

The impact is the potential consequence should the risk materialise. It can be both quantitative and qualitative in nature.

Level of likelihood to occur: Low/medium/high

The likelihood is the estimated probability that the risk will materialise even after taking account of the mitigating measures put in place.

Table 3.4 b: 'Other direct cost' items (travel, equipment, infrastructure, goods and services)

Please complete the table below for each participant if the sum of the costs for 'travel', 'equipment', and 'goods and services' exceeds 15% of the personnel costs for that participant (according to the budget table in section 3 of the proposal administrative forms).

Participant Number/Short Name	Cost (€)	Justification
Equipment		
Travel		
Other goods and services		
Total		

KEY: What is a purchase of good and services?

Purchase of good and services (Article 10 of the Grant Agreement): These contracts do not cover the implementation of action tasks, but they are necessary to implement action tasks by beneficiaries. Find further information in the Annotated Grant Agreement: http://ec.europa.eu/research/participants/data/ref/n2020/grants_manual/mngra/n2020-amga_en.pdf