D2.1 Impact Assessment Guidebook Final Update

Version 2, June 2016

IDC Analyze the Future · IDG · bluegreen · IIMC · Jožef Stefan Institute · Sustainable Finance & Consulting · FUTURE INTERNET PPP

Executive Summary

This deliverable is the final version of the Guidebook for the Impact Assessment (IA) process carried out in the FI-Impact (Future Internet Impact Assurance) Project, updated to reflect the modifications of the methodology employed in the project. The introduction specifies the main updates. It contains a description of the analytical methodology and the tools, which will be used to perform the ex-ante Socio-Economic Impact Analysis and market forecast during the course of the project. It describes how to use and apply the methodology, processes and tools. While designed as a manual for internal Consortium use, it will be available to all Phase III stakeholders with an interest in understanding the relationship between particular FI-PPP actions and wider ICT market trends and potential in Europe.

It is expected that given the tools to understand the context and potential of the market, all FI-PPP stakeholders can act on the information to assess and maximize their individual involvement. The European Commission and FI-PPP administrators can use it to better understand how we intend to assess Phase 3 of the FI-PPP. Accelerator projects can use it to categorize and understand the market potential of their portfolio of funded enterprises. Finally it can be used by funded projects to identify and assess their particular market, allowing them to maximize their potential and actual impacts, verifying the coherence and sustainability of their actions with the market trends and outlook.

It is divided into seven general sections. Following an introduction, Section two explains the motivations for carrying out an IA and its value to the European Commission and FI-PPP Phase 3 administrators, accelerators and individual consortia. Section Three describes the Methodological Framework including the Key Performance Indicators used during the course of the project to measure economic, social and scientific and knowledge impact, as well as potential end-user benefits. The Fourth Section describes how the Impact Assessment Methodology is implemented, while Section Five describes how quality control validation and risk management issues are addressed. Section Six describes the self-Assessment tools that any internal or external initiative can use to measure their performance, benchmark against industry standards or monitor their own performance over time. It is essentially based on the IA methodology and correlated analysis. Section Seven provides some references for background reading.

While this document, the underlying analytical data, the output studies, reports and mappings are all intended to be available to the public, the analytical approach and software tools used to derive information may be based or contain foreground information from partners of the FI-Impact Consortium.

Acknowledgements

FI-IMPACT (Future Internet Impact Assurance) is co-funded as a Specific Support Action by the European Commission under FI-PPP (Framework Programme 7) – Contract No. 632840 The views expressed in this document are those of the authors and contributors do not necessarily reflect the official European Commission's view on the subject.

Index

List of Tables

List of Figures

1. Introduction

1.1. Scope of the Deliverable

This deliverable describes the Impact Assessment (IA) process, the tools employed to achieve results and the market context FI-IMPACT has used to assess Phase 3 of the FI-PPP and forecast potential impacts up to the year 2020. It is designed to help all Phase III stakeholders to better understand particular FI-PPP actions and their relationship to wider ICT market trends and potential in Europe. It is expected that based on understanding the context and potential of the market, all FI-PPP stakeholders can act on this information to assess and maximize their individual involvement. Therefore, this Guidebook is intended to help the European Commission and FI-PPP administrators to understand how Phase 3 of the FI-PPP was assessed. Accelerator projects can use it to categorize and understand the market potential of their portfolio of funded enterprises. Phase 3 funded projects themselves can use it to identify and assess their particular market allowing them to maximize their potential and actual impacts, verifying the coherence and sustainability of their actions with the market trends and outlook.

The FI-Impact Guidebook will:

- Explain the motivations for carrying out of IA to Future Internet administrators, initiatives and individual FI-PPP Phase 3 consortia;
- Describe the benefits of impact that each category of user of the document can expect to achieve;
- Describe and motivate the Key Performance Indicators and the measurement system used;
- Describe the particular IA indicators and KPI for each indicator anticipating their scope, metrics, calculation methods, and indicative data collection needs and sources;
- Provide hands-on guidelines describing how consortia can implement and exploit the indicators to better align their plans and performance with users requirements and market trends;
- Highlight the criteria of identification of good practices and potential success cases, based on the KPIs;
- Describe the process of implementation and recommended frequency/timing of Performance and Impact Assessment.

The intended audience includes the specific stakeholders from the FI-PPP made up of European Commission and FI-PPP project participants. In particular it is intended to help Phase III Accelerator projects to establish a common framework, methodology and vocabulary for assessing the market and the single initiative clusters across the range of the Phase III ecosystem.

Furthermore the approach is based on industry accepted evaluation metrics and measurement process that have been used for several decades and is based on deep business knowledge and data. Given its commercial applicability it is clearly also of interest to external stakeholders. Examining this document will provide solid evidence-based analysis to Industrial and Research communities that are interested to find out how the Future Internet will advance, investors that are looking for market outlook and single technology providers that are interested in market potential.

Finally it is a drill-down evolution to a standard IA approach that takes the European practice of Impact Assessment to a deeper, initiative level, allowing a potentially more advantageous way to evaluate programs. As such this document may be interesting to other units and directorates that are looking for improved methods to assess their own programs and initiatives.

1.2. Main Updates

Concerning the methodology, the main updates concern:

- Par.3.4 Update of Key Performance Indicators
- Par.3.5 Identifying Accelerators good practices (new)
- Par.3.6 Update of the Market Model
- Par. 3.9 Update of the Economic Impacts Model
- Par. 3.10 Update of potential end-user benefits
- Par 3.11 Update of potential social impacts
- Par. 3.12 Update of potential knowledge and scientific impacts
- Par 3.13 Update of the Scenario methodology

Concerning the implementation process, the main updates concern:

Chapter 4 – Implementation: alignment of foreseen process and timing to actual deployment of the methodology

Chapter 6 – Approach to self-assessment tool: alignment with last updated of the self-assessment tool.

1.3. Glossary

This section provides an explanation of the terms used within this guidebook:

- IA = Impact Assessment. In the context of this guidebook the Impact Assessment abbreviated IA is the output of the FI-Impact Project pertaining to the qualitative and quantitative analysis and forecast of the FI-PPP potential socio-economic impact.
- KPIs = Key Performance Indicators
- Funded initiatives or subgrantees = the initiatives funded by the Phase 3
- FI-PPP = The Future Internet Public-Private Partnership, short: FI-PPP, is the European initiative promoting Internet-enabled innovation.
- FIWARE = FIWARE is used in the context of this guidebook to mean the entire FI-PPP community, the open source platform, the enabling technologies and the support infrastructure.
- FI = Future Internet refers to those technologies promoting Internet-enabled innovation
- Project = in this context a “project” is an initiative receiving grant funding from the European Commission though an FI-PPP Phase 3 Accelerator project call.
- Program = A group of activities which are designed to be implemented in order to reach policy objectives. In this context it is the FI-PPP program.
- Phase III initiatives are all the projects responding to the FI-PPP Phase 3 Accelerators Open Calls, including those selected and not selected. They are also called proposals or applicants.
- Proposers are the components of the team presenting a proposal.

- Phase III projects, or in short "projects", are the initiatives which have successfully passed at least one phase of selection by one of the 16 FI-PPP Phase 3 Accelerators.
- Phase III Accelerator Projects are referred to as Accelerators and not as projects.
- Policy =A policy can be defined as an agreement or consensus on a range of issues, goals and objectives which need to be addressed
- Outcomes = the effect the process has had on the initiatives targeted by it.
- Outputs= the products or results of the process.
- SE = Socio-Economic

2. Intended Use of the IA Methodology

This chapter is provided to:

I. Explain the need for an IA;
II. Establish and communicate the benefits of an IA for the different Stakeholders in the FI-PPP;
III. Lay down guidelines for using this guidebook.

Furthermore, it defines the context, the processes that will be carried out by the FI-Impact project, the stakeholders and their expected roles and benefits.

2.1. Why an IA is important

There were approximately 21.6 million Small and Medium Enterprises in Europe in 2013 employing more than 88.8 million people and generating 3.7 trillion Euros of revenue[1]. The business demography in Europe is different to North America or Asia Pacific where SMEs generate approximately 10% less to the regional GDP.

Table 1 SME Comparison Number, Employment and Value Added Eurostat 2013

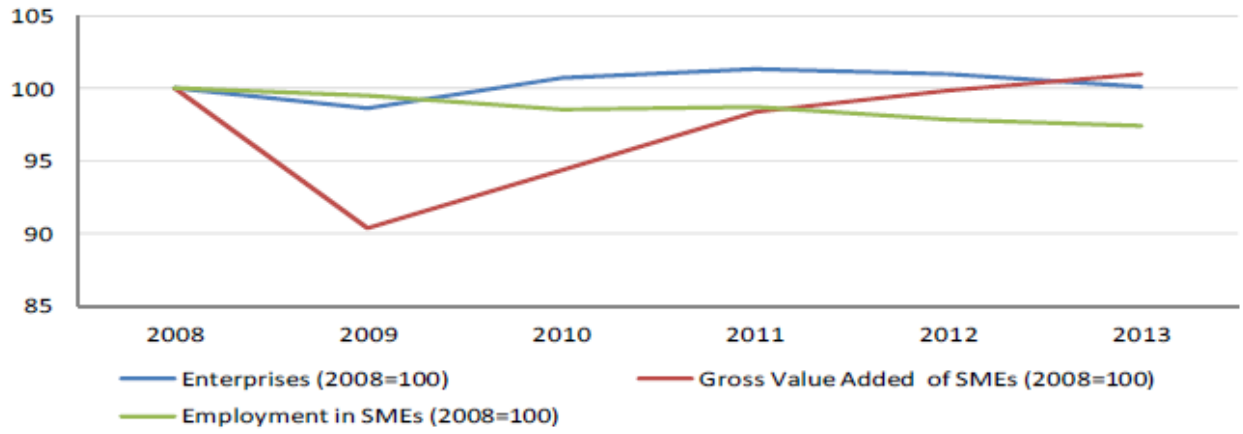
	Micro	Small	Medium	SMEs	Large	Total
Number of enterprises						
Number	19,969,338	1,378,374	223,648	21,571,360	43,517	21,614,908
%	92.4%	6.4%	1.0%	99.8%	0.2%	100%
Employment						
Number	38,629,012	27,353,660	22,860,792	88,843,464	44,053,576	132,897,040
%	29.1%	20.6%	17.2%	66.9%	33.1%	100%
Value Added						
Million Euros	1,362,336	1,147,885	1,156,558	3,666,779	2,643,795	6,310,557
%	21.6%	18.2%	18.3%	58.1%	41.9%	100%

SMEs are more important to our economy. However, the European Commission Directorate of Enterprise's annual report[2] on the economic performance of SMEs shows just how fragile this section of our economy is. The years starting in 2008 have had a profound impact on the financial and economic position of many SMEs as they are in fact less resilient to economic downturn than their larger counterparts. Only after six years are the numbers of business registries, employment and Value Added returning to 2008 levels as we can see in the Figure 1 below.

[1] Data Eurostat 2013 (excluding financial services)

[2] Annual Report on European SMEs 2013/2014, Final Report July 2014

Figure 1 Returning to 2008: DG Enterprise Report on European SMEs 2014



Source: Annual Report on EU SMEs, Eurostat Data 2013

While the economic downturn has been more marked in some sectors and in some countries, it is clear that the micro-enterprises have fared the least well. Studies like the Annual Report on European SMEs paint a clear picture of the impact of a macro-phenomenon like economic downturn, clearly identifying sectors and segments that have done poorly or have fared better but it is the IA process that correlates SME related phenomenon like access to finance, availability of skilled staff or experienced managers, competition, cost of production, customers base or regulation influence the potential impact of the SMEs performance and help policy makers take a proactive stance in relation to the macro economic trends. IAs are regularly carried out by government institutions like the European Commission at a higher level to guide policy and to highlight the costs and benefits of different policy alternatives to provide meaningful program such as the FI-PPP in high growth potential sectors like Future Internet, but there are fewer examples of IA geared for smaller sub-segments and sectors like those found in Phase III of the FI-PPP.

It is clear that we must ensure that this segment of the economy has the right incentives and is put in the condition to express its potential and Programs such as the FI-PPP are key contributors to this process. It is essential that these programs are closely monitored in order to adjust their governance based on ongoing results and to make sure that investment and policy are as focused and effective as possible. It is important that all stakeholders including the Micro and Small Enterprises understand the potential of the various market segments and customer bases if they wish to perform better and generate market impact.

It is our intention to take the IA approach further and adapt it to the innovators and SMEs launched by Phase III and to all the FI-PPP ecosystem. We will analyse their targeted markets and analyse which sectors and approaches will potentially fare best. We will highlight which components of their business strategy may help to maximize their potential impacts, identified through the performance indicators presented in this deliverable, and assess their potential cumulative impacts.

2.2. Value and How the IA can be used by Stakeholders

2.2.1. The European Commission

The European Commission is well aware of the growth potential of the FI-PPP, having already carried out a-priori[3] and midterm IA[4].

These analyses have the objectives of helping the EU institutions to design better policies and laws facilitating better-informed decision-making in the legislative process. Furthermore they are intended to ensure coherence of Commission policies. Focusing on the benefits and costs of different policy alternatives they generally improve the quality of policy and EU intervention keeping it as simple and effective as possible.

However these types of analysis are for the Commission alone and have wider policy and resource allocation ramifications. They necessarily look at the entire ecosystem and aggregate data, drawing conclusion at a very high level. These types of studies discover trends and medians of results and draw overall conclusions. Trends such as job creation, economic growth, business creation are described at a programmatic level.

The FI-Impact project on the other hand will carry out a more specific IA than undertaken in previous studies, analyzing a well-defined segment of the FI-PPP program with specific markets, actors and goals. The KPIs are meso-program level and describe real go-to-market uptake potential, from the outlook of a single industrial sector. The FI-IMPACT ex-ante IA will provide Program Managers with a new snapshot of potential that may influence their approach in the future as well as concrete talking points for the promotion of this PPP and similar approaches in the technology domains considered.

2.2.2. The FI-PPP Program Stakeholders

The FI-PPP is surrounded by a number of actors that go beyond current project participants, Commission Services, Accelerator projects, participating SME and Entrepreneurs. There is a whole community of platform developers, Industrial actors, research communities, public authorities and investors who have in some way contributed to the status of the requirements, technology use cases and implementation platforms. They are all potential benefiters/users of the IA. The FI-Impact IA is able to answer their questions as to which FIWARE technologies, which countries, which markets and which channels hold promise as potential success areas. Leveraging the time and investment of the whole Phase III communities they can get an idea of real implementation potential of areas they are planning to invest in and assess the potential and outcomes of technologies and markets. They can also look at single KPIs and monitor any given parameter over the course of the project. Investors can single out groups of initiatives to assess investment potential in the SMEs and Entrepreneurs or in the Ideas/sectors that look most promising further promoting the uptake of FIWARE technologies.

[3] FI3P - “Towards a competitive European Internet industry”, May 2012

[4] Interim assessment of the FI-PPP, May 2012

2.2.3. The Accelerator Projects

The FI-IMPACT ex-ante IA has a clear value to the Accelerator Projects. By offering an independent IA and especially by providing insight into the potential market demand of the range of initiatives being selected, our project will provide useful complementary information and intelligence supporting the Accelerators in their activity. In addition FI-IMPACT will be in the unique position to be able to aggregate and compare the results of the calls of all the Accelerators, providing monitoring results and highlighting which proposals are presented to multiple calls and which proposers are active in multiple proposals. This will help avoiding double funding.

FI-Impact will offer insight into the assessment process based on over 50 years of Market Analysis experience of FI-Impact partners. The FI-IMPACT Coordinator is a global market leader in IT market analysis. Members of the FI-Impact consortium are in an authoritative position to provide a framework for demonstrating the potential Socio-Economic impact of the horizontal technologies at the core of the FI-PPP Phase 3 funded projects. Members of the FI-Impact consortium have deep experience in providing qualitative and quantitative based analysis and evidence of the potential of the vertical Industrial Sectors addressed.

The IA carried out in FI-Impact will be a valuable tool for Accelerator project managers to analyse their portfolio of projects in the context of the wider economic IT ecosystem. Being able to define which industrial sectors, and which technologies will contribute to the overall IT landscape and how important that contribution will be in the near future, is essential to understand how to best advise and guide their SME/Entrepreneurs in the essential start phases where they can still tune their business approach. FI-Impact's IA will provide them with KPI based qualitative evidence tied to accurate market purchasing and growth projection, proving them with valuable market intelligence to help Accelerators and the projects they fund make better informed decisions.

The Accelerators will need to assess and measure their project portfolio. Many will have to decide who they should continue to support through further financing and who should not receive further support. The FI-Impact IA will give them an additional tool to support internal analysis and make better-informed decisions, keep the Commission Services informed of the reasons for their decisions and compare their performance across Phase 3 FI-PPP. FI-Impact can provide a valuable glossary and common yardstick for Accelerator managers to talk about potential and market of their SME/Entrepreneur initiatives.

2.2.4. The SME and Entrepreneurs

Beyond the grant funding provided through Phase 3 of the FI-PPP, the fundamental interest of successful SMEs and Entrepreneurs is to survive and be profitable. The best way to make money is to have a differentiated product or service offering and a well-defined target customer base. FI-Impact's IA will provide insightful analysis of the outlook for market being targeted by SMEs/Entrepreneurs' co-funded under Phase 3 FI-PPP. For example in the early phases of development a SME may have a good FIWARE enhanced technical solution for Manufacturing. At an early stage they may have the chance to modify their approach including intended implementation. Understanding for example, that the discrete manufacturing domain is expecting stronger growth than the process-manufacturing domain originally targeted may be helpful in targeting higher potential customers and alternative channels to reach that market. Small changes at an earlier

stage, can result in dramatically more positive outcomes. FI-Impact will provide an Honest Broker Market and sectorial analysis that can truly serve as an early stage reality check.

2.3. Overall usability of IA results

The European Commission will find the IA useful for introspective analysis and policy planning. FI-PPP administrators and supervisors may want to use the IA to assess their outcome and performance and prepare internal and external communication. The Accelerators may want to use the IA to access their portfolio of projects and adjust their geographic, technological or funding plans for upcoming sub-calls and future activities. The funded initiatives themselves can use the IA to analyse their target market objectives based on the sectorial findings, and some initiatives may decide to reposition themselves based on expected competition and niche market analysis. The deliverables released in Workpackage 2 of the FI-Impact Project will all be in the public domain and published on the FI-Impact portal after delivery to the European Commission.

The results themselves can be combined with other research, aggregated, republished or used for predictive, consulting and analytical purposes. FI-Impact and other data sources on which our analysis is based should be referenced when used or republished.

2.3.1. Overall mapping results

The first step of our IA will include high level mapping of Phase III activities and will contain holistic information regarding the entire body of proposals that are received. It will contain at least the following useful information:

a) Total number of proposals submitted,
b) Number of retained proposals and in the funding range
c) Geographic origin of proposers
d) Business type of proposers
e) Organizational characteristics of proposers
f) Size of Proposer organization
g) Expertise of proposers
h) The funds provided for each target sector;
i) The FIWARE technologies leveraged.

Additionally, by request of partners from the Accelerator projects “statistical” data regarding the name and frequency of proposers that appear in more than one proposal submission either to an Accelerator call or across different Accelerators will be provided.

2.3.2. Target market assessment

The Accelerators will receive a large number of proposals. A subset of these will be funded across one or more phases. A typical IA would be quite complex and require a dedicated team, reliable data and will take several person weeks to complete. It is impossible to carry out several hundred of these studies and the FI-IMPACT IA will be a meso-level analysis, carried out ex-ante as very few or none of the examined initiatives will reach the market before the end of our project. We will first map the initiatives and cluster similar initiatives. At this point we will analyse the clusters according to the methodology described in this guidebook. Detailed analysis will be carried out by vertical industrial

sectors and by horizontal technological sectors according to the market addressed by the funded initiatives. It will include

a) Vertical industrial and horizontal technological clustering of all the funded initiatives;
b) Identification of NACE rev. 2 target markets addressed;[5]
c) Geographical coverage of the clusters and their targeted markets;
d) Main demand trends affecting the markets targeted by the clusters;
e) Fi-WARE technologies addressed and role in the FI-PPP ecosystem;

The market model designed by FI-IMPACT will allow to estimate:

f) The potential take-up and revenues of the clusters
g) Their growth potential
h) The economic factors influencing the estimated market

The selection of initiatives will be performed by the Accelerators in various waves and following several steps of selection. FI-IMPACT will deliver in early 2015 a first mapping of the Accelerators' calls results to be shared with all the FI-PPP community and will regularly update it. The ex-ante IA including the market estimates will be produced mid 2015 as indicated in this Guidebook and updated once in the second year of the project.

2.3.3. FI PPP Ecosystem Assessment

The assessment will also be carried out considering the entire FI-PPP ecosystem. This is intended to examine if the funding is potentially effective in its context assuming an aggregation of all of the activities performed to date and considering the plans and on-going activities required to complete Phase III. It represents the macro-economical and technical overview of the programme and will include a survey and evaluation of the:

a) Services, tools, applications, technologies that will be supplied by the funded initiatives
b) The applicants position in the FI-PPP ecosystem;
c) Coverage of roles in the ecosystem;
d) The potential impact per clusters of initiatives with similar target markets.

2.3.4. Results

The results of this deliverable and ensuing IAs will be used by FI-Impact internally to complete the obligations expected from the contract with the European commission and will be the basis for the deliverables that are at the basis of the agreement. In any case where there is doubt as to the process or significance, partners will first reference this document.

The Results and the IA analysis at various stages will be used to communicate with FI-PPP programme stakeholders. For example, FI-Impact will carry out aggregated analysis and mapping of the FI-PPP Phase 3 Calls, the nature of their respondents, and the particular

[5] see:http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=LST_NOM_DTL&StrNom=NACE_REV2

focus of proposals received. The initial results are already being used in communications with the community and through the Basecamp FIWARE wide discussion portal.

3. Description of the Methodology Framework

3.1. Overview

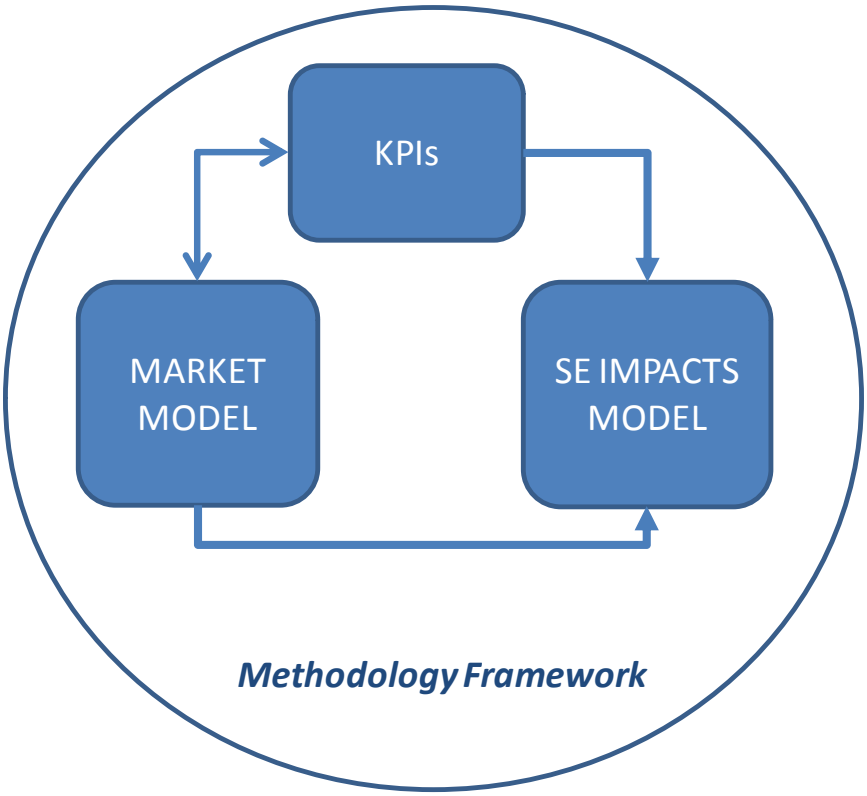
The main objective of FI-IMPACT is to collect and assess the qualitative and quantitative evidence of the potential socio-economic impact of the FI-PPP program by measuring and projecting potential market sector economic potential, stakeholder take-up and technological impact of Phase III projects to 2020.

The methodology framework designed to achieve these goals is presented in Figure 2 below and is based on three main components, each of which is based on different specific methodologies. They are:

- **A market model**, which will draw on the detailed mapping of the Phase III projects to estimate their potential take-up, their target markets (e.g. their "footprint" on the EU economy), their demand drivers, their potential revenues;
- **A socio-economic impacts model (SE impacts model)**, which will build on the market estimates to assess the potential direct, indirect and induced impacts of the Phase III projects, in terms of macro-economic impacts, social impacts, users' benefits, the social and scientific impacts.
- The development of **Key Performance Indicators (KPIs) measuring the readiness** of the Phase III projects to achieve their objectives and potential impacts with reference to objective benchmarks. The development and measurement of KPIs responds to 3 main objectives:
    - To carry out a qualitative analysis of the main factors affecting the selected projects and their chances of success, feeding into the main assumptions of the market and impacts models;
    - To develop an online self-assessment tool that all projects can compile to gain feedback on their readiness for success. The self-assessment tool will be available to all projects and proposers, including those who were not successful in receiving grant funding.
    - To identify a long list of 50 potential success stories out of the expected 1100 funded projects and a short list of up to 10 cases with high impact potential, to be used to illustrate the value and reach of the FI-PPP.

As better explained in the following paragraphs, the market model results are an input for the SE impacts model. The results of both models are ex-ante assessments, because it takes at least 1-2 years after the end of a project to produce impacts. While most of the funded initiatives have been launched on the market by the end of 2016, their real market success can be properly measured only 2-3 years after the end of the programme. However, both models include **forecasting results to 2020** based on main trends and likely scenarios based on IDC research.

Figure 2 Methodology Framework Components and Interdependencies



Source: FI-IMPACT 2014

Figure 2 shows the interdependencies of the methodology framework components. The market model and the KPIs are interdependent as they will be developed in parallel and influence each other. Both KPIs and the market model feed into the SE impacts model.

Each of the components of the methodology are described in detail below. As shown in Figure 2, the methodology will be implemented through a Monitoring and Impact Assessment cycle (as Accelerators will continue recruiting and selecting new projects, and/or training them, throughout the duration of FI-IMPACT). As a result, it will be necessary to revise and update the market and impact estimates, as the basis of analysis will change. In addition we expect to take into account and as necessary incorporate feedback received from the FI-PPP community and other stakeholders.

The cycle includes the following main steps (more detail is presented in chapter 3):

- Development of the Methodology Framework;
- Monitoring of FI-PPP initiatives;
- Mapping of FI-PPP Phase III and initial measurement of KPIs;
- Implementation of the web-based instruments including the self-assessment tool;

This phase of the cycle was concluded in June 2015, when the first full description of the Phase III activities was presented, after the first wave of calls was concluded and FI-IMPACT had access to a sizable sample of the data. After this the study team worked in parallel on the data collected through the monitoring and mapping following two different methodology "paths", closely inter-related, until the end of the project in June 2016:

- The **KPIs path**, to carry out the cyclical assessment of the projects to identify and promote good practices and potential success stories;
- The **IA path**, to implement the market and IA models and estimate the ex-ante impacts.

This is shown in the Figure 3 with the following main steps:

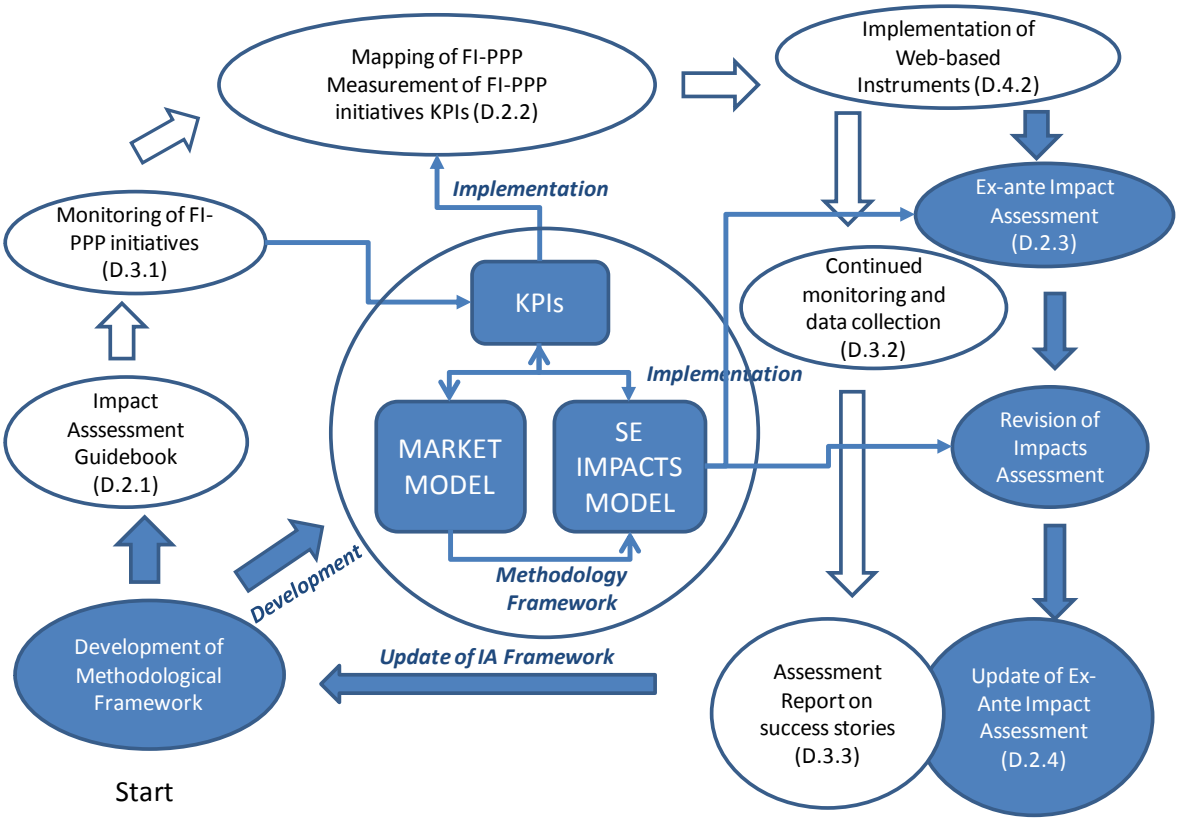
KPIs Path:

- Continued monitoring on Phase III; cyclical data collection and assessment of the projects to identify success stories;
- Production of the final Assessment report on the good practices and success stories.

IA Path:

- Production of the first ex-ante Impact Assessment;
- Revision of the IA taking into account feedback, new results from monitoring and data collection from the Accelerators;
- Production of an updated ex-ante Impact Assessment

Figure 3 FI-IMPACT's Monitoring and Impact Assessment Cycle



Source: FI-IMPACT 2014

The cycle depicted in Figure 3 is a necessary simplification to describe the workflow and highlight the main dependencies between activities and the main deliverables. In reality, interaction with the Accelerators will be ongoing and we will develop and implement the models as an iterative process. There will be by necessity "cut-off" dates of data collection

before the main deadlines for deliverables, in order to enable the finalization of elaborations and estimates.

3.2. Methodology rationale

Research on socioeconomic impacts has focused on the causality links between the deployment of ICT and the achievement of potential benefits, the mechanisms of diffusion and adoption of ICT, the role of policies to compensate market failures and/or overcome barriers to ICT adoption (for example the digital divide). Initially very simple technology diffusion models were used, taken from market research methodologies, based on the assumption that the use of ICT products and services would by itself lead to the achievement of benefits. But very soon it became clear that the evolution towards the Information Society required a systemic approach and that the reaping of benefits was related with social, cultural, organizational as well as technical innovation.

Today the analysis of ICT impacts takes place within the more general perspective of innovation policies and strategies, within the conceptual framework of the evolution of the innovation system. More sophisticated models are used to analyse the links between research and development, innovation systems and the business environment to understand the effectiveness of the innovation process and therefore the mechanisms of uptake of ICT technologies and services. These considerations must be taken into account when assessing the potential demand for the main services and applications to be launched by the Phase III projects.

The emergence of open innovation and social innovation models is driving a new reflection in the IA area. The combination of technology and social innovation is a powerful force for change whose impact will be strongly felt over the next 5 - 10 years. According to the ISTAG (IST Programme Advisory Group)[6], ICT is entering into a societal or infra-centric phase, in which social innovation is becoming a main driver for ICT development. Social innovations are new ideas (products, services and models) that simultaneously meet social needs (more effectively than alternatives) and create new social relationships or collaborations. This is very clear in the so-called apps economy, for example.

One of the disruptive consequences of this shift is that the dynamics of innovation have changed substantially. Innovation has moved 'down' the value chain. Bottom up and user generated innovation has become more influential and traditional models of production, social organisation and value creation as well as the speed of innovation have changed dramatically. This calls for a flexible and agile approach towards innovation that enables the continuous identification and valorisation of emerging opportunities. To what extent will Phase III project exploit these innovation mechanisms, such as social innovation? This will be an important aspect of our analysis, requiring for example to classify/cluster the Phase III projects based on their level of innovation, type of business model and ability to exploit the new demand drivers.

These trends and challenges are well represented in the structure of Horizon 2020, the EU Framework Programme for Research and Innovation, which aims at bridging the

6 IST Programme Advisory Group (ISTAG) report "Orientations for EU ICT R&D & Innovation beyond 2013" http://cordis.europa.eu/fp7/ict/istag/documents/ istag_key_recommendations_beyond_2013_full.pdf

research-innovation-market gap (the valley of death). In fact, the FI-PPP itself is an innovation platform inspired by similar principles, which aims at building synergies between stakeholders (business actors) originating from multiple industry verticals to create and operate a sustainable Future Internet business ecosystem in Europe. This ecosystem is composed of inter-dependent, inter-linked business stakeholders, adopting new business roles and offering new value propositions towards end customers. As described by the 2013 FI-PPP White Paper[7], this ecosystem follows a more advanced economic logic than traditional platform based business ecosystems, based on the rationale of linear bilateral exchange. The FI-PPP's innovative platform can be exploited by multiple groups of stakeholders from multiple entry points and business trajectories (or "sides"). Potentially this may result in complex value chains, depending on the business models chosen by the Phase III innovator projects.

In summary, the first step towards the assessment of the potential market impacts of Phase III requires mapping the whole FI-PPP ecosystem and analysing how the new projects fit into the FI-PPP value chain, what is their interaction with other stakeholders, what are their main business models. To do so we will need to analyse and group the selected projects into homogeneous clusters with similar roles in the value chain, business models and target markets (bottom-up analysis). The results of this analysis will feed the market model and the identification and measurement of KPIs, which in turn will feed the SE Impacts model.

However, our goal is not to estimate the potential impacts of each individual project and then simply add them up to calculate the overall impact. This approach is not only impractical, it would also multiply the chances of error. Our methodology for the market model combines a bottom-up approach (aggregating project data in clusters, leveraging our data collection and mapping of Phase III) and a top-down approach (leveraging data on the overall target markets' size and potential growth, based on IDC research and other public sources). The market model is essentially based on IDC methodologies.

The socio-economic IA model follows best practice established methodologies for estimating macroeconomic and social impacts. The IA methodology applied by FI-IMPACT is aligned with the EC's own IA and ex-ante evaluation Guidelines and with best practices in the IA field, well known by the consortium partners and employed in various studies for DG Connect. Their effectiveness is multiplied by the partners' unique knowledge of the ICT market and therefore their capability to identify and measure impacts and benefits based on a combination of proprietary data and public sources.

3.2.1. Conceptual Framework

It is important to reinforce the basic definition of impacts that are relevant in the context of policy evaluation methodologies, in order to clarify how we apply them in this project. They are:

7 "Towards FI-PPP Innovation and Business Ecosystems", by Pieter Ballon, Anand Raju, Cristina Cullell-March, Exploitation and Business Modelling WG, November 2013

- **Outputs** are the actual deliverables of the policy initiative or the programme, products or services delivered, corresponding to the **operational objectives**. They are under the direct control of the policy managers and can be directly verified.
- **Impacts** are the main effects of the policy intervention on the socio-economic system; they may be expected or unexpected, the first kind usually corresponds to the **overall goals** of a policy. Impacts tend to develop in the medium-long term and to be influenced by many other factors besides the policy intervention.
- **Results** (also called outcomes) are the immediate and short-term effects of the policy intervention. , They usually correspond to the **specific objectives.** Positive results are usually an intermediate step set out to achieve the desired impacts.

Applying these definitions to FI-IMPACT we define the following:

- **Outputs** are the actual results of the Accelerators (number of calls, number of proposals collected, number of projects funded… like) and of the Phase III projects activities (number of products created, number of Apps created, number of IT services created, number of FIWARE experimentation facilities used…);
- **Results or outcomes** are the immediate results achieved by the Phase III funded projects such as tools or technologies developed, prototypes or services tested;
- **Impacts** are the medium-long term consequences of the Phase III projects bringing the FIWARE-based innovation to market, producing revenues and creating jobs, finding customers and satisfying them, and triggering new innovation and indirect and induced impacts in the socio-economic system.

Measuring outputs can be achieved by monitoring specific indicators (e.g. number of proposals an accelerator received, or the number of apps created), whereas impact based assessment deals with goals and measurements, which are a consequence of the outputs and are relative to a – not necessarily pre-defined – baseline.[8]

As described below, FI-IMPACT's monitoring and mapping activities are focused on FI-PPP Phase III outputs, with a primary focus on Impact Assessment.

3.3. Monitoring and Mapping of FI-PPP Phase III outputs

FI-IMPACT is the only CSA with the task to provide an aggregated view of Phase III activities and achievements as well as impacts. The first step of FI-IMPACT was active engagement with the 16 Accelerators projects and with the other Coordination and Support Measures to coordinate monitoring of their main plans and activities. The main goal of this activity was to organise an ongoing flow of data and information from all the Accelerators to FI-IMPACT to collect the evidence needed for our assessments. It is not FI-IMPACT's responsibility to benchmark the Accelerators or to judge their comparative performance; our goal has been to cooperate with them and provide support in order to better assess the results of their calls for proposals. This has been done through the value-added analysis carried out of the data provided to us.

The main objectives of our monitoring activities are:

[8] Cmp.: Epstein, M. J., & Yuthas, K. (2014). Measuring and Improving Social Impacts: A Guide for Nonprofits, Companies, and Impact Investors. Berrett-Koehler Publishers.

- Mapping FI-PPP Phase III, that is providing a structured overview based on mapping templates of the 16 Accelerators and of the projects responding to their calls for proposals, which are their main outputs;
- Supporting the identification and measurement of KPIs of proposals/projects;
- Supporting the selection and in-depth assessment of the good practices and potential success stories;
- Providing data for the development of current and forecast market estimates.

3.3.1. Mapping Template of Accelerators

The mapping template of the Accelerators includes three main typologies of information:

- **Value proposition** that is their main objectives, target markets, FIWARE technologies privileged (if any), geography covered during the calls, expected benefits and total funding to be distributed;
- **Calls roadmaps**, including the number of calls and selection steps, their criteria of selection, the timing of calls and selection steps, the number of proposals expected and the numbers achieved, the number of proposals to be funded and the average funding
- **Data sharing**, meaning when and under what process the Accelerators delivered their datasets, how the confidentiality issues where managed, what where the structure of the datasets and their content (that is the type of data collected on proposals and whether it was coherent with the indicators suggested by FI-IMPACT). This data will not be used to evaluate the Accelerators, but simply to guide the elaboration and aggregation of the results. Since Accelerators have different timing and approaches to the selection and support of initiatives, FI-IMPACT must be very careful to harmonize the data for aggregation and insure comparability where possible. In addition, FI-IMPACT must respect the confidentiality requirements posed by the Accelerator and clarify how the data will be shared and disseminated within the FI-PPP community and beyond.

This data has been collected for each Accelerator and then aggregated, providing a map of the Accelerators collective coverage of target markets, geographies, and main selection criteria, with easy to understand infographics. The data has been provided to the Accelerators through the production of individual Accelerator reports, delivered in January 2016 and in May 2016. Each round of delivery has been followed by feedback and revisions and has been validated by the Accelerator, creating a mutual learning process.

Table 2 Mapping Template of Accelerators

	Data
Accelerator Value Proposition	Main objectives
	Target markets
	FIWARE technologies privileged (if any)
	Geography covered
	Expected EU benefits
	Total funding
Calls Roadmaps	Number of calls
	Criteria of selection of proposals
	Timing of calls and selection steps
	Number of proposals expected per each call
	Number of proposals to be selected per each calls
	Average funding per proposal
Data sharing	Approach to datasets sharing and dissemination, confidentiality
	Timing of provision of dataset
	Structure of dataset

Source: FI-IMPACT 2014

3.3.2. Analysis and Elaboration

The analysis and elaboration of the data collected with the mapping templates will has been carried out through statistical analysis of quantitative data and qualitative analysis by the IDC analysts.

The semantic analysis of the collected application proved impossible to do because of the low quality of the dataset (each accelerator provided inputs under different formats, and many provided only selected quantitative data on excel spreadsheets). The only text provided was the initial proposal abstract which was insufficient to develop a semantic analysis with valuable results.

Therefore, IDC recruited its IT vertical markets, software and services analysts and asked them to analyse the business ideas and value propositions of each selected initiative on the basis of their abstract and documentation. This resulted in a comparable classification of the funded initiatives in terms of vertical market target, type of technology offering, business model (B2B, B2C, B2B2C). These data have been validated with the Accelerators through the dissemination of individual Mapping reports, updated twice in the course of the life of the project.

These aggregated results, combined with the data collected for the KPIs have been used to produce a description of the FI-PPP Phase III ecosystem; a "go to market" roadmap of the Accelerators calls and of their projects, clarifying when the different batches of selected projects have been funded and when they can be expected to launch their FIWARE-based innovation on the market (this in turn will influence the expected timing of their impacts).

3.3.3. Mapping Template of Proposals/ Projects

The mapping template of proposals was designed to collect the data on their key characteristics, after consultation with the Phase III Accelerators. The data collected will be elaborated and aggregated to answer the main questions indicated in the table below.

There are three main measurement areas:

- **Organisational profiles**, describing the main characteristics of the organisations submitting proposals for funding by the Phase III Accelerators, by organizational type, number of employees, turnover and number of years established;
- **Exploitation of FIWARE**, focusing on which FIWARE technology enablers the proposers plan to use;
- **Duplication check**: The Accelerators asked FI-IMPACT to carry out a check of the possible presentation of the same proposal to more than one Accelerator or the presence of the same personnel in multiple proposals. The EC has declared that presenting the same proposal to more than one Accelerator for potential funding is possible, but that no proposal can be funded twice.

All Accelerators are expected to collect these data points so the coverage of these aspects should be complete for all Phase III proposals.

These data are objective and neutral (as there is not direct correlation with the likely performance or success of proposals). Their aggregation and elaboration will allow the synthetic description of the average proposal profiles, geographical coverage across the EU 28 and planned exploitation of FIWARE. A key result will be a gap analysis of the uncovered areas (both thematic and geographic).

Table 3 Mapping Template of Proposals/ Projects

	Data	Segmentation and Elaboration Criteria	Mapping question
Organisations Profile	Type of organization	SME, Start-up, Web Entrepreneur, other (% distribution)	Who are the proponent organisations - by type?
	Location by country	28 EU (% distribution by country)	Where do the proponent organizations come from? Are all the EU28 MS equally represented?
	Number of years since foundation	Aggregated into average life classes (% distribution by size class)	What is the average number of years of establishment of the proponent organisations? Are there more start-ups and web entrepreneurs or more SMEs?
	Number of employees	Aggregated into classes of company size (% distribution by size class, broken down by type)	What is the average size of the proponent organisations?
	Annual Turnover	Aggregated into classes of turnover (% distribution by turnover class, broken down by type)	What is the average level of turnover of the proponent organizations?

	Data	Segmentation and Elaboration Criteria	Mapping question
Exploitation of FIWARE	Role in the FI-PPP Value Chain	Developer of Enabler, Service Provider, Technology Partner for Others, Training Provider, Application Developer, Market Facilitator (% distribution of organization by role).	Which role do proponents plan to play? Are there some roles that are more popular/ roles not covered?

	FIWARE Technology to be used	Category of technology from the catalogue (% distribution of proponents by type of technology)	What is the level of exploitation of FIWARE technologies? What is the balance between areas covered/not covered?
	FIWARE Technology Generic Enabler to be used	Name and type of enabler (% distribution of proponents by enablers, ranking of enablers most used)	What is the level of exploitation of FIWARE enablers? What is the balance between enablers covered /enablers not covered (in %)? Which enablers appear more attractive for the proposers?
	Data	**Segmentation and Elaboration Criteria**	**Mapping question**
Duplication check	Number of proposals	Number and % distribution of proposals by accelerator and total, by country and total	How many proposals were submitted by accelerator and by country? What is the level of coverage of the EU28?
	Number of proposers	Number of CVs included with proposals, aggregated in average size classes (% distribution of proposals with average number of proponents)	How many CVs were included with each proposal on average?
	Level of duplication of proposals	Cross check of same proposals by accelerator call (number of proposals on total presented to more than one call/accelerator)	How many proposals were presented to more than one call?
	Level of duplication of proposers	Cross check of proposers CVs across proposals and accelerators calls (number of CVs appearing in more than one proposal)	How many CVs were presented in more than one proposal (within one call or for different calls)?

Source: FI-IMPACT 2014

3.4. Key Performance Indicators

Based on the data collection and active engagement with the Phase III Accelerators, we have modified the indicative Key Performance Indicators outlined in the original FI-IMPACT proposal to focus on 4 main assessment areas.

Compared to the first release of the methodology, we have operationalized the "potential benefits indicator" developing the "Business and Consumer Market Needs" indicator. We have also added potential Social impacts indicators. The updated definitions of the main KPIs are presented below.

For each assessment area we have identified a set of indicators that is measurable with the data collected during the application process (see the tables below).

The assessment areas correspond to the 4 main groups of factors affecting the likely implementation and performance of the projects, plus an assessment on potential social impacts. They are:

- **Innovation Focus**: level of originality, maturity and innovation sustainability of the sub-grantee's offering, assessed on the basis of questions on the type of innovation pursued by the initiative and its closeness to market.
- **Market Focus**: performance in the collection of knowledge about target customers and in the development of a coherent strategy and plan to address the targeted market. This is based on questions investigating in detail the type of market and customer addressed.

- **Feasibility**: capability to insure the economic viability of the business idea through the collection of necessary funding, assessed on the basis of the level of development of the business and financial plan of the funded initiative.
- **Market Needs**: performance in the potential satisfaction of targeted customers' needs, measured as the level of alignment between the solutions' promised benefits and real market needs. This indicator is measured separately for business and consumer users, using benchmarks derived from IDC's data on real market needs.
- **Social Impacts**: identification of the main type of social impacts potentially achieved by the funded projects.

There is another measurement area complementing the KPIs:

- **Profile** of the funded projects**,** including a set of basic descriptive indicators of the funded projects, based on the mapping templates of the proponents and their organizations. This set of indicators does not aim at measuring the performance of the projects, but rather they will be used to position them in the ecosystem.

Our objective is twofold:

- To apply a factor analysis or similar statistical techniques to elaborate the basic indicators and identify clusters of projects with similar value propositions, target markets, business models. To do so we will also leverage the mapping indicators described above.
- To elaborate a synthetic indicator of performance for each of the 4 assessment areas, based on a semantic scale (high, medium, low) calculated through the aggregation of the basic indicators per area. This indicator can be measured for individual projects, for project clusters, for the entire group of projects funded by Phase III.

For each area FI-IMPACT has made sure to measure the minimum indispensable of indicators to justify the assessment, where necessary substituting missing basic indicators with a proxy.

For every synthetic indicator we have indicated the benchmarking scale corresponding to the high-medium-low level based on objective data and evidence. In most cases the benchmarks were not absolute (e.g. a target number to be achieved) but relative: for example, whether the technology solution suggested is coherent with the priorities of investment indicated by the target users. IDC's databases of ICT users' preferences and priorities for investments have been leveraged for these evaluations.

The KPIs measurements have been used to help us identify good practices in each performance area and potential success stories (high performance initiatives). This methodology is described in depth in Deliverable 3.3.

A good performer does not necessarily need to have top scores in all 4 areas, as there are different ways to achieve success. For example, a project focused on incremental innovation (low innovation level, in our scoring scale) but with high feasibility and a large potential market may be equally or more successful than a project proposing disruptive innovation with a highly rewarding but smaller niche target market. The mapping indicators and the 4 performance assessment areas represent the conceptual framework driving the development of the self-assessment tool.

In fact, the measurement of KPIs compared with the mapping indicators for each projects cluster will help to correlate performance readiness with the projects positioning in the FI-PPP value chain. This should help to respond to questions such as: what is the correlation (if any) between the exploitation of specific FIWARE technologies and performance readiness?

KPIs	Reference Data	Basic Indicators	Synthetic Indicator
Innovation Focus	6 Questions on the key factors affecting the type of innovation of the business idea	3 Indicators measured with a numerical score 3 indicators measured as multipliers (weighting factors)	**Innovation Focus**: aggregation of basic indicators on a scale of 1 to 5 from Low (1) to Very High (5)
Market Focus	6 Questions on the key factors affecting the market approach of the business idea	1 Customer Development Indicator (aggregation of answers) 1 Market Attractiveness Indicator (Aggregation of answers)	**Market Focus**: weighted average of basic indicators on a scale of 1 to 5 from Low (1) to Very High (5)
Feasibility	4 Questions on the key factors affecting the feasibility of the business idea	1 Capital Requirements Indicator (aggregation of answers) 1 Scalability indicator (aggregation of answers)	**Feasibility focus**: weighted average of basic indicators on a scale of 1 to 5 from Low (1) to Very High (5)
Business and Consumer Market Needs	1 Question on the list of benefits to be provided by the business idea (Different list per each market targeted - Business/Government or Consumer)	Indicator on main benefits for business/government by targeted market (Score 1 to 6) Indicator on main benefits for consumers by targeted market (score 1 to 6)	**Market needs focus**: level of coherence between the respondent answers and the benchmark on a scale from 1 (Low) to 5 (very high)
Potential Social Impacts	Selection of potential Impacts area out of a list of 9 areas Selection of potential social group as user target out of a list	Indicator of presence of social Impact for each selected area (on a scale from 0 = low to 1 = high) Indicator of presence of social group as user (on a scale from 0 = low to 1 = high)	**Social Impacts Focus**: weighted aggregation of indicators

Table 4 Overview of KPI indicators

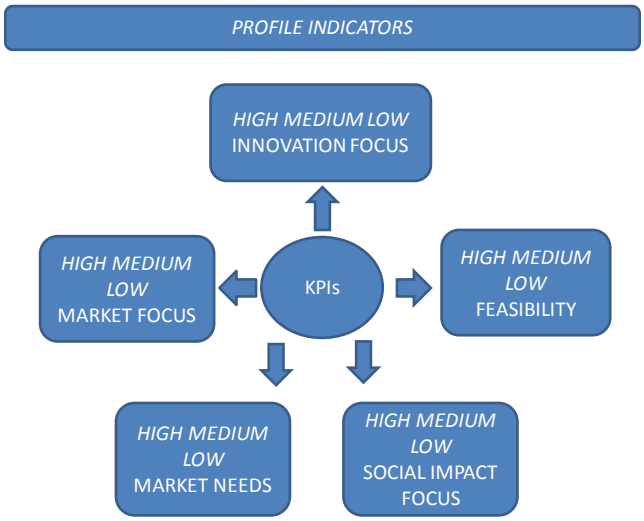


Figure 4 Main typologies of Key Performance Indicators

Source : FI-IMPACT 2016

3.4.1. Data collection for the KPIs

The data collection for the KPIs was performed through a self-assessment survey based on an interactive online tool. This tool is described in depth in the final deliverables of WP3 and WP4. The questionnaire survey designed for the self-assessment and the measurement algorithms was revised in the second part of the project, based on a quality review carried out with a group of experts as documented in the project's deliverables.

3.5. Identifying Accelerators Good Practices

As requested by the 1st Review Report of the FI-IMPACT project, the study team carried out an in-depth analysis of the main practices implemented by Phase 3 Accelerators' and their correlation with the sub-grantees' performance. The ultimate goal is to identify the good practices which most influenced the chances of success of sub-grantees, in order to provide useful insights for the management of similar processes.

It should be stated immediately that this analysis was not meant to evaluate the Accelerators' as such, to praise the good and shame the bad performers. Every Accelerator has success stories to show, as well as likely failures. As venture capitalists say, funding innovators means to fail more often than to succeed, but taking risks is the essence of the game. However, since Phase 3 is not a standard venture capital fund but a policy initiative, it is relevant to look at the mix of activities experimented in the programme and analyse the evidence about which of them appear to be correlated with a high frequence of good performers.

For the sake of this assessment we developed the following definitions:

- By good practice we mean an activity performed by one or more of the Accelerators' consortia according to their acceleration plans, which based on objective evidence is shown to have contributed to the good performance of sub-grantees.
- By good performance of the sub-grantees we mean first of all their market success (measured in terms of positive dynamics of revenue growth and customer growth); their ability to convince potential investors and collect additional funding ("traction"); if they are not yet on the market, their market readiness (measured by FI-IMPACT's KPIs scores).

To achieve this goal, FI-IMPACT has designed a suitable methodology, developed a database of 23 comparable indicators of accelerators practices, carried out face-to-face qualitative interviews with the A16 coordinators, and carried out a network analysis measuring the frequency of connections between all FI-PPP projects partnerships. To measure performance of the sub-grantees, we have used the FI-IMPACT KPIs and the Mattermark scores. A statistical correlation analysis was carried out between all the quantitative indicators collected (based on the Spearman method), and the correlation between each practice (for example funnel or pipeline selection approach) and the distribution of performance scores was analysed.

The results are presented in a report annexed to the D.2.4.

Unfortunately, the statistical approach to the correlation analysis has not provided very significant results, notwithstanding the multiple efforts made by the study team to apply a variety of statistical methods and define the indicators in different ways. This is possibly due to the mixed dataset on the performance of subgrantees, which does not really

measure market success but potential success. It is possible that such an analysis carried out in 2 or 3 years' time, when the differentiations between the group of subgrantees will be more marked and many of them will have disappeared, could provide better results.

However, selecting and accelerating new enterprises is a complex process and an art, more than a science. It is also likely that quantitative comparable indicators cannot really capture the combination of activities which make the difference for start-up performance. Good accelerators will mix and choose the type of support required by different candidate start-ups and adapt their strategies to the specific case and personalities they are dealing with.

Based on these considerations, we conclude that a qualitative analysis is probably the best approach to assess potential good practices and extract lessons learned. This was also done by the study team and the results are presented in the Accelerator practices benchmarking report.

3.6. Revenue Forecast Market Model Methodology

3.6.1. Updated Approach

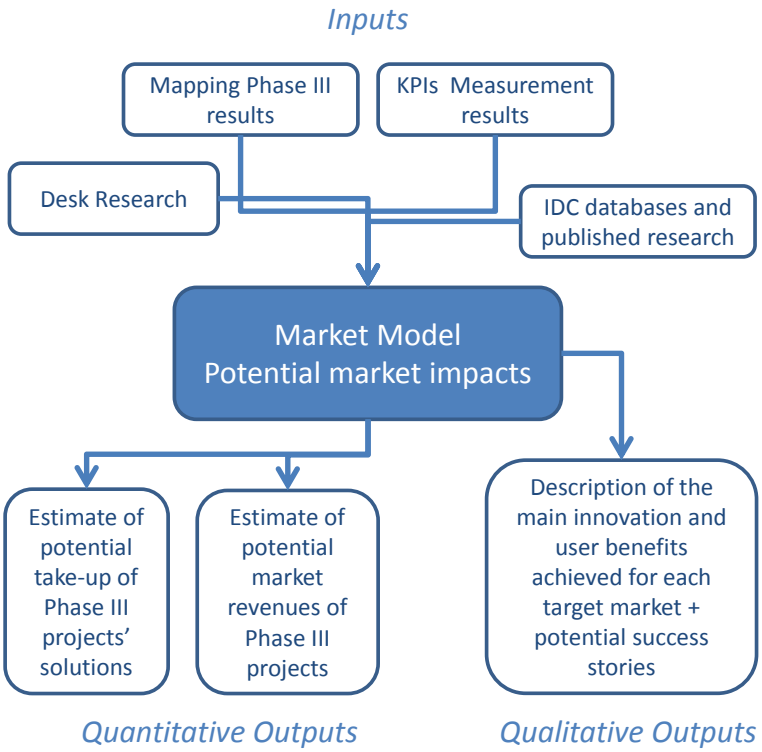
This paragraph provides an update of the market model methodology originally designed by the project, based on the actual implementation. This update includes the description of the key input factors, the key forecast assumptions, the structure of the model, the approach to the sensitivity analysis and to the counterfactual scenario, the updated results (estimates of the number of jobs were added).

The results of the model are presented in Deliverable D.2.4 "Update of Impact Assessment and Forecast".

The revenue forecast market model (Figure 5) applied IDC methodologies to estimate the potential demand for the outputs of Phase III funded initiatives on the basis of their target markets. The market model did not take into consideration proposals not shortlisted for funding by Phase III Accelerators.

The model calculated the potential market impact of the Phase III projects based on economic impacts indicators calculated at the meso-level (company clusters) and macro level (total Phase III projects).

Figure 5 Outline of Market Model



Source: FI-IMPACT 2014

The main inputs of the model (see Figure 5) were:

- The results of Phase III mapping of projects and KPIs measurement, specifically the segmentation of the funded projects into homogeneous clusters with similar value propositions, target markets, business models. Important elements will also be the description of the positioning of the projects in the FI-PPP ecosystem and their "footprint" in the EU market where final business and consumer markets will be impacted by the funded projects. This will define the scope of the market model. In addition, the Accelerator roadmap and the information on projects' plans will help us estimate the likely time to market of the proposed solutions.
- Desk research on main public sources about the demand drivers and barriers of the technology solutions developed by the Phase III projects and more in general if the FI-based technologies and services. This will contribute to shape the main assumptions about take-up perspectives.
- IDC ongoing research on ICT markets and its main databases. They include:
    - IDC's worldwide Blackbook, a database providing quarterly updated data on IT spending and IT market status and growth, for all the main market segments, for 54 countries, with a 3 years forecast (Figure 6). The Blackbook data is collected through first level research by local analysts (on average 100,000 interviews per year) and aggregated by IDC's worldwide research experts. This is an invaluable source of intelligence about market size and growth trends.
    - IDC's forecast methodology based on cross-checking and validating IDC's experts opinions through a structured "assumption builder" tool and periodical assessment of business, social and technological market growth drivers. IDC's 3 years forecasts are developed within a worldwide scenario

of the IT market evolution, whose assumptions are specified and validated for each of the main world regions (including Western and Eastern Europe).

- IDC's Vertical Markets research, which analyses the potential demand of ICTs by technology and solution for the main vertical markets. As part of our mapping exercise we have outlined a first match between IDC's verticals and the Accelerators' declared market targets (Figure 7), which will be updated with the same data about the market targets of the Phase III project clusters. This is one of the ways in which we will outline the Phase III "footprint" on market demand and shape the main assumptions about take-up.
- IDC's research on Digital Transformation dynamics and emerging demand trends on innovative technologies such as Big Data, IoT and Social Media technologies by vertical market. As an example, Figure 8 shows the top 3 "hot" application areas of Future Internet technologies by each vertical market, based on IDC's annual survey of business users' investment priorities and adoption patterns. These data can be used to investigate if the solutions proposed by the Phase III projects meet the priority investment areas of their potential users.

This data has been used as input to the model in order to estimate:

- The overall size of the potential target markets addressed by Phase III project for 2014 to 2020 in terms of IT spending and number of users. These markets are a subcomponent of the overall IT market estimated by IDC and are influenced by the future developments assumptions held by IDC for the period 2014-2018.
- The share of these markets that can be potentially captured by the Phase III projects in terms of IT spending and number of users once they reach the market. We will take as a focal point for the measurement the first year when all of the Phase III projects innovation will be on the market.

To assess the market impacts, the model is focused on the following economic impacts indicators:

- **Amount of potential revenues collected by Phase III projects,** measured as the value in Euro per year for the period 2014-2020 since the initiatives start going to market. This value was segmented for the 3 main technology clusters. Annual and cumulative growth rates were measured and compared to the corresponding global ICT markets growth rates, sourced from IDC data.
- **Level of take-up measured in terms of the number of potential business and consumer users**, in absolute terms.
- **Impact on employment** measured as the total number of jobs created by the sub-grantees in the period 2014-2020.

Table 5 Market Impact Indicators

	Level of Impact	
Indicators	**Projects' Cluster**	**Total Phase III**
Potential take-up	Number of users per cluster	Total number of users

Potential revenues	Potential revenues per cluster	Total revenues
Employment impact	Number of jobs of the subgrantees	Total number of jobs of the subgrantees

Source: FI-IMPACT 2016

The main quantitative outputs of the market model therefore were:

- Quantitative estimates of the potential revenues of the Phase III projects the EU, broken down by:
  - Phase III initiatives cluster
  - Target market (consumer vs industry sectors for the business market)
- Quantitative estimates of the potential take-up of the Phase III projects in terms of number of potential users in the EU, broken down by:
  - Phase III initiatives cluster
  - Type of user (business vs consumer)
  - Vertical market (for business users)
- Quantitative estimates of the potential number of jobs associated with the subgrantees, broken down by:
  - Phase III initiatives cluster

The main qualitative outputs of the model have been:

- Qualitative descriptions of the innovation dynamics potentially triggered by Phase III projects innovation, of the potential user benefits, potential success stories, as well as potential barriers to adoption and failure risks.

It is important to note that these analyses are still mainly ex-ante, because even if the funded initiatives have been launched on the market, during the life of the FI-IMPACT project they are still generating limited revenues as they are in the very early phase of their existence.

The objective of this market model is to estimate the maximum potential impact on the market of all the Phase III subgrantees, taking into account their chances of success and survival (measured through the death rate assumptions).

3.6.2. Implementation of the Market Revenue Forecast model

The methodology of development of the Market Revenue Forecast model is articulated in two main steps:

- Baseline assumptions: understanding the nature of funded initiatives (step 1);
- Forecast assumptions: Estimating their future trends and likeliness of success (step 2).

Step 1: Baseline Assumptions

The baseline assumptions build on the following indicators sourced from the Impact assessment survey and the mapping activities.

- Number of funded initiatives at the end of Phase 3 (reference population);
- Market Entry year for each initiative;
- Distribution of funded initiatives by type of offering, target industry sector, number of team members, and geographical scope;

- Average revenue generated by a single initiative during its first year on the market.

The average starting year revenues were validated through the check of actual data provided by some accelerators.

The 3 main technology clusters used in the model concern the type of solutions they offer as follows:

- Pure software solutions: initiatives offering solutions based only on software such as apps
- Hardware and software solutions: initiatives offering a combination of hardware and software, for example IoT solutions including sensors or 3d Printing based services
- Web based services: initiatives offering not a technology tool or solutions, but an online service.

Step 2 Forecast Assumptions

The forecast assumptions include the following components:

- Average death rates modulated by type of company, category and by scenario;
- Segmentation of subgrantees in 7 categories with different revenue growth paths;
- Development of 3 scenarios assumptions (baseline, optimistic, and pessimistic) to reflect the potential alternative development paths of FIWARE innovation take-up and provide a realistic range of the possible variation of the revenues forecasts.

Average death rates

Death rates are a critical input to the model and difficult to estimate. The death rate is extremely high among start-ups, in particular in a dynamic and competitive sector such as the digital one. A large share of new IT start-ups fails and disappears within five years from their market entry, impaired by high competition, market trends, and inadequate business plans. Survival rates tend to increase as companies get older. About 45% of Phase 3 subgrantees have less than 1 year of experience, or no experience, so they are start-ups in a very early phase of their life (see Figure 7). Another 25% have between 2 and 4 years of experience. In addition, death rates are influenced by economic conditions, increasing in recessions and decreasing with economic growth and positive demand dynamics, so they must vary by scenario.

To take these factors into account we have used the following approach:

- The starting point was the average death rate for new enterprises after 5 years, sourced from Eurostat[9], of 56%;
- This was applied to the companies in the reference population with 2 or more years of experience;
- A higher death rate of 80% after 5 years was applied to the younger companies of the reference population (with 1 year or less of experience) based on the opinion of the same start-up experts interviewed for the validation of the self-assessment survey;

[9] http://ec.europa.eu/eurostat/statistics-explained/index.php/Business_demography_statistics

- This resulted in an average death rate (after 5 years on the market) for the baseline scenario of 64%;
- The average death rate was increased by 8% for the pessimistic scenario and decreased by -8% for the optimistic scenario.

The average 5 years' death rates for each scenario are presented in the table below.

Table 6 Average 5 years death rates by scenario

	Model 2nd Release
Optimistic Scenario	59%
Baseline Scenario	64%
Pessimistic Scenario	69%

Source: IDC 2016

Segmentation of Subgrantees by 7 growth trajectories

To provide a realistic view of the potential future of our varied population of innovative SMEs we have designed 7 different growth trajectories based on their characteristics and perspectives. This is an original addition to the model methodology and provided an important element of flexibility for the calculation of impacts.

The 3 scenarios described below and their different assumptions have been incorporated in the model through a different distribution of Phase 3 funded initiatives by category by scenario. Basically, in the optimistic scenario the categories with higher growth potential are more numerous, while in the pessimistic scenario we have increased the number of subgrantees falling in the categories with negative or slow growth perspectives.

The segmentation has been carried out based on the following criteria:

- Categories 1 to 3 include the subgrantees who will eventually fail: we called them "dudes, lemons and dogs".
- Categories 4 to 7 include those who will remain standing after 5 years, by 2020. The survivors are enterprises that will have a positive impact on the market and whose revenues will grow across the years. The majority of them will show a regular trend across the years both in terms of yearly revenues increase and new hired employees and tend towards stability, even if they differ in terms of when their peak of growth will be (categories 4 to 6, "Runners, Sprinters and Slow Learners").
- Finally, we expect that a minor percentage of subgrantees (potentially very high achievers, the "stars" of our population) will start very slow during the first 2-3 years and will then take-off, with rapidly increasing revenues which may continue climbing fast beyond 2020, after the period covered by the model. These high achievers can be found more often in the web services cluster of funded initiatives, because of their focus on new, emerging services markets.

More specifically, these are the 7 categories included in the model:

- **Category 1: Duds –** Failing in Y1: funded initiatives that will die after 1 year;
- **Category 2: Lemons –** Failing in Y3: funded initiatives (not in Category 1) that will not survive after 3 years;
- **Category 3: Dogs** - Failing in Y5: funded initiatives (not in Categories 1 and 2) that will not survive after 5 years;
- **Category 4: Runners -** Stably growing: funded initiatives whose revenues progressively expand over time;
- **Category 5: Sprinters -** Growing and then stabilizing: funded initiatives whose revenues will peak in the first years and then stabilize;
- **Category 6: Slow Learners -** Peaking after a while**:** funded initiatives whose revenues' growth will not be immediate but will peak at later stages;
- **Category 7 - Stars**: high achievers whose revenues are flat during the first 2-3 years with a considerable revenue explosion in the longer term.

Scenario assumptions

The main objective of the scenarios used in this market model is to define the potential range of variation of the forecast revenues to 2020 under positive or negative economic and framework conditions, thereby providing a more realistic view of the estimated market impacts and economic impacts.

The FI-IMPACT market model deals with a small group of business initiatives (if compared to the size of the European economy) building their products and services on the FIWARE technology platform: taking a broader perspective we can say that their footprint falls within the FIWARE market, which in turn is part of the overall ICT market.

IDC's consolidated scenario methodology is based on a model which considers the evolution of ICT markets as influenced by the interaction of four main group of factors as follows:

- Macroeconomic factors, measured in terms of GDP growth dynamics (sourced from main public sources) and total ICT spending growth dynamics (sourced from IDC);
- Policy/regulatory conditions, with a specific focus on EC policies on the Digital Single Market and other ICT policies by national governments;
- Global megatrends of digital innovation, based on IDC forecasts about emerging technology trends including specifically IoT, Big Data future demand perspectives.
- FIWARE/ICT market dynamics: this means the main supply-demand dynamics which may lead to faster or lower take-up of innovative technologies in the EU.

For the sake of this study we have developed the baseline scenario assumptions first, and then the alternative scenario assumptions. We report here a brief summary of the main scenarios outline, which are described more in detail in D.2.4.

Baseline scenario

The baseline scenario is based on the extrapolation of the current trends of positive, moderate growth of the European economy, even if the UK vote to leave the EU will increase uncertainty in the short-medium term. Global macro trends will continue driving the diffusion of digital innovation (IoT, Big Data, Cloud computing) and digital transformation within medium-large companies.

Concerning the market of FIWARE technologies, this baseline scenario foresees a healthy growth of the supply industry and a corresponding gradual development of demand,

especially by the most advanced, competitive and innovative enterprises, large and small. In this scenario, the funded initiatives focused on incremental innovation and improving efficiency, productivity and customer relationship management will fare best, while those aiming for disruptive innovation and mass market take-up may have a more difficult time.

Optimistic scenario

The chances of an optimistic scenario depend on more favorable framework and economic conditions in the period to 2020, accompanied by higher ICT investments and digital innovation moving to a faster adoption curve compared to the baseline scenario. In this scenario we assume a leap ahead of awareness of potential benefits and willingness to adopt digital innovation by mainstream IT users and especially SMEs, helped by the removal of policy and regulatory barriers to digital transformation.

Concerning the market of FIWARE technologies, in this scenario the faster increase of demand of digital innovation will accelerate the emergence of the hyper-connected society, create good opportunities for Phase 3 subgrantees and drive global demand for FIWARE-based innovation, both incremental and disruptive. In this scenario we foresee a more favorable environment for start-ups and innovative SMEs, with a likely increase of venture capital and business angels funding. This would result in higher survival and success rates as FIWARE subgrantees would be better able to grow aggressively in the European and worldwide markets.

Pessimistic scenario

This scenario is focused on the potential risks which may undermine the current trends toward positive moderate growth in Europe. There are several factors which may drive this scenario: within Europe, the most relevant now is clearly the impact of the UK leaving the EU. According to most leading sources (IMF, OECD, Brexit may weaken GDP growth in the short term and increase uncertainty, which may affect negatively private and public investments, including in ICT. Worldwide, there is a continuing risk of a badly managed slow-down of the Chinese economy, and/or of the Indian economy, as well as of a deepening crisis in Russia and Brazil, which may affect EU exports. This would result in lower GDP and ICT spending growth to 2020 compared to the Baseline scenario.

Uneven demand across Europe will not help the FIWARE market and Phase 3 funded initiatives, who would find fewer opportunities to grow across the whole EU and may be tempted to remain close to national or niche markets. In this scenario the availability of venture capital and risk capital for SMEs and start-ups will also be more limited than in the baseline scenario. These factors will drive higher death rates and lower revenue increases in the population of subgrantees.

Calculation of results

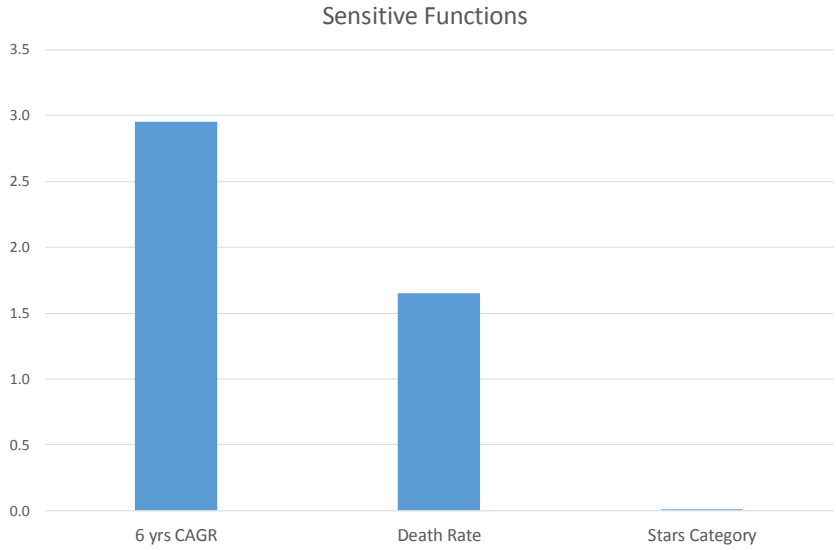
Building on these assumptions, the model allowed to estimate the forecast revenues and jobs of the funded initiatives.

3.6.3. Sensitivity analysis

The study team carried out a sensitivity analysis of the Revenue Forecast model in order to test the level of variation of results in correlation with the variation of key assumptions. The sensitivity analysis was carried out on the following parameters:

- **6 years average growth rate**: how our assumption on the average companies' growth rate is related to the overall revenue forecast result? How total revenue forecast changes from varying this assumption?
- **Death rates and growth trends**: would a different average death rate have a strong impact on total revenue generated? How could a higher percentage of "stars" benefit the overall revenue forecast scenario?
- **The variation of the share of companies falling in category 7 (stars)**

To show the main results, we computed the so-called sensitive functions [10] on the cumulative 2020 revenues forecast. This gives us an indication of the model's sensitivity level with respect to the considered variables. As highlighted in the chart below, the model is strongly sensitive to the 6 years CAGR assumption, slightly less to the death rate and nearly not impacted by the variation of the share of category 7 (stars).



Source: FI-IMPACT elaboration on IDC data, 2016

Figure 6 Market Revenue Model Sensitive Functions

3.6.4. Counterfactual scenario

The support that the FIWARE project and ecosystem provided to subgrantees is not just in terms of funding, but also of technology support, mentoring and networking. The aim of this section is to answer this question: what would have happened to funded initiatives without FIWARE? How would our revenue forecast change without FIWARE?

Main Assumptions

The counterfactual scenario is based on 3 main assumptions:

10 The sensitive functions are a normalized ratio of the final output range (in this case subgrantees generated revenues) and the considered variable range (in this case 6 yrs CAGR, death rate, category 7/stars share, respectively). They are used in sensitivity analysis to measure the impact that model's inputs and variables have on the final model output.

A. Without the FIWARE Acceleration programme, lower seed capital availability would have reduced the number of start-ups and/or slowed down their time to market.
B. Without the FIWARE technological platform and support, the subgrantees would have suffered from more difficulties in the development of their solutions and their market strategies.
C. Without the accelerator programme providing business development consulting, mentoring, interaction with potential customers, investors and a community of peers, the chances of success and growth rates of the funded initiatives would have been lower.

Impact of the Counterfactual Assumptions on the Model input indicators

At the light of these 3 disruptive factors, our counterfactual analysis led us to reconsider our market model with the following adjusted assumptions with respect to the baseline scenario:

- **A smaller reference population**: instead of considering 936 initiatives as a starting point of the scenarios, we assume that only 690 new initiatives would have found enough seed capital to start their journey to the market (a reduction of 26%). This follows from assumption A, and was implemented by assuming a lower number of funded initiatives per country compared to the current status, linked with the availability of early stage funding. Without FIWARE many funded initiatives would not exist nowadays.
- **A delayed market entry year**: some of the funded initiatives that would exist even without FIWARE would have probably delayed or postponed their go-to-market strategies, as explained in assumption A.
- **Slightly lower 6 years' growth rates and higher death rates**: Assumptions B and C translate into slightly lower growth rates and a higher death rate for the selected initiatives. Thanks to FIWARE technological setup and "accelerator effect", companies fine-tuned their solutions, boosted their market strategies, decreasing the failure rate that characterize startups and organizations with no or low experience.

The results of these different inputs to the model are shown in the table below.

	2014	2016	2020	Cumulative 2020	2014-2020 CAGR
Baseline Scenario (€ M)	12	96	394	1,204	78%
Counterfactual Scenario (€ M)	4	25	110	348	73%
Revenues Reduction (%)	67%	74%	72%	71%	

Table 7 The Counterfactual Revenues Scenario

Source: FI-IMPACT Market Model, 2016

These results show the beneficial effect that FIWARE had on potential entrepreneurs and in general on the European economy. Without the existence of FIWARE we forecast a 67% reduction of our revenue estimates in 2014, that becomes a 72% reduction in 2020. Cumulative revenues to 2020 decrease from € 1,204 Million to € 348 Million, with a 71% reduction.

Many of the funded initiatives would not exist without FIWARE and those who exist anyway would have encountered higher market challenges and growth obstacles than

what they experience now. Instead of 325 start-ups and SMEs generating € 394 million in 2020, we would be now analyzing nearly 250 initiatives generating €110 million in 2020.

3.7. Socio-Economic Impact Assessment Methodology

Building on the results of the model estimating the potential "market impacts" of the Phase III projects, we have developed the Economic Impact methodology focused on the assessment of the likely global, cumulative impacts of the FI-PPP on the EU social and economic system, for the period up to 2020 (5 full years after the first FI-PPP innovations reach the market). This methodology includes a macroeconomic impact model with a wider scope than the revenue forecast model, incorporating a quantitative estimate of the direct, indirect and induced impacts on EU economic and employment growth.

The main value-added of this methodology will be to look beyond the immediate consequences of bringing to market about a thousand innovative ideas, which are likely to be relatively small compared to the size of the EU economy and markets. By looking at the social as well as the economic dimension, and taking a medium-long term perspective to 2020, this methodology will highlight the potential contribution of the FI-PPP ecosystem to innovation and growth, focusing on its capability to enable the diffusion of digital transformation and digital culture in Europe.

The main steps have included:

- Identification and classification of the main potential economic and employment impacts;
- Definition of the main indicators measuring these impacts, their scope, measurement approach and expected results;
- Development of the macroeconomic impact model measuring direct, indirect and induced economic impacts;
- Development of forecast scenarios defining the main trends and framework conditions affecting the perspective evolution of the demand for Phase III technologies and solutions to 2020;
- Estimate of the forecast scenarios consequences on the range and intensity of main socio-economic impacts;
- Sensitivity analysis of the model key assumptions
- Drawing conclusions on the most likely, cumulative FI-PPP socio-economic impacts to 2020 and the overall role of the FI-PPP ecosystem for innovation and growth in the EU economy and society.

Compared to the initial plan, FI-IMPACT has focused its estimates on the economic and employment impacts which are of primary relevance for the FI-PPP programme.

We have not estimated the potential environmental, knowledge and scientific impacts which, due to the particular profile of the Phase 3 Accelerator programme, appear to be less likely and relevant.

We have estimated the potential social impacts of the funded initiatives on the basis of the assessment survey, but have not expanded this analysis which has been entrusted by the EC to a UK consultancy applying a very innovative methodology.

3.8. Identification and classification of impacts

This task is based on desk research of the main public sources and economic literature on ICT socio-economic impacts, as well as IDC research on Internet technologies and services. The preliminary identification of indicators for each category of impact is presented below. It will be finalized when elaborating the data on the actual projects selected by Phase III Accelerators.

3.9. Economic Impacts

This paragraph presents the updated methodology of the economic impact model based on the implementation. It provides an updated description of the indirect impacts estimate, the forecast assumptions for the alternative scenarios, the approach to the sensitivity analysis.

3.9.1. Description

Within the context of FI-IMPACT we will use the following definitions of the economic impacts:

- **Direct Impacts** are the initial, immediate economic activities (i.e. jobs, business outputs and income) potentially generated by Phase III projects once they go to market, after the end of Phase III. Direct impacts coincide with the first round of spending or new jobs created in the economy. This will take at least 1 year after the solutions launched by the Phase III projects hit the market.
- **Indirect Impacts** are the economic activities (additional business outputs, income and jobs) occurring in other businesses/industries supplying inputs to the Phase III projects (supplier impacts) and in the businesses adopting the Phase III projects innovations. They are generated at the same time as the direct impacts, because they are a function of direct impacts. In the framework of an input-output analysis, these relationships are usually identified respectively as "backward linkages" and "forward linkages": "the term backward linkage is used to indicate the interconnection of a particular sector to other sectors from which it purchases inputs (demand side); while the term forward linkage is used to indicate the interconnection of a particular sector to those to which it sells its output."[11]
- **Induced Impacts** are the second order effects over the entire economy generated by the combined direct/indirect impacts, due for example to the additional spending by the newly hired employees, or the increased wages and salaries of the enterprises benefiting from the direct and indirect impacts. This spending creates induced revenue increases and employment in nearly all sectors of the economy. The timing of induced impacts is slightly delayed compared to direct and indirect impacts.

The sum of the direct, indirect and induced impacts defines the **total economic impact**.

The indicators chosen to measure these impacts are the following:

- Absolute value of the direct, indirect and induced impacts of all the Phase III projects, in millions of EURO;
- Incidence of this value as a % of EU GDP;
- Number of jobs created, calculated on the basis of employment/revenues ratios.

[11] *Eurostat Manual of Supply, Use and Input-Output Tables*, Eurostat Methodologies and Working papers, 2008 Edition.

Table 8 Macro-Economic Impact Indicators

	Value of the potential FI-PPP market		Employment Impacts
	Value in €	% of EU GDP	Number of Jobs created
Direct Impacts			
Indirect Impacts			
Induced Impacts			
Total			

Source: FI-IMPACT 2014

3.9.2. Scope and Measurement Approach

The methodology we suggest is standard practice in the IA of infrastructures investments and ICTs. IDC has applied it several times, starting in 2009 on behalf of Microsoft[12] and more recently calculating the potential GDP and employment impacts of cloud computing in the EU on behalf of the EC[13], including forecasts to 2020 based on alternative scenarios. It is also applied in academia, for example economist Federico Etro[14] calculated the economic impacts of cloud computing by using a dynamic stochastic general equilibrium (DSGC) calibrated model augmented with endogenous market structures in line with recent developments in the macroeconomic literature. The same model was recently applied again by two Japanese economists finding that cloud computing appears to generate positive economic impacts in Japan as well[15]. More recently it has been applied by IDC to assess the economic impacts of the European Data Economy[16].

Many of the Phase III projects are planning to use cloud computing, so we expect that these similarities will help us in assessing the potential multiplier of direct impacts. A more specific reference comes from the results of the GPD and employment impacts of FI-PPP phase 1 calculated by the FI3P project led by Rand Computing with Wik Consulting and IDC[17].

Direct Impacts

The measurement of direct impacts will be based on the results of the Revenue Forecast Market model about the potential revenues generated by the Phase III projects. For the sake of this measurement, we will consider the Phase III projects as a group of new

12 The Economic Impact of IT, software and the Microsoft ecosystem on the global economy, Global White Paper IDC 2009

13 Study "Uptake of cloud computing in Europe", ibid.

14 Federico Etro May 2011, see references

15 Ozu-Kasuga 2014, see references

16 "The European Data Market Study" 2nd interim report, available at www.datalandscape.EU

17 Fi3P study, Final Report, available at http://www.fi3p.eu/assets/pdf/final/ FI3P%20Final 20Study%20Report20v1 200.pdf

enterprises entering the market with a set of new products. Given the profile of these organisations and web entrepreneurs, we can assume that all or the great majority of them should be classified as part of the IT industry sector. Therefore, we should assess whether they will have a positive incremental or negative or neutral substitution impact on the forecast revenues of the IT industry. Based on IDC's research on the evolution of IT spending, this will depend on the type of technologies and services they will offer. For example, IDC has recently estimated that every Euro spent on a cloud computing SaaS (Software as a Service) solution replaces €2.30 previously spent in traditional hardware, software and services to deliver the same outcome[18].

3.9.3. Indirect Impacts

The methodology of measurement of indirect impacts has been revised and improved compared to initial plans.

Indirect impacts come from increased revenues of organizations supplying goods and services to the Phase III projects, as well as the increased revenues and jobs gained by business users adopting Phase III supported technologies and services. The estimate of indirect impacts is critical for the assessment of overall economic impacts particularly for general purpose technologies such as ICT. The basic assumption is that the business benefits of Future Internet technologies improve productivity, reduce IT capital costs liberating resources for business innovation, allow faster time to market of new products and services, and generally increase the competitiveness and revenues of the user industries. These aggregated impacts represent additional GDP growth and new jobs creation.

Indirect Impacts are the economic activities generated along the company's supply chain by Phase 3 initiatives. We have measured separately:

- Backward indirect impacts, which are generated in those businesses that supply inputs (services and materials) to the funded initiatives (in this channel are generated incremental revenues due to the selling of input to start the new business and to produce these FIWARE solutions;
- Forward indirect impacts, which are generated in those businesses to which funded initiatives sell their products (in this channel are generated incremental revenues due to the utilization of these FIWARE solutions).

3.9.4. Estimate of Backward Indirect Impacts

We assumed that funded initiatives need inputs from almost all the sectors of the economy. Since they are establishing new activities that need to start a new business, they face all kind of costs, that are:

- Cost of materials and inputs, which are technology specific (tech provider);
- Labor and capital costs, administrative and all operational costs, transport and delivery costs, electricity, rent, office materials costs, and so on (businesses providing these inputs are referred as "All services and materials providers for the business activity").

18 "Uptake of Cloud in Europe" see references

We follow two distinct methodologies to estimate these two different types of impacts. In particular, in order to estimate the indirect backward impacts, we refer to a method known as the Input-Output (I/O) analysis, while for the indirect forward impacts we developed a methodology based on IDC data on IT spending and its relation with companies' turnover and employment, in order to estimate the economic impact that technologies could have on boosting adopters' revenues, and as a consequence generating new jobs.
The Input-Output (I/O) methodology was introduced by Wassily Leontief in 1966,[19] and quantifies "the mutual interrelationships among the various sectors of a complex economic system".[20] This method is based on national input-output tables that describe the flow of goods and services between all sectors of an economy over a period of time. These tables provide information on all inputs used in production: labor, capital, land, and intermediates, which are the intermediate inputs in production.[21] The structure of each sector's production process is represented by a defined vector of structural coefficients that describes in quantitative terms the relationship between the inputs it absorbs and the output it produces. The objective is to calculate the output of individual sectors for the given final demand.

For the purpose of our analysis, which is the estimation of backward linkages (the interconnection of a particular sector to other sectors from which it purchases inputs) inside the European economy, we only consider the part of the table that deals with the domestic inter-industry linkages, that is the interactions between domestic industry sectors for inter-industrial inputs, used in the production of final goods.

It should be mentioned that we do not consider either imports' or exports' contribution to the total output.

The main step is to calculate the output multipliers, which reflect the cumulative revenues of the economy, which are induced by one additional unit of final demand of a certain commodity.[22] Output multipliers allow us to estimate the indirect backward impact that the funded initiatives have on the economy of their suppliers.

Assumptions:

- Funded initiatives need inputs from almost all the sectors of the economy. Since they are establishing new activities that need to start a new business, they face all kind of costs. We consider labor and capital costs, administrative and all operational costs, costs of materials and inputs, transport and delivering costs, electricity, rent, office materials costs, and so on.
- Since I/O tables are based on NACE 2categories,[23] we classified the funded initiatives by NACE 2 code, leveraging the technology clusters and the detailed information of the global database. The classifications results are presented in the table below.

[19] *Input-output economics*, New York, Oxford University Press, 1966.
[20] *Input-Output Economics,* Second Edition, Oxford University Press, 1986.
[21] For a detailed explanation of I/O table see the Technical Appendix.
[22] For a detailed methodology on the output multipliers calculation see the Technical Appendix.
[23] Eurostat, NACE Rev.2, Statistical classification of economic activities in the European Community.

Type of Solution provided	NACE code	Description
Hardware and Software	C26 J58	Computer, electronic and optical product Publishing services (include 58.2: software publishing)
Purely Software	J58	Publishing services (include 58.2: software publishing)
Web Services	J62_J63	Computer programming, consultancy and related services; Information services (include 63.1: web portals)

Table 9 Classification of funded initiatives by NACE 2 code

Source: FI-Impact 2016 and Eurostat NACE Rev. 2

Once we identified the most appropriate NACE codes, we calculated the output multipliers,[24] which are then applied to the revenues of the funded initiatives.

Type of Solution provided	NACE code	OUTPUT MULTIPLIERS
Hardware and Software	C26 J58	**0.98** **0.91**
Purely Software	J58	**0.91**
Web Services	J62_J63	**0.75**

Table 10 Output Multipliers for the funded initiatives

Source: FI-Impact 2016 and Eurostat NACE Rev. 2

Here we present the calculated multipliers that represent the net revenues of the economy, which are induced by one additional unit of final demand of a certain commodity. Hardware and software solutions show multipliers (average between 0.98 and 0.91) higher than Purely software (0.91) and Web services solutions (0.75): it means for example that the production of Hardware and software solutions creates more revenues along the supply chain than the production of Web services, when there is the same increase of the final demand of these solutions.
An explanation can be found by looking at the single net multipliers by each NACE code: the Manufacturing sector (NACE code C) generates more revenues when contributing to the production of a Hardware and software solution (0.30) than in the case of production of a Purely Software (0.25) or a Web service solution (0.11), because the contribution of manufacturing inputs is higher in the first case and the sector receives an higher return in terms of generated revenues.
The estimates of the backward indirect revenues represent the incremental revenues that are generated among the subgrantees' suppliers' businesses. These results directly depend on the value of the Output multipliers and on the results of the Revenue model, the direct impacts.

[24] Multipliers are values greater than 1, since they account for direct and indirect impacts overall. We consider separately direct and indirect impacts, so we consider "net multipliers" (multiplier-1) to account just for indirect backward impacts. For a detailed explanation about data and calculation, please refer to the Technical Appendix.

3.9.5. Estimate of Jobs generated through Backward linkages

In order to understand how the revenues are generated in the supplier firms and how are related to the creation of new jobs, we estimated how much of the new revenues generated in these firms could have been translated in new jobs. We based our approach on IDC internal data and desk research. We first considered how the change in turnover among the users affect the change of the employment by using a regression model.[25] We then evaluated a sample of international companies, looking at time series of revenues, the number of employees, and the cost of labor, as the average annual wage[26]. The aim was to estimate how much of the change in revenues for the sample of companies could be transformed into new (or lost) jobs. Our assessment revealed that the average ratio between the change in the cost of labor and the change in revenues is around 12%. The table below shows the results of our estimation in terms of potential new jobs created by the backward linkages impacts.

3.9.6. Estimate of Forward linkages Impacts

The approach we used to calculate the forward impacts started from trying to answer the fundamental question of "How will the solutions provided by the funded initiatives allow customers to increase their revenues and jobs?". Our aim is to understand how adopters' revenues respond when their overall IT spending increases by buying FIWARE solutions.

We can divide our approach in the following steps:

- Leveraging our analysis of the subgrantees population and our estimates about their potential users by industry, we collected data about the average turnover of the user companies and their average number of employees. This allowed us to estimate the turnover per employee by industry sector.[27]
- Based on IDC internal data on average external IT spending per company[28] and an estimate of the average cost of FIWARE subgrantees solutions, we assumed that the average increase of final users' IT spending embedding FIWARE solutions is 2%. We then ran a regression that analyses how companies' turnover responds to changes in companies' IT spending.
- Finally, we differentiated the impact of IT spending growth on turnover by the type of solution provided by the funded initiatives and also by industry sector, through the application of differentiation multipliers. From a technological point of view, we considered that there are solutions that do not increase revenues but lead to costs saving. Examples: an online accommodation booking website helps hotels in increasing bookings and then revenues, while smart lights in a city helps to

[25] We found that a change in turnover of 1% leads to an employment change of 0.3%.
[26] OECD.Stat, Definitions of Structural Business Statistics Regulation (Commission Regulation (EC) No. 2700/98 of 17 December 1998). "Wages and salaries include the values of any social contributions, income taxes, etc. payable by the employee even if they are actually withheld by the employer and paid directly to social insurance schemes, tax authorities, etc. on behalf of the employee. Wages and salaries do not include social contributions payable by the employer". We slightly increased the value of wages in order to take into account the social contributions payable by the employer, and we find an average cost of labor of 35,000€.
[27] Source for turnover and employment data is Eurostat, 2014, Annual enterprise statistics for special aggregates of activities (NACE Rev. 2) [sbs_na_sca_r2].
[28] Source for IT Spending is an IDC survey on external IT spending per employee on a sample of 1,404 companies.

decrease costs, but they do not help to increase municipalities incomes. By an industry sector point of view, instead we considered for example that a hardware and software solution, such as an IoT solution, in the Manufacturing sector could have a greater impact on turnover than in the Education sector.

- Based on this we calculated the different forward indirect impacts by industry sector.

3.9.7. Estimate of Jobs generated through Forward linkages

To estimate the potential number of jobs that could be created in the economy due to the presence in the economy of the Phase III projects, we applied the same methodology we used for the backward linkage jobs.[29]

3.9.8. Induced Impacts

Finally, another round of impacts descends from the consumption induced by increased business revenues, thanks to the additional income earned by employees. This is known in economic literature as the Keynesian multiplier or demand multiplier, and is applied to the total of direct plus indirect impacts. Keynesian multipliers are not specific to ICT but are calculated based on average consumption impacts.

Here we only consider the impact of private consumption spending by all employees in the economy. No additional government spending or tax revenues have been considered. We consider increase in production, both as a direct and indirect impact, new jobs and increased wages. As people spend part of their wages, this creates an increase of the final demand and therefore a further increase in production, spending, and jobs.

We consider both the number of new salaries and new employees through the creation of new jobs, and the number of already existing workers. Existing workers are employees working on a FIWARE funded initiative, as part of their activity within a company whose main business is not a FI-WARE project. These employees have not been enrolled to work specifically on these initiatives, but they were already part of organizations that are now developing these funded projects as one of their business activities. Then, they receive a higher salary, due to the fact that they work on FIWARE projects as a second business.

To estimate additional spending and jobs, we followed the following steps:

- We identified the disposable income30, which is the sum of wages and salaries, mixed income, net property income, net current transfers and social benefits other than social transfers in kind, less taxes on income and wealth and social security contributions paid by employees, the self-employed and the unemployed. According to OECD.Stat, the disposable income in EU 28 is on average 23,000 euro.

[29] See paragraph A2.

[30] Source: https://data.oecd.org/hha/household-disposable-income.htm and OECD.Stat Net National Disposable Income 2014, Constant prices, OECD base year. The definition is: "the sum of wages and salaries, mixed income, net property income, net current transfers and social benefits other than social transfers in kind, less taxes on income and wealth and social security contributions paid by employees, the self-employed and the unemployed".

- We then identified the consumption rate through the gross household saving rate.31 Saving rate is 10.3%, meaning that the remaining 89.7% of the salary is spent in the economy.
- The assumption made at this point is that induced spending is generated both by new jobs created, and by the increase of salaries of existing workers.
- The number of new jobs created is calculated following the same approach we used to calculate backward and forward jobs.

3.9.9. Results under alternative scenarios

As performed for the Revenue Forecast Model, we have developed alternative assumptions for three alternative scenarios: baseline, optimistic and pessimistic scenarios. The main storyline and the assumptions developed for the Revenue forecast models hold for these scenarios. It is necessary to adopt additional assumptions, which include the following.

Pessimistic Scenario Assumptions by type of impact:

- **Backward indirect impacts**: if the revenues of the funded initiatives are lower, then the impacts on the backward side will be smoothed. The assumption is simple: if the economic conditions of the funded initiatives suffer a backlash, then they spend less in inputs and services, and suppliers will register lower revenues all other things remaining equal. On the employment side, if the economic conditions become unstable, the percentage of revenues that firms supplying inputs will allocate for new jobs will be lower.

- **Forward indirect impacts**: if the economic conditions deteriorate, businesses will suffer from lower production, and then turnover per employee will decrease. Revenues will be lower, due to a most likely softer impact of IT spending on turnover. If revenues decrease, as for the backward side, the percentage of revenues that adopters will allocate for new jobs will drop.

- **Induced impacts**: finally, for the induced impacts, negative economic conditions could translate in lower consumption both in terms of disposable income (if, for example, people are requested to pay higher taxes for a restrictive economic policy) and in terms of lower consumption rate (in favor of a higher saving rate). Again, all businesses will be less willing to hire, and the percentage of revenues that they will allocate for new jobs will decrease.

Optimistic Scenario Assumptions by type of impact:

- **Backward indirect impacts**: if the revenues of the funded initiatives are higher, then the impacts on the backward side will raise. The assumption is simple: if the economy expands, then the funded initiatives will spend more in inputs and services, and suppliers will register higher revenues, all other things remaining equal. On the jobs side, if the economic conditions become stable, the percentage of revenues that firms supplying inputs will allocate for new jobs will be higher.

[31] Definition at http://ec.europa.eu/eurostat/cache/metadata/en/nasa_10_nf_tr_esms.htm

- **Forward indirect impacts**: if the economic conditions improve, businesses will face higher production, and then turnover per employee will increase. Moreover, a higher impact of IT spending on turnover it is very likely. This will generate higher revenues. If revenues expand, as for the backward side, the percentage of revenues that adopters will allocate for new jobs will increase.

- **Induced impacts**: finally, for the induced impacts, positive economic conditions could translate in higher consumption both in terms of disposable income (if, for example, people are requested to pay lower taxes for an expansive economic policy) and in terms of higher consumption rate (in favor of a lower saving rate). Again, all businesses will be more willing to hire, and the percentage of revenues that they will allocate for new jobs will increase.

3.9.10. Sensitivity Analysis

To validate the Economic Model, we also carried out a sensitivity analysis, which is the study of how the uncertainty in the output can be assigned to the uncertainty in the inputs. In our case, we considered the response of the revenues to different changes in the inputs, which means to what extent the model is affected by the inputs.

In particular, our analysis focuses on indirect forward impacts, for which a series of assumptions are made outside the structural characteristics of the economy, so they are susceptible to changes. Forward impacts are generated in those businesses to which funded initiatives sell their products, so the variables on which they depend are the turnover of the companies which buy FIWARE products (the end users), their IT spending growth (i.e. the growth of end users IT spending after the purchase of FIWARE products), and the degree to which the change in IT spending growth affect the end users' turnover (turnover elasticity). These variables do not depend on the structure of the economy, because for example companies' turnover can change because the funded initiatives target a different kind of companies, smaller or bigger. Alternatively, if we consider backward impacts, they depend on the multipliers derived from the input/output tables, which instead reflect the structure of the economy, and cannot be changed. The same reasoning can be done for induced impacts, for which we cannot change the disposable income or the consumption rate.

Looking more in detail at the sensitivity analysis, we considered two of the variables above mentioned:

I. End users' IT spending growth (with the purchase of FIWARE products);
II. End users' turnover.

In particular, we considered that

a. Turnover varied from a minimum of 25,000 € to a maximum of 75,000 €;
b. IT spending growth varied from a minimum of 1% to a maximum of 3%;
c. Turnover elasticity is fixed at 0.338.

The results show that the model responds similarly to changes in IT Spending growth and to changes in Turnover elasticity. It means that the model is not sensitive to one specific variable, which could have determined a biased model. Nevertheless, more specifically, we can highlight some differences in the responses, in particular that the model seems to have higher responses for changes in the IT spending growth. This can be shown by

considering the sensitivity function, which explains the sensitivity of a parameter on the output, i.e. how the model responds to a variation of the inputs. In particular, the sensitivity function shows that the model responds more to a variation in IT spending growth than to a variation of company's turnover. The resulting values that has been calculated to assess the sensitivity of the model to the inputs are presented in the table below.

Rate of variation of economic model results	IT spending increase	Company's Turnover increase
2016	0.82	0.74
2020	0.86	0.71

Table 11 Results of Sensitivity analysis

Source: FI-Impact 2016

3.9.11. Results achieved

In conclusion, the Economic Impact Model allowed to calculate the potential direct, indirect and induced impacts on the EU economy in value terms, share of EU GDP and number of jobs created for the period 2014-2020. These results are presented differentiated under 3 main alternative scenarios.

3.10. Potential end-user benefits

The methodology of assessment of the potential end-user benefits was changed compared to the initial plan, by leveraging the impact assessment survey and the KPI on market needs, as described below.

3.10.1. Description

As described in Section 2.5 the market model will measure the Phase III project clusters and their potential economic impacts, describe their value chains and potential market positioning. Building on this and IDC research we will select a list of the main typologies of end-user benefits, separately for business users and consumers, correlated with the main projects' clusters.

3.10.2. Scope and Measurement approach

The potential users' benefits were identified through the self-assessment survey and the results were used to measure the "Business and Consumer Market needs" KPI. The methodology approach and scoring are described in the KPIs chapter.

3.10.3. Expected results

The expected results are a ranking of the main expected benefits and their level of intensity for each of the Projects' clusters and an aggregated view for the FI-PPP Phase III.

This was achieved for the main business and consumer benefits and is presented in detail for each industry target market and consumer market segment, compared with the ranking coming from IDC's surveys. The final result was also to assess the coherence between the subgrantees perception of the user benefits and the market requirements. The results were presented in D. 2.3 and updated and finalized in D.2.4.

3.11. Potential Social Impacts

This paragraph was updated and aligned with the social impact methodology applied in the project.

3.11.1. Description

All public and private initiatives and organisations, have social impacts, whether positive or negative, intended or unintended. Measuring social impact can be difficult to assess, particularly if the measured targets are challenging to attribute to numeric indicators or are referring to time-delayed (e.g. 10 years from now) effects.

FI-IMPACT's social impact measurements aims at the definition and approach towards identifying and measuring potential social impacts which arise through the implementation of the FI-PPP Phase III accelerator programme.

A potential social impact is hereby defined as (based upon the most common viewpoints on social impact found in an extensive literature review): "The effect of an activity on the social fabric of the public and well-being of the individuals and community groups.[32]"

As a starting point we have categorized the social impacts into the following four groups: potential impacts on social behaviour; social inclusion; learning and thinking; and democracy and participation (table 8). In addition, impact areas related with the social challenges addressed by H2020 have been examined.

Based on this desk research and leveraging the results of the mapping of the Phase III initiatives and their expected outputs we have elaborated the indicators used to measure social impacts.

Table 12 Potential Social Impact Indicators

Type of Stakeholder	Type of Impact	Indicators	
		Projects' cluster	**Total Phase III**
Individuals segmented by age/education/income	Potential Impacts on social behavior	High, Medium, Low, None	Aggregated indicators
Social groups at risk of exclusion (disabled, long-term unemployed…)	Potential impacts on social inclusion	High, Medium, Low, None	Aggregated indicators

32 Compare with IAIA's (International Association for Impact Assessment) KEY CITATIONS list for social impact assessment (http://www.iaia.org)

Students / overall population	Potential impacts on learning and thinking	High, Medium, Low, None	Aggregated indicators
Citizens segmented by age/ education / income	Potential impacts on democracy, transparency, participation	High, Medium, Low, None	Aggregated indicators

3.11.2. Scope and Measurement Approach

The social impact indicators reflect the extent to which subgrantees have social impact in eleven key areas. They focus on identifying specific social benefits that subgrantees will support and the contribution to quality of life for specific social groups. It also contextualises the impact of subgrantees against the average social impact of all surveyed projects in these areas.

The indicators for the social impact are derived from the main focus areas within the FI-PPP programme, the societal challenges of the Horizon 2020 programme, and the FI-PPP Phase II. For FI-PPP Phase II we analysed the described use cases, which were used to test the developed technologies in real world scenarios[33].

3.11.3. Expected Results

As we did in the first round of measurement (whose results were presented in D2.3), the measurement of readiness of projects of FI-PPP Phase III was conducted with two key questions regarding potential social impacts. After careful consideration the list of questions regarding social impacts was limited to the two following questions to keep the questionnaires short enough. Including more questions might have resulted in decreased return rates of subgrantees answering the questionnaires, mainly as it might have been considered as too overwhelming.

The measurement of readiness addresses the following key social benefits of the FI-PPP Phase III:

- Perceived security of communities, neighbourhoods and housing
- Protection of privacy and security of personal digital data
- Citizens involvement and participation in open government
- E-inclusion
- Fitness and well-being
- Health
- Quality of life in urban areas
- Quality of life as a result of better access to information and data
- Social inclusion
- Access and use of e-learning and innovative learning methodologies
- Demand and use of sustainable transport solutions

33 See project list for FI-PPP Phase 2 on https://www.fi-ppp.eu/

Additionally, the readiness measurement asks specifically for the contributions for the following social groups:

- Unemployed
- Socially excluded groups (e.g. homeless, immigrants, etc.)
- Low income (e.g. unemployed single parents)
- Ethnic or cultural minorities
- Elderly (over 65 years old)
- Disabled

The questions were answered in a range from 1 to 5, whereas 1 is the lowest value, i.e. no impact, and 5 is the highest, i.e. highest impact.

3.12. Potential Knowledge and Scientific Impacts

This paragraph is updated on the basis of the results of the monitoring and mapping analysis of the subgrantees.

3.12.1. Description

Scientific and Knowledge impacts are normally produced by cooperative research projects such as those funded by the FI-PPP in Phase I and II. Phase III is naturally different and more focused on innovation and go-to-market applied research and development. For this reason we do not expect knowledge impacts connected with basic research, but those connected with applied research and innovation.

There may be impacts relevant for science: for example if some initiatives will use FIWARE for exploitation / testing of scientific results, or if they plan solutions targeted to the scientific environment. The nature and scope of the funded projects will guide the selection of the appropriate indicators.

However, the monitoring activities did not highlight significant impacts of the type indicated below, since the subgrantees were mainly focused on business impacts. Therefore, we were unable to measure this type of impacts.

Table 13 Potential Scientific and Knowledge Impact Indicators

Potential Scientific and Knowledge Impacts	Indicators	
Type of impact	**Projects' cluster**	**All Phase III Projects**
Patents and Publications	High, Medium, Low, None	Aggregated indicators
Use of standards	High, Medium, Low, None	Aggregated indicators
Collaboration between researchers	High, Medium, Low, None	Aggregated indicators
Knowledge transfer and spill-over effects	High, Medium, Low, None	Aggregated indicators
Network effects	High, Medium, Low, None	Aggregated indicators

Source: FI-IMPACT 2014

3.13. Scenario methodology

This paragraph presents an update of the scenario methodology used in the FI-IMPACT project. The development of the scenario assumptions for the Market Revenues Forecast model and the Economic Impacts model was described in the respective chapters.

IDC's approach is based on a consolidated scenario methodology which corresponds to standard practice in market forecasting and builds on the company worldwide continuous monitoring of main trends and their interactions. As the company is specialized in ICT, our scenario methodology is specifically focused on ICT trends and the forecasting of emerging ICT markets. This methodology has been applied and validated in multiple studies for policy clients and specifically the European Commission in the last 10 years. IDC's main specialty is in the development of medium-term scenarios (3 to 5 years).

The process is based on the following main steps:

1. Analysis of the main trends and framework conditions affecting the development of the targeted market, based on desk research and IDC analysts' expertise, as well as data collection on the specific topic;
2. Identification and selection of the main critical factors affecting the evolution of the targeted market segment characterized by:
   2.1. High level of impact on the targeted market
   2.2. High level of uncertainty and potential role of driving alternative market trajectories
3. Development of key assumptions on the main trends to 2020, using the IDC's Assumption Builder tool and leveraging IDC's worldwide Market Forecast Assumptions, quarterly updated;
4. Development of a baseline scenario and of alternative growth scenarios storylines, based on the different combination of key assumptions about the main trends and the evolution of main framework conditions;
5. Calculation of indicators measuring the key trends by scenario, where this is foreseen (for example GDP forecast estimates).
6. Description of each scenario's qualitative and quantitative impacts feeding into
7. Forecast calculations projecting the indicators under the alternative scenarios;
8. Communication of the scenarios results and feedback collection from the EC, the peer reviewers, the stakeholder community;
9. Revision and finalization of forecasts and scenarios.

In this case we have developed key assumptions for 3 main scenarios for the period 2014-2020, which feed into the 2 main models developed by the study team, the market model forecasting revenues and the economic impact model estimating the direct, indirect and induced impacts.

To develop the specific scenario assumptions for this study we have been able to leverage IDC's forecasting scenario model based on the interaction between four main groups of key factors shaping the ICT market evolution.

As illustrated in the Figure 57 below and Table 55 they are:

- Macroeconomic factors;
- Policy/regulatory conditions, with a specific focus on EC policies on the Digital Single Market and other ICT policies by national governments;
- Global megatrends of digital innovation
- Fiware/ICT market dynamics

Each cluster aggregates a set of interrelated key factors; their combination differentiates the three scenarios. The scenarios are characterized by the interaction and co-dependency of these factors; no scenario can be explained only by one factor or one group of factors, not even GDP growth.

This conceptual framework:

- is focused on factors with a high level of impact on the development of ICT markets
- is used to identify the level of uncertainty of main trends over the next 5 years, so that:
    - trends with low uncertainty are similar for all scenarios;
    - trends with high uncertainty determine the differences between scenarios.

As part of its forecast methodology[34], IDC updates quarterly a set of worldwide Market Forecast Assumptions which are developed jointly by the company analysts through an internal tool called the IDC Assumption builder. Assumptions are edited and assembled by IDC Global Research Organization which feeds them back to the analyst teams.

The scenario assumptions presented in this report build on the 2016 Q1 Market Forecast Assumptions.

4. Implementation of the Impact Assessment Methodology

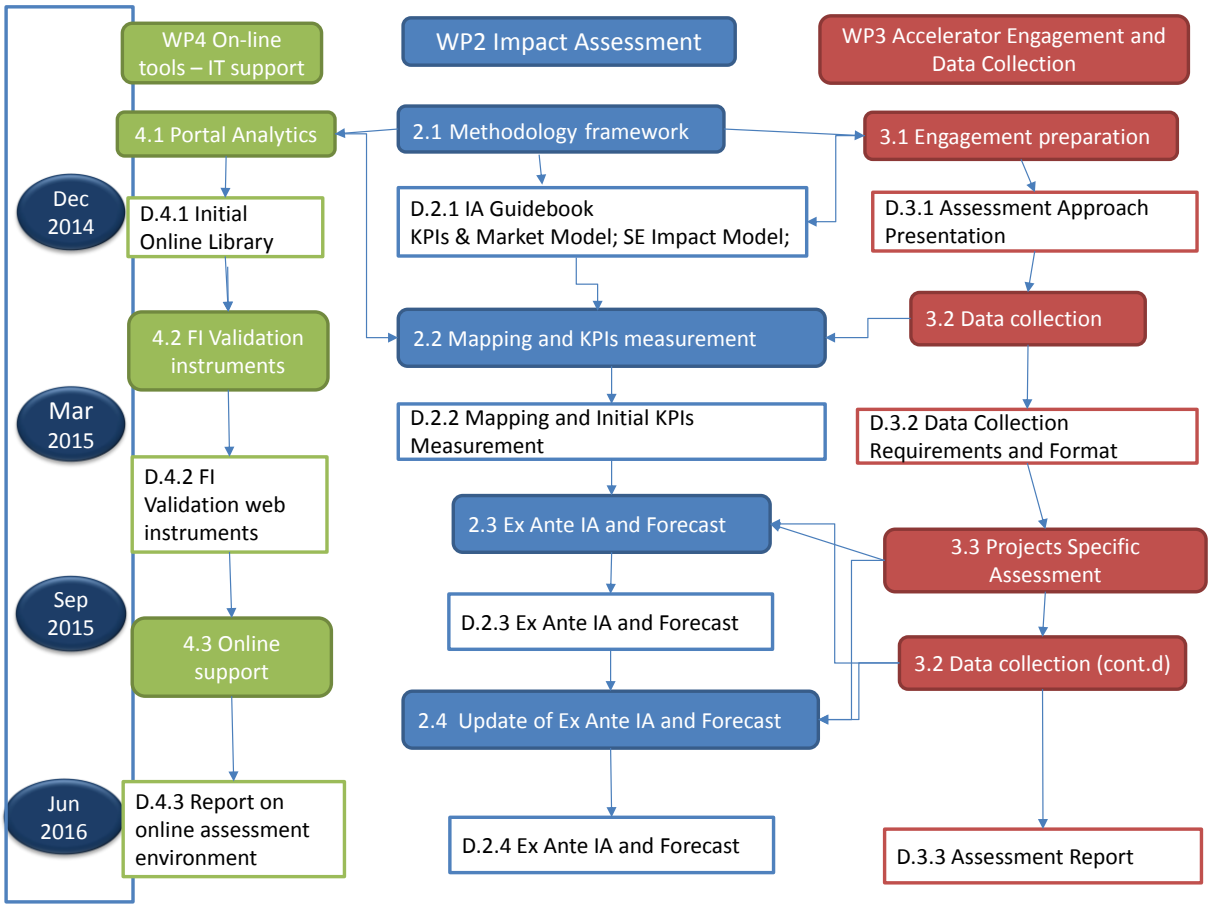
4.1. Process and Timing

The implementation of the Impact Assessment methodology described above was carried out mainly through the Work packages 2, 3 and 4 as shown in Figure 11 below. The other work packages of FI-IMPACT (WP1 – Dissemination and Community Engagement and WP5 – Project Management) are not shown in this Figure because while essential to achieving the project's goals, they are not primarily concerned with these activities.

As shown below, the main responsibility of the methodology development and implementation is carried by WP2 with the support of WP3 which coordinates the interaction with the 16 Accelerators and the data collection. WP4 has also a supporting role by developing and maintaining the online tools, primarily the online resources library and the self-assessment tool.

34 http://www.idc.com/about/methodology.jsp

Figure 7 Impact Assessment Process



Source: FI-IMPACT 2014

The methodology implementation process is summarized in Figure 3 as the monitoring and Impact Assessment cycle. The main steps are the following.

4.1.1. Methodology development and monitoring

The first 6 months of FI-Impact (from July to December 2014) were dedicated to the following activities:

- Development of the Methodology Framework, which included:

- Design of the 3 main components of the framework (Key Performance Indicators, the Market Model and the SE Impacts Model), their scope, their interdependencies and their expected outputs;
- Identification and classification of the KPIs and of the impact indicators;
- Identification of the most appropriate data collection and measurement methods for the indicators selected;
- Description of the forecasting and scenario building methodology;
- Development of the quality control and risk management process;
- Development of the Mapping Templates and the Self-Assessment tool template.

This is all reported in this Impact Assessment Guidebook.

In parallel FI-Impact carried out the following activities:

- Organization of the active engagement process with the 16 FI-PPP III Accelerators, shared between the FI-IMPACT Partners;
- Development of data collection questionnaires to be used within the call for proposals, which were designed in consultation with the Accelerators and the EC, (to facilitate harmonization of application formats and the consequent elaboration and aggregation of proposal data);
- Data collection about the Accelerators themselves and the forthcoming calls for proposals, dealing with confidentiality issues through NDAs;
- Producing a "go to market" roadmap of the Accelerator calls and selection processes, to identify when the different batches of projects will be funded and when they can be expected to go to market;
- Agreement with the FI-PPP community for FI-IMPACT to collect, aggregate and share monitoring data about the calls results and the type of proposals collected, including potential duplication of proposals and proposers.
- Development of infographics to share visualized and summarized versions of first monitoring results with the FI-PPP community.

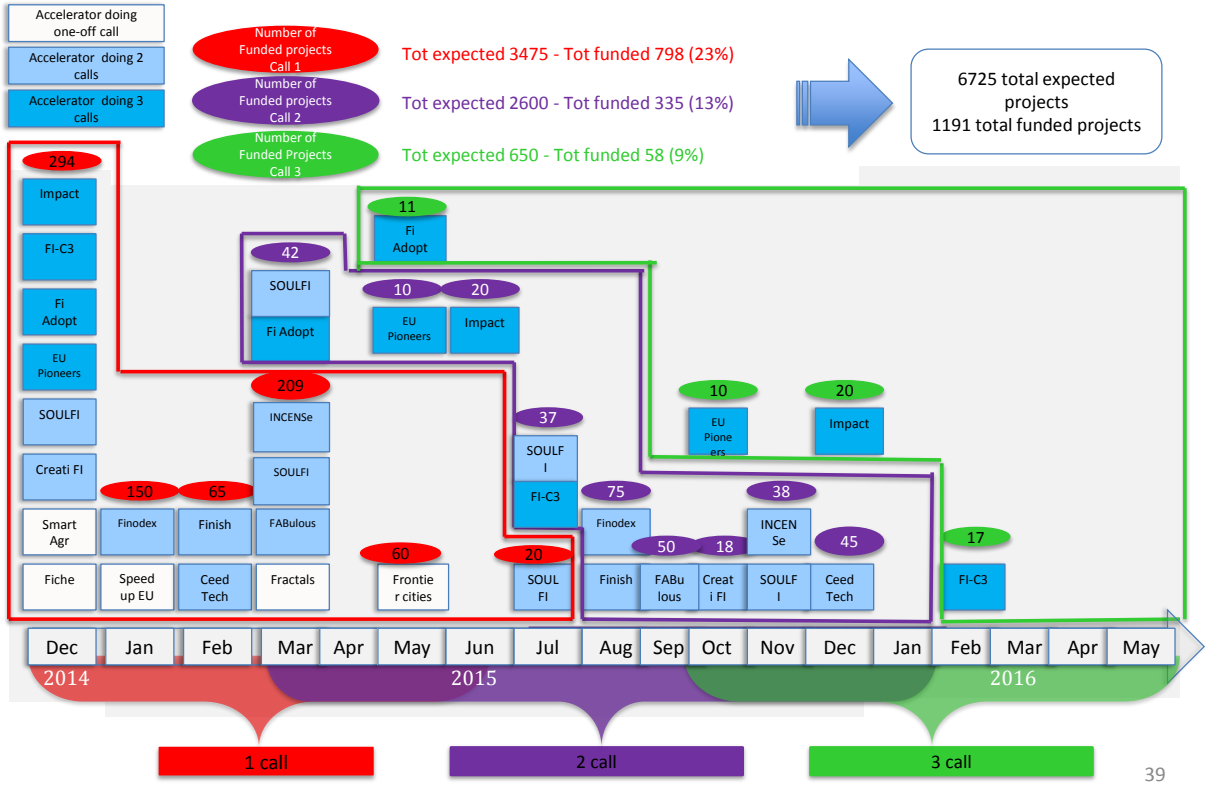
The first results of this process and the key components of the methodology were presented in the FI-Impact Assessment Approach presentation (Deliverable 3.1, December 2014).

4.1.2. Mapping and Measuring KPIs

Contrary to our plans about carrying out "waves" of monitoring activities at pre-defined intervals, the continuous flow of activity by accelerators about subgrantees has required an equally almost continuous interaction with the accelerators. Therefore, the global database of subgrantees managed by IDC has become a "live" document continuously updated and shared with the Accelerator community.

The main results of the mapping activity are presented in the deliverable 2.4.

Figure 8 Accelerator Calls Roadmap



Source: FI-IMPACT 2014

4.1.3. KPIs cyclical assessment process

The periodical measurement of KPIs enabled a cyclical assessment of the funded projects feeding into the mapping updates, gradually developing the analysis of the FI-PPP Phase III "footprint" in the socio-economic system.

This was based on continuous data collection as described in the previous paragraph. The self-assessment survey was also kept open to the end of the project.

The other main objective of this activity has been to identify and promote good practices and potential success stories (a task entrusted to WP3).

This work is presented in the following deliverables:

- Final Assessment report on the good practices and success stories (D.3.3 –June 2016);
- Final report on the online environment (D.4.3 –June 2016).

4.1.4. Impact Assessment Process

The Impact Assessment methodology built on the results of the monitoring and mapping of the funded projects, and included the implementation of the Market Revenues model, the Economic Impact model, the development of scenarios and the forecast of indicators to 2020.

This work was carried out following the approach described by this Guidebook, even though the initial schedule had to be revised and delayed, to take into account a much longer than expected time lag between the calls implementation, the actual selection of

funded initiatives, and the delivery of data about them to FI-IMPACT. In practice the main deliveries of the assessment results have been the following:

- Deliverable 2.2 "Mapping and initial KPIs measurement" was delivered in June 2015 with the first round of mapping results;
- Deliverable 2.3 "Ex-ante impact assessment and forecast" was delivered in October 2015 with updated mapping results and the first release of the Revenue Market model;
- Deliverable 2.4 "Update of Ex-ante Impact assessment and forecast" was delivered as planned in June 2016 including updated mapping results, an updated release of the Revenues Market model and the first release of the Economic Impact Model.

5. Quality Management and Risk Management

5.1. Quality management processes

The FI-IMPACT consortium considers quality control as a fundamental element of the implementation of the project. This chapter presents the quality management, validation and risk management processes that will be applied specifically to the Impact Assessment methodology.

The methodology presented in this report is based on best practice in the field and strives to achieve the highest possible quality results at each step.

The quality process is based on the following main steps:

- **Quality Planning**: preliminary analysis of the main quality requirements for each phase of the methodology and measures to be taken to meet these requirements. For each phase of the methodology we have identified the expected results, the quality requirements to be respected, how they can be controlled and how they should be revised if they don't respect these quality requirements. This will be applied specifically to the three main components of the methodology framework:
  - The measurement of KPIs
  - The market model
  - The Socio-Economic (SE) Impacts model
- **Quality Assurance**: this is the implementation of the quality plan through evaluation of the overall technical work performance on a regular basis to provide confidence that the implementation of the methodology will satisfy the quality requirements. This will be implemented quarterly and at each main milestone of the project. This will be assured by the Quality manager through regular internal quality reviews under the coordination of the FI-IMPACT Project Manager and will be reported in the management progress reports.
- **Quality Control:** review of the main results of each phase of the methodology by monitoring the key parameters for compliance to quality requirements and identifying ways to eliminate causes of unsatisfactory performance. This will be implemented in the process of production and delivery of the IA deliverables including:
  - D.2.2 Mapping and Initial KPIs Measurement in March 2015;
  - D.2.3 Ex-Ante IA and Forecast in September 2015
  - D.2.4 Update of Ex Ante IA and Forecast in June 2016.

- **Feed-back and Validation**: finally, we will also go through a process of feed-back and validation of the main methodology approach and results by the FI-PPP Phase III community as described in the paragraph 5.3.

The following paragraphs present our quality planning for the main components of the methodology.

5.2. Quality of indicators

The indicators designed for each of the 3 main components of methodology (KPIs, market model and economic impacts model) correspond to the main principles of good practice indicated by the Commission's IA Guidelines. The indicators strive to follow the criteria identified by the acronym RACER as indicated in the following table.

Table 14 Quality requirements of Indicators

Quality requirement	Description	**Quality Assessment Approach**
Relevant	Closely linked to the objectives to be reached	Expert evaluation by the consortium partners
Accepted	Recognized by the main interested stakeholders	Through the feedback and validation activities
Credible	Credible for non-experts, unambiguous and easy to interpret	Through the feedback and validation activities
Easy to monitor	Data collection should not require excessive effort by the Accelerators/projects who must provide the data and should be feasible through the resources available to the FI-IMPACT consortium	Preliminary check of data collection requirements followed by test in practical experience
Robust	Robust against manipulation, e.g. providing consistent results upon repeated application	This will be tested through statistical methods of the internal consistency of data and sensitivity tests of their range of variation

The measurement process, when we will start measuring the indicators with the data collected from the Accelerators, will provide a reality check. In that phase it may be necessary to modify, revise or drop an indicator, if it does not satisfy these main quality requirements. The eventual modification of indicators will be clearly documented in order to guarantee full transparency and understanding of the measurement process.

5.3. Quality of data

5.3.1. Validity and Reliability of data

Within the context of this project, we will also need to examine the quality and internal consistency of the data to be elaborated as inputs for the market model and socio-economic impacts model. The main quality parameters which will be considered are the **validity and reliability** of data. More specifically, these terms are defined in statistics as follows[35]:

- **Validity** means the degree to which the data measures what it is designed to measure. Validity reflects those errors in measurement that are systematic or

[35] See for example Measurement: Reliability and Validity Measures", by Jonathan Weiner, PhD, Johns Hopkins University http://ocw.jhsph.edu/courses/hsre/PDFs/HSRE_lect7_weiner.pdf

constant. Validity can be verified in various ways: through the opinion of the main stakeholders ("face validity"), and/or of experts, through correlation with external variables (for example predicting future performance) and/or checking that the measured sample is sufficiently representative of the structure of the universe under analysis.

- **Reliability** is the extent to which a measurement gives results that are consistent upon repeated application. Variations in a repeated measure can be due to chance or unsystematic events, systematic inconsistency or actual change in the underlying event being measured. Statistical tests (for example Cronbach's coefficient of Alpha statistics) can measure the internal consistency of data.

There can be no validity without reliability, but there can be reliability without validity. Therefore validity is almost more important than reliability. Moreover, validity and reliability are not binary concepts based on yes/no assessments, but vary within a continuum. The criteria used to assess the validity and reliability of the data used in this project will be clearly documented.

5.3.2. Quality control of data from other sources

The IA methodology will combine data collected from the Phase III initiatives with data collected from other sources, especially from IDC databases and research. The consortium partners will apply to these data the same criteria of quality control described above, clearly documenting the data sources. In addition, IDC applies quality control processes to data collection and elaboration based on the following principles:

- Supply chain cross-checks: IDC performs a series of checks within the supply side, and the software and component markets focusing on processors, graphics chips, operating system licenses, and disk drives. These crosschecks insure proper market sizing and provide additional insight on market performance.
- Time series analysis. Historical data by vendor, brand, market segment, channel, and other variables are plotted in a time series. For example, graphical tools provide indications of discrepancies and outliers in market trends. Any discrepancy in trends and patterns are reviewed.
- Market share and growth analysis. Data is analyzed by form factor and market segment. Analysis is performed on vendors or sections of their data that show an unusual growth pattern. IDC communicates the potential discrepancy to vendors for verification. If sufficient evidence is not provided, triangulation work is performed.
- Triangulation. IDC uses secondary sources of confirmation through an extensive network of partners within the supply, distribution and demand side communities.

5.4. Quality requirements: KPIs measurement

The preliminary quality requirements of the KPIs measurement phase of the project and their assessment approach are presented in the table below.

Table 15 KPIs: Quality Requirements

Methods	Description	Quality requirements	Quality Assessment Approach
Monitoring Phase III	Data collection from Accelerators on calls, proposals and projects selected	Timely, efficient, complete, consensus based	Validation by project manager based on execution of data collection
Mapping templates	Design of monitoring and mapping indicators of FI-PPP Phase III	The indicators must be Relevant, Accepted, Credible, Easy to monitor, Robust	Performed by the consortium partners (see table above)
Statistical analysis of mapping data	Elaboration and aggregation of the data on proposals	Results must be valid, reliable, and coherent	Through statistical tests and expert assessment by consortium partners
Measurement of KPIs	Elaboration of synthetic performance indicators by cluster and for all the FI-PPP Phase III, compared to benchmarks	Transparent, coherent, comparable and as much as possible based on objective and evidence-based criteria	Through statistical tests and expert assessment by consortium partners

5.5. Quality requirements: Market model

The preliminary quality requirements of the Market model phase of the project and their assessment approach are presented in the table below.

Table 16 Market model: Quality Requirements

Methods	Description	Quality requirements	Quality Assessment Approach
Clustering of funded projects	Segmentation of funded projects into homogeneous clusters with similar value propositions, market targets, business models	Robust, valid and reliable	Through statistical tests and expert assessment by consortium partners
Market model design	Definition of the structure of the model, inputs and outputs	Robust, valid and reliable	Through statistical tests and expert assessment by consortium partners

Methods	Description	Quality requirements	Quality Assessment Approach
Estimate of potential take-up	Calculation of the potential users population reached by the FI-Phase III initiatives by cluster and target market	Robust, valid and reliable	Through statistical tests and expert assessment by consortium partners
Estimate of potential revenues	Calculation of the potential revenues collected by the FI-Phase III initiatives by cluster and target market	Robust, valid and reliable	Through statistical tests and expert assessment by consortium partners
Analysis of potential innovation and users benefits	Description of potential innovation and users benefits by cluster and target market	Robust, valid and reliable	Through statistical tests and expert assessment by consortium partners

5.6. Quality requirements: Socio-economic impacts model

The preliminary quality requirements of the Socio-economic impacts model phase of the project and their assessment approach are presented in the table below.

Table 17 SE impacts model: Quality Requirements

Methods	Description	Quality requirements	Assessment Approach
Identification and classification impacts indicators	Definition of indicators by impact category specifying scope, measurement approach and expected results	The indicators must be Relevant, Accepted, Credible, Easy to monitor, Robust	Performed by the consortium partners (see table above)
SE impacts model design	Definition of the structure of the model, inputs and outputs	Robust, valid and reliable	Through statistical tests and expert assessment by consortium partners
Estimate of indirect and induced impacts	Calculation of the multipliers driving indirect and induced impacts	Coherent with literature on macroeconomic impacts Robust, valid and reliable	Referenced through desk research Through statistical tests and expert assessment by consortium partners
Development of forecast scenarios	Identification of the main trends and framework conditions affecting potential demand and design of alternative demand trajectories to 2020	Transparent, coherent, and as much as possible based on objective and evidence-based criteria Accepted by FI-PPP Phase III community	Clear documentation of scenario development process and key assumptions behind scenarios Validated through feedback by stakeholder community

Methods	Description	Quality requirements	Assessment Approach
Estimate of forecast scenarios impacts	Calculation of the main economic impacts and qualitative impacts by scenario	Coherent with literature on macroeconomic impacts Robust, valid and reliable Accepted by FI-PPP Phase III community	Referenced through desk research Through statistical tests and expert assessment by consortium partners Validated through feedback by stakeholder community

5.7. Feedback and validation

Feedback and validation of the main methodology approach and results by the FI-PPP Phase III community will be carried out as follows:

- Ongoing interaction with the Accelerators on the development of the main indicators and continuous verification of the quality of datasets delivered by them;
- Feedback on the present Impact Assessment Guidebook (D.2.1) which will be widely circulated within the Phase III community.
- Feedback on the results of the first D.2.3 Ex-Ante IA and Forecast (September 2015)

We will collect opinions and insights whether the IA deliverables are aligned with the following criteria (in a broad way, as this will not be a formal peer review):

- Relevant scope and appropriate methods;
- Reliable data, sound analysis and credible results;
- Valuable conclusions and recommendations;
- Clarity and completeness of the deliverables.

5.8. Quality control of Deliverables

The Quality Manager will be responsible of the quality control of deliverables, which will be based on:

- Quality control by the deliverables' authors
- Internal peer review and eventual requests for revisions
- Sign-off and delivery to the EC

The peer reviewers will receive the draft deliverables 2 weeks in advance to the delivery date and will provide specific feedback. An English-language check will be part of the quality control mechanism for each deliverable. For each of the main deliverables of the project the internal Peer Reviewers will review and, where necessary, clearly indicate the necessary revisions.

The deliverable's authors will implement the requested revisions before delivery to the EC, under the control of the Project Manager.

The peer review will be based on the following criteria:

- Compliance to quality requirements indicated below (valuable conclusions and recommendations, clarity and completeness)

- Conformance of deliverables to the objectives set forth by the workplan;
- Conformance of deliverables structure to the requirements defined by the workplan;
- Conformance of deliverables content to the requirements defined by the workplan;
- Quality of the research presented in the deliverables;
- Appropriate selection of methodologies depending on objectives and scope of the research;
- Appropriate implementation of methodologies according to workplan;
- Conformance of empirical work and/or technical support to most accepted and widely used best-practices in each appropriate functional/professional field.

The PM will be responsible of the last control of the deliverables before sending them to the EC and will decide how to implement revisions in case they are requested by the peer reviewers or by the EC after delivery.

Table 18 Quality Requirements for Deliverables

Quality Requirements	Description	Quality Parameters	Applied to
Valuable Conclusions and Recommendations	Conclusions and Recommendations must be relevant for the final objectives of the study, provide value added, be comprehensive, useful, applicable and sufficiently detailed. They must be objective, not influenced by any personal or partisan bias.	Value added Comprehensiveness Usefulness Practicability Impartiality	All deliverables and reports
Clarity and completeness of Deliverables	Deliverables must be clear, comprehensive, and easy to read, in a style and look appropriate for their targeted audience. They must be complete, responding to the study workplan and specifications, providing supporting evidence and background as appropriate, and documenting the methodology employed.	Clarity Completeness Suitability for target audience Communication Value added	All deliverables and Reports

5.9. Risk Management

Risk management ensures that adverse events are avoided and/or their negative impact is minimized. The objective of this risk management process is to anticipate these possible events (assigning to each a probability and an impact) and to provide a mechanism to control and mitigate them.

Concerning the IA methodology, the partner responsible for WP2 will bear the main responsibility for risk management, under the supervision of the Project Manager supported by the Quality Manager.

The WP leader will monitor constantly the potential problems, with the support of the consortium partners involved with the IA methodology. The table of the main potential

risks will be updated with the corresponding countermeasures and contingency plans. The WP leader will report to the PM about the results and consequences of risk management and will also alert the Quality manager if some unavoidable risks will require changes in the methodology and technical work.

Table 19 IA methodology: main potential risks

Risk	Impact (H, M, L)	Probability (H, M, L)	Management Strategy
Insufficient reliability and quality of data/information from the funded projects	H	L	Careful organization of data collection process with the collaboration of the Accelerators, plus quality control and cross-check of data collected, with further rounds of data collection if necessary
Difficulty in aggregating the data about the funded projects to estimate cumulative impacts	H	M	Use of advanced statistical methods such as factor or cluster analysis to identify key similarities and differentiators; two-step aggregation process, first clustering projects and then estimating cumulative impacts; use of semantic indicators allowing comparability of different indicators (scorecard approach)
Lack or incompleteness of data from desk research	H	L	Expand the list of sources and deepen the cross-analysis of collected data also leveraging expert interviews
Difficulty in estimating correctly the size of the potential market of the funded projects	H	M	The consortium team will leverage IDC's experience in estimating emerging demand of new services and will investigate the similarities of Phase III suggested solutions and products with others in other market segments to provide estimates. The estimates will be cross-checked for validation with leading stakeholders from the FI-PPP community with expertise in the same target markets.
Insufficient evidence from the funded projects about potential jobs creation	H	H	The consortium will compare the projects with similar companies and initiatives and identify parameters of job creation
Non respect of the schedule	M	M	The PM will follow closely the implementation of the work plan and inform the EC of any risks of significant delays and the corrective actions to be taken.
Insufficient quality of the research presented in the deliverables	H	L	Design and implementation of best practice methodologies complemented by quality assurance process by the Quality manager and internal peer review.
Lack of clarity, communication value, non-	M	L	Internal peer review mechanism, leveraging the partners' experience in dissemination and communication activities

Risk	Impact (H, M, L)	Probability (H, M, L)	Management Strategy
suitability to target audience, incompleteness			

Legenda: H = High; M = Medium; L = Low

6. Approach to Self-Assessment Tool

6.1. Overview

As defined in Sections two and three of this document the proposed indicators and assessment framework will facilitate an Impact Assessment aggregating and analysing sectorial clustered economic data for the entire FI-PPP. An enormous undertaking if not that Project partners have more than 50 years' experience doing exactly this job and a wealth of background data as a starting point. As defined in these sections, this Impact Analysis will consider data and economic activity data regarding economic sectors at the meso-level. Single Economic Sector Assessment and Market Forecasts are the result of tens of person months of concerted team effort. Thus FI-Impact expects to be able to cluster similar proposals and identify meaningful market sector outlook and potential impact. This means we do not expect to enter into details individual proposals selected for funding beyond a mapping carried out on higher-level KPIs. Additionally we have a time frame and calendar strictly governed by the FIWARE calendar and contracts agreed with the European Commission. This initial version of this Guidebook was completed in December 2014, the initial mapping and KPI measurement will take place before the end of March 2015 and the ex-ante assessment will be performed before the end of the Summer of 2015.

On the other-hand SMEs and Entrepreneurs participating in the program may or may not have development and go-to-market time frames that are aligned with the timing of FI-IMPACT. The number of SMEs and Entrepreneur may be more numerous than any study could expect to accommodate. Furthermore, the initial period of any business start-up is rarely typified by a final product offering and consolidated market channels. Their real market economic potential may occur after FI-PPP activities have already been formally concluded. Their market uptake may be performed in start-ups with different businesses having owners or partners not involved in the original accelerator funding process. The status of an initiative in April in April 2015 may not the same as its status in April 2015. For this reason we had decided to create a self-assessment tool that can be used to guide FI-Impact - Phase III funded and non-funded SMEs and Entrepreneurs with-in or beyond the accelerator funded group; now, and in the future. FI-Impact is developing a tool to allow a time-differentiated analysis to be carried out by the partners but, more importantly, by the SMEs or Entrepreneurs themselves. FI-Impact is developing an online self-assessment tool to give SMEs and Entrepreneurs the ability to monitor their potential impact and to learn what elements are needed to drive impact and how measurement and evaluation changes that potential.

6.2. Objectives

The self-assessment tool has two specific purposes:

1. **A Learning Tool** for SMEs and Entrepreneurs: to determine strengths and weaknesses through assessing their initiative on several key impact parameters and learn about ways to improve and increase their impact;
2. **A Monitoring Tool** for **the General FI-PPP/FIWARE Community**: to generate insights into strengths and weaknesses of Future Internet Public-Private-Partnerships (FI PPPs) to detect which aspects of the FIWARE offering offer the highest potential and how initiatives are configured to exploit them.

The self-assessment tool is a living benchmarking tool based on a growing corpus of data points entered directly by the initiatives themselves. KPIs reflect a historical viability model based on good practice taken from literature. This will allow Phase 3 funded projects to (1) compare their potential performance to successful initiatives based on industry proven high-level indicators; (2) see how their initiatives are changing and what effect that may have on their potential; and (3) indicate on any given axis which initiatives have scored the highest in terms of potential and allow them to share their experiences (if willing) with other projects and interested stakeholders. It is intended for learning and providing bottom-up insights into what works and what can be improved, not meant for objective measurement, benchmarking or rating purposes.

6.3. Development of the tool

The self-assessment tool was developed on the basis of the KPIs and analysis framework described earlier in this guidebook. The data analysis framework is derived from ICT start-up business literature industry standard benchmarking indicators, participant data and summarises the general parameters that projects need to achieve sustainable impact. The framework consists of Six General parameters, including:

1) Organisational Profile
2) Exploitation of FIWARE
3) Innovation Focus
4) Market Focus
5) Feasibility
6) Market needs (based on understanding of potential benefits)
7) Social impacts

Each of the seven parameters are turned into separate self-assessment questionnaires, including an explanation of how measurement is performed and why the specific parameter is important to achieve impact.

The parameters 1 to 2 have been extracted from the FI-PPP Mapping template described in Section 2.3.2. The parameters 3 to 6 correspond to the KPIs identified in Section 2.4. The Social Impacts questions have been developed based on the approach described in Section 3.10.

Subsequently the tool will be used to determine best practices and methods for improvement by building on comparative analysis, participant experiences, evaluation reports and FI-Impact and Accelerator project expert views.

6.3.1. Quality control

Initial functionality and results will be evaluated and discussed with tool users and experts, to determine if the tool is:

1) Fit for purpose and able to achieve its goals
2) Usability of the tool
3) Quality of the questions
4) Quality of the results
5) Value for future use and needed improvement

When operational the tool will be offered without charge via the FI-Impact portal at www.fi-impact.eu. The tool was presented in Future Internet Validation Web-Based Instruments (D4.4.2) in March 2015.

6.4. How the Tool Works

The specifications of the final release of the Impact assessment tool are presented in Deliverable 4.3 "Report on online Assessment environment", June 2016.

7. References

DG Enterprise and Industry, Operational Guidance for Assessing Impacts on Sectoral Competitiveness within the Commission Impact Assessment System - A "Competitiveness Proofing" Toolkit for use in Impact Assessments

DG Employment, Social Affairs and Inclusion, **Assessing Social Impacts**

DG Justice and citizens' rights. Operational Guidance on taking account of Fundamental Rights in Commission Impact Assessments

DG Regional Policy, Assessing Territorial Impacts: Operational guidance on how to assess regional and local impacts within the Commission Impact Assessment System

Federico Etro, ***"The Economic Impact of Cloud Computing on Business Creation, Employment and Output in Europe. An application of the Endogenous Market Structures Approach to a GPT innovation",*** Ca Foscari University of Venice, March 8, 2012, The IUP Journal of Managerial Economics, Vol. IX, No. 2, pp. 7-22, May 2011 http://www.voxeu.org/article/economics-cloud-computing

FI3P - "Towards a competitive European Internet industry" - A socio-economic analysis of the European Internet industry and the Future Internet Public-Private Partnership, Final Study report, prepared for the EC DG Information Society and Media by Rand Europe, IDC, WIK Consult, IC Focus, ISMB, May 2012, http://www.fi3p.eu/assets/pdf/final/ FI3P%20Final 20Study%20Report20v1 200.pdf

Gordon, T. J. (1994). Cross-impact methodologies. Washington, DC: United Nations University. (Part of Glenn 1994a).

IDC, "Uptake of Cloud in Europe. Follow-up of IDC Study on Quantitative estimates of the demand for Cloud Computing in Europe and the likely barriers to take-up", SMART 2013/0043, IDC study for EC DG CONNECT, October 2014

IDC, **The Economic Impact of IT, software and the Microsoft ecosystem on the global economy**, Global White Paper IDC 2009

PWC (Price Waterhouse Coopers) and partners, "A partial and Fragile recovery" – Annual Report on European SMEs 2013/2014, Final Report July 2014, SME Performance Review 2014, on behalf of DG Enterprise

OECD, Measuring the digital economy – a new perspective, December 8 2014http://www.oecd.org/sti/measuring-the-digital-economy-9789264221796-en.htm

Ozu-Kasuga, "*The Economic Impact of Cloud Computing Diffusion in Japan",* Atsushi Ozu, Director of Research, Institute for Information and Communications Policy (IICP)", Ministry of Internal Affairs and Communications (MIC), and Norihiro Kasuga, Professor, Faculty of Economics, Konan University , 2014

Secretariat General + DG Enterprise and Industry, "Operational Guidelines to Assess Impacts on Micro-Enterprises"

The SROI Network: A guide to Social Return on Investment, January 2012

Weisbrod Glen, Economic Development Research group, Weisbrod Burton, Economics Dept., "Measuring Economic impacts of projects and programs" Northwestern University. USA, 1997 http://edrgroup.com/pdf/econ-impact-primer.pdf

http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/performance-review/files/supporting-documents/2014/annual-report-smes-2014_en.pdf

Economic Impact Model References

Leontief, Wassily W. Input-Output Economics. 2nd ed., New York: Oxford University Press, 1986.

ten Raa, Thijs. *The Economics of Input-Output Analysis.* Cambridge University Press, 2005.

Dietzenbacher, Erik and Michael L. Lahr, eds. *Wassilly Leontief and Input-Output Economics*. Cambridge University Press, 2004.

Eurostat Manual of Supply, Use and Input-Output Tables, Eurostat Methodologies and Working papers, 2008 Edition

Le tavole delle risorse e degli impieghi e la loro trasformazione in tavole simmetriche, nota metodologica, ISTAT, Ottobre 2006

The Economic Impact of Domestic Appliances Industry in Europe, Report for the European Committee of Domestic Equipment Manufacturers (CECED), April 2015, Europe Economics