DigCompSAT

A Self-reflection Tool for the European Digital Competence Framework for Citizens

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DigCompSAT Final Report for the JRC by ALL DIGITAL

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Abstract

The European Digital Competence Framework for Citizens (DigComp) provides a comprehensive approach for digital competence that can be adapted to many areas of life. The DigCompSat tool aims at testing empirically the set of DigComp 2.1 competences corresponding to levels 1 to 6 (foundation, intermediate and advanced). It can be considered that these are the most widely needed digital competence levels for most European citizens for their employment and career development.

The tool is designed with a methodological perspective that allows measuring of digital competence by the three elements - knowledge, skills and attitude – for each of the 5 DigComp areas. It also provides respondents with a self-reflection path on their digital competence.

The tool was piloted in Ireland, Latvia and Spain by 16-65 year old individuals. The selected countries represented the three country categories defined by the Digital Skills Index (DSI) in 2020 regarding the percentage of the no- and low-skilled population in the society: Ireland over EU average, Spain close to EU average, and Latvia below EU average.

The piloting provided reliable feedback of digital competence level for the 5 competence areas for different age and gender groups, education and digital skills levels. The DigComp tool has sound psychometric properties, including the validity and internal consistency of the items. The tool is able to perform three main functions for test takers: measuring existing competences based on the respondents' self-reflection; identifying competence gaps; and raising awareness. The conciseness of the items allowed a test-time of less than 30 minutes across different countries, age and educational background groups and genders.

This report describes the process and methodology taken to achieve the result. The annexes provide the statistical data and the Item Bank used. To achieve the Item Bank, a number of experts and users have been involved in iterative consultations and focus groups as part of the applied methodology during the initial design, validation and development process of the tool.

CONTENT

Executive Summary

Identifying digital skills and needs has been a challenge throughout the world. At a European level, the DigComp framework provides a comprehensive approach, which can be adapted to many areas of life, regardless of the fast-developing digital technology. The update of the DigComp Framework to version 2.1 addressed that need when it defined 8 proficiency levels along 3 dimensions: complexity of tasks, autonomy and cognitive domain.

The DigComp Tool developed in this project addresses DigComp competence levels 1 to 6, which are the most widely needed digital competence levels for most European citizens, especially with their employment and career development in mind. The Tool was designed with a methodological perspective that allows assessing of digital competence by the 3 elements – knowledge, skills and attitude – for each of the 5 DigComp areas, and that provides respondents with a self-reflection path on their digital competence.

The target population included 16-65-year-old individuals identified as with basic, intermediate and advanced level of digital skills, from different EU Member States. The selected countries represented the three country categories defined by the DSI index (2020), regarding the percentage of the no- and low-skilled population in the society: Ireland over EU average, Spain close to EU average, and Latvia significantly below EU average.

The project piloting was carried out during the Covid-19 crisis and required the team to amend plans accordingly (e.g. the pilot setting was moved online instead of face-to-face). The Tool provided reliable feedback of digital competence level for the 5 competence areas for different age and gender groups, education and digital skills levels, as well as respondents from countries with cultural variety and different training and learning patterns.

This report is written to describe the process and methodology that was taken to achieve the end result. An accompanying document of technical annexes provides all the statistical data, the Item Bank versions and other materials.

Editors' Foreword

Digital technology is transforming traditional structures, methods and assumptions about how we communicate, learn, work and live. In particular, digital competence is increasingly needed for employment and career development. The European Commission has prioritised and supported digital skills development supporting employees and job seekers in every setting with DigComp, the European Digital Competence Framework for citizens. DigComp is a reference framework that describes what it means to be digitally competent. It can be used across sectors, disciplines and systems to enable people to develop digital competence. DigComp sets out the 21 competences necessary to be digitally competent and maps these across 8 proficiency levels, from the most basic to advanced levels. Digital competence is a key transversal competence. It defines what it means being able to use digital technologies in a critical, collaborative and creative way. DigComp supports this comprehensive understanding of digital competence, including issues such as information storage, digital identity, developing digital content and behaviour online, in everyday life such as working, shopping and participating in society.

The European Commission launched in September 2020 the new Digital Education Action plan to foster the development of a high performing digital education ecosystem (priority 1) and to enhance digital skills and competences for the digital transformation (priority 2). Quite a number of actions under priority 2 deal with the further development of digital competence in general, and DigComp in particular, such as the update of the framework (version DigComp 2.2) and the development of a European Digital Skills Certificate. The self-reflection approach in this report is to be seen as an initial contribution to these.

By testing empirically DigComp 2.1, the methodology presented in this report aims to inspire users to build their own self-reflection tools. The item bank presented in 3 languages in the annexes has been co-created by the authors and refined by a number of experts, which gives them further validity. The items are focused on employment and career development needs. We trust that an iterative process of consultations with experts and users has been key for the psychometric properties of this self-reflection tool, in particular for the validity and internal consistency of the items. It is to be noted that the set of items used should take into account the ever -and fast- changing of digital innovations and uses. Therefore, the item bank here developed will need to evolve accordingly.

In addition to DigComp, the European Commission has developed related digital competence frameworks for educators **(DigCompEdu)** and for educational organisations **(DigCompOrg)**, as well as for entrepreneurial competences **(EntreComp)** and personal, social and learning to learn competences **(LifeComp).** In particular for schools' digital capacity, a free online self-reflection instrument exists **(SELFIE)** and for teachers, it is under development.

These competence frameworks and tools, and related studies on "Learning and Skills for the Digital Era" are part of JRC research since 2005. More than 30 major studies have been undertaken resulting in more than 140 publications. Further information on all our studies can be found on the JRC Science hub:

https://ec.europa.eu/jrc/en/research-topic/learning-and-skills

Acknowledgements

Chapter 1. INTRODUCTION

1.1 DigComp and the general aims of the DigCompSAT project

The European Digital Framework (DigComp) was originally developed by the Joint Research Centre, European Commission, in 2013 to identify and define the digital competence that is relevant for all citizens who live and work in Europe today.[1]

The DigComp framework (in the 2.1 version) identifies 5 main areas of digital competence which comprise 21 specific competences; it provides a title and short description for each of them and defines how they are articulated at 8 proficiency levels and 4 macro-levels (foundation, intermediate, advanced and expert); it provides examples of each competence in two application scenarios (employment and education).

European citizens are not expected to achieve the highest proficiency level in all 21 DigComp competences, as digital competence is instrumental to achieve personal, social and professional goals, which differ across individuals, vary over the lifetime and depend on living and working circumstances. Nevertheless, DigComp offers a clear view of the wide range of knowledge, skills and attitudes related to the use of digital devices and services that are needed to achieve a full participation in our society. It can be used therefore to assess one's strengths and weaknesses in this domain, hence one's potential for improvement. Moreover, it can be used to identify the training needed in response to one's personal development aims, job-related requests and so on.

The DigCompSAT project was launched to design and trial an Item Bank of questions covering **all 21 competences** of DigComp2.1, to be used in a **self-administered test** that should aim at:

1. **assessing** the level of respondents' proficiency in each of the 5 competence areas, and highlighting strengths and weaknesses in the specific competences;
2. enhancing respondents' general awareness and **understanding** of the articulation of digital competence according to the DigComp framework.

A key additional factor taken into account in the development of the Item Bank and the field trials was the **time constraint**, it should be at the lower end of an 20-30 minutes interval, in order to minimize the probability of users dropping out too early, leaving it incomplete. This requirement, matched with the above aims and other conditions, significantly affected the design of the Item bank, as illustrated in the next chapters.

To summarize the purpose of the Item Bank, we propose the notion of a **self-reflection tool**, even though the official and common-use name of the project refers to a 'self-assessment tool' (SAT).

It should be stressed that **this tool is not intended to measure the users' current digital competence in view of its certification or similar purposes**. This would require a different approach from that adopted in this project in terms of: test delivery mode (which should be in presence and under controlled conditions rather than self-administered); amount and type of content/questions (a significant number of knowledge

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[1] The DigComp framework is in its third edition, all available at https://ec.europa.eu/jrc/en/digcomp. A sequential numbering scheme of two numbers (major, minor) is used to keep track of different versions of DigComp. When there is a significant change in the conceptual reference model, the first number (major) is changed (i.e. 1.0 to 2.0). Improvements or integrations of specific aspects are reflected in the number after the comma (e.g. 2.0 to 2.1).

The version published in 2013 is considered 1.0. The version published in June 2016 is DigComp 2.0 as it includes an update of the conceptual model and new vocabulary. The version published in May 2017 is DigComp 2.1 and includes an update of proficiency levels and examples.

questions and practical exercises, real or simulated, would be needed, increasing the cost and complicating their production and maintenance in multiple languages and over time); time needed for taking the test on all 21 competences at different proficiency levels.

1.2 Specific aims and steps of the DigCompSAT project

The stages and activities agreed with JRC to deliver the final Item Bank and methodology are visualized in the image below.
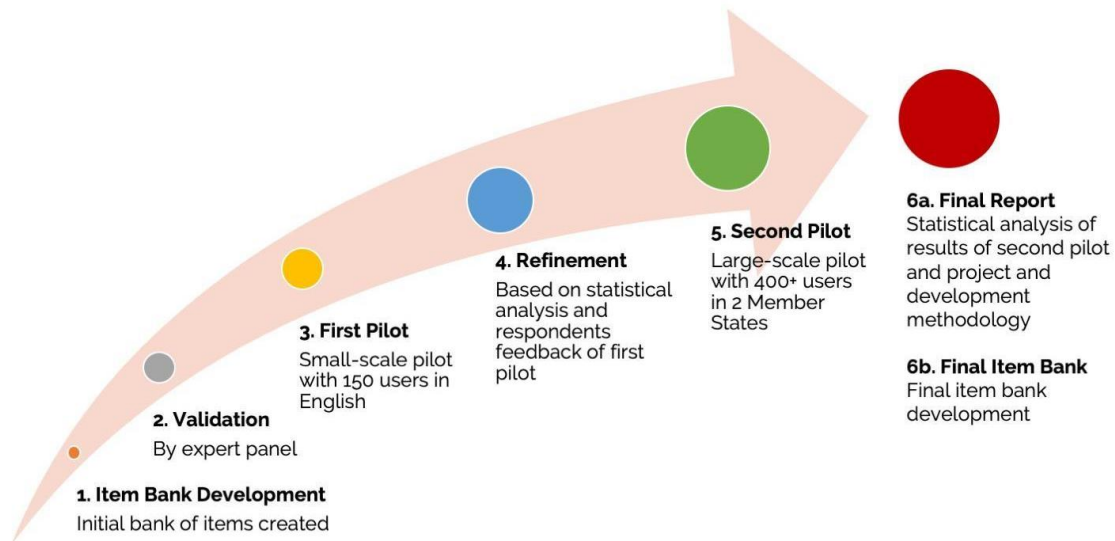
Figure 1 – Project Overview

Chapter 1 of this report gives a brief overview of the project, its aims and objectives and timeline.

Step 1 (Item Bank creation) is addressed in Chapter 2 of this Report along with step 2 (Validation by expert panel).

Step 3 (first pilot in Ireland) is the content of Chapter 3, whereas step 4 (the refinement of the Item Bank based on Pilot 1 results) is dealt with in Chapter 4.

Step 5 (second pilot 2 in Latvia and Spain) is the content of Chapter 5, which also summarizes the main conclusions of the statistical analysis done on the pilot's results (step 6a).

The last (minor) items revision following Pilot 2 and the main features of the resulting final Item Bank (step 6b) are described in Chapter 6.

Finally, Chapter 7 presents the main challenges and key lessons learnt throughout the different project steps, including some still open issues.

To facilitate reading, at the beginning of chapters 2, 3, 4 and 5 – which illustrate the operational phases of the project – we provide a short summary of the key challenges, steps made and related guiding criteria, and some results.

Chapter 2. INITIAL ITEM BANK CREATION

KEY CHALLENGES

● Developing **self-assessment (SA) tool** for people interested in an employability perspective

● Identifying the **appropriate vocabulary, syntactic and composition rules** to meet the SA statements' intended 'quality' criteria

● Guaranteeing **usability** of the test in different contexts and limiting its obsolescence

● Developing SA statements that should cover the knowledge, skills and attitude elements of each **DigComp competence**

● Developing SA statements that should reflect the three main **macro-proficiency levels**: foundation, intermediate and advanced

● Defining effective and standardized **answering options**

STEPS

1. Analysis of DigComp main topics 2 3 4 5	
1 **2. Preparation of SA statements and answers** 3 4 5	
1 2 **3. Validation by experts** 4 5	
1 2 3 **4. Design of initial Item Bank** 5	
1 2 3 4 **4. Design of DigCompSat for Pilot 1**	

1. Analysis of the main subcomponents/topics of DigComp's 21 competences	identified 48 main topics
	classified the 48 main topics by type (knowledge, skills, attitude)
2. Preparation of self-assessment statements and answering options	looked at existing sources (mostly based on the DigComp framework) for inspiration
	created SA statements (ex-novo, re-using and/or adapting sources

	Statements design criteria
	related to one of the DigComp's main topics
	short and simple as possible
	related to practical actions and common situations in digital life (especially in the world of work) valid in different national contexts
	with examples
	neutral with respect to commercial brands and specific technological solutions
	addressed all three competence elements (knowledge, skills and attitudes)
	referred to DigComp's three macro proficiency levels, roughly in the following proportion for each competence: 25% foundation level, 50% intermediate level and 25% advanced level
	Answering options
	scale for Knowledge and Skills statements on a 4-level scale, reflecting in particular the degree of autonomy, one of the key dimensions of proficiency levels in DigComp 2.1
	scale for Attitude statements on 4 levels
3. Validation by experts	105 items covering all DigComp areas and competences
	2 initial questions called 'reference' items taken from the DSI measuring approach added on JRC's request to perform additional analysis
4. Design of initial Item Bank	105 items covering all DigComp areas and competences
	2 initial questions called 'reference' items taken from the DSI measuring approach added on JRC's request to perform additional analysis
	Item Bank for Pilot 1 100 items called 'original' or 'true' items covering in sets of 4, 5, or 6 all 21 DigComp competences, with a balanced mix of competence element types and proficiency levels. 5 items called 'fake' or 'over claiming' items, one for each DigComp area, designed with the aim to check the attention paid by respondents in answering the questions.
5. Design of DigCompSAT for Pilot 1	DigComp areas and related items presented in the sequence Area 1, 3, 4, 5 and 2, to avoid leaving the areas with less familiar topics at the end, when respondents tend to be more tired
	added the answering option "I don't understand this question" to give respondents the possibility to highlight questions that they found unclear

2.1 Item bank creation methodology

Given the project's general aims, we agreed with the Joint Research Centre (JRC) to develop **self-assessment (SA) statements** that should cover the knowledge, skills and attitude elements of each DigComp competence and reflect the three main macro-proficiency levels: foundation, but mostly intermediate and advanced, given

that the SAT's envisaged ideal target users (Europass customers) are people interested in an employability perspective.

Considering that we had identified **48 main topics** in DigComp's 21 competences (see Annex 11 – Main subcomponents/topics), we agreed to develop **at least one item per topic**, up to around **100 items in total**. Test-taking duration with this volume of items would be checked in the first pilot survey.

The creation of the Item Bank took place with the following steps.

Identification of competences' sub-components/ main topics

Through a preliminary analysis, we identified for each DigComp competence their sub-components (henceforth called for simplicity 'main topics' or 'topics'), by splitting the competence descriptor text into the 1-4 short sentences (separated by a full stop, comma or "and" conjunction) that make up the descriptor itself. In total, we identified 48 short sentences out of DigComp's 21 competences (see Annex 11).

Analysis of main topics

With the aim to create (or find) at least one SA statement for each main topic in the Item Bank, we first analysed and discussed the meaning of each short sentence: *"what are we talking about here and what do we want to highlight?"* In this questioning, we also had in mind the SAT's ultimate goal to enhance the respondents' understanding of digital competence and stimulate their self-reflection about their positioning with respect to it.

We then classified our interpretation of the sentences to one or more of the three competence elements in DigComp and chose the words that would characterize the related SA statements:

— **knowledge** (K = "I know what /that…", "I am aware of …");
— **skills** (S = "I can …", "I know how to …", "I am able to…");
— **attitude** (A = "I care/am concerned about…", "It is a problem for me that …", "I enjoy/like …").

Such 'tagging' helped us find, adapt or create one or more SA statements coherent with the identified element types (the scales used to assess these components are presented below).

For instance, when analysing competence 4.2 Protecting personal data and privacy, we identified two aspects to highlight in one of its main topics "To understand that digital services use a 'Privacy policy' to inform how personal data is used", these are:

a) the awareness/ knowledge that privacy policies exist, a typical knowledge aspect (proposed SA statement *"I know that digital service providers usually have privacy policies that explain how they use the personal data they collect from me"*);

b) the attention/effort put into actually reading those policies, an attitude aspect (proposed SA statement *"I am concerned about and read the privacy policy of the digital service providers I want to register to"*).

The mix of items related to different competence topics varies depending on the features of each competence, and our interpretation of them. But in principle, we agreed with JRC to have in the initial Item Bank at least one attitude statement and a variable number of knowledge and skills items for each competence. As we shall discuss later, attitude items proved somewhat problematic in various respects and eventually we kept one or more of such items only for each competence area.

Preparation of self-assessment statements and answering options

Once we identified the types of SA statements that we wanted, we looked at existing sources (see Annex 1 – List of sources for the initial Item Bank), possibly but not necessarily based on the DigComp framework. We used in this process research documents, working groups publications, publicly available online self-assessment tests, suggestions from experts of specific topics. We used these sources to get inspiration and, when appropriate and possible, in agreement with the source owners, also to re-use and/or adapt some SA

statements which looked fit for the Item Bank. When we could not find something convincing to work on, we created ex-novo the desired SA statements.

For the first pilot survey that would test the SAT items, we envisaged to use about 100 statements. These should be selected and validated by an expert panel from a larger set of approximately 140 items.

- For competences with 1-2 main topics, we prepared on average 6 items. The expert panel selected 4 items for the pilot test.
- For competences with 3-4 main topics, we prepared on average 8 items. The expert panel selected 6 items for the pilot test.

The number of items selected by the experts (4 or 6) should provide enough variety to give test-takers a broad idea of what each competence is about.

In the initial creation and later selection/revision of SA statements, we adopted the following criteria:

A. they should be related directly or implicitly to one of the DigComp's main topics and all topics of each competence should have at least one statement addressing them;

B. they should be as short and simple as possible;

C. they should relate as much as possible to practical actions and situations which are common in digital life, especially in the world of work, but without being too connected to specific contexts, to increase usability of the test in different contexts and limit its obsolescence;

D. whenever appropriate and feasible (and taking into account the previous requirement), they should include examples (usually in parenthesis) in order to clarify the statement's meaning and increase the informative function of the SAT;

E. they should address, with a variable composition for each competence, all three competence elements (knowledge, skills and attitudes);

F. they should refer in terms of task complexity and cognitive domains to DigComp's three macro proficiency levels (Foundation, Intermediate, Advanced) roughly in the following proportion for each competence: 25% foundation level (1-2) (F), 50% intermediate level (3-4) (I) and 25% advanced level (5-6) (A);

G. the phrasing should be in principle neutral with respect to proficiency aspects (e.g. "I am able to" rather than "I find it easy to") because these should be highlighted by the answering option selected by the respondent (see below);

H. the phrasing should be such that, depending on the type of statement (K, S, A) the respondent can select a meaningful answer from the proposed options set (below), after the instruction "Please choose among the following the option that best describes your situation";

I. there should be for each competence area one 'fake' statement, i.e. over claiming items asking about non-existing/absurd concepts, to be used for controlling the effect of overestimation due to random answering or intentional over claiming which are frequent in self-assessment tests. The usefulness and contribution of these items would be tested in the first pilot survey.

The answering options for Knowledge and Skills statements are on a 4-level scale, reflecting one of the key dimensions (autonomy) of proficiency levels in DigComp 2.1. The scale for Attitude statements is also on 4 levels, but the answer's wording reflects the diversity of these statements that may start with "I care/am concerned about…", "It is a problem for me that …", "I enjoy/like …" and so on.

The three scales are articulated as follows:

Knowledge

0. I have no knowledge of this / I never heard of this

1. I have only a limited understanding of this and need more explanations

2. I have a good understanding of this

3. I fully master this topic/issue and I could explain it to others

Skills

0. I don't know how to do it

1. I can do it with help

2. I can do it on my own

3. I can do it with confidence and, if needed, I can support/guide others

Attitude

0. Not at all

1. Not much / very little

2. Yes / Yes I am /Yes I do

3. Very much!

2.2 Validation by experts

An expert panel was convened in Brussels on November 14, 2019 to review the initially developed Item Bank in a structured workshop (see Annex 2 – Experts Workshop Participants and Agenda).

During the meeting the 15 invited experts were split into five groups (each made of 3 experts plus one representative of ALL DIGITAL, EC and JRC team members) and were given the task to look carefully at the 142 SA statements (6-8 for each DigComp competence) prepared by ALL DIGITAL in view of the first pilot test.

Each group was assigned competences/SA statements to comment upon and, if needed, suggest improvements by answering to the following questions:

— Are they clear and easy to understand?
— Are they at an appropriate level in terms of complexity/cognitive challenge?
— Are they correctly classified as referring to the knowledge, skills and attitude competence element types?
— Are there any important competence aspects missing? (in view of providing future test users with a sufficiently articulate presentation of each competence)
— Which items could be removed? (while retaining general balance of type and level)

The distribution of competence areas and items among the expert groups is illustrated in the following table and aimed to evenly distribute the workload in terms of item complexity and numbers.

Table 1 – Distribution of items among the expert groups

DigComp competences	Items n°	Group n°
5.1 Solving technical problems 5.2 Identifying needs and technological responses	12	Group 1
5.3 Creatively using digital technologies 5.4 Identifying digital competence gaps	14	
1.1 Browsing, searching and filtering 1.2 Evaluating data, info	14	Group 2

4.3 Protecting health and well-being 4.4 Protecting the environment	12	
3.1 Developing digital content 3.2 Integrating and re-elaborating content	12	Group 3
3.3 Copyright and licenses 3.4 Programming	12	
2.6 Managing digital identity 4.2 Protecting personal data and privacy	16	Group 4
2.2 Sharing through digital technologies 2.4 Collaborating through digital technologies	14	
1.3 Managing data, info and content 2.1 Interacting through digital technologies	12	Group 5
2.3 Engaging in citizenship through digital technologies 2.5 Netiquette	16	

The goal for each group was to come up with an approved list of 4 to 6 items (original version, revised version, new/alternative statement), for a total of the around 100 statements to be used in the first pilot survey. Each group reviewed 4 competences in the two 2-hour sessions, allowing approximately one hour for each competence.

The feedback from the experts was the following proposal:

— 9 items were accepted as such and left unchanged;

— 42 items were recommended to be removed (much discussion took place within each group on which items to 'sacrifice' in view of the 100 items target for the first pilot);

— 84 items got a proposal of a revised version of the statement. Along with the revised version, in 27 cases the proposed proficiency level (foundation, intermediate advanced) was also changed. Similarly, in 28 cases the proposed statement type (knowledge, skills and attitude) was changed;

— in 7 cases, a completely alternative statement was proposed to replace the existing item.

Based on the suggestions of the experts, a further review of the Item Bank was carried out in cooperation with the JRC staff. The removals, revisions and replacements suggested by the experts were carefully assessed and some items were further modified and integrated. The resulting Item Bank was checked to verify, once again, the items balance with respect to knowledge, skills and attitudes and to proficiency levels. As well, the resulting Item Bank was analysed both in terms of the content and the syntactic structure of the items, to verify that they would guarantee a self-reflection experience adequately reflecting DigComp's articulated view of digital competence, and a fluid usage for the users. The version of the Item Bank used in the first pilot was released after this second revision phase (see Annex 11: Item Bank used in Pilot 1**).**

2.3 The initial Item Bank

The Item Bank used in Pilot 1 comprised 105 items related to all DigComp areas and competences.

Of these items, 100 called **'original' or 'true' items** covered in sets of 4, 5 or 6 items (depending on the number of sub-components of each competence) all 21 DigComp competences, with a balanced mix of competence element types and proficiency levels.

Another 5 items called **'fake' or 'over claiming' items** (one for each DigComp area) were statements designed as absurd or referring to non-existing tools and services, with the aim to check the attention paid by respondents in answering the questions.

In the Moodle implementation of the Item Bank in Pilot 1 (see below), that we also call DigCompSAT in the following pages, DigComp areas and their items were presented in the sequence Area 1, 3, 4, 5 and 2. This was done to avoid leaving the areas with topics less familiar to users (4 and 5) at the end, when respondents tend to be more tired.

Finally, we added a fifth answering option "I don't understand this question", which aimed to give respondents the possibility to highlight questions that they found unclear. As discussed later, this option created some issues, both in Pilot 1 and 2 (where it was made available again, albeit in a different formulation).

Chapter 3. PILOT 1 – SMALL-SCALE PILOT IN IRELAND

KEY CHALLENGES
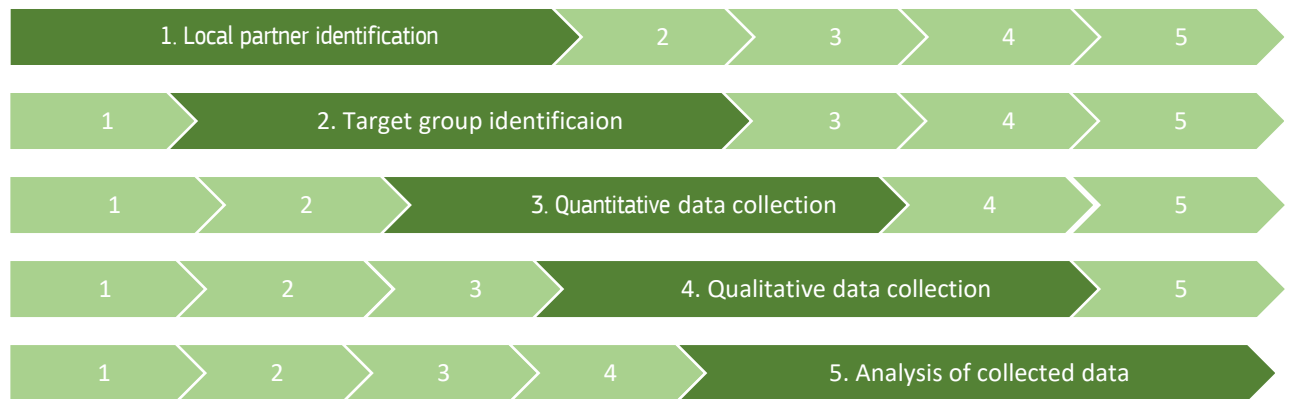
●**Gathering data** (answers to the DigCompSAT) for psychometric and other statistical analysis of the Item Bank

●**Evaluating** the reliability and validity of the Item Bank

STEPS

1. Local partner identification	2	3	4	5
1	2. Target group identificaion	3	4	5
1	2	3. Quantitative data collection	4	5
1	2	3	4. Qualitative data collection	5
1	2	3	4	5. Analysis of collected data

1. Local partner identification	Partner selection by ALL DIGITAL in agreement with the JRC (Irish Computer Society – ICS Skills)
	Criteria for local partner identification
	Experience with DigComp Framework in practice · Availability of the organisation for the tasks in the estimated time
	Proven outreach to the target group in terms of overall number and composition
	Appropriate facilities and human resources for the assisted data collection process
2. Target group identification	150 participants
	Participants selected to proportionally represent the demographic situation in Ireland
	Parameters for target group selection
	gender

	age group education level digital skills level (measured through ad-hoc 'sampling' questionnaire)
	'Sampling' questionnaire on gender, age, education and questions to assess preliminary digital skills level based on those used by EUROSTAT for the DSI human capital indicator
3. Quantitative data collection	Valid SAT questionnaires from at least 150 respondents
	Moodle platform for online data collection: free open source product, multilingual, user interface accessible from different devices, export database to SPSS
	Participants supported face-to-face during test-taking in ICS and other local partners' premises
4. Qualitative data collection	Observation and dialogue with respondents during test-taking
	Focus groups with 15 participants to discuss their experience with the test
5. Analysis of collected data	178 completed records on Moodle platform, 144 of which valid and used for statistical analysis
	Notes on the observations and focus group results analysed by the research team

KEY RESULTS

Time spent on SAT (minutes)

STANDARD DEVIATION: 24.73

MIN: 12
MEDIAN: 27
MEAN: 35
MAX: 111

Test score (%)
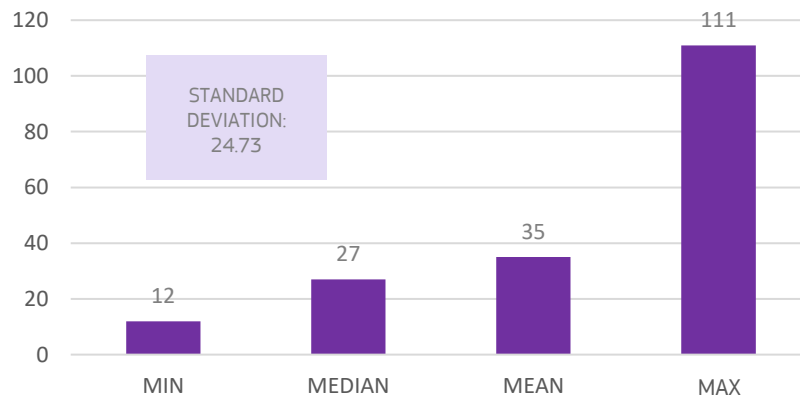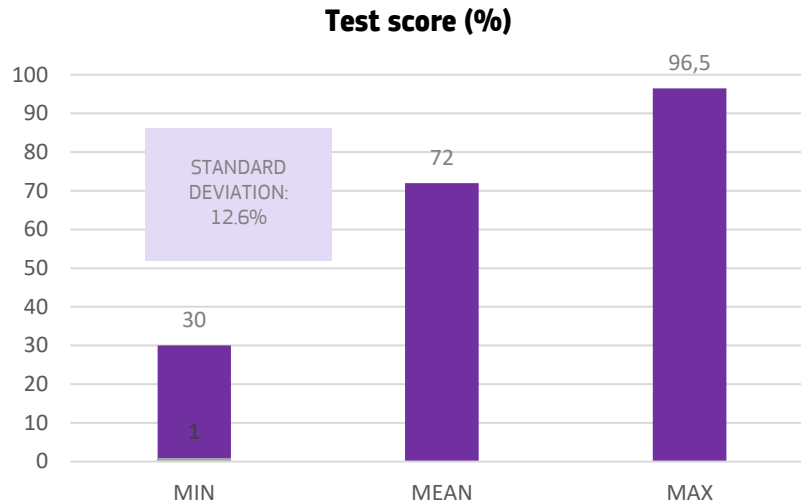
3.1 Objectives and approach of the First Pilot

The first pilot took place in Ireland since the Item Bank was originally developed in English, to facilitate all the initial project steps and interactions among the ALL DIGITAL team members, JRC staff, experts and ALL DIGITAL had found a good local partner in that country.

The pilot was to test among 150 individuals the initial Item Bank. The test aimed to obtain data for a psychometric and statistical analysis to evaluate the reliability and validity of the Item Bank. This analysis should help to identify the items which had the greater impact on the competence areas, better reliability properties, and those items that were weaker and therefore candidates for removal from the Item Bank.

The first pilot had two components with related data collection processes: first, a **quantitative** step to collect valid SAT questionnaires from at least 150 respondents and a **qualitative** step represented by a focus group with a small number (15) of those respondents to discuss their experience with the questionnaire.

3.2 Selection of the piloting partners

For both Pilot 1 and Pilot 2, ALL DIGITAL selected local partners to carry out the tests, in agreement with the JRC. Local partners first in Ireland and later in Spain and Latvia were chosen based on the same criteria:

— Experience with DigComp Framework in practice.
— Availability of the organisation for the tasks in the estimated time, i.e. planned period of the field test in the year (January 2020 for Pilot 1 and Spring 2020 for Pilot 2) and duration (2-3 weeks maximum).
— Proven outreach to the target group in terms of overall number (150 people in Pilot 1, at least 200 people in each country for Pilot 2) and composition.
— Appropriate facilities and human resources for the assisted data collection process, in particular: experienced local coordinators familiar with the software used for data collection (Moodle); high speed Internet connectivity and PCs or laptops to access the data collection platform (as we shall see, in Pilot 2 this requirement became less important as the whole process was moved entirely online).

In Ireland, the local partner selected for Pilot 1 was ICS Skills. ICS Skills is a registered charity established by The Irish Computer Society (ICS) in 1997. ICS Skills is the national awarding body for a range of IT skills programmes from digital skills to IT Professional skills. It has overseen the participation of over 700,000 citizens in the European Computer Driving Licence (ECDL) programme alone. It has also delivered basic Internet skills training to over 8,000 individuals including; people aged 45+, farming communities, small business owners, jobseekers, persons with disabilities, and disadvantaged groups. ICS Skills have experienced staff who are used to delivering research projects and working with the target audience.

3.3 Identifying the target group in Ireland

The participants of the pilot were selected to proportionally represent the demographic situation in Ireland (see Annex 4 – Demographics). All the participants were assigned one value of the following parameters each:

— gender (male, female)

— age group (16-24, 25-54, 55-65)

— education level (low= primary or lower secondary school; medium= upper secondary school and college (non-university); high= university graduate, master or equivalent, doctoral or equivalent)

— digital skills level (foundation, intermediate and advanced)

To identify individuals with the required demographic features and digital skills level, we used a pre-selection questionnaire (see Annex 3 – Sampling questionnaire) with three questions on gender, age and education background and other questions on their recent digital experience, based on the methodology developed by EUROSTAT for the Digital Skills Index (https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=14342).

3.4 Managing data collection and participants' qualitative feedback

ALL DIGITAL set up a Moodle platform which hosted first the sampling questionnaire and later the 107 questions to be answered by the test participants. Moodle was chosen as a free open source product, which has several advantages compared to other online survey platforms. It supports all standard quiz question types, an export database to SPSS and promotes multilingual survey. It also grades questions and records test-taking time automatically, shows correct/incorrect scores and provides feedback for test-takers after completion. Furthermore, it has an easily customizable user interface accessible from different devices (computers, tablets, mobile). It also supports multi-session delivery of the DigCompSAT (i.e. a user can save progress to return to a competence area of the DigCompSAT).

Data collection took place over a three-week period in January 2020. ICS Skills worked with its partner organisations to engage suitable candidates. The vast majority of the participants attended learning venues, while others were engaged at their workplaces. After the sampling questionnaire was completed and assessed for eligibility, a brief explanation about how to access the SAT on the Moodle platform, they were told that they could respond at their own pace, taking a break if needed (see below "agreed break points").

Participants answering the SAT from ICS Skills' and partners' premises were supported by local coordinators/observers face-to-face. Coordinators did not help with *interpreting* the items and could give only technical support at request of the participants, although none of them was required. They also had an observing role and identified if candidates had issues with any particular items, recording these issues on a structured note-taking sheet for all the items. This was, in fact, the start of the qualitative part of the pilot,[2] as the coordinators/observers took notes and asked for explanations during the data collection sessions to respondents about any uttered difficulty, recommendation, misunderstandings with the items or the response options, unknown terms, phrases, language barriers etc. These notes were shared later on with the ALL DIGITAL research team and proved very useful for the interpretation of some results (e.g. concerning the average scores and difficulty index of some questions/items). The ALL DIGITAL team also worked with ICS Skills to understand lessons learnt for the design of Pilot 2.

3.5 Key statistical results

3.5.1 Number of records used for statistical analysis

The data collection process produced 178 completed records on the Moodle platform: 21 respondents were removed from the database due to the following facts: their attempts were not finished and the information

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[2] The qualitative part of Pilot 1 with the 'Focus Groups' is presented later on in section 3.6.

in some of the items could not be processed; their attempts had more than 5 skipped items;[3] their attempts lasted only 10 minutes or less and it was judged unlikely that a participant could realistically read the items and the answers in such a short time. The remaining 157 records were used for a first round of statistical analyses that led to identifying 13 more records to be removed due to a very high over claiming score (see Annex 5.3). The full statistical analysis was then performed with 144 respondents' records.

3.5.2 Participants' demographics and test results

The demographics of participants included in the final statistical analysis of Pilot 1 are summarized in the table below. The table shows that in the Irish pilot, there was a demographic weighting in favour of younger, more educated, working-age users, and away from older and less educated users. Additionally, they tended to be more in the notionally higher digitally-skilled category according to the scoring of the initial sampling survey.

A number of lower-educated, older candidates were identified and contacted along with the others by ICS Skills earlier in December, but then did not show up to take the SAT in January, probably due to the hiatus of the New Year break. As a result, ICS Skills recruited again later in January, but at shorter notice mostly younger, more educated candidates were available to complete the SAT.

Table 2 – Demographics of pilot respondents in Ireland

Pilot 1 – Ireland (Target – 150, Verified completed SATs – 144)											
Male	*Female*	*16-24*	*25-54*	*55-65*	*Low Educ*	*Med Educ*	*High Educ*	*No Skills (6 & under)*	*Foundation (7-14 pts)*	*Intermediate (15-22 pts)*	*Adv (23 & over)*
63	*81*	*35*	*88*	*21*	*5*	*66*	*73*	*3*	*12*	*47*	*82*
44%	*56%*	*24%*	*61%*	*15%*	*3%*	*46%*	*51%*	*2%*	*8%*	*33%*	*57%*
	144			*144*			*144*				*144*

Average test time

The average **time spent on the SAT** by the 144 participants was 35 minutes, with the minimum of 12 minutes and the maximum of 111 minutes and the standard deviation of 25. The correlation analysis of test time with respondents' gender, age group, general education level and initial digital skills level showed the following:

— gender did not show differences in the taking test time;

— on average, younger participants had finished the SAT in a shorter time;

— the average time spent on the test by the lower education group was longer than for medium or high education level groups. However, low educated people were rather underrepresented in the pilot;

— respondents in the foundation skills group required more time to complete the SAT than those with initial intermediate or advanced digital skills.

Average scores

As mentioned in Ch. 2.3, there were 100 'true' + 5 'fake' items used in Pilot 1 (all of them classified for internal purposes as knowledge, skill or attitude items). These items could be answered by using one of the 4-level scales offered by the system depending on the type of item, and an additional option "I don't understand this question". The scoring was the same for answers at the same level, ranging from 0 to 1 point, as shown in the last column in Table 3.

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[3] The participants had been advised not to skip the items, but as the platform did not restrict participants from moving to the next item before answering the previous one, this occurred in some cases.

Table 3 – Answering options and scoring by item type

Knowledge items	Skills items	Attitude items	Score
I have no knowledge of this / I never heard of this	I don't know how to do it	Not at all	0.00
I have only a limited understanding of this	I can do it with help	Not much/ very little	0.33
I have a good understanding of this	I can do it on my own	Yes I am / Yes I do /Yes it does	0.67
I fully understand this topic/issue and I could explain it to others	I can do it with confidence and, if needed, I can support/guide others	Very much	1.00
I don't understand this question			0.00

Table 4 below shows the average scores of participants' answers for all items in Pilot 1. The mean values for the scores are expressed in percent out of 100%. The participants were not warned that there were fake items intentionally included in the SAT. It was expected that participants with higher level of digital competence would recognize the fake items more easily and would choose the answer "I don't understand this question", since those items were designed not to be actually understood, thus receiving 0 points. At the same time, we expected that participants with lower level of digital competence would state that they "Have no knowledge of this…", which would also give them 0 points for the item. So, assuming that the items were well formulated, and the participants would answer honestly, we expected that on average the participants would receive very low scores for the fake items, ideally close to 0 points. Eventually, the fake items were confusing to all the participants. As a result, whereas the mean score for the "true" items was 72.1%, the mean score for fake items was only 48.8%, which was higher than we expected.

Table 4 – Average scores of participants' answers for all items in Pilot 1

	True Items (100)	Fake Items (5)
Mean	72,1	48,8
Minimum	30,3	5,0
Maximum	96,5	90,0
N	144	144
Std. Deviation	12,6	19,1

The correlation analysis of average scores with respondents' gender, age group, general education level and initial digital skills level shows the following:

— there is no visible trend of correlation between age groups and average scores, having spread between 70.4 % to 72.9 %;

— there is a slightly higher average score for male (74%) compared to female (70%) answers;

— correlation is observed between respondents' education level and test results. For the lower education group, the average score is 67.6%, for the medium level education 69.2% and 75.0% for the higher education group;

— a clear correlation between the SAT scores and respondents' initial digital skills level is observed. The average score for foundation level respondents is 62.8% raising up for all groups sequentially and reaching an average score of 76.3% for the advanced digital skills group.

3.5.3 Indicators used for the overall SAT reliability and quality of individual item

The approach for the psychometric analysis has several dimensions (metric properties and structural components):

— Cronbach's alpha

— Means

— Standard Deviation

— Difficulty

— Discrimination

— Dimensionality

— Structural elements

— Proficiency levels

— Item types

— Individual scores

— Proficiency levels

— Background variables

Cronbach's alpha model as basis for test reliability

One of the most common indicators to check the internal consistency of a test (based on Classical Test Theory) is Cronbach's alpha.

Cronbach's alpha measures reliability or internal consistency. Reliability is how well a test measures what it should. SPSS calculates the alpha value with the following equation:

Where: N = the number of items. $c̄$ = average covariance between item-pairs. $v̄$ = average variance.

Alpha can range from .00 (no consistency in measurement) to 1.0 (perfect consistency), and from 0.7, a test can be deemed as good or acceptable.

Item statistics

Beyond Cronbach's alpha, item statistics (like Means and Standard Deviation) were used to show the distribution of items. For instance, item statistics can indicate items with extremely high values, suggesting they might decrease reliability (hence deleting an item should be considered).

Standard deviation is a measure of dispersion in statistics. 'Dispersion' tells how much data is scattered. Specifically, it shows how much data is spread out around the mean or average.

In an optimal case – even if the items look reasonably homogenous – they might contain sufficient unique variance, in which items are not isomorphic with each other. In extreme cases, items may not be representative of the same content domain or may be only capturing a small bandwidth of the construct. Average inter-item correlation provides an appropriate assessment to detect item-redundancy.

Difficulty index

Item difficulty is a measure of individual test question difficulty. It is the proportion of test takers who answered correctly out of the total number of test takers.

The higher is the value, the easier is the item. Difficulty index helped us to judge whether the items had been appropriately assigned with proficiency levels.

Discrimination index

Discrimination index is the ability of a test to discriminate between different levels of learning. The discrimination index measures how discriminating items in a test are – i.e. how well an item can differentiate between good candidates and less able ones. For each item it is a measure based on the comparison of performance between stronger and weaker candidates in the exam as a whole. The discrimination index value for an item ranges from -1 to +1 with positive numbers over 0.3 reliably implying that an item is positively discriminating. A high discrimination index indicates the test is able to differentiate between levels. The discrimination index can be calculated in different ways and shows results in percentage or in decimal fraction. Its value can be negative, as well.

The discrimination index's value shows, if:

— >= 30%: the item is discriminative, so sorting people by level of skills or knowledge (fewer respondents could answer correctly)
— <30%: or negative, the item is moderate, not discriminative (more people could answer it).

Discriminative items are needed in a test to identify respondents with higher skills, but too many discriminative items might make the test too difficult to accomplish.

Dimensionality

While Cronbach's alpha measures internal consistency and reliability, it is not an indicator of the number of constructs (specific domains) being measured by a scale and how these constructs load together. For this purpose, we have applied dimensionality and confirmatory factor analysis.

Dimensionality describes how the separate items of the measurement tool link to each other and if there are groups of items forming within the assessment tool. If some of the items correlate, they form a dimension or a factor. Regarding dimensionality, we took into account three variables: competence areas, specific competences and proficiency levels. The focus of dimensionality is to know whether the competence areas, competences and the proficiency levels constitute unique constructs.

The psychometric analysis – beyond describing the general metric parameters (reliability) of the DigCompSAT – in the case of Pilot 1, was meant also to support decision-making in the refinement process of the Item Bank. In the case of Pilot 2, psychometric analysis has mainly served the purpose of confirming the reliability and validity – the two technical properties that indicate the quality and usefulness of the competence measurement instrument. We have used various statistical methods and indicators to investigate the metric properties of DigCompSAT.

3.5.4 SAT reliability results

Cronbach's Alpha for the SAT

In order to measure the reliability of the SAT and judge the internal consistency of the items Cronbach's alpha was measured for the 100 'true' items[4] in the Item Bank (SAT total) and for the 'true' items belonging to each of the competence areas. **The Cronbach's alpha value for SAT is 0.980**, which is considered excellent. The Cronbach's alpha for each of the competence areas presented in Table 5 and are also considered good.

Table 5 – Reliability statistics for 5 competence areas

Competence Area	Cronbach's Alpha	Number of Items
1	0,907	14
2	0,944	31
3	0,911	16
4	0,917	21
5	0,926	18

In Annex 5 – Pilot 1: Statistical Analysis, we provide additional tables 5.11 to 5.16 with total statistics with the Cronbach's Alpha if Item Deleted. This measurement indicates what is expected to happen when an item is removed from the Item bank. If the item has a weaker correlation to other items of the same competence area it lowers the Cronbach's alpha value on average. If such an item is removed, then the Cronbach's alpha for the remaining items will improve thus improving the reliability. In general, because a higher value of Cronbach's alpha is usually considered better, items whose removal provide the biggest improvement to Cronbach's alpha should be considered for removal. However, other indicators and consideration may lead to reconsider such decision.

Additional Item Statistics

Several additional indicators were calculated for SAT items in Moodle platform and by using SPSS. The numbers are presented in the 5 tables 5.17 to 5.21 in Annex 5, one for the items of each competence area. The tables include the following information:

⎯ Item code,

⎯ Minimum: minimum score for the group of participants for the item,

⎯ Maximum: maximum score for the group of participants for the item,

⎯ Mean: mean score for the group of participants for the item,

⎯ Difficulty: item difficulty in percent for the group of the participants,

⎯ Corrected Item-Total Correlation: discrimination value of the item,

⎯ Cronbach's Alpha if Item Deleted: possible improvement in Cronbach's alpha if item was deleted (calculated per competence area),

⎯ DIF: result if differential item functioning analysis indicate large (L) or moderate (M) impact of item score for some of the sub-groups of participants,

⎯ Number of "I don't understand…": number of times participants have chosen the answer "I don't understand the question".

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[4] Since the Pilot 1 participants commented that some of the 'fake' items had been perceived as confusing, those items were not included in the calculations of Cronbach's alpha.

— Dimensionality: describing correlation between several items of the same competence area

Tables from 5.22 to 5.26 in Annex 5 give the detailed values of these indicators for all the items grouped in the 5 DigComp areas. Here below, we just summarize the analysis of these results.

In general, the items in the Item Bank were perceived as not very difficult as the item **difficulty** value mostly falls into the upper range of the interval. Generally, items that have difficulty of 80% or more are seen as too easy and such items were considered for improvement or removal from the Item Bank.

The item **discrimination** (Corrected Item-Total Correlation) indicator is affected by item difficulty and items with value below 0.2 should definitely be considered for removal. There were, however, no such items in the Item Bank and rather some items (9) in the range from 0.2 to 0.5 were considered for improvement of removal.

The **differential** item functioning analysis identified a Moderate impact for several items, suggesting that these items should be considered for improvement, and a Large impact for a few items, indicating that they should be considered for removal from the Item Bank.

We calculated how many times participants had chosen the answer option "**I don't understand the question**" for each item. The feedback gathered from participants indicated that several items were perceived as confusing (even leaving aside the 'fake items'), suggesting that these items should be considered for improvement or removal.

The analysis of item **dimensionality** performed by a JRC expert concluded that there is one strong general factor that all items in the Item Bank relate to, and this factor can be interpreted to be the respondents' general digital skills. Additional analysis[5] measured the relation between individual items and found 2 items with a negative relation with other items of the same competence area (which were considered for removal from the Item Bank) and others with a weaker relation to other items in the respective competence areas, which were considered for improvement.

3.6 Focus group discussion with pilot participants

As anticipated in section 3.4 above, two 1-hour long focus groups were held in January 2020, and additional feedback was gathered from a smaller discussion group (34 people in total), following the quantitative data collection process. The focus groups involved 15 participants each, who volunteered from among the test-takers. Participants were from both the 16-24 years old cohort and 25-54 y.o. cohort and had mixed educational backgrounds. Notes were taken by the facilitator (for a full account see Annex 6 – Pilot 1: Focus Groups Report).

The standard and supportive questions designed by ALL DIGITAL and discussed in these groups were:

1. Were there any understandability issues with the questions? (What about the clarity of the questions? How far did you understand what they are asking for?)

2. What do you think about the difficulty of questions? Were the questions easy for you to answer? (Can you tell examples? Why were some questions hard to answer?)

3. What do you think about the length of the questionnaire?

4. How much do you think this questionnaire helped you to understand the range of digital skills that you could learn?

5. What kind of changes would you suggest for the system? Why?

The focus groups identified a general issue with the language used in the test, considered to be a "heavy language" or "language often too dense and too complex". This general issue in fact came out of different aspects:

— some questions were indeed too convoluted

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[5] Confirmatory analysis with bi-factor model.

— some questions used words that could be simplified or made clearer

— some questions found "difficult/irritating" were actually fake items, which were intentionally written to sound strange, unrealistic etc.

— some technical/difficult/specific words were intentionally used as part of the digital vocabulary that test-takers were expected to know.

Other critical observations concerned Attitude items, which by their very nature are less directly related to digital abilities and were deemed by respondents "not very informative", or to have too obvious replies and show no link to digital skills (e.g. "being concerned about the environmental impact of …" or "acknowledging the differences in cultural background and the age of people for communication in digital environments"). Several of these items were eventually removed from the Item Bank also due to their poor statistical indicators.

Additional suggestions from the focus groups, taken up in the refinement of the Item Bank, concern: a more systematic use of examples in statements (much appreciated by respondents); changing the "I don't understand the question" answering option, that many people did not choose even when it might have been the right answer, because to many participants it sounded like admitting "to being stupid"; and changing the "I fully master …" beginning in the highest Knowledge item answering option, that several respondents found 'unnatural'.

The results of the focus group along with those of the statistical analysis contributed to the next stage: the refinement of the DigCompSAT.

Chapter 4: ITEM BANK REFINEMENT

KEY CHALLENGES

- **Update** the Item Bank based on Pilot 1 quantitative and qualitative results

- Cut the number of items to achieve **a test-taking duration** in the 20-30 minutes range

STEPS

| 1. Selection of items to be removed | 2 | 3 |

| 1 | 2. Items improvement | 3 |

| 1 | 2 | 3. Updating the profiency levels of the items |
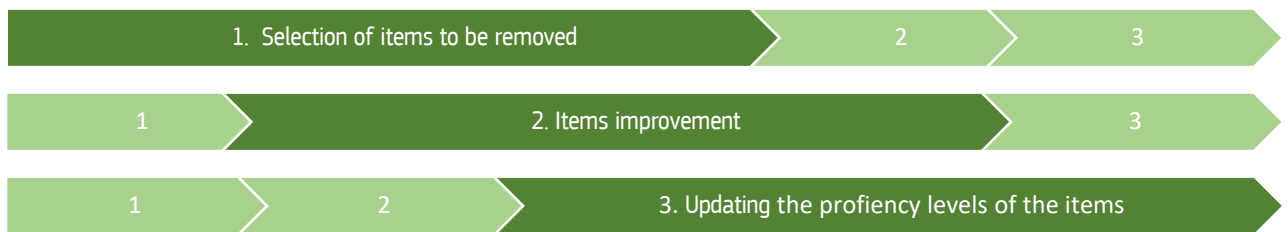
1. Selection of items to be removed	Decision of criteria for item elimination to be considered in the revision of the Item Bank, but not applied automatically
	The hierarchy for item elimination
	Discrimination value of the item < 0.5
	Dimensionality, items weakly related to digital competence or specific areas
	DIF, results of differential item functioning analysis indicating large (L) or moderate (M) impact of item score for some of the sub-groups of participants
	Difficulty index > 80%, as they are considered easy items
	Removal of all 5 'fake' items and 18 'true' items
	82 items selected for the Pilot 2 test
2. Items improvement	50 items unchanged
	15 items underwent minor amendments and editing
	17 items underwent more significant revisions (rephrasing, adding examples etc.)
	2 answering options modified

3. Updating the items proficiency levels of the items	Items proficiency levels re-assigned based on Difficulty index values from Pilot 1

Features of refined Item Bank for Pilot 2

Coverage of the 21 competences

3 competences have 3 items

17 competences have 4 items

1 competence has 5 items

 Item type

all 5 Areas and 14 competences have at least 1 Attitude item. Skills and Knowledge items are distributed evenly across competence Areas

The first pilot test made two important contributions to the improvement of the DigCompSAT, in view of Pilot 2.

First, through direct observation of test-takers and the focus groups held with them, we gathered useful qualitative feedback on the test's items, especially on the language used, and on some test   platform functionality to be improved. For example, this included having clearer information about when the user moves from one competence area to the next and removing some unnecessary icons from the navigation system.

Second, the statistical analysis of the test's answers allowed us to identify eventually 18 'true' items (along with the 5 'fake' items), whose removal from the Item Bank should improve the overall quality of the test and shorten its average duration.

In fact, the results of these two processes in part overlap: 7 of the items identified for removal due to their discrimination index value had also been signalled as critical by the qualitative feedback. In other cases, highlighted weaknesses and suggestions for improvement stemming from the focus groups oriented the review of the items concerned.

Originally, it was expected that after the first pilot the number of items would be reduced to about 60 (with a cut of 40 items), in order to achieve the desired test-taking time of 20-30 minutes. However, the average time needed by Pilot 1 respondents to complete the test with all 107 items was 35 minutes (approximately 3 items per minute). At this rate, cutting about 20 'true' items plus the 5 'fake' items, would reduce average duration by around 8 minutes, therefore within the desired time range. For this reason and given that the overall quality of the test was already high (Cronbach's Alpha of 0.98 for the 100 items and above 0.9 for each of the five competence areas), we agreed with JRC for a more limited item cut (leading to the 82 items used in Pilot 2).

4.1 Selection of items to be removed

Regardless of duration considerations, keeping the mandatory requirement that all 21 DigComp competences should be addressed by the SAT items, we had agreed with JRC that the hierarchy to follow for item elimination should be:

1. **Discrimination** value of the item < 0.5
2. **Dimensionality**, items weakly related to digital competence or specific areas
3. **DIF**, results of differential item functioning analysis indicating large (L) or moderate (M) impact of item score for some of the sub-groups of participants
4. **Difficulty index** >80%, as they are considered easy items

These criteria were considered carefully in the revision of the Item Bank, but were not applied automatically, in order to have in Pilot 2 3-5 items left to be tested for each competence, so as to provide users with a still rich overview of digital competence and enough item variety, in particular with respect to Attitude items (that should have been seriously cut, as 9 out of 22 such items had Discrimination value below 0.5).

Taking these considerations into account the following items were identified for removal:

— 9 items due to their Discrimination value (Q8, 35, 49, 52, 67, 70, 80, 94, 103). Two of them also due to Dimensionality (Q70, 80) and another 2 due to Large DIF (Q49,67);

— 4 items only due to Dimensionality (Q3, 81 ,89, 105; Q3 also due to Large DIF);

— 2 items only due to DIF (Q36, 96);

— 3 items had a relatively high Difficulty index (Q46, 100) and only simply in order to balance the mix of items in the related competence (Q75);

— By removing the above 18 items, the 5 'fake' items (as they confused respondents and had the worst Cronbach's Alpha values) and the 2 initial reference questions, the resulting Item Bank for the second pilot test had 82 items and the following features:

— in terms of competence **coverage**, 3 competences have 3 items, 17 competences have 4 items, and 1 competence has 5 items;

— in terms of item **type**, all 5 Areas and 14 competences have at least 1 Attitude item and Skills and Knowledge items are distributed evenly across competence Areas;

— in terms of item **levels** (recalculated as explained below), there are 17 Advanced items in Areas 3, 4, 5; only 1 in Area 2; and none in Area 1. On the opposite, almost all 15 Foundation items are in Areas 1 and 2; one is in Area 4; and none in Areas 3 and 5. The 50 Intermediate items are quite evenly distributed across all Areas.

The items proficiency levels, originally assigned during the workshop based on consensus building among the experts, were re-assigned based on the Difficulty index values resulting from Pilot 1, by using the scale below:

Table 6 – Revised scale to identify items levels based on Difficulty index values

Proficiency level	Difficulty index value
DIFFICULT	
Very difficult	6-10
Difficult	11-20
Moderately difficult	21-34
About right for the average student	35-65
INTERMEDIATE	
Fairly easy	66-80
FOUNDATION	
Easy	81-89
Very easy	90-94
Extremely easy	95-100

The decision to stretch the 'difficult' category to 65 Difficulty index value reflects the skewed answers distribution in the Irish pilot towards the high levels of the scale (for many questions, numerous respondents chose answering options 3 and 4: I have a good understanding …, I fully master …, I can do it on my own …, I can do it with confidence … etc.). This might be explained by the biased participants composition towards people with high education and digital skills levels and also, possibly, by the well-known overstatement bias of respondents in self-perception/assessment tests.

4.2 Items improvement

For the remaining 82 items of the Item Bank, the weaknesses highlighted by the Pilot 1 focus groups and related suggestions for improvement, as well as shortcoming highlighted by the statistical analysis were taken into account as follows:

— 50 items were left unchanged, except that the word Internet was written systematically with initial capital letter and all items made to end with a full stop;

— 15 items underwent minor amendments and editing (e.g. "I am aware that" replaced with "I know that" and others)

— 17 items underwent more significant revisions (e.g. rephrasing, adding examples etc.), also through an intense interaction with JRC experts. In this process, we paid attention to keep and, in some cases, to restore a balance, when possible at competence level, in the mix of items by proficiency levels. As seen above, the consideration of the first pilot's results had in some cases led us to reclassify at Intermediate or Advanced level items which were originally considered to be at Foundation level. In order to have a mix of items with different proficiency levels, when revising some of those items we made changes which should bring them back to the Foundation level.

Finally, revisions also concerned two answering options which had been pointed at as problematic during the first pilot:

1. The "I don't understand the question" answering option was replaced with "This question is unclear to me";

2. The highest answering option for Knowledge items "I fully master this topic/issue and I could explain it to others" has been replaced with "I fully understand this topic/issue and I could explain it to others".

Chapter 5: PILOT 2 – LARGE SCALE PILOTS IN LATVIA AND SPAIN

KEY CHALLENGES

- **Translating the 82 items** of refined Item Bank into Spanish and Latvian for the large-scale Pilot 2

- **Gathering data** (answers to the DigCompSAT) for the psychometric and other statistical analysis of the Item Bank

- **Evaluating the reliability** and validity of the Item Bank

- Dealing with the **impact of the Covid-19** pandemics

STEPS

1. Local partner identification	2 → 3 → 4 → 5
1 → 2. Target group identificaion	3 → 4 → 5
1 → 2 → 3.Translation of the item bank	4 → 5
1 → 2 → 3 → 4. Pilot. delivery	5
1 → 2 → 3 → 4 → 5. Analysis of collected data	

1. Local partner identification	Partner selection by ALL DIGITAL in agreement with the JRC (IBERMATICA in Spain, Baltijas Datoru Akademija in Latvia). Partner selection criteria as in Pilot 1
2. Target group identification	400 participants (200 in Spain, 200 in Latvia)
	Participants selected to proportionally represent the demographic situation in Spain and Latvia, as in Pilot 1
	'Sampling' questionnaire as in Pilot 1, but with adjusted scoring thresholds for preliminary skills level measurement.
	Piloting partners explained about the specific complexity of Attitude items

34

3. Translation of the item bank	Selected translators who are familiar with the DigComp Framework
4. Pilot delivery	Valid SAT questionnaires from at least 400 respondents
	Spain: test delivery carried out exclusively online, due to restrictions for the Covid-19 pandemic
	Latvia: test delivery carried out both online and in presence
	Additional participant feedback gathered through (voluntary) post-SAT 'User Experience' survey (101 respondents)
5. Analysis of collected data	460 completed records on the Moodle platform valid for the statistical analysis
	No items to be removed due to statistical indicator values. 8 items to be improved due to high rate of "unclear to me" answers
	81% of respondents to post-SAT survey rated the overall user experience as good or excellent

KEY RESULTS

Time spent on SAT (minutes)

SPAIN (200 respondents) LATVIA (260 respondents) TOTAL

STD. DEVIATION:
SPAIN 32,2
LATVIA 26,9

	MIN	MEDIAN	MEAN	MAX
SPAIN	11	24	37	120
LATVIA	10	22	31	120
TOTAL	10	23	34	120

Test score (%)

■ SPAIN (200)   ■ LATVIA (260)   ■ TOTAL

STD. ERROR OF MEAN:
SPAIN 1,52%
LATVIA 1,35%

	MIN	MEAN	MAX
SPAIN	15,3	57,1	100
LATVIA	9,7	55,8	96,8
TOTAL	9,7	56,4	100
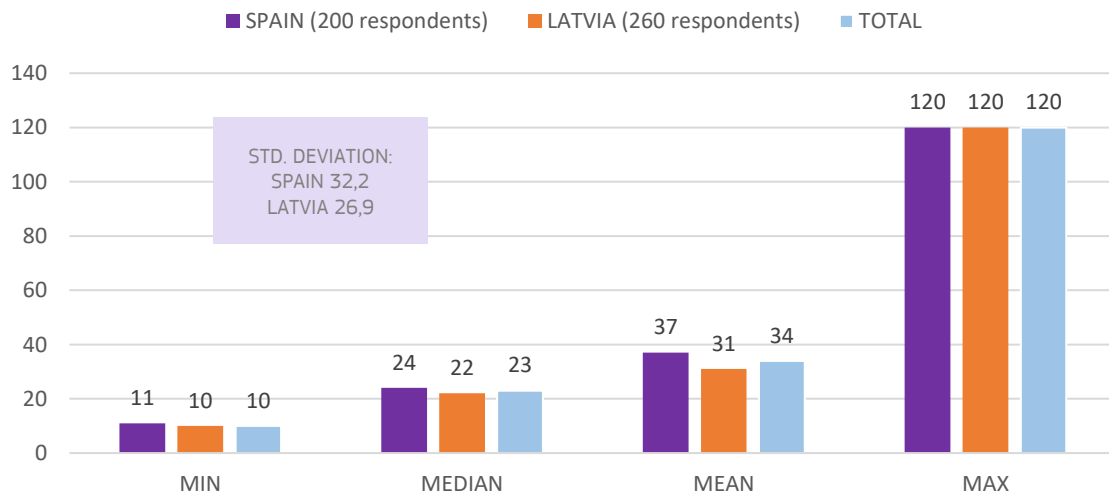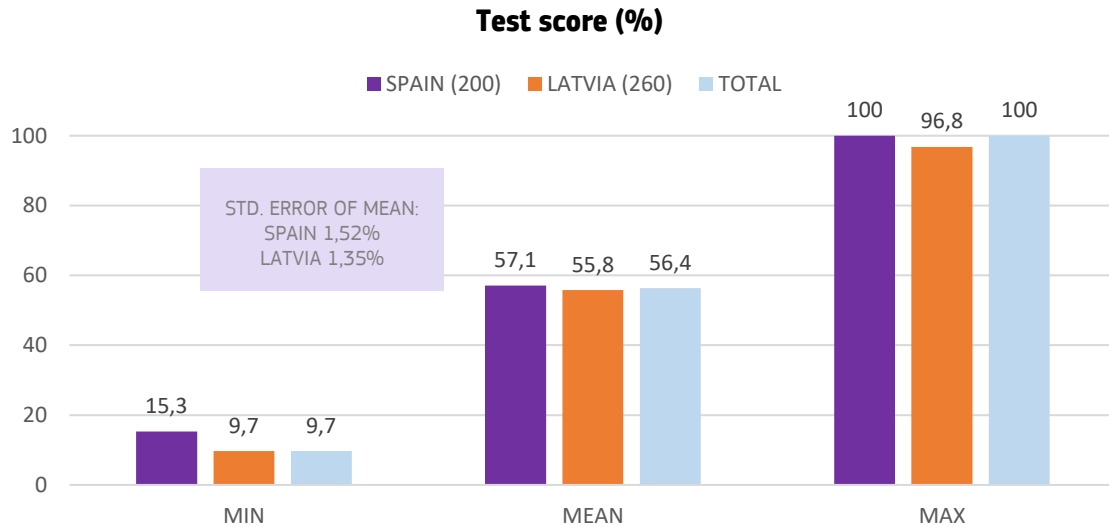
5.1 The objectives of the second pilot

The first objective was to translate the refined assessment tool for foundation, intermediate and advanced levels into the languages of the two Member States involved in the large-scale pilot. The piloting partners translated the Item Bank into Spanish and Latvian. The Pilot organisations then also validated that the language of the survey was appropriate and local native speakers could understand its terminology (in particular terms and expressions related to the 'digital world' and used in the everyday practice of the country.) There was a final check of the translation on the system before it is used in the large pilot.

Secondly ALL DIGITAL was to prepare the digital platform of the instrument for the pilot. We used Moodle again for data collection, which provides among others various question types, unlimited responses, a survey progress bar and it supports multi-language surveys, multi-users and data export. The digital format also provides a simple digital competence profile report at the end to inform individuals about their performance.

Eventually, ALL DIGITAL made sure that the pilot organisations were ready for recruitment and data collection, and fully understood the recruitment tasks.

5.2 Second pilot partners

In Spain, Ibermática is the main contractor for the Basque Government's IKANOS project since 2014. The IKANOS project intends to contribute to the development of a digitally competent Basque society, which is highly participative, co-responsible and user of high-impact digital services. Through the use of digital technologies, societies increase their competitiveness and improve the quality of life of individuals and their collective well-being.

In Latvia, Baltijas Datoru Akademija (BDA) (the Baltic Computer Academy) is the leading centre in the Baltic region for training and certification of professionals and users in the field of digital technologies, as well as providing general and basic digital skills training for employability. BDA has been successfully operating in the Latvian market since 1994.

5.3 Target, coverage and sampling

Pilot 1 had shown that reaching the desired demographic sampling was a major challenge and partners in Pilot 2 were therefore tasked to focus on ensuring that the sampling was much more closely aligned to the sampling targets.

As in Pilot 1 (see Annex 4: Demographics), the target group of Pilot 2 was again set to mirror the demographics of the population in general for each country in terms of gender, age and educational level, with an even split across DigComp competences levels 1 to 6. The partners targeted a country-representative sample of 200 individuals in both Spain and Latvia (400 people in total).

Identifying the target group

To identify individuals across the 6 competence levels in the First Pilot, statements similar to those of the DSI (Digital Skills Index, EUROSTAT) were used. In addition, the questionnaire asked for the gender, age and education level (see Annex 3 – Sampling Questionnaire). In the first pilot, since it was a face to face delivery approach, the questionnaire had been completed on paper, with the partner then compiling the results for analysis. We used the same questions in an identical questionnaire in the Pilot 2, but it was created as an online survey instead of on paper.

"Skills" level in sampling

ALL DIGITAL also analysed the initially-measured skill level of the users in the first pilot (from their sampling questionnaires) against their actual scores in the SAT. The ALL DIGITAL team adjusted the thresholds of the scoring for the second pilot slightly to compensate for a slight "over-scoring" in the sampling questionnaire in the first pilot. The changes have impacted the initial digital skills level that was assigned to each respondent (SAT test-taker) based on the preliminary survey results. These changes from Pilot 1 to Pilot 2 were needed because ALL Digital had a sampling objective to have proportional representation of the 3 macro competence levels: Foundation, Intermediate and Advanced (from DigComp level 1-6). See Annex 3 – Sampling Questionnaire.

5.4 Pilot 2 delivery approach and the Covid-19 crisis

To understand how to smoothly deliver Pilot 2 due to Covid-19 crisis, ALL DIGITAL project team reviewed the first pilot. Aspects such as recruitment of participants and online delivery of DigCompSat were rethought. In the light of the impact of the crisis, public 'lockdown' and the closure of public buildings, libraries, schools, etc, across the most of Europe by this time, ALL DIGITAL and the partners considered available options to deliver the second pilot *before* the summer of 2020. Spain was very badly affected at this time with a complete lockdown in place.

Both pilot partners in Latvia and Spain expressed confidence that they could recruit, deliver and support users to take the DigCompSAT *online*. They worked with their own local partners to support the recruitment, taking into account the demographic requirements, and felt that they could reach the targets with respect to the recruitment. Individuals were recruited remotely by email and phone, completing the sampling survey online. They were eventually sent a link with their username and password credentials when confirmed.

The system itself was also changed to reflect this new fully online delivery mode. There had been some feedback after Pilot 1 showing that people were not aware that they were moving across the 5 competence areas. ALL DIGITAL corrected this in the second pilot with information on each screen indicating which section (corresponding to a DigComp area) the user was currently in, and a short text introduction to each area-section.

Finally, there was a new additional "Guidance" information page (illustrated in Figure 2) which included basic information on the system, the time it would take to complete, the structure of the 5 sections, the answering options, and the feedback users would receive after completing the test.
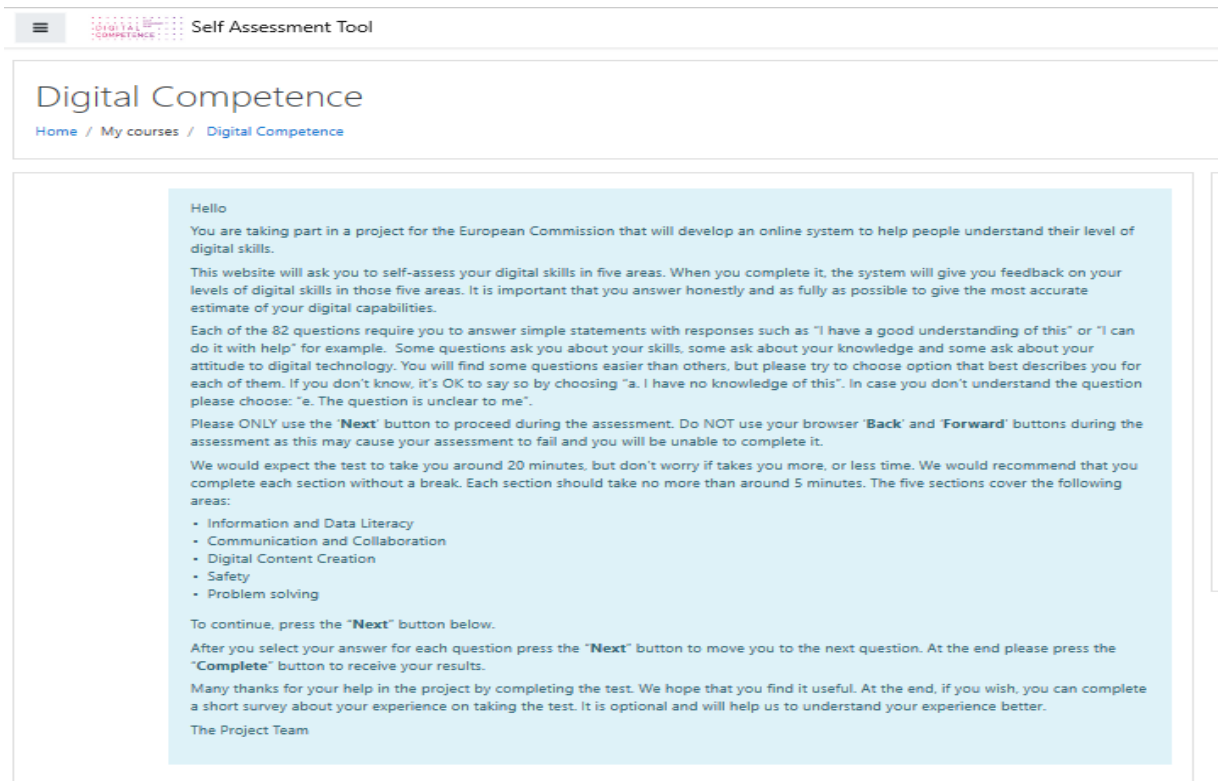
Figure 2 – Screenshot of DigCompSAT Guidance page

5.5 Translation of the Item Bank

For the translation of the Item Bank's statements, piloting partners were explained about the challenges posed by the Attitude items (that they do not address digital skills or knowledge as such, that most of them had a poor scoring in pilot 1 etc.) and were asked to pay particular attention to them in the translation process. The translation of the Item Bank was performed with the following steps:

— A translation template document was prepared in Excel separating text for each individual item, each answer, introduction sections, end report and some technical texts for the user interface in Moodle, and text fragments for the sampling survey. This made the translation more precise and comparable to the translation into other languages.

— Translators very familiar with DigComp Framework were selected to perform the translation from English to both Latvian and Spanish.

— A meeting with the translators and the ALL DIGITAL project manager was conducted explaining the goals of the translation and the expected result.

— The ALL DIGITAL project manager was made available for the translator to contact for any questions during the translation process. It streamlined the translations and gave additional feedback about the results during the translation process. The work of the entire translation for both countries was checked and validated by the pilot partners.

— The final translation was presented to the ALL DIGITAL project team. In addition, samples of translated items were presented to some selected potential users to receive feedback about the items' formulation clarity. The final translated Item Bank was reviewed again by the piloting partners to see the translations in context.

— In the translation process, minor wording adaptations were made to a few items in order to make the matching of statements and answers sound 'right': in the Spanish version this concerned some of the items' answering options; in the Latvian version it rather concerned a few statements' wording. The need for wording coherence (hence slight adjustments) between statements and answering options is likely to show up in different ways in other future language translations of the Item Bank.

— After the pilot had been carried out, statistical analysis showed differences in how participants of the second pilot phase from two countries treated the answer option "This question is unclear to me". The formulations of the translated item texts were evaluated again by the experts of the project team to make sure that the translation was not causing the differences.

5.6 Pilot Delivery in each country

The planning for the second Pilot had taken place well before the Covid-19 crisis hit, which created significant disruption and delay. While the pilot should have taken place over three weeks in April 2020, it was finally delivered over four weeks in July 2020.

Spain

The design of the DigCompSAT project in Spain originally involved a number of educational and training organizations that were accessed through the collaboration of the Basque Government and with whom an agreement was established for their users to complete the questionnaire in face-to-face sessions during their regular classes. These organizations were:

— The University of Mondragon

— The University of the Basque Country

— The professional and occupational training centres of Tolosaldea, Usurbil and the Institute of the Machine Tool in Elgoibar.

— The Kzgunea Telecentre Network, and

— The Basque employment service Lanbide, through the training courses it carries out for unemployed and employed people who want to improve their training.

It was originally planned that universities and vocational training centres would provide young people under 25, vocational training centres would provide people between 26 and 49 and the occupational training courses of the employment service and the telecentre network would provide older users.

Agreements had been reached with all the organizations so that the tests would be carried out in person, integrated into the usual training activity within the course schedule. The teachers of the closest centres were informed of the project's objectives and were shown the test designed for the piloting process. A strategy to distribute the access links among the users was established, so that it would not be necessary to register personal information of the final users (our objective was to maintain privacy and not to have to register names or e-mail addresses).

To meet this objective, each organization would provide access to the piloting process. Once the piloting test was performed, an automatic process would deliver the new password for users to access the DigCompSAT test.

In this way, each centre would have managed the identities of their students without the Ibermática team accessing personal data of users. In each organization there was a project coordinator and Ibermática had a mailing list of teachers and coordinators involved in the project.

When confinement arrived in Spain on March 14, this whole initial plan had to be revised. It took the centres from a few days to a few weeks to implement new protocols and schedules to continue with the online classes. Afterwards, Ibermática was told that they could not share the online time dedicated to teaching with other projects. The telecentre network was closed, and the employment service suspended the training activity.

In response to Ibermática's proposal for students to take the test online, they were told that there was already a very large volume of online assignments that teachers were handing out to students and that they could not add taking the test as just another assignment. The project team was forced to redesign the process for recruiting volunteers through personal contacts, taking into account that they would not have face-to-face contact with end users and that all communication would be through email.

In general, Ibermática feels that, in Spain, the implementation of this project has been greatly affected by the circumstances arising from the confinement caused by the pandemic Covid-19. The 6 weeks of isolation, the total interruption of training activities in person, the lack of presence in the workplace and the social climate have significantly impacted on people's expectations and their willingness to participate in a questionnaire, even though this was part of a European research project. Largely the intended target numbers for sampling were achieved, but the engagement process was far more difficult, particularly to reach candidates with lower education.

Latvia

Since the Covid-19 impact in Latvia was not as severe, some learning venues in Latvia were still engaged for test-taking and were able to accept users in small groups and provide them with access to the terminals, but this occurred only on a very small scale. The piloting of DigCompSAT in Latvia was performed via 3 coordinating centres to achieve a better coverage of the target demographic groups and regional representation:

— "Baltic Computer Academy", a training centre in the capital city of Riga,

— "Ventspils digital centre", a public organisation of regional municipality of Ventspils city, in the region of Kurzeme,

— "Competence development centre of Zemgale region", a public organisation of regional municipality to Jelgava city, in the region of Zemgale.

Initially it was planned to conduct the pilot testing partially in the premises of those 3 organisations but due to the outbreak of Covid-19, most of the testing was performed online. Only a few of the people who visited the regional centres for other reasons completed the DigCompSAT on the premises.

The potential participants of the pilot were contacted individually, through the company managers who had previously indicated the need to assess the digital skills of their employees, or through word of mouth. Some of the participants who completed the pilot test found it interesting and valuable and asked the coordinators if it was possible for their friends and colleagues to participate, too.

Because most of the participants did it online, it took them two stages to complete all the required assignments. The first stage involved completing the sampling survey for assessment of fit to a demographic group. The second stage involved completing of DigCompSAT and the end survey. This required handling of personal data of the participants, e.g. contact information. The participants were asked to give their consent on handling of personal data for this purpose. The personal data was only known to the coordinators of the 3 coordinating centres.

In the first pilot there were actually no *technical* help requests from users to tutors in the room. There were numerous requests for help with understanding the items or the terminology, but none relating to the use of the Moodle platform delivering the test. In Pilot 2, the pilot partners agreed and understood that, because demographic targeting was a priority, participants with low skills and / or low education could need technical support, and therefore provided a technical support number to call if required.

5.7 Key statistical results

5.7.1 Number of records used for statistical analysis

In Pilot 2, 481 participants completed the sampling questionnaire[6] and the SAT, but 21 were excluded from the results of demographics and statistical analysis for a variety of reasons. About 10 participants apparently "clicked through" and completed the SAT in an unrealistic time frame. There were also a small number who completed the sampling questionnaire but fell outside of the demographic targets (over or under age). Finally, a few entered an unidentifiable ID for the sampling and were therefore also excluded. Eventually, we identified a total of 460 completed (200 from Spain and 260 from Latvia) and verified SAT results, for which demographic data was correctly gathered and who completed the SAT in a time deemed feasible.

5.7.2 Participants' demographics and test results

Table 7 – Total number of Pilot 2 participants included in the final statistical analysis

Overall	Spain	Latvia	Total
Target number	200	200	400
Verified completed SATs	200	260	460

The initial target was to have a SAT respondents' sample in each of the 2 countries that matched the general population distribution by age, gender and general education groups in Spain and Latvia. For the initial digital skill level based on the sampling questionnaire, the target was to have all 3 levels (Foundation, Intermediate and Advanced) equally represented in the respondent's samples in each country.

Taking into account the Covid 19 situation and that the test had to be completed online, some of the sample demographic targets were not fully achieved. This problem mostly concerned the distribution by education levels. The lower education target number was reached in Latvia, but significantly underrepresented in Spain. This group is particularly hard to reach in normal circumstances, and, in Spain, it proved to be even harder during the Covid-19 emergency. In Latvia, the higher education level representatives were overrepresented at the expense of the medium level education group. This might be explained by the fact that the medium level education respondents (mostly with VET education level, blue collars or unemployed) are the group less interested in digital skills. The higher education group was also overrepresented in Spain.

Regarding age, the participants were spread across the range with roughly half in the "active working age" 25-54 group. This group are perceived to be the most likely users of a SAT to test digital competences in the future.

The gender proportions in the sample group perfectly matched the distribution of gender in Spain, while in Latvia there was a slightly larger proportion of females in the SAT respondents' sample than in the general population.

Finally, the perceived initial digital skill level was also fairly evenly spread with a slight majority (42%) who fell into "intermediate" level. This feature is common for both countries.

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[6] The number of people who completed the sampling questionnaire was in fact much higher at 570, but many of them subsequently did not complete the SAT and are therefore not included in the demographic analysis.

Figure 3 – Demographics of Pilot 2 participants across the two countries
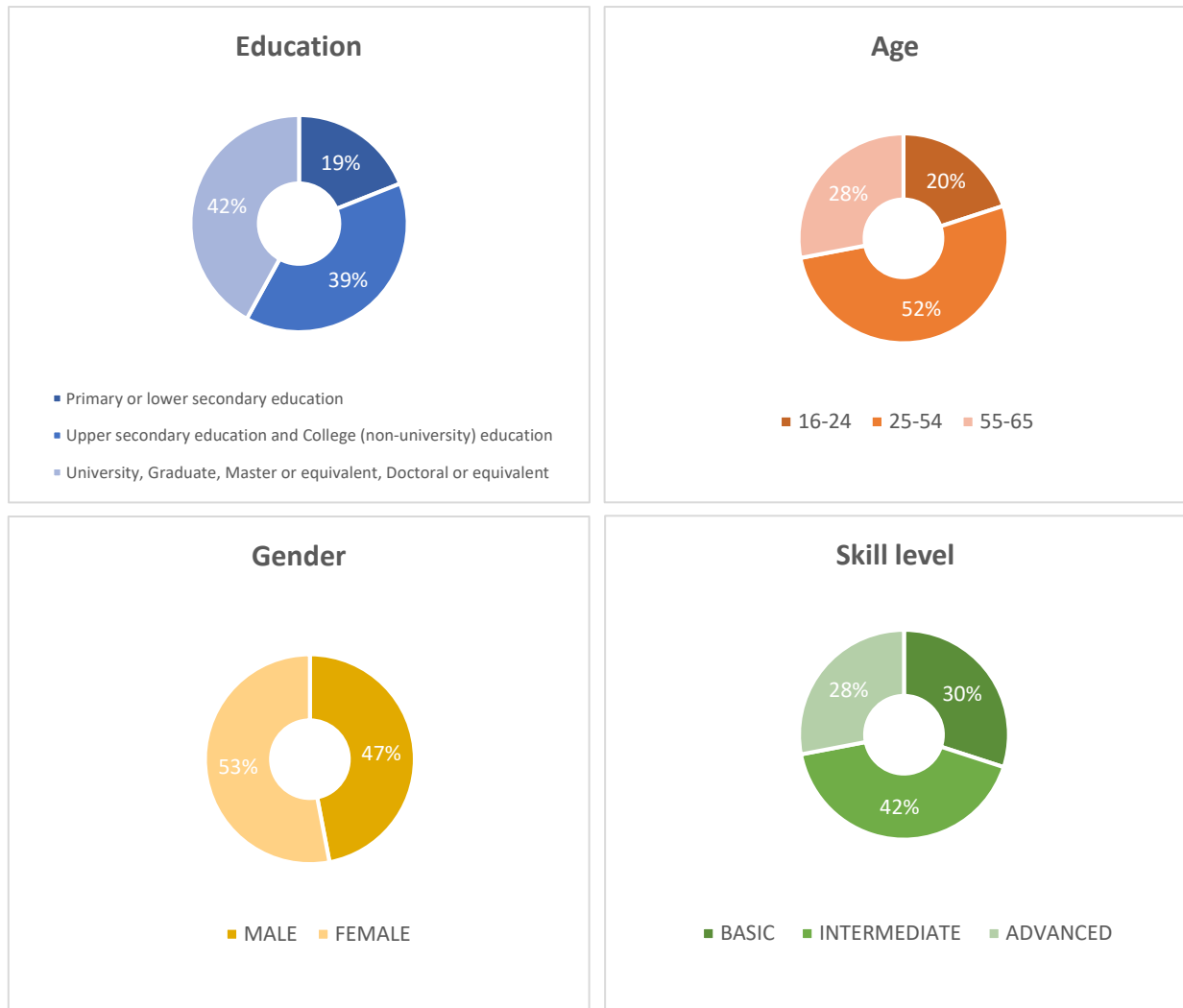
5.7.3 Participant SAT results analysis

Average test time and analysis of time spent on the SAT

The time spent on the SAT during the second pilot was measured for the whole SAT. The Moodle platform allowed to complete the whole SAT in one sitting, but it also allowed to take breaks. Most of the data was gathered online without direct supervision of participants.

The average time spent (mean value) on the SAT by 460 participants was thus calculated to be 34 minutes with the minimum of 10 minutes and the maximum of 120 minutes. The time spent on the test included 82 items for the second pilot.

The mean value of time spent on the second pilot was compared to the mean value of the time spent on the SAT during the first pilot. The mean values were similar (35 for the first pilot and 34 for the second pilot), however it was expected that it would take less time on average for a participant to complete the SAT during the second pilot because the number of items for the second pilot was smaller. In addition to mean a median value was calculated for the time spent on the SAT during the second pilot and compared to the median value of time during the first pilot. The median for the second pilot was 23 minutes compared to the median value for the first pilot 27 minutes. We explain this comparatively longer mean time on Pilot 2 due users taking breaks or being distracted in an online test environment as opposed to the classroom environment of Pilot 1. At the same time an online environment is how the SAT would work in future.

Table 8 – Mean and Median time for test taking in Pilot 1 and 2

First Pilot				Second Pilot			
No of participants	No of Items	Mean Time	Median Time	No of Participants	No of Items	Mean Time	Median Time
144	107	35	27	460	82	34	23

Analysis was performed for **test time correlation** with respondent's gender, age group, general education level and initial digital skills level as well as differences between 2 piloting countries. The following observations can be made:

— Overall, the (mean value of) time spent on SAT was longer by Spanish (37.27 minutes) than Latvian (30.98 minutes) respondents.

— No specific differences for test taking time for gender have been observed, as in Pilot 1.

— The mean (value of) time spent on SAT by age group was about 40 minutes for the younger participants and 30 and 35 minutes for the two older age groups. The median values are close for each of the three age groups. These findings are different from Pilot 1 where age group 16-24 years old spent noticeably shorter time on the SAT. This result reinforces the view that younger people taking the test most likely from home were multi-tasking while doing it, or made more interruptions, and eventually took longer to complete the SAT, than would have been the case if they had taken the test in person, as in Pilot 1.

— Contrary to Pilot 1, where the lower education group took longer than the others, in Pilot 2 there was no visible correlation between education level and time spent on tests.

— Surprisingly, in Pilot 2, people with higher preliminary digital skills spent more time (about 2 minutes longer) on the test than people with foundation level skills, with the intermediate skills group in between them. In Pilot 1 the opposite had occurred.

— **Average scores:** Analysis of SAT average scores was performed to analyse differences by age, gender, education and initial digital skills level as well as the 2 piloting countries Spain and Latvia. The following results were obtained:

— SAT results show slight differences in average scores for the 2 piloting countries. The mean score for participants from Spain is 57.1% and the mean score for participants from Latvia is 55.8%.

— The results showed slightly higher mean scores for the younger respondent groups: for participants for 16-24 years old is 60.5%, for 25-54 years old – 55.9%, and for 55-65 years old – 54.8%. The same trend was observed in Pilot 1.

— SAT results show clear correlation between the education level and average score. The mean score for primary education group is 49.2%, for secondary education group is 57.7%, and for university education group is 58.5%. Correlation between education level l and SAT results was equally found in Pilot 1

— The means scores show a significant correlation between the initial digital skill levels of the participants and the SAT scores achieved by the participants. The mean score for foundation level group is 35.8%, for intermediate level group is 56.7%, and for advanced level group is 77.7%. This is an indicator that the SAT can be used to distinguish between the participants of different digital skill levels. These results confirm the findings of Pilot 1.

Item Reliability – Cronbach's Alpha for the SAT

In order to measure the reliability of the SAT and judge the internal consistency of the items Cronbach's alpha was measured for the 82 items in the Item Bank for the SAT total and for the items belonging to each of the competence areas. The Cronbach's Alpha for SAT is 0.987 which is considered good. This also a slight

improvement from the first pilot where the Cronbach's alpha was 0.980. The Cronbach's alpha for each of the competence areas are presented in the table and are also considered good.

Table 9 – Cronbach's Alpha for the SAT in Pilot 1 and 2

Pilot1		Pilot2	
Cronbach's Alpha	Number of Items	Cronbach's Alpha	Number of Items
0,980	100	0,987	82

Table 10 – Cronbach's Alpha for each competence areas in Pilot 1 and 2

Competence Area	Cronbach's Alpha	Number of Items	Cronbach's Alpha	Number of Items
1	0,907	14	0,932	12
2	0,944	31	0,958	23
3	0,911	16	0,945	16
4	0,917	21	0,939	16
5	0,926	18	0,953	15

Additional Item Statistics

Several additional indicators were calculated for SAT items in the Moodle platform and by using SPSS. The numbers are presented in Annex 7 – Pilot 2: Statistical analysis of SAT answers   . The indicators include the following information:

— Difficulty: item difficulty in percent for the group of the participants,

— Corrected Item-Total Correlation: discrimination value of the item,

— Cronbach's Alpha if Item Deleted: possible improvement in Cronbach's alpha if item was deleted (calculated per competence area),

— Number of unclear items: number of times participants have chosen the answer "This question is unclear to me".

Concerning the Item Difficulty index, in Pilot 2 no items in the Item Bank have fallen in the upper range of the interval (80% or above) which would lead to consider them too easy and thus to be removed.

Concerning item discrimination (Corrected Item-Total Correlation), items with discrimination lower than 0.2 should be considered for removal, but there are no such items in the Item Bank of Pilot 2.

Cronbach's alpha value is good for all five competence areas and for SAT in general.

Finally, the "unclear items" indicator pointed at two items with a high number of participants (68 and 41) who have chosen the answer option "This question is unclear to me" and another 6 items with 22 to 33 such respondents. This choice of answer suggested that these items need modifications or should be considered for removal. As we shall see in the next chapter, 7 of the 8 identified items have eventually been improved, whereas none has been removed.

Main conclusions of the statistical analysis

Correlations between items:

— Based on factor analysis and correlation analysis performed after both pilot phases it can be concluded that the answers to the items of the Item Bank show a good correlation to one major factor that is being measured by the DigCompSAT. We have concluded that this underlying factor is digital skills in general, which means that the Item Bank may be used to get a good initial judgement of person's self-reflection on their digital skills.

— The individual items that were assigned to each of the five competence areas in DigComp Framework showed similarities in answers and were considered related. This can be interpreted as the items belonging to a specific competence area suggesting a certain level of digital skill in that competence area.

— Some of the items showed very high correlations with the items of the same competence (see section 7.5 of Annex 7 – Pilot 2 Statistical Analysis of SAT Answers). If reduction of the number of the items in the Item Bank was a goal, then these items could be considered for removal. Removing of the items may decrease the time it takes to finish the DigCompSAT without compromising the precision of the person's self-reflection on their digital skills. Alternatively, some of these items may be exchanged with new ones.

Time

— The number of items in the Item Bank was reduced for the second pilot testing phase. It was expected that the average time spent on the DigCompSAT would be reduced accordingly. The median values of time spent were indeed smaller for the second pilot.

— However, the direct comparison is hard to perform since most of the participants of the second pilot phase were performing the DigCompSAT online without supervision. As said before, we suspect that some of them might have been switching to other tasks during testing thus increasing the time spent that was registered in the testing environment This is a lesson for future similar experiments to provide respondents with the recommendations to strongly concentrate on test taking without any unnecessary breaks.

Scoring

— There were differences in the average scores for the participants of both pilot phases. These should be compared with care because of several reasons. The scoring of the answers for the items was done differently in pilots 1 and 2, and the second pilot had a better representation of people with lower digital skills.

— However, data analysis performed after the second pilot suggests that DigCompSAT may be used to indicate the digital skill level of the participants as there are clusters of people who perform better or worse than average with statistical significance.

— There were indicators that some of the items were more difficult than others with participants choosing an answer with lower point value. The participants were not made aware of the point values of the answers, but they may have judged the values by the text of the item. After the first pilot phase some of the items that were perceived as very easy were reformulated or removed from the Item Bank, leaving the Item Bank for the second pilot phase without extremely easy or extremely difficult items. For that reason, we concluded that the items should be valued equally when devising the final scoring system for DigCompSAT.

5.8 Feedback from participants

In the second pilot we developed a simple post-SAT "User Experience" survey to gather feedback from the participants (see Annex 9 – Pilot 2: User Experience Survey and Results). The voluntary survey was similar to the Focus Group in the first Pilot in the types of questions asked of respondents.

We had 101 completions of the post-SAT survey. 81% rated it overall as good or excellent (see Figure 4 next page), 61% would probably or definitely recommend a friend, and 68% probably or definitely understand DigComp better. The 'understandability' and 'language' were always likely to be split based on education. 93% think the length is 'just right' or 'a bit too long' (which is positive considering it will be reduced further for the final version). Finally, 62% felt the report contained the right level of detail. For full details and further analysis please see Annex 9.

Figure 4 – User experience survey of Pilot 2

How do you rate your overall experience with the test?

■ POOR   ■ AVERAGE   ■ GOOD   ■ EXCELLENT
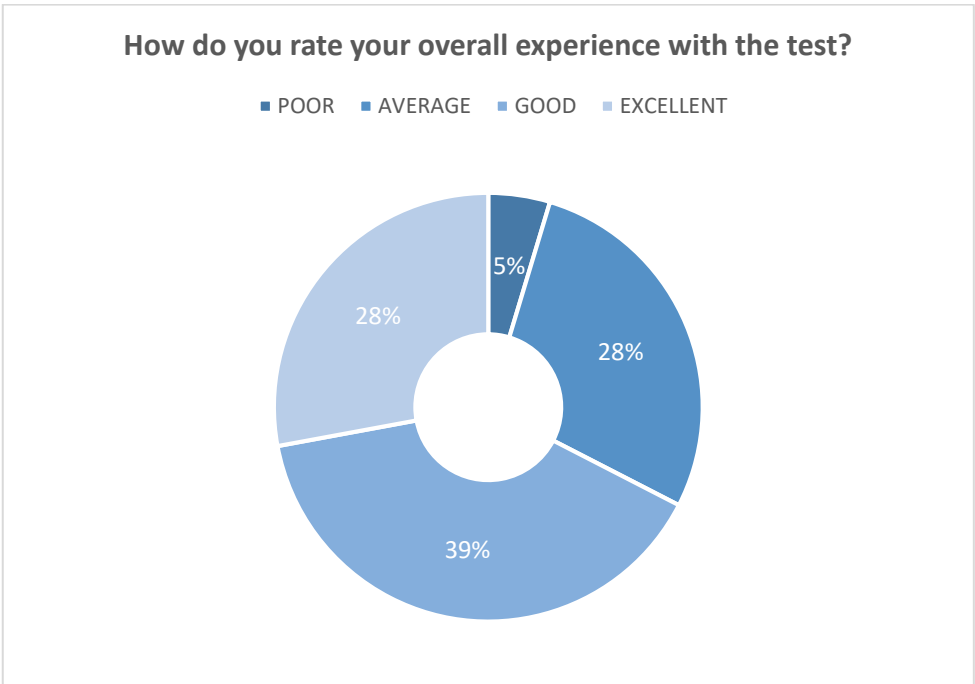
Chapter 6. FINAL ITEM BANK FEATURES AND CONSIDERATIONS FOR ITS FUTURE USE

6.1 The Item bank

The median time for test-taking in Pilot 2 was significantly shorter than in Pilot 1: **23 minutes** compared to 27 minutes for the first pilot.[7] The revised Item Bank therefore matches even better the desired test-taking duration.

At the same time, we have very good results from statistical analysis. The **Cronbach's Alpha** values for the SAT total in Pilot 2 is an excellent 0.987 and the values for the five areas are all above 0.93.

Besides, no items should be definitely removed based on the other statistical indicators from Pilot 2 results:

— none reached the 80% difficulty indicator threshold that we used in Pilot 1;

— none was below or equal to the 0.2 minimum acceptable level of the discrimination index (the lowest level is above 0.3 for 1 item)

— and correlation analysis pointed at items that might be considered redundant, but a much larger test might be needed to reach more stringent conclusions.

The analysis of **unclear items** has identified 2 items for which a relatively large number of respondents chose the answer "The question is unclear to me":

— Q48 "I am interested in understanding how a task can be broken down into steps so that it can be automated." (68 people who found them unclear),
— Q40 "I am keen to create new digital content by mixing and modifying existing resources. (41 people who found them unclear)."

Interestingly, both are Attitude items and it is difficult to assess whether such high response rates reflect the fact that respondents have flagged them unclear because they did not have a good enough level of digital competence to understand what they meant, or because they lacked additional context/information to understand what they referred to (especially Q48 is related to 3.4 Programming competence), or because they were worded ineffectively, or a mix of these reasons.

In any case, in the light of the above considerations, we agreed with JRC to keep the Pilot 2 Item Bank as the final one, but to improve the statements of Q40 and Q48 and to make some changes (different wording, adding examples and context) to another 5 items which got a relatively high rate of "unclear to me" answers (Q5, 34, 39, 62, 78), with the aim to enhance their understandability.

The final version of the Item Bank with 82 statement and the agreed revisions can be found in Annex 13 – Final Item Bank in English, Latvian and Spanish.

6.2 The DigCompSAT Report

The screenshot below (Figure 5.) shows an extract of the final "Digital Competences SAT report" that was presented to users after completion of the SAT in Pilot 2. All competences and competence areas were covered in this way. There was colour-coding indicating competences that users should focus upon with simple associated statements. In the User Experience feedback from users, 62% felt that this was "just right" in the level of detail provided. 19% felt there a was "a bit too much detail", although this could be that the report wording may have felt repetitive, especially if the user was largely on the same level across all areas or competences. Conversely, 13% felt that it was "a little short on detail".

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[7] The fact that the mean time was at 34 minutes (only slightly lower than in Pilot 1 reflects the fact that many respondents at home (especially younger people) most likely interrupted test-taking more than once, leading to unrealistic durations.

It should be mentioned here that the DigCompSAT report was designed for the test environment of the piloting. More work would be needed to try different versions and visualisations before a final tool would be offered to end-users. That is also the case for the user experience raised in the next section.

Figure 5. Screenshot of the DigCompSAT Report

6.3 Improving the user experience

Although the user experience with the DigCompSAT was considered good and even excellent by most respondents (see Figure 5 above), the diversity of topics addressed by the 21 competences of DigComp -a key feature of the framework's value- and the resulting long list of items designed for the self- reflection experience may be often confusing for the test users. Some "unclear to me" answers in Pilot 2, especially when items have an abstract/general character (Attitude items are particularly prone to this problem) certainly reflected this bewilderment. A useful improvement is to make visible the competence area where the user is acting at each moment, for instance by putting the area title at the beginning of the set of related items (as we did in Pilot 2). Colouring the items' background based on the area they belong to, might also help. An additional step might be within each competence area, to somehow highlight keywords taken from the specific competence title that the subset of items belongs to (e.g. "Programming", "Netiquette" etc.). This adds information that may help many users contextualize and better understand the items (albeit probably not those users with very low digital skills, who may find those keywords meaningless).

Another desirable feature that we found important for the user experience is the inclusion of examples in the items, as they make the statements clearer and more contextualised. Examples are also helpful to better

characterize (from the test designer's point of view) the proficiency level associated with the given item. There are however trade-offs and warnings about the use of examples in the items:

— too many examples may make the statement too long and cognitively demanding. The problem may be limited for a single item, but the user will go through around 80 of them;
— using examples increases the risk of referring to commercial brands, which test designers may want to avoid, except for the most widely known, unavoidable ones which identify types of services, e.g. YouTube;
— using examples may make the item too context-specific (e.g. by referring to local or national digital services) or technology-dependent, creating problems with item translation for different language-countries and for obsolescence aspects.

6.4 Extending the use of the DigCompSAT

Whereas DigCompSAT was designed and built having in mind primarily an employability perspective -helping people in the labour market (or willing to enter into it) assess and reflect on their digital competence- it could be a useful tool also in the field of education and training.

The self-reflection/assessment path offered by DigCompSAT might be used to inform and train learners on the multiple dimensions of digital competence and on its transversal function, e.g. as a key competence for social and economic inclusion and to exercise active citizenship in our society today.

In view of such educational use and also in order to facilitate users in taking the test and coping with time constraints, test delivery might be modular for the 5 competence areas. For instance, users should be able to decide from which area to start their self-reflection/assessment path, without necessarily following the official DigComp area sequence. Also, once users have completed all the questions of an area, it could be desirable that they could finish that area and receive feedback for it.

Chapter 7. CONCLUSIONS: KEY CHALLENGES AND LESSONS LEARNED

7.1 A reliable self-reflection tool for DigComp

The DigComp self-reflection tool for digital skills at foundation, intermediate and advanced levels, as the main product of the present research project, proved to be a reliable assessment tool for the five competence areas and as a whole test. Based on the Cronbach's alpha model's results for reliability, we can say that the tool assesses reliably digital competence in a target group having from low to advanced levels of digital skills, and can be used modularly, as well, to assess the five competence areas.

Its soundness is based on the strong reliability properties proven by Cronbach's Alpha, the concise items that allow a test-time of less than 30 minutes, across different countries, age and educational background groups and genders, and that can be used by beginners, as well.

It was also proven that countries with different proportions of the target group (different levels of involvement in the digital world) can use it to assess their level of digital skills.

Summing up, the developed SAT instrument currently is able to perform three main functions for test takers:

— To assess existing competences based on the respondents' self-reflection

— To identify competence gaps

— To raise awareness - motivation to develop own skills

7.1 Impact of Covid-19

The impact of the Covid-19 crisis cannot be underplayed. In the second pilot, it forced us to switch from "in-centre" delivery to entirely remote and online. The positive side of this was that the system was tested largely as it might be used in future, online and remotely, rather than in a classroom setting.

In general, Ibermática felt that the implementation of this project (and particularly recruitment of lower educated candidates for the DigCompSAT) was greatly affected in Spain by the circumstances arising from the confinement caused by the pandemic Covid-19.

7.2 The importance of methodology

The applied methodology, which consisted of both quantitative and qualitative elements and involved different input sources (questionnaires on the SAT platform, experts consultation, focus groups with end users), contributed valuable data to the tool's initial design, validation and development process.

The qualitative methodology was very important in this process. In particular, test respondents played a significant role in validity checking; they shared many valuable experiences in the focus groups and online surveys that illuminated several hidden or contradictory data in the statistical analysis. They behaved as very self-conscious potential 'end users' and represented an honest and engaged approach on the assessment instrument. Thanks to the piloting partners, participants were motivated, communicative and showed real interest toward the assessment instrument.

From a methodological perspective, the focus of the tool development process was the initial design and the following refinement of the Item Bank, for which we gathered information and data through different research methods. We realised that design and refinement of SAT required quite complex skills, beyond experiences with digital skills and well-knowing the DigComp Framework. It also required some training experience (testing, measuring digital skills among people), experience with the target group (digital skills of disadvantaged people), some sociological approach (survey design), writing skills (for the statements' texts), as well as expert knowledge of statistical analysis.

7.3 Challenges and opportunities relating to assessing 'Competence'

During project implementation we faced several challenges which allowed us to formulate a 'vision' that might be useful for similar activities in the future.

Dealing with DigComp's holistic view of digital competence

Besides helping users to become more aware of what is digital competence and its wide articulation today, one of the main challenges was to create a path of self- reflection aimed at identifying user's level of proficiency in 5 DigComp areas identified by DigComp. This was done by asking users to answer to a set of statements pertaining to 21 competences (the Item Bank) using self- reflection, rather than through another approach which would be the observation of their performance with given (authentic or simulated) tasks.

Competence is an observable expression of knowledge, skills and attitudes deployed by an individual in an integrated way. In the process of measuring competences, the level of autonomy and cognitive activation in relation to a task are observed. In order to properly measure their level of competence, individuals should therefore be observed while performing tasks with different levels of difficulty.

Given the goal of supporting individual's self-reflection process in our project (rather than objectively measuring skills), the formulation of statements were drafted and combined so as to have a balanced mix of items addressing all three components of competence, namely knowledge, skills and attitudes, for each competence area.

The challenge of assessing attitudes

As the pilots' results repeatedly showed, SAT users found it difficult to reflect autonomously on their attitudes. Several attitude items had to be removed after Pilot 1 for their poor values in key statistical indicators and for the qualitative feedback gathered from respondents. Despite attempts to improve those that were kept for Pilot 2, and without any serious problem that might lead to their removal in the final Item Bank, attitude items continued to show weaker results on statistical indicators and users' feedback also at this stage. This difficulty can be related to three aspects: the difficulty of identifying which are the relevant attitudes in the various digital competences; the difficulty of formulating effective items related to attitudes; and users' lack of familiarity with the attitude dimension in relation to digital competence.

An established list of significant attitudes for digital competence has yet to be developed. The analysis of the main competence topics/components performed for the initial Item Bank creation and of the attitude examples in the DigComp 1.0 report helped us identify some of them, but the task is still open (the DigComp 2.2 revision is expected to clarify these aspects). Moreover, further reflection is needed regarding how attitude items should be scored in a self-reflection tool such as DigCompSAT, or should they be scored at all. In Pilot 2, one way of scoring was suggested (see Table 3: Answering options and scoring by item type), however, there is more room for reflection in this area. For example, some might suggest that attitudes are not measurable, but exemplified in terms of personal values and they are strongly contextualised.

Concerning the formulation of attitude-related statements, based on such analyses and suggestions from the expert workshop, we first wrote attitude items starting with "I care for/am concerned about...", "It is a problem for me that ...", "I enjoy/like to ..." and so on. After Pilot 1, we used other expressions such as "I am interested in ...", "I am keen ...", "I am careful about ...", "I am willing to...". Some of these expressions eventually led many respondents to choose the "I don't understand this question" (Pilot 1) or "This question is unclear to me" (Pilot 2) answering options. Possibly, more effective wording along these lines can be found and we tried a few further changes in the Item Bank's final version.

The choice of words and the syntactical structure of statements was very important for all items, including attitude ones. As we have seen, in order to make the self- reflection path more friendly, the use of 'heavy language' or 'language often too dense and complex' should be avoided (as indicated by some of the Pilot 1 participants). Items should refer to clear and concrete situations in order to facilitate understanding, especially for attitude items.

This suggests an alternative option to define and assess attitude items that might be tried in the future: trying to assess attitudes by referring to behaviours which are seen to be closely related to them and asking about the frequency with which they occur. Of course, an attitude may not translate into what we perceive as a coherent behaviour for a number of reasons (constraints, lack of conditions, including of related knowledge and skills, etc.). Behaviours are inevitably context-dependent and therefore measuring attitudes indirectly through them may not be effective at capturing the 'true attitude' of the respondent. But part of this risk might be avoided by carefully selecting the behaviour to question about and the wording of the self-assessment statement.

The third reason why attitude items proved more difficult, in our view, is that users found strange and unfamiliar those statements which, rather than questioning about clearly digital-related knowledge and skills

(as expected in a test on digital competence), asked them about aspects such as 'being open to exchanging digital content', 'being careful about checking the privacy policies of the digital services', 'taking a step-by-step approach to address a technical problem' and the like. Attitudes are an important part of DigComp's holistic view of digital competence that needs to be highlighted and addressed more directly in order to increase citizens' awareness and understanding of it.

Complementary paths to develop a better understanding of digital competence

In combination with structured self- reflection routes such as the one created with DigCompSAT, it is desirable to offer users optional paths enabling them:

— to acquire a better awareness of what the digital competence described by DigComp is 'in action', through exemplary tasks and a guide for the observation of the proficiency level;

— to fully grasp the transversal character of digital competence through tasks (simulations) in which the contribution of other key competences such as entrepreneurial, personal, social and learning to learn is integrated;

— to become familiar with the very concept of 'competence', as made of knowledge, skills, and attitudes.

In order to encourage a deeper engagement in digital competence development, self- reflection statements are not enough: integrating them, for instance, with videos which put specific competences 'in situation' and show them in action might have a stronger effect, and again help understand better what digital competence is about. But of course the development of a graphically rich self-assessment environment comes with higher costs.

From users' feedback to user engagement

Finally, the challenge that we faced trying to gather feedback from users on the quality of questions through the "don't understand/unclear" answering option, might be turned into an opportunity to gather a wider input from test-takers and stimulate a participatory process in the DigCompSAT future development. The inclusion of the "don't understand/unclear" option among the answers selectable by users turned out, as said before, to be a problematic element for the interpretation of the collected data. Many respondents selected that option when, most likely, they should have stated that they knew nothing about, or were unable to do certain things. We therefore recommend for similar projects in the future, to provide for each item a separate feedback option with the "unclear to me" answer (easier to manage by the respondent and to process by the SAT managers) or an open field for any user notes.

At a more general level, we recommend allowing users to provide feedback on the whole self-evaluation/reflection experience in order to encourage a constant improvement of the items (proposed themes, level of difficulty, syntactical structure and vocabulary of the items). In fact, test-takers could be encouraged to provide through an open "Your suggestions" field whatever feedback they felt could also improve the content of the Item Bank. This may allow the future DigCompSAT managers to capture through the users, as much as possible in real time, the evolution of digital practices and related competence in various domains (not strictly professional).

Annexes

Annex 1 – List of sources for the initial Item Bank

Ferrari, A., Punie and Barbara Brečko (Eds.) (2013) DigComp: **A Framework for Developing and Understanding Digital Competence in Europe**. Luxembourg Publication Office of the European Union. EUR 26035 EN. doi:10.2788/52966. Available at: DIGCOMP: A Framework for Developing and Understanding Digital Competence in Europe.

Vuorikari, R., Punie, Y., Carretero Gomez S., Van den Brande, G. (2016). **DigComp 2.0: The Digital Competence Framework for Citizens. Update Phase 1: The Conceptual Reference Model**. Luxembourg Publication Office of the European Union. EUR 27948 EN. doi:10.2791/11517. Available at: https://publications.jrc.ec.europa.eu/repository/bitstream/JRC101254/jrc101254_digcomp%202.0%20the%20digital%20competence%20framework%20for%20citizens.%20update%20phase%201.pdf

Carretero, S.; Vuorikari, R. and Punie, Y. (2017). **DigComp 2.1: The Digital Competence Framework for Citizens with eight proficiency levels and examples of use**, EUR 28558 EN, doi:10.2760/38842. Available at: https://publications.jrc.ec.europa.eu/repository/bitstream/JRC106281/web-digcomp2.1pdf_(online).pdf

Tae Seob Shin, Hyeyoung Hwang, Jonghwi Park, Jian Xi Teng and Toan Dang (2019). **Digital Kids Asia-Pacific. Insights into Children's Digital Citizenship**. UNESCO. Available at: https://unesdoc.unesco.org/ark:/48223/pf0000367985

Van Deursen, A.J.A.M., Helsper, E.J. & Eynon, R. (2014). **Measuring Digital Skills. From Digital Skills to Tangible Outcomes (DISTO) project report**. Available at: www.oii.ox.ac.uk/research/projects/?id=112

Final skills questionnaire, developed as part of the 'From Digital Skills to Tangible Outcomes' project. (http://www.lse.ac.uk/media-and-communications/assets/documents/research/projects/disto/Final-skills-questionnaire.pdf)

The Global Kids Online key measures selected from the full Global Kids Online (GKO) survey questionnaire (http://www.globalkidsonline.net/survey)

ECDL and ICDL materials

https://www.aicanet.it/documents/10776/134638/ECDL+Information+Literacy_Syllabus_IT.pdf/6bd08505-8c1e-458b-baf9-9c39f6b42d64

ICDL https://icdl.org/media/ECDL_ICDLOnlineCollaboration1.pdf

Essential digital skills framework (UK Government) https://www.gov.uk/government/publications/essential-digital-skills-framework

For DigComp Area 1 Information and data literacy, item suggestions were provided by data literacy experts Davide Taibi (ITD-CNR, Italian National Research Council EdTech Institute) and Andrea Nelson Mauro (DataNinja Academy). For competence 3.4 Programming, they were provided by Alessandro Bogliolo (University of Urbino and EU Code Week coordinator).

ONLINE SELF ASSESSMENT TESTS

Andalusian Regional Government: http://www.digcomp.andaluciaesdigital.es/#Again-No-back-button

Basque country – Ikanos: http://test.ikanos.eus/index.php/566697?newtest=Y&lang=en

Castilla y Leon – TuCertyCIL: https://tucerticyl.es/competencias-digitales-para-la-ciudadania-nivel-basico https://tucerticyl.es/competencias-digitales-para-la-ciudadania-nivel-intermedio

Digital Competence Wheel (Danmark): https://digital-competence.eu/survey/

DCDS project http://www.dcds-project.eu/wp-content/uploads/2018/12/D5_Contents_assessment_tool.pdf

Annex 2 – Experts Workshop Participants and Agenda

Meeting Details

Date/ time: 14th November 2019, 09h00 – 16h30

Location: ALL DIGITAL (AD), Rue du Commerce 123, Brussels, 1000, Belgium.

Meeting rooms: Atomium and Acropolis meeting rooms (level -1) and Rm 104 (level 1).

Participants

— 14 Experts
— 6 EC members (including 3 from the JRC)
— 6 ALL DIGITAL DigCompSAT team

	Name	Organisation
1	**Ana Isabel Vitórica Leoz**	Basque Government
2	**Linda Keane**	ICS Skills
3	**Roberto Gonzales Lejarzegi**	Ibermatica
4	**Signe Brike**	Baltijas Datoru Akadēmija
5	**Franck Mockler**	ICDL Europe
6	**Ellen Helsper**	London School of Economics
7	**Artur Pokropek**	Polish Academy of Sciences
8	**Mart Laanpere**	Centre for Educational Technology, Tallin University
9	**Eleonor Grenholm**	Regionbibliotek Uppsala
10	**Nathalie Denos**	PIX
11	**Anders Skov**	Center for Digital Dannelse
12	**Antonio Jesús Fernández Cano**	Guadalinfo/ Andalusia SAT
13	**Ana Infantes Núñez**	Castilla La Mancha
14	**Marco Mazzini**	Smartive
15	**William O'Keeffe**	EC DG EMPL
16	**Alexander Riedl**	EC DG CNECT
17	**Sandor Szalai**	EC DG CNECT
18	**Yves Punie**	EC JRC
19	**Marcelino Cabrera**	EC JRC
20	**Riina Vuorikari**	EC JRC
21	**Mara Jakobsone**	ALL DIGITAL Project Team
22	**Stefano Kluzer**	ALL DIGITAL Project Team
23	**Uldis Zandbergs**	ALL DIGITAL Project Team
24	**Sandra Troia**	ALL DIGITAL Project Team
25	**Peter Palvolgyi**	ALL DIGITAL Project Team
26	**Ian Clifford**	ALL DIGITAL Project Team
27	**Renato Sabbadini**	ALL DIGITAL CEO

Agenda

09h00 Understanding the project (30 mins)

— Welcome (Renato Sabbadini)
— Overview of project (Ian Clifford)
— Piloting process (Ian Clifford)
— Item bank development methodology (Stefano Kluzer)
— Results, statistical analysis (Mara Jakobsone)
— Target output of the workshop (Ian Clifford)
— Next steps (Ian Clifford)

09h30 Reviewing the competences – consistency of approach (1h)

To ensure consistency of reviewing approach to be followed later, the whole group reviews together a competence area (6-8 items) for language, meaning, construction, etc. Some may be clearer and apparently straight-forward items, the others may be more complex, contestable etc. The purpose of this session is to ensure all have an agreed understanding of the *process* of reviewing for consistency purposes.

10h30 Reviewing the competences (2h)

Split participants into five groups (two groups move to other rooms), with mix of knowledge area and SAT experts. AD team and JRC staff also split across the groups

— Each group then reviews two competences
— Each competence may have
   • "Clear" items – simple review and approval
   • "Complex" items - Each complex item has possibility of broader /tighter focus, or changes of wording etc
   • Missing items – in some cases, Experts may request to replace some existing item with a new different one

12h30 Feedback and comments (30m) 5 minutes from each group to the whole.

Issues encountered, any specific comments

13h00 Lunch Break

14h00 Reviewing the competences (part 2) (2h)

— Same groups, continuing review of two further competences each group

16h00 Feedback and comments (30m) 5 minutes from each group to the whole

Issues encountered, any specific comments

16h30 Close

Annex 3 – Sampling questionnaire

The following survey was used in both Pilots for sampling.

3.1 The Sampling Questionnaire

Q1. Did you use the internet in <u>the last 3 months</u> on a computer or another digital device, for example, smartphone or tablet?

        YES ☐   No ☐   **(if no you can stop here, thank you)**

Q2. Have you done/are you able to perform the following activities?

*For each question, put a X in only **one** column.*

Activities	Yes, I can do it			No,
	with help	on my own	and help others	I cannot do it at all
1. Searching for information online	☐	☐	☐	☐
2. Sending or receiving emails	☐	☐	☐	☐
3. Participating in social networks	☐	☐	☐	☐
4. Using Word processor software	☐	☐	☐	☐
5. Editing digital photos	☐	☐	☐	☐
6. Buying products online	☐	☐	☐	☐
7. Transacting with online government services	☐	☐	☐	☐
8. Transferring/ Backing up files on your devices	☐	☐	☐	☐
9. Troubleshooting your printer	☐	☐	☐	☐
10. Managing websites with content management systems	☐	☐	☐	☐

Q3. What is your gender?   ☐ **Male**   ☐ **Female**

Q4. What is your age? ☐ **Under 16**   ☐ **16-24**   ☐ **25-54**   ☐ **55-65**   ☐ **over 65**

Q5. What is the highest level of your education? *(Please tick only one)*

1. *Primary or Lower secondary education*	☐
2. *Upper secondary education and College (non-university) education*	☐
3. *University Graduate, Master or equivalent, Doctoral or equivalent*	☐

3.2 Scoring of the Sampling Questionnaire

If question 1 was answered 'no', the candidate was disregarded. In question 2, the following scoring was applied in both pilots, for all questions. A maximum of 30 points could be scored.

Table 3.1

Selection	Score
No, I cannot do it at all	0 points
Yes, I can do it with help	1 point
Yes, I can do it on my own	2 points
Yes, I can do it and help others	3 points

Scoring of the Sampling questionnaire

The scoring thresholds for the Sampling questionnaire used in Pilot 1 were the following:

Table 3.2

Interval	Level
0-6 points	No skills
7-14 points	Basic
15-22 points	Intermediate
23-30 points	Advanced

Scoring analysis

The statistical analysis of the 124 participants's results of Pilot 1 (with known scores) for the Sampling questionnaire is summarized in the table below.

Table 3.3

Measurement	Points
Mean Value of Scores	22.12
Standard Deviation	5.923
Cutpoint 1 (Mean-2*STDEV)	10.274
Cutpoint 2 (Mean-1*STDEV)	16.197

Cutpoint 3 (Mean+1*STDEV)	28.043
Cutpoint 4 (Mean+2*STDEV)	33.966

The suggestion for scoring the questionnaire as in the table above is the following.

Use mean score +/- one standard deviations for intermediate level. This corresponds to two thirds of the scores and represents two thirds of the society. Use mean score minus two standard deviations for beginner level. Use mean score plus two standard deviations for advanced level. One minor adjustment is done. Value of 28 points is assigned to advanced level. The scoring does not exclude very advanced participants that might be IT professionals from participating. However, those people also represent part of the society.

Table 3.4 Revised Scoring thresholds for Pilot 2 Sampling questionnaire

Interval	Level
0-9 points	No skills
10-15 points	Basic
16-27 points	Intermediate
28-30 points	Advanced

It is worth noting that the scoring thresholds used in Pilot 2 do not reflect the way the levels are calculated in Digital Skills Index (DSI) used by the European Commission. In DSI, a person can have basic skills only if they have at least one competence in each competence areas. The DSI methodological introduction is available here: https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=14342.

Annex 4 – Demographics

4.1 Overall Demographic targets for Pilots 1 and 2

Table 4.1 – Overall Demographic targets for Pilots 1 and 2

Ireland				Spain				Latvia			
Ireland Overall Target	**150**			**Spain Overall Target**	**200**			**Latvia Overall Target**	**200**		
Digital Skills	Basic	Inter	Adv	**Digital Skills**	Basic	Inter	Adv	**Digital Skills**	Basic	Inter	Adv
Overall	50	50	50	**Overall**	67	67	67	**Overall**	67	67	67
Aged 16-24											
Low Ed	2	2	2	**Low Ed**	4	4	4	**Low Ed**	2	2	2

Med. Ed	4	4	4	Med. Ed	2	2	2	Med. Ed	8	8	8
High Ed	4	4	4	High Ed	3	3	3	High Ed	4	4	4
Male	5	5	5	Male	5	5	5	Male	7	7	7
Female	5	5	5	Female	5	5	5	Female	8	8	8
Aged 25-54:											
Low Ed	6	6	6	Low Ed	15	15	15	Low Ed	5	5	5
Med. Ed	10	10	10	Med. Ed	9	9	9	Med. Ed	18	18	18
High Ed	11	11	11	High Ed	12	12	12	High Ed	10	10	10
Male	14	14	14	Male	18	18	18	Male	15	15	15
Female	14	14	14	Female	18	18	18	Female	17	17	17
Aged 55-65:											
Low Ed	3	3	3	Low Ed	8	8	8	Low Ed	3	3	3
Med. Ed	5	5	5	Med. Ed	5	5	5	Med. Ed	11	11	11
High Ed	5	5	5	High Ed	7	7	7	High Ed	6	6	6
Male	6	6	6	Male	10	10	10	Male	9	9	9
Female	7	7	7	Female	11	11	11	Female	11	11	11
Sub Total:	**50**	**50**	**50**	**Total:**	**67**	**67**	**67**	**Total:**	**67**	**67**	**67**
Total:			**150**	**Total:**			**200**	**Total:**			**200**

4.2 Demographic results for Pilot 1 – Ireland

Table 4.2- Demographic results for Pilot 1 – Ireland

Education	Result	Target	% of Target
Primary or Lower secondary education (Low)	5	32	16%
Upper secondary education and College (non-university) education (Medium)	66	57	116%

University Graduate, Master or equivalent, Doctoral or equivalent (High)	73	61	120%
Age			
16-24	35	28	125%
25-54	88	82	107%
55-65	21	39	54%
Gender			
Male	63	74	85%
Female	81	76	107%
Skill			
No skills	3	0	
Basic	12	50	24%
Intermediate	47	50	94%
Advanced	82	50	164%

4.3 Demographic results for Pilot 2 – Spain and Latvia

Table 4.3 – Demographic results for Pilot 2 – Spain (200 respondents) and Latvia (260 respondents)

	Spain			Latvia		
	Actual	Target*	% of target	Actual	Target*	% of target
Education						
Primary or Lower secondary education	51	82	63%	38	40	96%
Upper secondary education and College (non-univ.) education	60	50	119%	119	142	84%
University Graduate, Master or equivalent, Doctoral or equivalent	89	68	131%	103	78	132%
Age						
16-24	37	29	126%	53	58	91%
25-54	101	109	93%	138	125	110%
55-65	62	62	100%	69	78	88%
Gender						
Male	99	98	101%	117	129	91%
Female	101	102	99%	143	131	109%
Digital Skill						
Basic	54	67	81%	83	87	95%
Intermediate	92	66	139%	102	86	119%
Advanced	54	66	82%	75	87	86%

* Target is calculated to reflect the composition of the national population for each feature.

4.4 Demographics breakdown by country

Graphs 4.1 Graphics of breakdown by country and demographic: Latvia
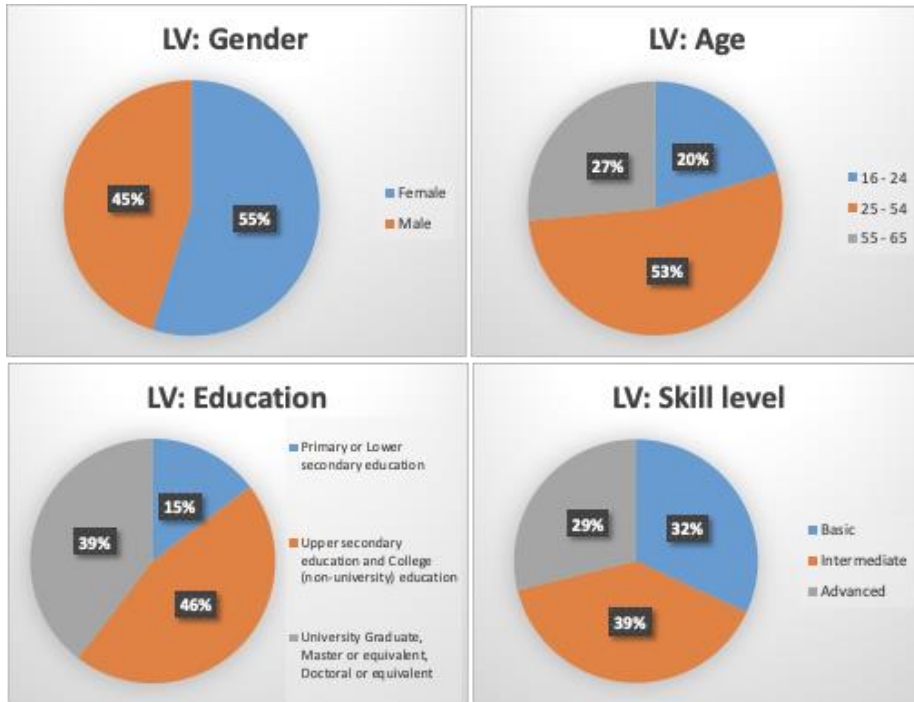
Graphs 4.2 – Graphics of breakdown by country and demographic: Spain
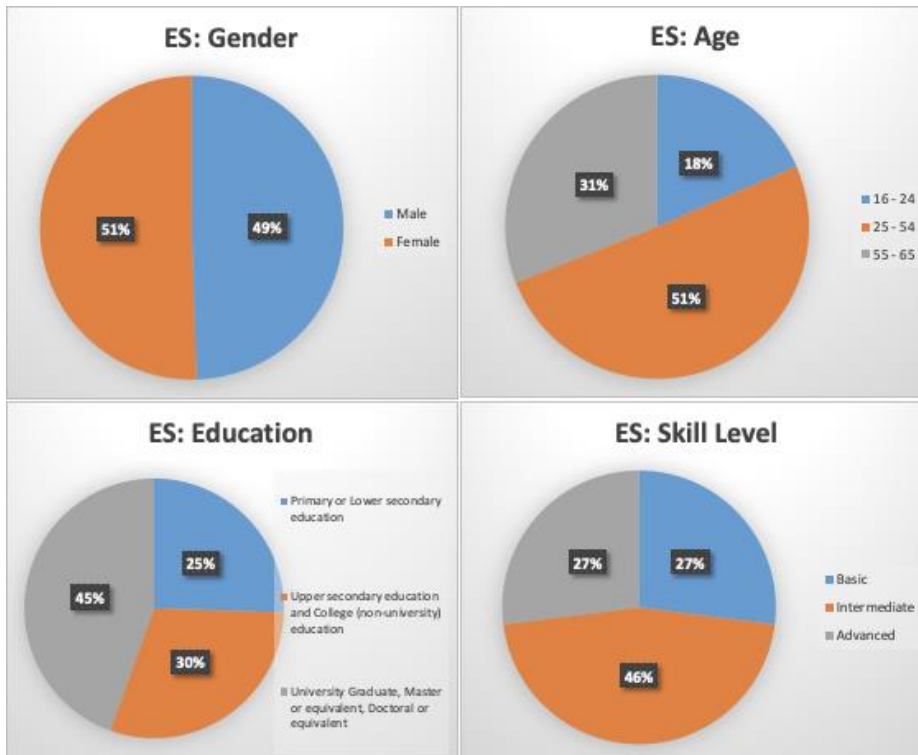
Annex 5 – Pilot 1: Statistical Analysis of SAT Answers

5.1 Detailed analysis of time spent and test scores

Time spent on test

The time spent on the SAT during the first pilot was measured for the whole SAT. The Moodle platform allowed to complete the whole SAT in one sitting, but it also allowed to take breaks. Because of this possibility, there were 10 attempts registered as being 4 hours or longer. It was deemed unrealistic that SAT would take such a long time. Therefore, those attempts were set at the 111 minutes which was the longest time that was just possible in one sitting.

The average time spent on the SAT by 144 participants was thus calculated to be 35 minutes with the minimum of 12 minutes and the maximum of 111 minutes and the standard deviation of 24.730. The time spent on the test includes all 107 items of the SAT.

Further on analysis of time spent on SAT by different groups of participants is presented.

Time by Gender

The participants (N=144) were divided in two groups:

  — 1 – female (N=81),
  — 2 – male (N=63).

The mean value of time spent on SAT by both genders was 35 minutes with only slight variation in range and standard deviation of values. It can be concluded that both groups will have spent similar time on SAT.

Table 5.1 Time by Gender

Time by Gender	Cases					
	Included		**Excluded**		**Total**	
	N	**Percent**	**N**	**Percent**	**N**	**Percent**
Time * Gender	144	100,0%	0	0,0%	144	100,0%
Report – Time						
Gender	**Mean**	**Minimum**	**Maximum**	**N**	**Std. Deviation**	
Female	35	15	111	81	24,297	
Male	35	12	111	63	25,470	
Total	35	12	111	144	24,730	

Time by Age Group

Participants (N=144) were divided in 3 age groups:

— 1 – 16-24 years old (N=35),
— 2 – 25-54 years old (N=88),
— 3 – 55-65 years old (N=21).

The mean value of the time spent on SAT by three age groups was 29 minutes for younger age group and 36 and 39 minutes for two older age groups. The difference is not big., but it can be expected that younger participants will finish the SAT in shorter time than others.

Table 5.2 Time by Age Group

Time by Age Group	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
Time * Age	144	100,0%	0	0,0%	144	100,0%
Report – Time						
Age	**Mean**	**Minimum**	**Maximum**	**N**	**Std. Deviation**	
16-24 years	29	13	111	35	16,851	
25-54 years	36	12	111	88	25,537	
55-65 years	39	12	111	21	31,187	
Total	35	12	111	144	24,730	

Time by Education Level

Participants (N=144) were divided in 3 groups based on their education level:

— 1 – low (N=5),
— 2 – medium (N=66),
— 3 – high (N=73).

The mean value of low education group is noticeably higher at 60 minutes, but the number of participants from this groups is very small (N=5) so it may not represent the group very well. It would benefit the next pilot phase to gather more data for this group. The mean value of time spent on SAT by medium education group was 31 and by higher education group was 37 minutes.

It is suspected that younger age groups have not yet been able to reach higher education levels and the results divided by the age groups are related to results divided by education level groups.

Table 5.3 Time by Education Level

Time by Education Level	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent

| Time * Education | 144 | 100,0% | 0 | 0,0% | 144 | 100,0% |

Report – Time					
Education	**Mean**	**Minimum**	**Maximum**	**N**	**Std. Deviation**
Low	60	24	111	5	46,462
Medium	31	12	111	66	15,836
High	37	15	111	73	28,361
Total	35	12	111	144	24,730

Time by Digital Skills Level

Participants (N=144) were divided in 4 groups according to their digital skills level:

— 1 – no skills (N=3),
— 2 – foundation (N=12),
— 3 – intermediate (N=47),
— 4 – advanced (N=82).

The mean value for no skills group is 26 minutes which is less than the average of total sample. The number of participants in that group is small, however. The mean value of foundation skills group is 38 minutes which is more than for intermediate skills group 33 minutes and advanced skills group 36 minutes. The number of participants for foundation skills group is rather small, too. But it could be expected that foundation skills group requires more time to complete the SAT that is administered in digital environment.

Table 5.4 Time by Digital Skills Level

Time by Digital Skills Level	Cases					
	Included		**Excluded**		**Total**	
	N	**Percent**	**N**	**Percent**	**N**	**Percent**
Time * Digital Skills	144	100,0%	0	0,0%	144	100,0%

Report – Time					
Digital Skills	**Mean**	**Minimum**	**Maximum**	**N**	**Std. Deviation**
No skills (6 and under)	26	12	38	3	13,204
Foundation (7-14 points)	38	23	111	12	24,147
Intermediate (15-22 points)	33	13	111	47	22,553
Advanced (23 and over)	36	12	111	82	26,477

Total	35	12	111	144	24,730

Average Scores

The SAT itself contains two parts with various number of items.

— Item Bank (QTrueProc) – 100 items that were part of the Item Bank and were original items.
— 'Fake' Items (QFalseProc) – 5 items that were part of the Item Bank and were fake items.

Additionally, 2 items were included for the reference (QRefProc) and they were not part of the Item Bank.

The mean values for the scores are expressed in percent out of 100%. This is done because the items were coded differently in the groups. Reference items (QRefProc) were coded so that the score would range from 0 to 1. Original items (QTrueProc) and fake items (QFalseProc) were coded so that the score would range from 0 to 4.

The participants were not warned that there were intentionally fake items included in the SAT. It was expected that the participants with higher level of digital competence would recognize the fake items more easily. The expected value for the best answer for fake items was 0. It was expected that participants that received higher scores in original items would receive low scores in fake items. However, the fake items were confusing to the participants. Even though the mean score for the original items was 72.07% the mean score was 48.75% which should be considered higher than expected.

Table 5.5 Average Score of Items

Average Score of Items	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
QRefProc	140	97,2%	4	2,8%	144	100,0%
QTrueProc	144	100,0%	0	0,0%	144	100,0%
QFalseProc	144	100,0%	0	0,0%	144	100,0%
Report – Average Score						
	QRefProc		**QTrueProc**		**QFalseProc**	
Mean	76,6786		72,0694		48,7500	
Minimum	7,50		30,25		5,00	
Maximum	100,00		96,50		90,00	
N	140		144		144	
Std. Deviation	24,98101		12,63734		19,08300	

Average Score by Gender

All of the participants (N=144) were divided in two groups:

— 1 – female (N=81),
— 2 – male (N=63).

The mean score for females is 70.52% for original items and 47.59% for fake items. The mean score for males is 74.07% for original items and 50.24% for fake items. The mean score for both groups is 72.07% for original items and 48.75% for fake items.

Table 5.6 Average Score by Gender

Average Score by Gender	Cases					
	Included		**Excluded**		**Total**	
	N	**Percent**	**N**	**Percent**	**N**	**Percent**
QRefProc * Gender	140	97,2%	4	2,8%	144	100,0%
QTrueProc * Gender	144	100,0%	0	0,0%	144	100,0%
QFalseProc * Gender	144	100,0%	0	0,0%	144	100,0%
Report – Average Score						
Gender	**QRefProc**		**QtrueProc**		**QFalseProc**	
Female	**Mean**	72,0833	70,5154		47,5926	
	Minimum	10,00	40,50		10,00	
	Maximum	100,00	93,25		90,00	
	N	78	81		81	
	Std. Deviation	25,36556	11,63483		17,82048	
Male	**Mean**	82,4597	74,0675		50,2381	
	Minimum	7,50	30,25		5,00	
	Maximum	100,00	96,50		90,00	
	N	62	63		63	
	Std. Deviation	23,42800	13,65519		20,64345	
Total	**Mean**	76,6786	72,0694		48,7500	
	Minimum	7,50	30,25		5,00	
	Maximum	100,00	96,50		90,00	

		140	144	144
	Std. Deviation	24,98101	12,63734	19,08300

Average Score by Age

All of the participants (N=144) were divided in 3 groups depending on the age:

— 1 – 16-24 years old (N=35),
— 2 – 25-54 years old (N=88),
— 3 – 55-65 years old (N=21).

The mean score for age group 1 is 70.37% for original items and 55.00% for fake items. The mean score for age group 2 is 72.87% for original items and 45.91% for fake items. The mean score for age group 3 is 71.55% for original items and 50.24% for fake items. The mean score for all age groups is 72.07% for original items and 48.75% for fake items.

Table 5.7 Average Score by Age

Average Score by Age	Cases					
	Included		**Excluded**		**Total**	
	N	**Percent**	**N**	**Percent**	**N**	**Percent**
QRefProc * Age	140	97,2%	4	2,8%	144	100,0%
QTrueProc * Age	144	100,0%	0	0,0%	144	100,0%
QFalseProc * Age	144	100,0%	0	0,0%	144	100,0%

Report – Average Score				
Age		**QRefProc**	**QTrueProc**	**QFalseProc**
16-24 years	**Mean**	66,4706	70,3714	55,0000
	Minimum	10,00	51,50	25,00
	Maximum	100,00	96,50	90,00
	N	34	35	35
	Std. Deviation	28,17100	11,47654	17,14986
25-54 years	**Mean**	79,8256	72,8693	45,9091
	Minimum	12,50	40,50	5,00
	Maximum	100,00	93,25	90,00

	N	86	88	88
	Std. Deviation	22,67024	11,87380	19,76217
55-65 years	Mean	80,5000	71,5476	50,2381
	Minimum	7,50	30,25	25,00
	Maximum	100,00	94,75	80,00
	N	20	21	21
	Std. Deviation	25,32162	17,21983	17,28266
Total	Mean	76,6786	72,0694	48,7500
	Minimum	7,50	30,25	5,00
	Maximum	100,00	96,50	90,00
	N	140	144	144
	Std. Deviation	24,98101	12,63734	19,08300

Average Score by Education Level

All of the participants (N=144) were divided in 3 groups based on their education level:

— 1 – low (N=5),
— 2 – medium (N=66),
— 3 – high (N=73).

The mean score for low education group is 67.55% for original items and 56.00% for fake items. The mean score for medium education group is 69.17% for original items and 47.80% for fake items. The mean score for high education groups is 75.00% for original items and 49.11% for fake items.

The low education group had the highest mean score for fake items. This indicates that participants from this group did not recognize the fake items as good as the other groups and treated them as original items.

Table 5.8 Average Score by Education Level

Average Score by Education Level	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
QRefProc * Education	140	97,2%	4	2,8%	144	100,0%

QTrueProc Education	*	144	100,0%	0	0,0%	144	100,0%
QFalseProc Education	*	144	100,0%	0	0,0%	144	100,0%

Report – Average Score

Education		QRefProc	QTrueProc	QFalseProc
Low	**Mean**	70,5000	67,5500	56,0000
	Minimum	47,50	50,25	35,00
	Maximum	100,00	86,50	80,00
	N	5	5	5
	Std. Deviation	23,00815	14,18450	15,96872
Medium	**Mean**	70,4435	69,1705	47,8030
	Minimum	7,50	30,25	10,00
	Maximum	100,00	96,50	90,00
	N	62	66	66
	Std. Deviation	28,19183	13,96996	19,49613
High	**Mean**	82,3973	75,0000	49,1096
	Minimum	22,50	46,75	5,00
	Maximum	100,00	93,50	90,00
	N	73	73	73
	Std. Deviation	20,80180	10,58268	19,00918
Total	**Mean**	76,6786	72,0694	48,7500
	Minimum	7,50	30,25	5,00
	Maximum	100,00	96,50	90,00
	N	140	144	144
	Std. Deviation	24,98101	12,63734	19,08300

Average Score by Digital Skills Level

All of the participants (N=144) were divided in 4 groups according to their digital skills level:

— 1 – no skills (N=3),

— 2 – foundation (N=12),

— 3 – intermediate (N=47),

— 4 – advanced (N=82).

The mean score for no skill group is 43.08% for original items and 31.67% for fake items. The mean score for original items for this group is noticeably lower than for other groups, but the number of participants in this group was very small (N=3) and SAT was not actually intended for this group.

The mean score for foundation group is 62.81% for original items and 50.00% for fake items. The mean score for original items is lower than for intermediate and advanced groups. This was expected because participants with lower digital skills level should evaluate themselves lower and the SAT results should indicate that. Still the number of participants in this group was small (N=12).

The mean score for intermediate group is 68.84% for original items and 49.36% for fake items. The mean scored for advanced group is 76.34% for original items and 48.84% for fake items. The scores for these two groups are higher and that represents their higher digital skill level when conducting self-assessment.

Table 5.9 Average Score by Digital Skills Level

Average Score by Digital Skills Level	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
QRefProc * Digital Skills	140	97,2%	4	2,8%	144	100,0%
QTrueProc * Digital Skills	144	100,0%	0	0,0%	144	100,0%
QFalseProc * Digital Skills	144	100,0%	0	0,0%	144	100,0%
Report – Average Score						
Digital Skills		QRefProc	QTrueProc		QFalseProc	
No skills (6 and under)	Mean	52,5000	43,0833		31,6667	
	Minimum	52,50	30,25		25,00	
	Maximum	52,50	56,75		35,00	
	N	1	3		3	

	Std. Deviation	.	13,26964	5,77350
Foundation (7-14 points)	Mean	54,5455	62,8125	50,0000
	Minimum	12,50	45,25	10,00
	Maximum	100,00	86,00	85,00
	N	11	12	12
	Std. Deviation	26,35854	12,33856	20,99784
Intermediate (15-22 points)	Mean	74,2391	68,8404	49,3617
	Minimum	10,00	40,50	15,00
	Maximum	100,00	94,75	85,00
	N	46	47	47
	Std. Deviation	24,37479	11,10687	16,99159
Advanced (23 and over)	Mean	81,3110	76,3354	48,8415
	Minimum	7,50	42,75	5,00
	Maximum	100,00	96,50	90,00
	N	82	82	82
	Std. Deviation	23,58406	10,88933	20,17361
Total	Mean	76,6786	72,0694	48,7500
	Minimum	7,50	30,25	5,00
	Maximum	100,00	96,50	90,00
	N	140	144	144
	Std. Deviation	24,98101	12,63734	19,08300

5.2 Detailed analysis of item reliability

Cronbach's Alpha

As written in the Report, the Cronbach's Alpha value for the whole SAT in Pilot 1 was 0,98 and the values for the 5 competence areas are also very good (over 0,9 for all areas) and are summarized in the table below.

Table 5.10 Reliability statistics for 5 competence areas

Competence Area	Cronbach's Alpha	Number of Items
1	0,907	14
2	0,944	31
3	0,911	16
4	0,917	21
5	0,926	18

Details for each competence area are provided below.

Cronbach's Alpha for Competence Area 1

Cronbach's alpha for competence area 1 was calculated for 14 items excluding the fake item in the competence area. The Cronbach's alpha value for the competence area was 0,907. The impact of item removal from the Item Bank for this competence area is presented in the table below in column Cronbach's Alpha if Item Deleted.

Table 5.11 Cronbach's alpha for competence area 1

Reliability Statistics	
Cronbach's Alpha	N of Items
0,907	14

Item-Total Statistics				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q3-1.1.1.	40,63	52,136	0,548	0,903
Q4-1.1.2.	41,24	50,643	0,565	0,903
Q5-1.1.3.	40,90	50,438	0,699	0,898
Q6-1.1.4.	41,29	47,271	0,685	0,898
Q7-1.1.5.	40,65	51,823	0,604	0,901
Q8-1.1.6.	41,05	52,522	0,468	0,906
Q10-1.2.1.	41,08	47,014	0,744	0,895
Q11-1.2.2.	41,04	51,131	0,494	0,905
Q12-1.2.3.	41,18	51,212	0,539	0,903

Q13-1.2.4.	40,88	52,902	0,518	0,904
Q14-1.3.1.	40,97	49,775	0,692	0,898
Q15-1.3.2.	40,88	48,930	0,743	0,896
Q16-1.3.3.	40,88	49,909	0,610	0,901
Q17-1.3.4.	41,48	47,902	0,666	0,899

Cronbach's Alpha for Competence Area 2

Cronbach's alpha for competence area 2 was calculated for 31 items excluding the fake item in the competence area. The Cronbach's alpha value for the competence area was 0,944. The impact of item removal from the Item Bank for this competence area is presented in the table below in column Cronbach's Alpha if Item Deleted.

Table 5.12 Cronbach's alpha for competence area 2

Reliability Statistics	
Cronbach's Alpha	**N of Items**
0,944	31

Item-Total Statistics				
	Scale Mean if Item Deleted	**Scale Variance if Item Deleted**	**Corrected Item-Total Correlation**	**Cronbach's Alpha if Item Deleted**
Q76-2.1.1.	90,56	255,787	0,601	0,942
Q77-2.1.2.	90,96	250,502	0,666	0,941
Q78-2.1.3.	91,46	247,047	0,601	0,942
Q79-2.1.4.	90,97	250,481	0,678	0,941
Q80-2.2.1.	91,49	254,531	0,419	0,944
Q81-2.2.2.	90,89	247,834	0,769	0,940
Q82-2.2.3.	91,22	246,925	0,685	0,941
Q83-2.2.4.	90,91	250,348	0,681	0,941
Q84-2.2.5.	91,08	247,526	0,693	0,941
Q85-2.2.6.	92,09	247,272	0,462	0,944

Q86-2.3.1.	90,97	246,733	0,701	0,941
Q87-2.3.2.	91,06	249,857	0,689	0,941
Q88-2.3.3.	90,88	250,049	0,653	0,941
Q89-2.3.4.	91,23	245,842	0,719	0,941
Q90-2.3.5.	91,99	258,720	0,216	0,946
Q91-2.4.1.	91,38	245,091	0,601	0,942
Q92-2.4.2.	91,22	245,387	0,751	0,940
Q93-2.4.3.	91,35	245,361	0,679	0,941
Q94-2.4.4.	92,06	251,102	0,425	0,944
Q95-2.5.1.	91,02	252,146	0,570	0,942
Q96-2.5.2.	90,84	253,576	0,513	0,943
Q97-2.5.3.	90,97	252,447	0,592	0,942
Q98-2.5.4.	91,19	251,123	0,537	0,942
Q99-2.5.5.	91,02	251,000	0,653	0,941
Q100-2.5.6.	91,05	251,585	0,528	0,943
Q101-2.6.1.	91,09	250,516	0,647	0,941
Q102-2.6.2.	91,08	249,372	0,673	0,941
Q103-2.6.3.	91,19	257,626	0,294	0,945
Q104-2.6.4.	91,20	247,015	0,651	0,941
Q105-2.6.5.	92,08	249,246	0,426	0,944
Q106-2.6.6.	91,45	248,417	0,619	0,942

Cronbach's Alpha for Competence Area 3

Cronbach's alpha for competence area 3 was calculated for 16 items excluding the fake item in the competence area. The Cronbach's alpha value for the competence area was 0,911. The impact of item removal from the Item Bank for this competence area is presented in the table below in column Cronbach's Alpha if Item Deleted.

Table 5.13 Cronbach's alpha for competence area 3

Reliability Statistics	
Cronbach's Alpha	**N of Items**
0,911	16

Item-Total Statistics				
	Scale Mean if Item Deleted	**Scale Variance if Item Deleted**	**Corrected Item-Total Correlation**	**Cronbach's Alpha if Item Deleted**
Q18-3.1.1.	37,10	91,199	0,530	0,908
Q19-3.1.2.	37,38	90,685	0,623	0,905
Q20-3.1.3.	37,92	85,358	0,712	0,902
Q21-3.1.4.	37,09	92,376	0,506	0,909
Q22-3.2.1.	37,57	89,715	0,581	0,907
Q23-3.2.2.	37,71	89,844	0,671	0,904
Q24-3.2.3.	37,78	87,740	0,756	0,901
Q25-3.2.4.	37,79	88,656	0,630	0,905
Q26-3.3.1.	37,14	95,659	0,403	0,911
Q27-3.3.2.	37,18	93,743	0,603	0,907
Q28-3.3.3.	37,54	89,747	0,606	0,906
Q29-3.3.4.	38,17	89,445	0,643	0,905
Q30-3.4.1.	37,92	86,524	0,677	0,903
Q31-3.4.2.	38,35	90,480	0,511	0,909
Q32-3.4.3.	38,42	90,664	0,541	0,908
Q33-3.4.4.	38,06	90,982	0,577	0,907

Cronbach's Alpha for Competence Area 4

Cronbach's alpha for competence area 4 was calculated for 21 items excluding the fake item in the competence area. The Cronbach's alpha value for the competence area was 0,917. The impact of item removal from the Item Bank for this competence area is presented in the table below in column Cronbach's Alpha if Item Deleted.

Table 5.14 Cronbach's alpha for competence area 4

Reliability Statistics	
Cronbach's Alpha	**N of Items**
0,917	21

Item-Total Statistics				
	Scale Mean if Item Deleted	**Scale Variance if Item Deleted**	**Corrected Item-Total Correlation**	**Cronbach's Alpha if Item Deleted**
Q35-4.1.1.	56,88	108,991	0,421	0,916
Q36-4.1.2.	57,33	101,634	0,681	0,910
Q37-4.1.3.	57,31	103,489	0,687	0,910
Q38-4.1.4.	57,19	104,619	0,668	0,911
Q39-4.1.5.	57,98	102,398	0,620	0,912
Q40-4.1.6.	57,51	103,566	0,619	0,912
Q42-4.2.1.	57,36	103,519	0,612	0,912
Q43-4.2.2.	57,15	104,480	0,635	0,911
Q44-4.2.3.	57,34	102,660	0,609	0,912
Q45-4.2.4.	57,04	106,376	0,627	0,912
Q46-4.2.5.	57,00	106,937	0,539	0,913
Q47-4.2.6.	57,25	104,972	0,598	0,912
Q48-4.3.1.	57,42	105,657	0,428	0,917
Q49-4.3.2.	57,24	107,440	0,454	0,915
Q50-4.3.3.	57,29	104,362	0,633	0,911
Q51-4.3.4.	57,88	105,965	0,522	0,914
Q52-4.4.1.	57,47	106,083	0,396	0,918
Q53-4.4.2.	57,71	106,446	0,472	0,915
Q54-4.4.3.	57,11	107,051	0,575	0,913
Q55-4.4.4.	56,93	105,114	0,607	0,912

| Q56–4.4.5. | 57,36 | 106,792 | 0,502 | 0,914 |

Cronbach's Alpha for Competence Area 5

Cronbach's alpha for competence area 5 was calculated for 18 items excluding the fake item in the competence area. The Cronbach's alpha value for the competence area was 0,926. The impact of item removal from the Item Bank for this competence area is presented in the table below in column Cronbach's Alpha if Item Deleted.

Table 5.16 Cronbach's alpha for competence area 5

Reliability Statistics	
Cronbach's Alpha	**N of Items**
0,926	18

Item-Total Statistics				
	Scale Mean if Item Deleted	**Scale Variance if Item Deleted**	**Corrected Item-Total Correlation**	**Cronbach's Alpha if Item Deleted**
Q57–5.1.1.	46,36	103,561	0,725	0,919
Q58–5.1.2.	46,53	103,356	0,719	0,919
Q59–5.1.3.	46,42	105,449	0,616	0,922
Q60–5.1.4.	47,24	101,752	0,612	0,922
Q62–5.2.1.	46,66	103,751	0,663	0,920
Q63–5.2.2.	46,49	104,112	0,634	0,921
Q64–5.2.3.	46,86	101,016	0,624	0,922
Q65–5.2.4.	46,76	103,412	0,613	0,921
Q66–5.3.1.	46,62	104,028	0,624	0,921
Q67–5.3.2.	46,87	106,003	0,460	0,925
Q68–5.3.3.	47,06	104,367	0,522	0,924
Q69–5.3.4.	47,15	100,825	0,657	0,920
Q70–5.4.1.	46,38	108,811	0,484	0,924
Q71–5.4.2.	46,47	102,432	0,660	0,920
Q72–5.4.3.	46,68	101,156	0,648	0,921

Q73-5.4.4.	46,37	104,934	0,664	0,921
Q74-5.4.5.	46,62	105,133	0,673	0,921
Q75-5.4.6.	47,13	102,185	0,587	0,922

Additional Item Statistics

Several additional indicators were calculated for SAT items in Moodle platform and by using SPSS. The numbers are presented in the following tables. The indicators include the following information:

— Item code,

— Minimum – minimum score for the group of participants for the item,

— Maximum – maximum score for the group of participants for the item,

— Mean – mean score for the group of participants for the item,

— Difficulty – item difficulty in percent for the group of the participants,

— Corrected Item-Total Correlation – discrimination value of the item,

— Cronbach's Alpha if Item Deleted – possible improvement in Cronbach's alpha if item was deleted (calculated per competence area),

— DIF – result if differential item functioning analysis indicate large (L) or moderate (M) impact of item score for some of the sub-groups of participants,

— Number of "I don't understand…" – number of times participants have chosen the answer "I don't understand the question".

There has been an additional analysis of dimensionality of items performed by JRC expert team. It has been concluded that there is one strong general factor that all the items in the Item Bank relate to. This factor can be interpreted as general digital skills. Based on confirmatory analysis with bi-factor model it has been concluded that there is also a relation between individual items and competence areas.

The following items show weaker relation to other items in the respective competence areas: Q3-1.1.1., Q11-1.2.2., Q12-1.2.3., Q13-1.2.4., Q77-2.1.2., Q78-2.1.3., Q80-2.2.1., Q81-2.2.2., Q82-2.2.3., Q86-2.3.1., Q89-2.3.4., Q90-2.3.5., Q18-3.1.1., Q19-3.1.2., Q26-3.3.1, Q70-5.4.1., Q71-5.4.2., Q73-5.4.4. These items may be considered for improvement for the next piloting phase. There were also two items that had a strong negative relation with other items of the same competence area: Q85-2.2.6 and Q105-2.6.5. Both of these items need to be considered for the removal of the Item Bank.

In addition, there were some items that had weaker relation with other items in the same competence area but this was characteristics for the specific competence. The competence with weaker relation between items were 2.4, 2.5, 4.2, 4.3 and 4.4.

Table 5.17 Additional Item Statistics for competence area 1

	Min	Max	Mean	Difficulty (%)	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	DIF (Large/ Moderate)	Number of "I don't under-stand ..."	Dimen-sionality
Q3-1.1.1.	2	4	3,53	88,4	0,548	0,903	L	0	Weak
Q4-1.1.2.	0	4	2,93	73,3	0,565	0,903		2	OK
Q5-1.1.3.	0	4	3,26	81,6	0,699	0,898		1	OK
Q6-1.1.4.	0	4	2,88	71,9	0,685	0,898	M	4	OK
Q7-1.1.5.	1	4	3,51	87,8	0,604	0,901	M	0	OK
Q8-1.1.6.	1	4	3,12	78,0	0,468	0,906		0	OK
Q10-1.2.1.	0	4	3,08	77,1	0,744	0,895		3	OK
Q11-1.2.2.	0	4	3,13	78,1	0,494	0,905		3	Weak
Q12-1.2.3.	1	4	2,99	74,7	0,539	0,903		0	Weak
Q13-1.2.4.	1	4	3,28	82,1	0,518	0,904	M	0	Weak
Q14-1.3.1.	1	4	3,19	79,9	0,692	0,898		0	OK
Q15-1.3.2.	1	4	3,28	82,1	0,743	0,896		0	OK
Q16-1.3.3.	0	4	3,28	82,1	0,610	0,901	M	3	OK
Q17-1.3.4.	0	4	2,69	67,2	0,666	0,899		1	OK

Table 5.18 Additional Item Statistics for competence area 2

	Min	Max	Mean	Difficulty (%)	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	DIF (Large/ Moderate)	Number of "I don't under-stand..."	Dimen-sionality
Q76-2.1.1.	2	4	3,71	92,7	0,601	0,942	L	0	OK
Q77-2.1.2.	1	4	3,31	82,6	0,666	0,941	L	0	Weak
Q78-2.1.3.	0	4	2,81	70,1	0,601	0,942		1	Weak
Q79-2.1.4.	0	4	3,30	82,5	0,678	0,941		1	OK

Q80-2.2.1.	1	4	2,78	69,4	0,419	0,944		0	Weak
Q81-2.2.2.	0	4	3,38	84,4	0,769	0,940		1	Weak
Q82-2.2.3.	0	4	3,05	76,2	0,685	0,941		1	Weak
Q83-2.2.4.	0	4	3,35	83,9	0,681	0,941		1	OK
Q84-2.2.5.	0	4	3,19	79,7	0,693	0,941		2	OK
Q85-2.2.6.	0	4	2,17	54,3	0,462	0,944	L	18	Strong Negative
Q86-2.3.1.	0	4	3,30	82,5	0,701	0,941	M	1	Weak
Q87-2.3.2.	1	4	3,21	80,2	0,689	0,941	M	0	OK
Q88-2.3.3.	1	4	3,38	84,5	0,653	0,941	L	0	OK
Q89-2.3.4.	0	4	3,03	75,9	0,719	0,941	M	1	Weak
Q90-2.3.5.	0	4	2,27	56,8	0,216	0,946	M	1	Weak
Q91-2.4.1.	0	4	2,88	72,0	0,601	0,942		8	Weak
Q92-2.4.2.	1	4	3,05	76,2	0,751	0,940		0	Weak
Q93-2.4.3.	1	4	2,92	72,9	0,679	0,941	M	0	Negative
Q94-2.4.4.	0	4	2,21	55,2	0,425	0,944	M	3	Negative
Q95-2.5.1.	0	4	3,24	81,1	0,570	0,942	M	1	OK
Q96-2.5.2.	0	4	3,42	85,6	0,513	0,943	L	3	OK
Q97-2.5.3.	1	4	3,29	82,3	0,592	0,942	M	0	OK
Q98-2.5.4.	0	4	3,07	76,7	0,537	0,942	L	2	OK
Q99-2.5.5.	1	4	3,24	81,1	0,653	0,941		0	OK
Q100-2.5.6.	0	4	3,22	80,4	0,528	0,943		3	OK
Q101-2.6.1.	0	4	3,17	79,3	0,647	0,941	M	2	OK
Q102-2.6.2.	1	4	3,19	79,7	0,673	0,941		0	OK
Q103-2.6.3.	0	4	3,07	76,7	0,294	0,945		1	Weak
Q104-2.6.4.	0	4	3,06	76,6	0,651	0,941		5	Weak
Q105-2.6.5.	0	4	2,19	54,7	0,426	0,944		10	Strong Negative

Q106-2.6.6.	1	4	2,81	70,3	0,619	0,942		0	Weak

Table 5.19 Additional Item Statistics for competence area 3

	Min	Max	Mean	Difficulty (%)	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	DIF (Large/ Moderate)	Number of "I don't under-stand …"	Dimensionality
Q18-3.1.1.	0	4	3,10	77,6	0,530	0,908		2	Weak
Q19-3.1.2.	0	4	2,83	70,7	0,623	0,905		1	Weak
Q20-3.1.3.	0	4	2,28	57,1	0,712	0,902		12	OK
Q21-3.1.4.	0	4	3,12	78,0	0,506	0,909		5	OK
Q22-3.2.1.	0	4	2,64	66,0	0,581	0,907	M	7	OK
Q23-3.2.2.	0	4	2,50	62,5	0,671	0,904		4	OK
Q24-3.2.3.	0	4	2,43	60,8	0,756	0,901		1	OK
Q25-3.2.4.	0	4	2,42	60,4	0,630	0,905	M	1	OK
Q26-3.3.1.	0	4	3,07	76,7	0,403	0,911	L	1	Weak
Q27-3.3.2.	1	4	3,03	75,7	0,603	0,907		0	OK
Q28-3.3.3.	0	4	2,67	66,7	0,606	0,906		3	OK
Q29-3.3.4.	0	4	2,03	50,9	0,643	0,905		5	OK
Q30-3.4.1.	0	4	2,29	57,3	0,677	0,903		10	OK
Q31-3.4.2.	0	4	1,86	46,5	0,511	0,909		18	OK
Q32-3.4.3.	0	4	1,79	44,8	0,541	0,908		6	OK
Q33-3.4.4.	0	4	2,15	53,6	0,577	0,907		5	OK

Table 5.20 Additional Item Statistics for competence area 4

	Min	Max	Mean	Difficulty (%)	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	DIF (Large/ Moderate)	Number of "I don't under-stand…"	Dimensionality

Q35-4.1.1.	1	4	3,31	82,8	0,421	0,916	M	0	OK
Q36-4.1.2.	0	4	2,86	71,5	0,681	0,910	L	1	OK
Q37-4.1.3.	0	4	2,88	71,9	0,687	0,910		1	OK
Q38-4.1.4.	0	4	2,99	74,8	0,668	0,911		1	OK
Q39-4.1.5.	0	4	2,21	55,2	0,620	0,912	M	2	OK
Q40-4.1.6.	1	4	2,68	67,0	0,619	0,912		0	OK
Q42-4.2.1.	0	4	2,83	70,7	0,612	0,912		1	OK
Q43-4.2.2.	1	4	3,03	75,9	0,635	0,911		0	OK
Q44-4.2.3.	0	4	2,85	71,2	0,609	0,912		1	Weak
Q45-4.2.4.	1	4	3,15	78,6	0,627	0,912		0	Weak
Q46-4.2.5.	1	4	3,19	79,7	0,539	0,913		0	Weak
Q47-4.2.6.	0	4	2,94	73,4	0,598	0,912		3	OK
Q48-4.3.1.	0	4	2,77	69,3	0,428	0,917	M	6	Weak
Q49-4.3.2.	0	4	2,95	73,8	0,454	0,915	L	4	Weak
Q50-4.3.3.	0	4	2,90	72,4	0,633	0,911	M	1	Weak
Q51-4.3.4.	0	4	2,31	57,6	0,522	0,914		1	OK
Q52-4.4.1.	0	4	2,72	67,9	0,396	0,918		6	Weak
Q53-4.4.2.	0	4	2,48	62,0	0,472	0,915		2	OK
Q54-4.4.3.	1	4	3,08	76,9	0,575	0,913	M	0	Weak
Q55-4.4.4.	0	4	3,26	81,4	0,607	0,912		1	Weak
Q56-4.4.5.	0	4	2,83	70,7	0,502	0,914		1	OK

Table 5.21 Additional Item Statistics for competence area 5

	Min	Max	Mean	Difficulty (%)	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	DIF (Large/ Moderate)	Number of "I don't under-stand…"	Dimen-sionality
Q57-5.1.1.	1	4	3,09	77,3	0,725	0,919	L	0	OK

Q58-5.1.2.	0	4	2,92	73,1	0,719	0,919		3	OK
Q59-5.1.3.	1	4	3,03	75,7	0,616	0,922		0	OK
Q60-5.1.4.	0	4	2,21	55,2	0,612	0,922	M	8	OK
Q62-5.2.1.	1	4	2,79	69,8	0,663	0,920		0	OK
Q63-5.2.2.	0	4	2,96	74,0	0,634	0,921		4	OK
Q64-5.2.3.	0	4	2,59	64,8	0,624	0,922		10	OK
Q65-5.2.4.	0	4	2,69	67,2	0,613	0,921		5	OK
Q66-5.3.1.	0	4	2,83	70,8	0,624	0,921		5	OK
Q67-5.3.2.	0	4	2,58	64,6	0,460	0,925	L	4	OK
Q68-5.3.3.	0	4	2,39	59,7	0,522	0,924		6	OK
Q69-5.3.4.	0	4	2,31	57,6	0,657	0,920		6	OK
Q70-5.4.1.	0	4	3,07	76,7	0,484	0,924		1	Weak
Q71-5.4.2.	0	4	2,99	74,7	0,660	0,920		1	Weak
Q72-5.4.3.	0	4	2,77	69,3	0,648	0,921		2	OK
Q73-5.4.4.	0	4	3,08	77,1	0,664	0,921	M	1	Weak
Q74-5.4.5.	1	4	2,83	70,8	0,673	0,921	M	0	OK
Q75-5.4.6.	0	4	2,32	58,0	0,587	0,922		7	OK

5.3 Overclaiming Items report

Summary

The report is presenting an analysis of overclaiming items used in pilot study of DIGCOMSAT measurement instrument. Psychometric analysis suggests that overclaiming items could be used to produce one-dimensional reliable scale that reflect overclaiming and overconfidence. Although all respondents exhibit some levels of overclaiming, the recommendation is that respondents with extreme high overclaiming scores (>18 points) should be excluded from the further psychometric analysis. In this pilot study 13 respondents got 18 points or more on the overclaiming scale.

Introduction

Many studies show that self-assessment of skills or knowledge is problematic (Paulhus 2002; Holden & Passey, 2010). Respondents are likely to indicate what they should (social desirability bias) or think (overconfidence bias) they know rather than what they actually do. Those tendencies of respondents to self-enhance when describing themselves remain a concern for measurements based on self-report methods. One of the few methods to monitor those tendencies in operational measurements is the overclaiming technique (OCT) proposed by Phillips and Clancy (1972). The technique was developed as an index for use in consumer surveys. The approach was then further elaborated by Paulhus, Harms, Bruce, and Lysy (2003) who propose to treat an overclaiming as a general indicator of self-favoring response bias. A typical overclaiming test is based on rating the familiarity of a list of items (things, concepts, terms). The list consists of existent terms ("targets" or "reals") that are complemented (at most 20%) by non-existent terms ("lures" or "foils"). Controlling for overclaiming is supposed to control for motivated misrepresentation in self-reports (Bing, Kluemper, Davison, Taylor, & Novicevic, 2011; Paulhus, 2011) however, in practice controlling for overclaiming might not be very easy because overclaiming might be contaminated by memory biases, interpretation errors and usually indicators for overclaiming are based only on few indicators which lead to not perfect reliability.

Because measurement of DigCompSAT is based on self-assessment, or rather self-reflection of skills and knowledge, it was decided that the overclaiming technique would be employed to monitor the behaviour of the measurement instrument in the pilot phase of the testing. During the pilot testing, 5 out of 107 items were designed to reflect nonexistence concepts or fake skills:

The wording of 5 items:

1. I know how to access media apps to update personal search strategies
2. I know how to use spelling checker to speedup software execution
3. I know I have to keep the windows closed when I enter the password to access my personal computer
4. I know how to use the ProblemSolver app that has a solution for all technical problems with digital devices
5. I can manage my online reputation using SmartR(r) application

The response options (different for different questions):

1. I did not understand the question
2. I don't know how to do it/ I have no knowledge of this / Not at all
3. I can do it with help / I have only limited understanding of this/ Not much/ very little
4. I can do it on my own/ I have a good understanding of this/ Yes, I do
5. I can do it with confidence and, if needed, I can support/guide others/ I fully master this topic/issue and I could explain it to others/ Very much

Descriptive statistics

Figure 1. presents distributions of responses to overclaiming items. Items are sorted from most overclaimed (Q2) to least overclaimed (Q5). It appears that most robust to overclaiming are items based on fake things (that resemble most originally proposed overclaiming scale). For item Q5 20% of respondents are claiming that they could use non-existing application in a good or very good way. On the other hand, 68% respondents agree that they could perform nonsense action "use spelling checker to speedup software execution" (Q2) in

good or very good way. Such results might indicate high level of overclaiming and overconfidence and strong effect of social desirability bias. On the other hand, however one need to remember that questions that used nonsense actions could be subjected to positive interpretation of respondents. Respondents are assuming that the items are correct and trying to interpret them as logical. For instance, in some situations switching off spelling checker could speed up text editor (Q2) or in some situations in specific office settings security regulations could mentioning covering windows to prevent for password stealing (Q1) and the name of "ProblemSolver" application could be interpret as a general name for the type of software (Q4). Therefore, overclaiming could not be judged based on single responses to an item but rather on consistent pattern of responses to the series of items. This could be done by constructing overclaiming scale, which will be done in next part of the document.
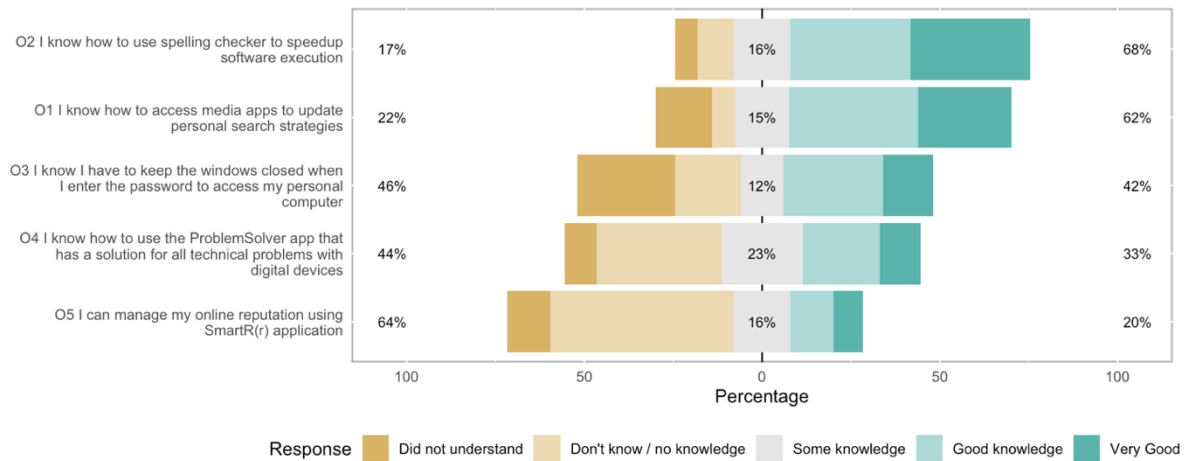
Figure 1. Distribution of overclaiming responses

Overclaiming scale

To construct overclaiming scale one need to go through all basic steps that are required while constructing normal type of scales. That is by investigating psychometric properties of items, analyzing dimensionality and examining the outcomes of the scale. The next sections such analysis is performed on overclaiming items.

Item level descriptive statistics (CTT)

In this section item analysis under Classical Test Theory (CTT) is conducted to check the properties of items. Response frequencies and item statistics are examined to assess whether items show sufficient variation to be able to differentiate respondents on the construct(s) investigated. Associations between items are examined to identify any negative correlations (and reverse code such items for next analyses). The **Item.total** column includes point-bi-serial correlation coefficient values between the individual items and the total score, while the **Item.Tot.woi** is the point-biserial between each item and the total score with that item omitted. **Difficulty** is the mean of the respondents on 0-4 scale. **Discrimination** is a difference in the proportion answering the item correctly between top third and bottom third respondents.

	Item.total	Item.Tot.woi	Difficulty	Discrimination
Table 1. Item descriptive statistics				
OItem1	0.7174	0.5137	2.503	2.192
OItem2	0.6424	0.4429	2.783	1.596
OItem3	0.7742	0.5839	1.828	2.596

OItem4	0.7142	0.5455	1.917	1.865
OItem5	0.7503	0.6076	1.529	1.769

Results confirm that items exhibit good measurement properties with reasonable high discrimination and balanced difficulty. This results in reliability high reliability (0.77) of the measure based on sum scores of the responses to 5 items (Table 4).

Table 2. Reliability statistics	
Statistics	**Value [95% CI]**
Cronbach's alpha	0.77 [0.71 – 0.82]
McDonald's omega	0.77

Dimensionality analysis

Polychoric Correlation Matrix

One fundamental analysis is the inspection of the polychoric correlation matrix, visually aided through shading or color-coding. Associations between items are examined to identify any negative correlations that usually are not desirable. Correlation matrix allow to investigate a structure of the measure. Items from the same competence should be more correlated with each other than with items from other competences. Values of the correlations could be interpreted as distances between items (min=-1; max=1).
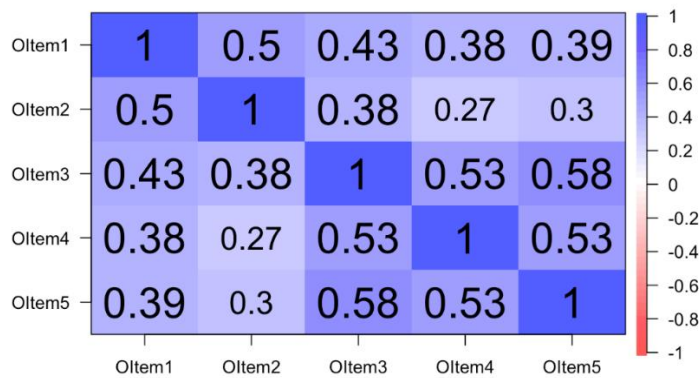
Figure 2. Polychoric Correlation Matrix

Overall items are highly correlated. Except correlations between Item 2 and Items 4 and 5.

Number of components by PA

Parallel analysis explores the number of factors/components via principal components and principal axis factoring, based on a comparison with simulated/resampled data. It suggests a number of factors/components based on eigenvalues (default is by comparing them with the mean of the simulated/resampled values).

Parallel Analysis Scree Plots
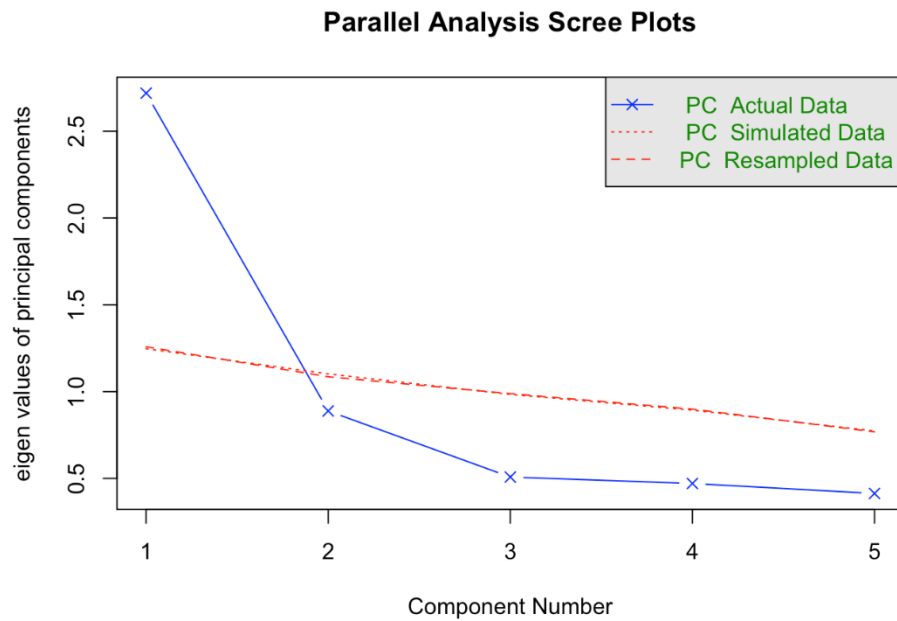
Figure 3. Parallel analysis

Parallel analysis in this situation confirms unidimensional structure of the scale. Parallel analysis suggests that the number of components is 1

Clustering (ICLUST)

For additional dimensionality analysis Item cluster analysis (ICLUST) was performed. ICLUST is an alternative to factor analysis that examines the similarities between items and explores a bottom-up solution that forms composite scales by grouping items so that Cronbach's alpha and beta (another measure of reliability) coefficients of the resulting scales increase. The results are visualized in a cluster graph that shows the steps of clustering and the resulting alpha and beta coefficients; if items cluster together as expected by theory, this can be considered as a support for the hypothesized structure. The arrows on the graph present cluster loadings (partial correlations corrected for attenuation) that could be interpreted as distance between the cluster and variable.

ICLUST
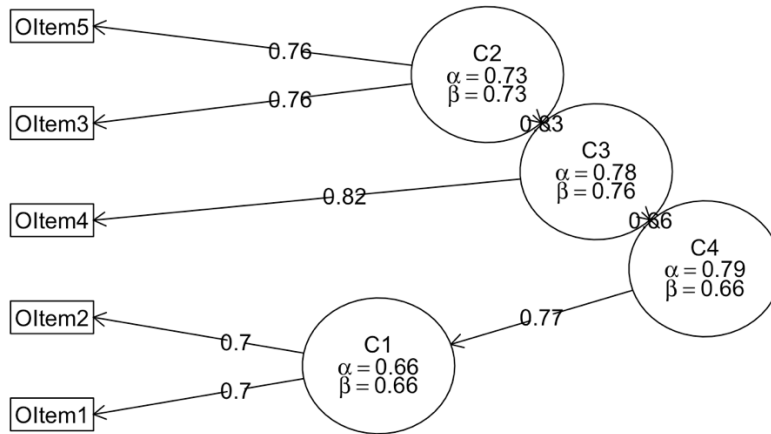
Item cluster analysis (ICLUST)

We could see that Items 2 and 1 are slightly more distant to other items. Although still the scale could be treated as unidimensional with C4 being the general factor.

Overclaiming scores

Once the good psychometric properties of the items were investigated and show appropriate characteristics a summary scale was constructed. The scale was constructed as simple sum of response scores from responses to overclaiming items. Figure 4 show the distribution of overclaiming scale.
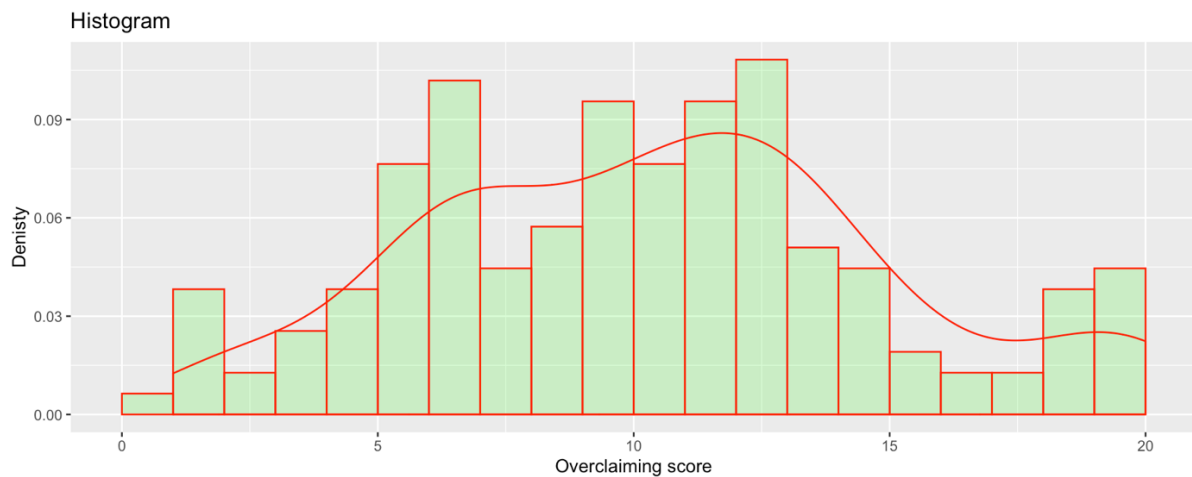
Figure 4. Distribution of overclaiming score with suggested cut-point (>18)

All respondents exhibit some levels of overclaiming. However, significant pick on the right side of the histogram is visible and strongly indicate extreme overclaimers. The recommendation is that respondents with extreme high overclaiming scores (>18 points) should be excluded from the further psychometric analysis. In this pilot study 13 respondents got 18 points or more on the overclaiming scale.

Overclaiming respondents

On Figure 5 basic characteristics of highly overclaiming respondents are presented against rest of the sample (normal).
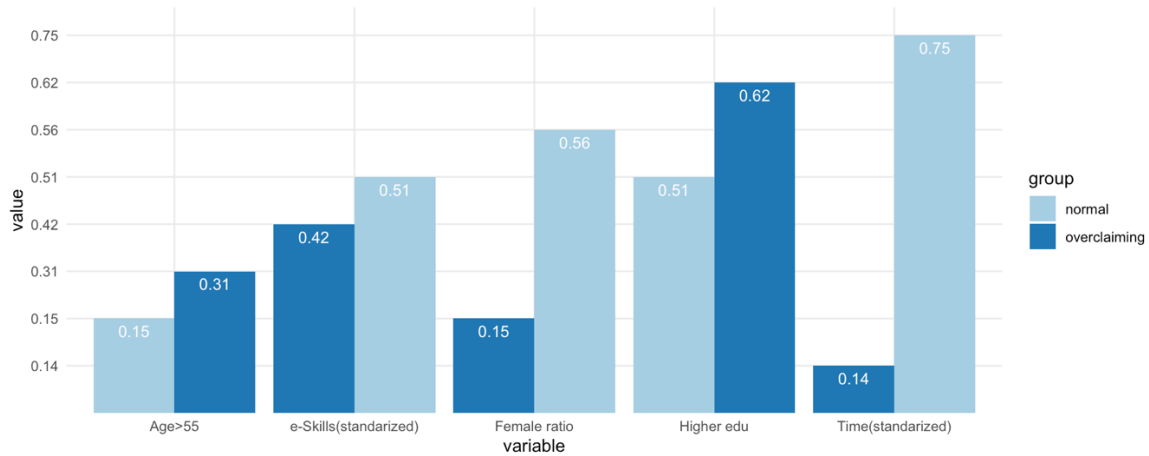
Figure 5. Profile of overclaiming respondents

The results of the analysis confirm the validity of the detection of highly overclaiming (that is problematic respondents). Highly overclaiming respondents answer the items extremely fast (probably not very carefully). They are mostly males, with slightly lower e-skills than rest of the sample. On average older and with higher education.

Conclusions

In conclusion, presented analysis suggests that overclaiming scale is reliable measure of overclaiming. Respondents with very high overclaiming scores (>18 points) should be excluded from the further analysis. Table 4. lists 13 respondents' IDs with scores of overclaiming 19 and higher. For further using of overclaiming items it is advisable to focus on overclaiming items based on fake things (that resemble most originally proposed overclaiming scale).

Table 4. List of respondents recommended to be excluded from further analysis	
N	**respondents ID**
1	ir015
2	ir034
3	ir036
4	ir037
5	ir038
6	ir040
7	ir051
8	ir068
9	ir113
10	ir178
11	ir180
12	ir201
13	ir202

Annex 6 – Pilot 1: Focus Groups Report

Introduction

This report was written by ICS Skills and provides feedback from two focus groups, which were held on the 28th and 30th January 2020 as well as feedback from a number of small discussion groups. Focus groups were held with 15 participants from both the 16-24 cohort and 25-54 cohort (34 people in total). Participants who attended the discussion group were of mixed ages and backgrounds. Notes were taken by the facilitator. A number of themes have been identified from the discussions and these are outlined in the main body of this report.

Methodology

Each of the focus groups followed the same interactive format and undertook the same discussions. They focussed on the following questions, which were provide by the project manager All Digital:

1. Were there any understandability issues with the questions? (What about the clarity of the questions? How far did you understand what they are asking for?)

   Note: this question was slightly altered in the field to a question about the use of language, including sentence structure and clarity of meaning.

2. What do you think about the difficulty of questions? Were the questions easy for you to answer? (Can you tell examples? Why were some questions hard to answer?)

3. What do you think about the length of the questionnaire?

4. How *much* did you think this questionnaire helped you to understand the range of digital skills that you *could* learn?

5. What kind of changes would you suggest for the system? Why?

The discussions were undertaken in two large groups and one small group notes were recorded by the facilitator. All those who attended the focus groups fully participated in the discussions and welcomed the opportunity to do so. They clearly shared a strong interest in the assessment tool and to ensuring that it was fit for purpose.

Outcomes and key themes

The following sections summarise the themes that were identified by the groups. There was a large amount of commonality in the comments made by the different participants in the discussions.

1. Clarity of the Questions

All of the participants had some issue with the language used in the questions. The variance could be attributed to age and education. For example, some younger participants said they felt that it was '*too technical*' at times or at least they felt that this was why they had difficulty with comprehension. When pressed for an example, one young participant cited question 31 (I understand the process that leads to the development of a sequence of understandable instructions that will be implemented in a given programming language). Another cited question 104. (I can manage my online reputation using SmartR(r) application. What was interesting about this is that older participants also has issues with these questions but for different reasons. Question 104 was one of the fake questions, so this obviously received a huge amount of complaints. However, many older well-educated participants also flagged question 31 for the phrasing.

Numerous participants remarked on questions which they had to re-read a number of times in order to understand the question and they found this to be extremely irritating. Some examples include questions 9, 41 (both "fake" items) and 51.

One participant took issue with the use of the term "I ought to" (Q95) she felt it would be "better to use 'I should' as no-one talks like that anymore"! The other participants agreed with this and they also took issue with the word "tinkering" which they felt was both "inappropriate and unprofessional". This brought them to

suggest that another example other than just the "maker movement" should be added to this question (Q67). Essentially revise the whole question.

One of the older participants of the discussion group who is a secondary school principal had the following to say regarding the language used.

> *I found the questions language heavy, particularly in the first third of the test. If the objective is to measure digital competencies of a wide demographic of European citizens, I wonder if the language will be accessible for many of those surveyed. I think certainly second level students will struggle with it; I expect a lot of answers will be 'I don't understand the question', but this does not necessarily mean that they don't have that particular competency. I think there are a lot of people with highly developed digital knowledge and abilities for whom the questions will be hard to access. You may find a correlation in your responses between academic ability and digital competency, or level of maturity and digital competency, which is not entirely valid.*

A number of participants in all groups took issue with the term *'I fully master'*:

"This didn't feel like a natural response to me".

*"If it is knowledge I have already acquired, then I **have** mastered it".*

2. Difficulty of the Questions

Over all participants found the questions were fine, some were more difficult than others. As discussed previously, the language used was often too dense and too complex, references to "attribution", "maker movement", "digital resources" etc., were mentioned again as examples of making the questions more difficult. In addition, participants felt that the questions were made more difficult to answer because of particular references that might be dated. For example, a "wiki" was given as an example several times, and it appears that that is not the preferred (or even well-recognised) tool for younger people.

Some questions had obvious "right" questions, i.e. where there was a moral edge to them like looking after the environment while other questions appeared judgemental – reference to cultural differences – the digital skill was not obvious here.

People reported that they selected an answer other than "I don't understand the question" even when that might have been appropriate because no one wants to say "I don't understand the question". There were a surprising number of participants who referred to this in all age groups.

Some ability terms were not very informative, for example "interested in", "aware of", "enjoy". People felt these were arbitrary, for example being aware of something, does not mean that they are actually able to do the task or that they did it. They cited Q.95 as one of many examples "I am aware that I ought to ask permission from a person before publishing or sharing photos about him or her".

3. Length of the questionnaire

Over all the majority of participants felt the questionnaire was too long. However, the degree to which this was considered a huge negative did vary.

The younger participants felt that while the questionnaire was long it was interesting, so they didn't mind too much. When asked if the length of the questionnaire would make them abandon it if they were not under supervision, the majority said no. However, the performance of the platform on the devices they were using did make them want to give up. They said that the questions took a long time to load at the beginning and this is what made them want to abort.

They also said that they felt that in some instances they had answered questions, but their answer was not recorded and the question showed as unanswered. They found this frustrating especially because it was not possible to go back to missed questions.

Older participants also felt it was too long and they stated that they would have stopped before the end had it not part of this pilot. They also thought that some questions were redundant and should be deleted, for example Q.76 "I know how to send, reply and forward e-mails" was cited as being redundant. One participant said "… if you couldn't even send an email you'd hardly be taking this test!"

I found that the older participants (30+) were frustrated and almost insulted by such basic questions, they felt a waste of their time.

4. Increased understanding of the range of potential learning in digital skills

Responses varied – younger participants agreed that the questionnaire helped them to realise that there were skills that they had not previously considered. Older participants were less inspired but did agree that it made them consider things like privacy and security

5. Suggested changes for the platform

It would be better to have 5 sections of 20 questions each rather than an arbitrary number and random selection.

> *"It is already divided into sections, but this way you would have a sense of where you were in the process, particularly if each section related to one of the 5 competencies".*

Be consistent in the question format: don't just give examples in some questions and not others.

There needs to be a check on the consistency of spelling and formatting. For example

> *" … the word Internet should have a capital I throughout because we are talking about the Internet, it comes up in Q1, 13, 87 and 106 I think".*

> *" … I might be being very picky but all the questions should end with a full stop there was inconsistency, some did some did not this may be a small detail but it irritated me!"*

Do not mix really basic questions in with more complex ones e.g. Q.76

A number of participants both young and old expressed frustration that it was not possible to return to a question which was either accidently skipped or skipped with intention. In some instances, participants thought they had answered questions but discovered via the side bar that in fact skipped them but there was no way to go back.

Finally, one participant thought the information icon in the progress panel should be hidden as it makes it look as though there are many more questions in the test.

Overall participants were positive about the platform and felt the test was comprehensive.

Annex 7 – Pilot 2: Statistical Analysis of SAT Answers

7.1 Time Spent on Test

The time spent on the SAT during the second pilot was measured for the whole SAT. The Moodle platform allowed to complete the whole SAT in one sitting, but it also allowed to take breaks. Most of the data was gathered online without direct supervision of participants. There is no information about how many breaks if any each participant took during the SAT. There were 38 attempts that registered as being longer than 2 hours. Because of the reduced Item Bank as compared to the first pilot it was deemed that it should not take a participant more than 120 minutes (2 hours) to finish the SAT without taking breaks. Therefore, the times that were longer than 120 minutes were reduced to 120 minutes.

The average time spent (mean value) on the SAT by 460 participants was thus calculated to be 33.72 minutes with the minimum of 10 minutes and the maximum of 120 minutes. The time spent on the test included 82 items for the second pilot.

The mean value of time spent on the second pilot was compared to the mean value of the time spent on the SAT during the first pilot. The mean values were similar (34.94 for the first pilot and 33.72 for the second pilot), however it was expected that it would take less time on average for a participant to complete the SAT during the second pilot because the number of items for the second pilot was smaller. In addition to mean, a median value was calculated for the time spent on the SAT during the second pilot and compared to the median value of time during the first pilot. The median for the second pilot was 23 minutes compared to median value for the first pilot 27 minutes. We explain this comparatively longer mean time on Pilot 2 due users taking breaks or being distracted in an online test environment as opposed to the classroom environment of Pilot 1. At the same time an online environment is how the SAT would work in future.

Table 7.1

First Pilot				Second Pilot			
No of participants	No of Items	Mean Time	Median Time	No of Participants	No of Items	Mean Time	Median Time
144	107	34.94	27.00	460	82	33.72	23.00

Time by Gender

All of the participants (N=460) were divided in two groups:

— 1 – Female (N=243),

— 2 – Male (N=217).

The mean value of time spent on SAT by females was 34.26 minutes while the time spent on Sat by males was 33.10 with a similar standard deviation. The mean values differ slightly but it can be concluded that both groups will have similar time spent on SAT.

Table 7.2

Time by Gender							
Gender	**N**	**Mean**	**Median**	**Minimum**	**Maximum**	**Std. Error of Mean**	**Std. Deviation**
Male	217	33,10	22,00	10	120	1,992	29,351
Female	243	34,26	23,00	10	120	1,900	29,626
Total	**460**	**33,72**	**23,00**	**10**	**120**	**1,374**	**29,470**

Time by Country

The second pilot was conducted in two countries and all of the participants (N=460) were divided in two groups:

— 1 – Spain (N=200),

— 2 – Latvia (N=260).

The mean value of time spent on SAT in Spain was 37.27 minutes while the time spent on Sat in Latvia was 30.98. The median values for both countries are very similar, 24 minutes for Spain and 22 minutes for Latvia respectively.

Table 7.3

Time by Country							
Country	**N**	**Mean**	**Median**	**Minimum**	**Maximum**	**Std. Error of Mean**	**Std. Deviation**
Spain	200	37,27	24,00	11	120	2,278	32,210
Latvia	260	30,98	22,00	10	120	1,670	26,921
Total	**460**	**33,72**	**23,00**	**10**	**120**	**1,374**	**29,470**

Time by Age Group

All of the participants (N=460) were divided in 3 groups depending on the age:

— 1 – 16-24 years old (N=87),

— 2 – 25-54 years old (N=241),

— 3 – 55-65 years old (N=132).

The mean value of the time spent on SAT by three age groups was 40.79 minutes for younger age group and 30.66 and 34.63 minutes for two older age groups. The median values are close for each of the three age groups. These findings are different than for the first pilot where age group 16 to 24 years old spent noticeably shorter time on the SAT. A likely explanation is that in Pilot 2 young people were distracted or took more breaks while taking the test and took thus a longer time to complete it. The % of respondent who took 120 minutes or longer is as follows: 13% among younger people; 6% among middle age people; 8% among older people.

Table 7.4

Time by Age Group							
Age	N	Mean	Median	Minimum	Maximum	Std. Error of Mean	Std. Deviation
16-24	87	40,79	24,00	10	120	3,885	36,233
25-54	241	30,66	21,00	10	120	1,704	26,452
55-65	132	34,63	23,50	11	120	2,535	29,119
Total	**460**	**33,72**	**23,00**	**10**	**120**	**1,374**	**29,470**

Time by Education Level

All of the participants (N=460) were divided in 3 groups based on their education level:

— 1 – Primary (N=89),

— 2 – Secondary (N=180),

— 3 – University (N=191).

The mean value of time spent on SAT is 32.25 minutes for primary education level, 30.77 minutes for secondary education level and 33.72 minutes for university level education group. The median values for all three education levels were 22, 23 and 23 minutes respectively.

Table 7.5

Time by Education Level							
Education	N	Mean	Median	Minimum	Maximum	Std. Error of Mean	Std. Deviation
Primary	89	32,25	22,00	11	120	3,104	29,287
Secondary	180	30,77	23,00	10	120	1,907	25,592
University	191	37,17	23,00	10	120	2,359	32,597

Total	**460**	**33,72**	**23,00**	**10**	**120**	**1,374**	**29,470**

Time by Digital Skill Level

All of the participants (N=460) were divided in 3 groups according to their digital skills level:

— 1 – Foundation (N=137),

— 2 – Intermediate (N=194),

— 3 – Advanced (N=129).

The mean value of foundation skills group is 32.40 minutes which is less than for intermediate skills group 33.86 minutes and advanced skills group 34.90 minutes. The median values for time spent on SAT were similar for all three digital skills groups, – 22, 24 and 21 minutes respectively.

Table 7.6

Time by Digital Skill Level							
Digital Skills	**N**	**Mean**	**Median**	**Minimum**	**Maximum**	**Std. Error of Mean**	**Std. Deviation**
Basic	137	32,40	22,00	10	120	2,299	26,911
Intermediate	194	33,86	24,00	11	120	2,067	28,789
Advanced	129	34,90	21,00	10	120	2,909	33,044
Total	**460**	**33,72**	**23,00**	**10**	**120**	**1,374**	**29,470**

7.2 Test Scores

Test Scores by Gender

All of the participants (N=460) were divided in two groups:

— 1 – Female (N=217),

— 2 – Male (N=243).

The mean score for females is 54.99% out of 100%. The mean score for males is 57.92%.

Table 7.7

Score * Gender					
Gender	**N**	**Mean**	**Minimum**	**Maximum**	**Std. Error of Mean**
Male	217	57,9179	9,66	100,00	1,51636
Female	243	54,9904	9,67	94,76	1,34214

Total	**460**	**56,3714**	**9,66**	**100,00**	**1,00836**

Test Scores by Country

All of the participants (N=460) were divided in two groups by country:

— 1 – Spain (N=200),

— 2 – Latvia (N=260).

The mean score for participants from Spain is 57.08% and the mean score for participants from Latvia is 55.83%.

Table 7.8

Score * Country					
Country	**N**	**Mean**	**Minimum**	**Maximum**	**Std. Error of Mean**
Spain	200	57,0763	15,34	100,00	1,51724
Latvia	260	55,8292	9,66	96,78	1,35090
Total	**460**	**56,3714**	**9,66**	**100,00**	**1,00836**

Test Scores by Age Group

All of the participants (N=460) were divided in three groups by age group:

— 1 – 16-24 years old (N=87),

— 2 – 25-54 years old (N=241),

— 3 – 55-65 years old (N=132).

The mean score for participants for 16-24 years old is 60.46%, for 25-54 years old – 55.93%, and for 55-65 years old – 54.84%.

Table 7.9

Score * Age					
Age	**N**	**Mean**	**Minimum**	**Maximum**	**Std. Error of Mean**
16-24	87	60,4644	14,99	100,00	2,27856
25-54	241	55,9297	9,67	98,38	1,37280
55-56	132	54,4802	9,66	96,78	1,93673

Total	**460**	**56,3714**	**9,66**	**100,00**	**1,00836**

Test Score by Education Level

All of the participants (N=460) were divided in 3 groups based on their education level:

— 1 – Primary (N=89),

— 2 – Secondary (N=180),

— 3 – University (N=191).

The mean score for primary education group is 49.17%, for secondary education group is 57.68%, and for university education group is 58.49%. This demonstrates clear trend that people with higher education level have also better digital competences.

Table 7.10

Score * Education					
Education	**N**	**Mean**	**Minimum**	**Maximum**	**Std. Error of Mean**
Primary	89	49,1694	9,67	94,73	2,43685
Secondary	180	57,6804	9,66	96,34	1,60713
University	191	58,4937	14,99	100,00	1,47705
Total	**460**	**56,3714**	**9,66**	**100,00**	**1,00836**

Test Score by Digital Skill Level

All of the participants (N=460) were divided in 3 groups based on their digital skills level:

— 1 – Foundation (N=137),

— 2 – Intermediate (N=194),

— 3 – Advanced (N=129).

The mean score for foundation level group is 35.79%, for intermediate level group is 56.74%, and for advanced level group is 77.68%. The means scores show a significant difference between the digital skill levels of the participants, as do the minimums scores achieved by the participants. This is an indicator that SAT can be used to distinguish between the participants of different digital skill level.

Table 7.11

Score * Digital Skills					
Digital Skills	**N**	**Mean**	**Minimum**	**Maximum**	**Std. Error of Mean**
Basic	137	35,7879	9,66	82,15	1,28674

Intermediate	194	56,7388	18,63	96,78	1,13722
Advanced	129	77,6790	37,29	100,00	1,06639
Total	**460**	**56,3714**	**9,66**	**100,00**	**1,00836**

7.3 Item Reliability – Cronbach's Alpha for the SAT

In order to measure the reliability of the SAT and judge the internal consistency of the items, Cronbach's alpha was measured for the 82 items in the Item Bank for the SAT total and for the items belonging to the each of the competence areas. The Cronbach's alpha for SAT is 0.987 which is considered good. This is a slight improvement from the first pilot where the Cronbach's alpha was 0.980. The Cronbach's alpha for each of the 5 DigComp competence areas are presented in the table and are also considered good.

Table 7.12

Pilot1		Pilot2	
Cronbach's Alpha	**Number of Items**	**Cronbach's Alpha**	**Number of Items**
0,980	100	0,987	82

Table 7.13

	Pilot1		Pilot2	
Competence Area	**Cronbach's Alpha**	**Number of Items**	**Cronbach's Alpha**	**Number of Items**
1	0,907	14	0,932	12
2	0,944	31	0,958	23
3	0,911	16	0,945	16
4	0,917	21	0,939	16
5	0,926	18	0,953	15

Competence Area 1

Cronbach's alpha for competence area 1 was calculated for 12 items the Cronbach's alpha value for the competence area was 0,932. The impact of item removal from the Item Bank for this competence area is presented in the table below in column Cronbach's Alpha if Item Deleted.

Table 7.14

Item-Total Statistics				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha
Q1.1.1.2.	7,4047	6,317	0,619	0,929
Q2.1.1.3.	7,2672	6,303	0,732	0,926
Q3.1.1.4.	7,4132	6,042	0,715	0,926
Q4.1.1.5.	7,2148	6,308	0,717	0,926
Q5.1.2.1.	7,3590	6,078	0,672	0,928
Q6.1.2.2.	7,3387	6,171	0,659	0,928
Q7.1.2.3.	7,3703	6,365	0,595	0,930
Q8.1.2.4.	7,2750	6,395	0,664	0,928
Q9.1.3.1.	7,2443	6,209	0,776	0,924
Q10.1.3.2.	7,3081	6,008	0,766	0,924
Q11.1.3.3.	7,2749	5,975	0,799	0,922
Q12.1.3.4.	7,4890	5,774	0,780	0,923

Competence Area 2

Cronbach's alpha for competence area 2 was calculated for 23 in the competence area. The Cronbach's alpha value for the competence area was 0,958. The impact of item removal from the Item Bank for this competence area is presented in the table below in column Cronbach's Alpha if Item Deleted.

Table 7.15

Item-Total Statistics				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha
Q13.2.1.1.	13,1471	26,043	0,672	0,956
Q14.2.1.2.	13,3228	25,909	0,659	0,956
Q15.2.1.3.	13,4341	24,904	0,826	0,954
Q16.2.1.4.	13,2761	25,961	0,721	0,956
Q17.2.2.1.	13,2373	26,311	0,542	0,958

Q18.2.2.3.	13,3193	25,206	0,791	0,955
Q19.2.2.5.	13,3962	24,993	0,824	0,955
Q20.2.2.6.	13,3160	25,541	0,745	0,956
Q21.2.3.1.	13,2587	26,078	0,646	0,957
Q22.2.3.2.	13,2808	25,439	0,765	0,955
Q23.2.3.3.	13,2227	25,848	0,740	0,956
Q24.2.3.5.	13,5482	26,030	0,574	0,957
Q25.2.4.1.	13,2610	25,703	0,713	0,956
Q26.2.4.2.	13,2908	25,530	0,734	0,956
Q27.2.4.3.	13,3150	25,153	0,775	0,955
Q28.2.5.1.	13,4004	26,895	0,303	0,960
Q29.2.5.3.	13,2711	26,168	0,600	0,957
Q30.2.5.4.	13,3865	25,123	0,789	0,955
Q31.2.5.5.	13,3982	25,309	0,769	0,955
Q32.2.6.1.	13,1974	26,366	0,644	0,957
Q33.2.6.2.	13,2526	25,853	0,748	0,956
Q34.2.6.5.	13,5630	25,670	0,636	0,957
Q35.2.6.6.	13,3591	25,487	0,698	0,956

Competence Area 3

Cronbach's alpha for competence area 3 was calculated for 16 items in the competence area. The Cronbach's alpha value for the competence area was 0,945. The impact of item removal from the Item Bank for this competence area is presented in the table below in column Cronbach's Alpha if Item Deleted.

Table 7.16

	Item-Total Statistics			
	Scale Mean if Item Deleted	**Scale Variance if Item Deleted**	**Corrected Item-Total Correlation**	**Cronbach's Alpha**
Q36.3.1.1.	6,5680	13,467	0,714	0,941
Q37.3.1.2.	6,6849	13,054	0,746	0,940
Q38.3.1.3.	6,7970	13,186	0,668	0,942

Q39.3.1.4.	6,7487	13,156	0,686	0,942
Q40.3.2.1.	6,8712	13,571	0,642	0,943
Q41.3.2.2.	6,8870	13,177	0,785	0,940
Q42.3.2.3.	6,7946	12,936	0,829	0,939
Q43.3.2.4.	6,6603	13,084	0,765	0,940
Q44.3.3.1.	6,7424	13,708	0,558	0,945
Q45.3.3.2.	6,5543	13,945	0,590	0,944
Q46.3.3.3.	6,7632	13,207	0,715	0,941
Q47.3.3.4.	6,9438	13,350	0,744	0,941
Q48.3.4.1.	6,7997	13,532	0,572	0,944
Q49.3.4.2.	6,8336	13,256	0,740	0,941
Q50.3.4.3.	7,0052	13,375	0,700	0,942
Q51.3.4.4.	6,8407	13,236	0,750	0,940

Competence Area 4

Cronbach's alpha for competence area 4 was calculated for 16 items in the competence area. The Cronbach's alpha value for the competence area was 0,939. The impact of item removal from the Item Bank for this competence area is presented in the table below in column Cronbach's Alpha if Item Deleted.

Table 7.17

	Item-Total Statistics			
	Scale Mean if Item Deleted	**Scale Variance if Item Deleted**	**Corrected Item-Total Correlation**	**Cronbach's Alpha**
Q52.4.1.3.	8,2417	10,367	0,740	0,934
Q53.4.1.4.	8,1105	10,533	0,751	0,934
Q54.4.1.5.	8,4385	10,129	0,750	0,934
Q55.4.1.6.	8,3277	10,110	0,755	0,933
Q56.4.2.1.	8,2140	10,037	0,769	0,933
Q57.4.2.2.	8,1435	10,298	0,725	0,934
Q58.4.2.3.	8,2591	10,125	0,768	0,933
Q59.4.2.4.	8,0575	10,609	0,736	0,934
Q60.4.2.6.	8,3400	10,733	0,554	0,938
Q61.4.3.1.	8,2150	11,000	0,417	0,941
Q62.4.3.3.	8,2795	10,274	0,716	0,934
Q63.4.3.4.	8,3606	10,643	0,621	0,937
Q64.4.4.2.	8,3155	10,735	0,569	0,938
Q65.4.4.3.	8,1228	10,838	0,568	0,938
Q66.4.4.4.	8,1048	10,427	0,732	0,934
Q67.4.4.5.	8,2066	10,460	0,686	0,935

Competence Area 5

Cronbach's alpha for competence area 5 was calculated for 15 items in the competence area. The Cronbach's alpha value for the competence area was 0,953. The impact of item removal from the Item Bank for this competence area is presented in the table below in column Cronbach's Alpha if Item Deleted.

Table 7.18

	Item-Total Statistics			
	Scale Mean if Item Deleted	**Scale Variance if Item Deleted**	**Corrected Item-Total Correlation**	**Cronbach's Alpha**

Q68.5.1.1.	7,6719	10,154	0,738	0,950
Q69.5.1.2.	7,6186	10,342	0,787	0,949
Q70.5.1.3.	7,7351	9,927	0,820	0,948
Q71.5.1.4.	7,8738	9,958	0,780	0,949
Q72.5.2.1.	7,7192	10,231	0,751	0,950
Q73.5.2.2.	7,5830	10,416	0,765	0,950
Q74.5.2.3.	7,6631	10,226	0,785	0,949
Q75.5.2.4.	7,7095	10,266	0,730	0,950
Q76.5.3.1.	7,6702	10,318	0,751	0,950
Q77.5.3.3.	7,9490	10,331	0,650	0,952
Q78.5.3.4.	7,9138	10,031	0,736	0,950
Q79.5.4.2.	7,7291	10,567	0,565	0,954
Q80.5.4.3.	7,7448	10,280	0,724	0,950
Q81.5.4.4.	7,6260	10,174	0,779	0,949
Q82.5.4.5.	7,7561	10,280	0,782	0,949

7.4 Additional Item Statistics

Several additional indicators were calculated for SAT items in Moodle platform and by using SPSS. The numbers are presented in the following tables. The indicators include the following information:

— Item code,

— N – number of participants,

— Minimum – minimum score for the group of participants for the item,

— Maximum – maximum score for the group of participants for the item,

— Mean – mean score for the group of participants for the item,

— Difficulty – item difficulty in percent for the group of the participants,

— Corrected Item-Total Correlation – discrimination value of the item,

— Cronbach's Alpha (calculated per competence area),

— DIF – result of differential item functioning analysis??

— Dimensionality of the Item Bank

— Number of unclear items – number of times participants have chosen the answer "This question is unclear to me".

In general, the items in the Item Bank have been perceived as not very difficult because the **item difficulty** is often measured in the upper range of the interval. Generally, items that have difficulty of 80% and more are considered easy. From Pilot 2 results, there is in fact no item with such value or higher. There are 9 items falling in the range immediately below (70-78% difficulty value): 5 of them belong to DigComp Area 1 Information and data literacy, 2 to Area 2 Communication and collaboration, 1 respectively to Area 4 Safety and Area 5 Problem solving. Area 3 Digital content creation has the largest number of items at the other end of the difficulty spectrum (6 out of 11 items with 23-41% difficulty value).

Items in SAT that have difficulty more than 80% should be considered for improvement or removal from the Item Bank. But since the SAT is designed for self-reflection on different digital skills and for the assessment of the related skills levels this should be viewed as suggestion.

The **item discrimination** (Corrected Item-Total Correlation) is affected by item difficulty. Items with discrimination lower than 0.2 should be considered for removal. There are no such items in the Item Bank. Items with discrimination in the range from 0.2 to 0.5 may be considered for improvement or removal. SK> there are 12 items <0.6 (9 of them Attitude items).

Cronbach's alpha value is good for all five competence areas and for SAT in general. This indicator may be used for consideration for removal of items, but it is not a strong indicator.

In addition, it was calculated how many times the participants have chosen the answer option "This question is unclear to me". This choice of answer was viewed as an indicator that some items need modifications or should be considered for removal.

All of the indicators may be used in combination to choose the items for improvement or removal from the Item Bank. At the same time the structure of the Item Bank should not be changed. There should still be items representing each of the competence areas. There should also be a balance of items representing different item types and different item difficulty levels in the Item Bank.

Table 7.19

Area 1	N	Min	Max	Mean	Difficulty (%)	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Number of "This question is unclear to me"
Q1.1.1.2.	460	0	1	0,59	59,2	0,619	0,929	4
Q2.1.1.3.	460	0	1	0,73	72,9	0,732	0,926	2
Q3.1.1.4.	460	0	1	0,58	58,3	0,715	0,926	14
Q4.1.1.5.	460	0	1	0,78	78,2	0,717	0,926	2
Q5.1.2.1.	460	0	1	0,64	63,7	0,672	0,928	22
Q6.1.2.2.	460	0	1	0,66	65,8	0,659	0,928	16
Q7.1.2.3.	460	0	1	0,63	62,6	0,595	0,930	4
Q8.1.2.4.	460	0	1	0,72	72,1	0,664	0,928	1
Q9.1.3.1.	460	0	1	0,75	75,2	0,776	0,924	1
Q10.1.3.2.	460	0	1	0,69	68,8	0,766	0,924	2

Q11.1.3.3.	460	0	1	0,72	72,1	0,799	0,922	2
Q12.1.3.4.	460	0	1	0,51	50,7	0,780	0,923	16

Table 7.20

Area 2	N	Minimum	Maximum	Mean	Difficulty (%)	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Number of "This question is unclear to me"
Q13.2.1.1.	460	0	1	0,78	78,3	0,672	0,956	0
Q14.2.1.2.	460	0	1	0,61	60,7	0,659	0,956	1
Q15.2.1.3.	460	0	1	0,50	49,6	0,826	0,954	5
Q16.2.1.4.	460	0	1	0,65	65,4	0,721	0,956	7
Q17.2.2.1.	460	0	1	0,69	69,2	0,542	0,958	3
Q18.2.2.3.	460	0	1	0,61	61,0	0,791	0,955	7
Q19.2.2.5.	460	0	1	0,53	53,4	0,824	0,955	15
Q20.2.2.6.	460	0	1	0,61	61,4	0,745	0,956	13
Q21.2.3.1.	460	0	1	0,67	67,1	0,646	0,957	1
Q22.2.3.2.	460	0	1	0,65	64,9	0,765	0,955	3
Q23.2.3.3.	460	0	1	0,71	70,7	0,740	0,956	2
Q24.2.3.5.	460	0	1	0,38	38,2	0,574	0,957	5
Q25.2.4.1.	460	0	1	0,67	66,9	0,713	0,956	15
Q26.2.4.2.	460	0	1	0,64	63,9	0,734	0,956	9
Q27.2.4.3.	460	0	1	0,61	61,5	0,775	0,955	7
Q28.2.5.1.	460	0	1	0,53	52,9	0,303	0,960	9
Q29.2.5.3.	460	0	1	0,66	65,9	0,600	0,957	17
Q30.2.5.4.	460	0	1	0,54	54,3	0,789	0,955	11
Q31.2.5.5.	460	0	1	0,53	53,2	0,769	0,955	17
Q32.2.6.1.	460	0	1	0,73	73,2	0,644	0,957	2
Q33.2.6.2.	460	0	1	0,68	67,7	0,748	0,956	2
Q34.2.6.5.	460	0	1	0,37	36,7	0,636	0,957	28
Q35.2.6.6.	460	0	1	0,57	57,1	0,698	0,956	10

Table 7.21

Area 3	N	Minimum	Maximum	Mean	Difficulty (%)	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Number of "This question is unclear to me"
Q36.3.1.1.	460	0	1	0,67	66,5	0,714	0,941	1
Q37.3.1.2.	460	0	1	0,55	54,8	0,746	0,940	7
Q38.3.1.3.	460	0	1	0,44	43,6	0,668	0,942	5
Q39.3.1.4.	460	0	1	0,48	48,4	0,686	0,942	33
Q40.3.2.1.	460	0	1	0,36	36,2	0,642	0,943	41
Q41.3.2.2.	460	0	1	0,35	34,6	0,785	0,940	24
Q42.3.2.3.	460	0	1	0,44	43,8	0,829	0,939	5
Q43.3.2.4.	460	0	1	0,57	57,3	0,765	0,940	4
Q44.3.3.1.	460	0	1	0,49	49,1	0,558	0,945	13
Q45.3.3.2.	460	0	1	0,68	67,9	0,590	0,944	3
Q46.3.3.3.	460	0	1	0,47	47,0	0,715	0,941	9
Q47.3.3.4.	460	0	1	0,29	28,9	0,744	0,941	20
Q48.3.4.1.	460	0	1	0,43	43,3	0,572	0,944	68
Q49.3.4.2.	460	0	1	0,40	39,9	0,740	0,941	15
Q50.3.4.3.	460	0	1	0,23	22,8	0,700	0,942	12
Q51.3.4.4.	460	0	1	0,39	39,2	0,750	0,940	19

Table 7.22

Area 4	N	Minimum	Maximum	Mean	Difficulty (%)	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Number of "This question is unclear to me"
Q52.4.1.3.	460	0	1	0,54	54,1	0,740	0,934	3
Q53.4.1.4.	460	0	1	0,67	67,2	0,751	0,934	2

Q54.4.1.5.	460	0	1	0,34	34,4	0,750	0,934	6
Q55.4.1.6.	460	0	1	0,45	45,5	0,755	0,933	11
Q56.4.2.1.	460	0	1	0,57	56,9	0,769	0,933	3
Q57.4.2.2.	460	0	1	0,64	63,9	0,725	0,934	2
Q58.4.2.3.	460	0	1	0,52	52,3	0,768	0,933	6
Q59.4.2.4.	460	0	1	0,73	72,5	0,736	0,934	0
Q60.4.2.6.	460	0	1	0,44	44,2	0,554	0,938	4
Q61.4.3.1.	460	0	1	0,57	56,7	0,417	0,941	4
Q62.4.3.3.	460	0	1	0,50	50,3	0,716	0,934	27
Q63.4.3.4.	460	0	1	0,42	42,2	0,621	0,937	9
Q64.4.4.2.	460	0	1	0,47	46,7	0,569	0,938	8
Q65.4.4.3.	460	0	1	0,66	66,0	0,568	0,938	1
Q66.4.4.4.	460	0	1	0,68	67,8	0,732	0,934	1
Q67.4.4.5.	460	0	1	0,58	57,6	0,686	0,935	2

Table 7.23

Area 5	N	Minimum	Maximum	Mean	Difficulty (%)	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Number of "This question is unclear to me"
Q68.5.1.1.	460	0	1	0,61	61,1	0,738	0,950	6
Q69.5.1.2.	460	0	1	0,66	66,5	0,787	0,949	1
Q70.5.1.3.	460	0	1	0,55	54,8	0,820	0,948	3
Q71.5.1.4.	460	0	1	0,41	40,9	0,780	0,949	12
Q72.5.2.1.	460	0	1	0,56	56,4	0,751	0,950	9
Q73.5.2.2.	460	0	1	0,70	70,0	0,765	0,950	1
Q74.5.2.3.	460	0	1	0,62	62,0	0,785	0,949	4
Q75.5.2.4.	460	0	1	0,57	57,4	0,730	0,950	13

Q76.5.3.1.	460	0	1	0,61	61,3	0,751	0,950	3
Q77.5.3.3.	460	0	1	0,33	33,4	0,650	0,952	11
Q78.5.3.4.	460	0	1	0,37	36,9	0,736	0,950	27
Q79.5.4.2.	460	0	1	0,55	55,4	0,565	0,954	5
Q80.5.4.3.	460	0	1	0,54	53,8	0,724	0,950	3
Q81.5.4.4.	460	0	1	0,66	65,7	0,779	0,949	1
Q82.5.4.5.	460	0	1	0,53	52,7	0,782	0,949	3

Analysis of the answer "The question is unclear to me"

As seen in the tables above, Pilot 2 participants were given the possibility to choose, beyond the 4-level answering scale for each item-question, a fifth option "The question is unclear to me", which was the same for all item types. This possibility was introduced in Pilot 2 because, given that test taking had to be done online and largely autonomously by the respondents, it was felt important that they could provide feedback (when necessary) about the wording and sentence structure of individual items, as it had occurred through face-to-face interactions with the organisers while taking the test in Pilot 1.

As Table 25 shows, only 2 items out of 82 did not get any "unclear to me" answer from Pilot 2 respondents. Another 54 items got this answer, but from a relatively small number of respondents (29 items from 1-3 people and 25 items from 4-10 people) out of the total 460 respondents. 26 items were found 'unclear' by 11 people or more, with 10 of those items considered 'unclear' by at least 19 up to 41 (1 item) and 68 (1 item) respondents.

Table 24 – Frequency of answering option 5 ("not clear to me")

Frequency of selection	Total N° items "not clear to me"
Never selected	2
Selected 1-3 times	29
Selected 4-10 times	25
Selected more than 10 times	26
Total items	**82**

Interestingly, the 3 items with the largest number of "unclear to me" answers are all Attitude items:

Table 7.25

Item n.	Statement	Competence	Freq. option 5

60	I am interested in understanding how a task can be broken down into steps so that it can be automated	3.4	68
51	I am keen to create new digital content by mixing and modifying existing resources	3.2	41
50	To express myself, I am careful to choose the right type of digital media knowing that it may depend on the audience and my aim	3.1	33 (LV only)

In the light of these results, we can make two broad observations: one concerning a test design issue which probably affected the responses; the other one concerning cultural attitudes of respondents in different countries.

"The question is unclear to me" answer was intended to refer to the perceived 'quality' of the item by the respondent, whereas the 4-level scale refers to the respondent's self-perception of the skills, knowledge and attitude addressed by the item. Putting them together into the 5-level scale has likely confused some respondents who selected the "unclear to me" answer when the right choice should have been one of the level 1 options ("I have no knowledge of this / I never heard of this", "I don't know how to do it" and "Not at all").

This can be seen by the statistical analysis which shows that items with a high rate of "unclear to me" answers tend to be in the 'harder' side of the difficulty spectrum (Difficulty index below 0,54).

A similar conclusion comes from looking closely at the 10 items which got the highest rate of "unclear to me" answers (i.e. by 19+ respondents). Some of them deal with 'specialist' topics (such as items referring to licences on digital content, the Right to be forgotten, algorithms etc.), which respondents probably were not familiar with. For other items, the "unclear to me" option was likely chosen –as originally intended– when the statement was perceived as too abstract, generic or obscure, also because of lack of context (an example of this is item 60 "I am interested in understanding how a task can be broken down into steps so that it can be automated" which refers to competence 3.4 Programming). These features may have been compounded also by translation aspects.

Based on these observations, we may conclude that it would have probably been better to offer on the test platform a separate feedback option <u>after</u> having answered the main question using the 4-level scale. Of course, this would have increased slightly the cognitive complexity of taking the test (by asking respondents to answer the main question and then decide whether they found it easy to understand or not) and possibly the test duration.

Concerning **cultural differences**, the number of respondents which chose the "unclear to me" option differs significantly in the two Pilot 2 countries. In Latvia, about half (51%) of the respondents (132/260) chose this option at least once, whereas only 30% of respondents in Spain (60/200) did the same. In Latvia, 13 respondents selected option 5 for 10 or more items (4 of them for 20 or more items), whereas in Spain, only 5 respondents selected it for 8-10 items and none for more than 10 items.

Reflecting this, also the number of items that were considered "not clear to me" differs significantly in the two countries as illustrated in Table 26 below. In Latvia, only 7/82 items never got a "not clear to me" answer, whereas in Spain almost half of all items (38/82) were considered clear (i.e. no respondent selected option 5 for them). At the other end of the spectrum, in Latvia 20 items were considered "not clear" by at least 10 respondents, whereas in Spain only 2 items were considered "not clear" by that many respondents: Q5 by 13 and Q48 by 20 people (respectively 9 and 48 people in Latvia).

Table 7.26 – Frequency of answering option 5 ("not clear to me") by country

	N° items "not clear to me"	
Frequency of selection	**Latvia**	**Spain**
Never selected	7	38

Selected 1-3 times	32	30
Selected 4-10 times	23	12
Selected more than 10 times	20	2
Total	**82**	**82**

There seems to be therefore some cultural factor at play contributing to this outcome.

An additional statistical analysis performed on Latvian data, shows that the respondents that selected option 5 at least once (group Y in tables 27 and 28) spent a bit less time on the test and had higher scores, and can therefore be assumed to have more advanced digital skills and awareness. This finding is coherent with the above interpretation that selecting option 5 may have been seen by many Latvian respondents as a way to contribute to the improvement of the test.

Table 7.27 – Test-taking time (LV only): "not clear" chosen at least once (Y), never (N)

Not Clear	N°	Mean	Median	Min.	Max.	Std. Error of Mean	Std. Deviation
N	132	32,22	23,00	10	120	2,31	26,59
Y	128	29,70	20,00	10	120	2,41	27,31
Total	**260**	**30,98**	**22,00**	**10**	**120**	**1,67**	**26,92**

Table 7.28 – Test score (LV only): "not clear" chosen at least once (Y), never (N)

Not Clear	N	Mean	Median	Min.	Max.	Std. Error of Mean	Std. Deviation
N	132	46,4	46,4	9,7	84,6	1,60	18,34
Y	128	65,5	68,5	14,2	96,8	1,84	20,84
Total	**260**	**55,8**	**56,2**	**9,7**	**96,8**	**1,35**	**21,78**

7.5 Correlation Analysis

Correlation analysis was performed on data gathered during the second pilot phase to identify the relations between items assigned to individual competences and competence areas. Spearman rank-order correlation coefficient (Spearman's rho) was calculated. Spearman's rho is a nonparametric measure of strength and direction of association that exists between the two variables measured on an ordinal scale.

The results of calculations are presented in the following tables divided according to 5 competence areas. The Spearman's rho coefficients are divided in the following intervals.

- Spearman's rho less than 0.3 was considered a low correlation. It was expected from the items that attempt to measure a very distinct factor from the rest of the items in the Item Bank.
- Spearman's rho between 0.3 and 0.5 was considered a moderate correlation. It was expected that an item would have a correlation in this range with the items that are believed to measure other competences.
- Spearman's rho between 0.5 and 0.7 was considered a high correlation. It was expected that an item would have a correlation in this range with the other items from the same competence.
- Spearman's rho above 0.7 was considered a very high correlation. A correlation in this range would suggest that an item may be overlapping with other items too much.

Correlations in Competence Area 1

The items in competence area 1 (items Q1-1.1.2. to Q12-1.3.4.) show moderate correlations in general. This is expected of the items that are related to a common competence and suggests that these items may be used to measure the respective competence area.

Items Q1-1.1.2, Q2-1.1.3, Q3-1.1.4, Q4-1.1.5 were attributed to competence 1 and show moderate of high correlations which suggest a stronger link to item the respective competence. However, items Q3-1.1.4, Q4-1.1.5 also show a high correlation to competence 3.

Items Q9-1.3.1, Q10-1.3.2, Q11-1.3.3, Q12-1.3.4 were attributed to competence 3 and show high to very high correlations. They also show moderate to high correlations to items from competence 1. If the reduction of Item Bank is considered the items with very high correlation to the other items of the same competence can be considered for removal.

It can be concluded that the items have a correlation to the other items in competence area but do not always clearly show a higher correlation with and only with the items of the same competence.

Correlations in Competence Area 2

The items in competence area 2 (items Q13-2.1.1 to Q35-2.6.6) in general show moderate to high correlations as can be expected from items of the same competence area. However, in this competence are items tend to have high or very high correlations to other items in several other competences.

There are a few items that show low correlations to several items in the same competence area. Most notably these are items Q17-2.2.1 and Q28-2.5.1. These items also show no high correlations with other items of the same competence area.

Items Q19-2.2.5, Q22-2.3.2, Q31-2.5.5 show high and even very high correlations to other items to the items of the same or other competences. These items may be considered for removal.

It can be concluded that the items have a correlation to the items of the same competence area. They do have moderate to high correlations with the items of the same competence but at the same time they have a correlation to the items from other competences as well.

Correlations in Competence Area 3

The items in competence area 3 (items Q36-3.1.1 to Q51-3.4.4) in general show moderate to high correlations as can be expected from items of the same competence area, but items from one competence also tend to have high or even very high correlations to items from other competences.

Items from competence 10 (Q36-3.1.1, Q37-3.1.2, Q38-3.1.3, Q39-3.1.4) have moderate to high correlation with the items of the same competence but also with the items of competence 11 (items Q40-3.2.1, Q41-3.2.2, Q42-3.2.3, Q43-3.2.4). This suggests that the competences may be perceived as overlapping.

Items from competence 11 (Q40-3.2.1, Q41-3.2.2, Q42-3.2.3, Q43-3.2.4) tend to have high to very high correlations with the items of the same competence but they also have the most cases of moderate to high correlations to items of other competences of the same competence area.

Items from competence 13 (Q48-3.4.1, Q49-3.4.2, Q50-3.4.3, Q51-3.4.4) have high to very high correlation to other items of the same competence with exception of item Q48-3.4.1. These items may be considered for removal if reduction of the number of items in the Item Bank is the goal.

It can be concluded that the items have a correlation to the items of the same competence area. They do have moderate to high correlations with the items of the same competence but at the same time they have a correlation to the items from other competences as well.

Correlations in Competence Area 4

The items in competence area 4 (items Q52-4.1.3 to Q67-4.4.5) in general show moderate to high correlations as can be expected from items of the same competence area.

Items from competence 14 (Q52-4.1.3, Q53-4.1.4, Q54-4.1.5, Q55-4.1.6) and from competence 15 (Q56-4.2.1, Q57-4.2.2, Q58-4.2.3, Q59-4.2.4, Q60-4.2.6) have high or very high correlations between themselves and the items of the other competence. This suggest that the competences are related and may be perceived as overlapping by the participants.

Items from competence 16 (Q61-4.3.3, Q62-4.3.3, Q63-4.3.4) and from competence 17 (Q64-4.4.2, Q65-4.4.3, Q66-4.4.4, Q67-4.4.5) have moderate correlations and are probably perceived as less overlapping as the items form the other competence in the same competence area. Item Q61-4.3.1 is the one item with the lowest correlation in this competence area. It has low correlation to most of the other items of this competence area.

It can be concluded that the items have a correlation to the items of the same competence area. They do have moderate to high correlations with the items of the same competence but at the same time they have a correlation to the items from other competences as well.

Correlations in Competence Area 5

The items in competence area 5 (items Q68-5.1.1 to Q82-5.4.5) in general show moderate to high correlations as can be expected from items of the same competence area. At the same time, most items in this competence area show high correlations not only to the competence they belong to but also to other competences of the same competence area.

In particular, items Q69-5.1.2, Q71-5.1.4, Q73-5.2.2, Q78-5.3.4 show high or very high correlations to not only items form the same competence but also to items form other competences.

It can be concluded that the items have a correlation to the items of the same competence area. They do have moderate to high correlations with the items of the same competence but at the same time they often have a high correlation to the items from other competences as well.

7.6 Item Correlation Tables

Table 7.30 – Item Correlations for Competence Area 1

Spearman's rho		Q1-1.1.2	Q2-1.1.3	Q3-1.1.4	Q4-1.1.5	Q5-1.2.1	Q6-1.2.2	Q7-1.2.3	Q8-1.2.4	Q9-1.3.1	Q10-1.3.2	Q11-1.3.3	Q12-1.3.4
Q1-1.1.2.	Correlation Coefficient	1,000	,572**	,582**	,470**	,514**	,539**	,425**	,533**	,479**	,442**	,476**	,507**

	Sig. (2-tailed)		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	456	454	442	454	434	440	452	455	455	454	454	440
Q2-1.1.3.	Correlation Coefficient	,572**	1,000	,637**	,633**	,542**	,541**	,447**	,532**	,592**	,546**	,588**	,596**
	Sig. (2-tailed)	0,000		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	454	458	445	456	438	442	454	457	457	456	456	442
Q3-1.1.4.	Correlation Coefficient	,582**	,637**	1,000	,637**	,568**	,532**	,475**	,515**	,577**	,594**	,625**	,651**
	Sig. (2-tailed)	0,000	0,000		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	442	445	446	444	426	432	443	445	445	444	444	431
Q4-1.1.5.	Correlation Coefficient	,470**	,633**	,637**	1,000	,651**	,531**	,429**	,518**	,639**	,633**	,669**	,629**
	Sig. (2-tailed)	0,000	0,000	0,000		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	454	456	444	458	437	442	454	457	457	456	456	442
Q5-1.2.1.	Correlation Coefficient	,514**	,542**	,568**	,651**	1,000	,562**	,384**	,515**	,593**	,582**	,598**	,567**
	Sig. (2-tailed)	0,000	0,000	0,000	0,000		0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	434	438	426	437	438	426	434	437	437	436	436	427
Q6-1.2.2.	Correlation Coefficient	,539**	,541**	,532**	,531**	,562**	1,000	,520**	,573**	,545**	,556**	,529**	,563**
	Sig. (2-tailed)	0,000	0,000	0,000	0,000	0,000		0,000	0,000	0,000	0,000	0,000	0,000
	N	440	442	432	442	426	444	441	443	443	442	443	430
Q7-1.2.3.	Correlation Coefficient	,425**	,447**	,475**	,429**	,384**	,520**	1,000	,558**	,489**	,502**	,494**	,489**
	Sig. (2-tailed)	0,000	0,000	0,000	0,000	0,000	0,000		0,000	0,000	0,000	0,000	0,000
	N	452	454	443	454	434	441	456	455	455	454	454	441
Q8-1.2.4.	Correlation Coefficient	,533**	,532**	,515**	,518**	,515**	,573**	,558**	1,000	,555**	,484**	,522**	,547**
	Sig. (2-tailed)	0,000	0,000	0,000	0,000	0,000	0,000	0,000		0,000	0,000	0,000	0,000
	N	455	457	445	457	437	443	455	459	458	457	457	443
Q9-1.3.1.	Correlation Coefficient	,479**	,592**	,577**	,639**	,593**	,545**	,489**	,555**	1,000	,734**	,737**	,647**
	Sig. (2-tailed)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000		0,000	0,000	0,000
	N	455	457	445	457	437	443	455	458	459	458	458	444
Q10-1.3.2.	Correlation Coefficient	,442**	,546**	,594**	,633**	,582**	,556**	,502**	,484**	,734**	1,000	,805**	,680**
	Sig. (2-tailed)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000		0,000	0,000
	N	454	456	444	456	436	442	454	457	458	458	457	443

Q11-1.3.3.	Correlation Coefficient	,476**	,588**	,625**	,669**	,598**	,529**	,494**	,522**	,737**	,805**	1,000	,732**
	Sig. (2-tailed)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000		0,000
	N	454	456	444	456	436	443	454	457	458	457	458	444
Q12-1.3.4.	Correlation Coefficient	,507**	,596**	,651**	,629**	,567**	,563**	,489**	,547**	,647**	,680**	,732**	1,000
	Sig. (2-tailed)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	
	N	440	442	431	442	427	430	441	443	444	443	444	444

**. Correlation is significant at the 0.01 level (2-tailed).

Table 7.31 – Item Correlations for Competence Area 2

Spearman's rho		Q13-2.1.1	Q14-2.1.2	Q15-2.1.3	Q16-2.1.4	Q17-2.2.1	Q18-2.2.3	Q19-2.2.5	Q20-2.2.6	Q21-2.3.1	Q22-2.3.2	Q23-2.3.3	Q24-2.3.5
Q13-2.1.1.	Correlation Coefficient	1,000	,645**	,671**	,555**	,257**	,527**	,654**	,460**	,590**	,700**	,661**	,363**
	Sig. (2-tailed)		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	460	459	455	453	457	453	445	447	459	457	458	455
Q14-2.1.2.	Correlation Coefficient	,645**	1,000	,671**	,588**	,161**	,485**	,651**	,447**	,486**	,647**	,587**	,347**
	Sig. (2-tailed)	0,000		0,000	0,000	0,001	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	459	459	454	452	456	452	444	446	458	456	457	455
Q15-2.1.3.	Correlation Coefficient	,671**	,671**	1,000	,652**	,426**	,668**	,724**	,619**	,586**	,709**	,634**	,493**
	Sig. (2-tailed)	0,000	0,000		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	455	454	455	448	452	452	444	445	454	452	453	450
Q16-2.1.4.	Correlation Coefficient	,555**	,588**	,652**	1,000	,319**	,556**	,609**	,599**	,581**	,583**	,564**	,333**
	Sig. (2-tailed)	0,000	0,000	0,000		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	453	452	448	453	450	447	438	440	452	451	451	448
Q17-2.2.1.	Correlation Coefficient	,257**	,161**	,426**	,319**	1,000	,516**	,394**	,514**	,254**	,339**	,316**	,599**
	Sig. (2-tailed)	0,000	0,001	0,000	0,000		0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	457	456	452	450	457	450	443	445	456	454	455	452
Q18-2.2.3.	Correlation Coefficient	,527**	,485**	,668**	,556**	,516**	1,000	,727**	,670**	,528**	,600**	,597**	,497**
	Sig. (2-tailed)	0,000	0,000	0,000	0,000	0,000		0,000	0,000	0,000	0,000	0,000	0,000
	N	453	452	452	447	450	453	442	442	452	450	451	448

Q19-2.2.5.	Correlation Coefficient	,654**	,651**	,724**	,609**	,394**	,727**	1,000	,671**	,546**	,709**	,684**	,478**
	Sig. (2-tailed)	0,000	0,000	0,000	0,000	0,000	0,000		0,000	0,000	0,000	0,000	0,000
	N	445	444	444	438	443	442	445	438	444	442	443	440
Q20-2.2.6.	Correlation Coefficient	,460**	,447**	,619**	,599**	,514**	,670**	,671**	1,000	,529**	,613**	,597**	,534**
	Sig. (2-tailed)	0,000	0,000	0,000	0,000	0,000	0,000	0,000		0,000	0,000	0,000	0,000
	N	447	446	445	440	445	442	438	447	446	444	445	443
Q21-2.3.1.	Correlation Coefficient	,590**	,486**	,586**	,581**	,254**	,528**	,546**	,529**	1,000	,613**	,613**	,297**
	Sig. (2-tailed)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000		0,000	0,000	0,000
	N	459	458	454	452	456	452	444	446	459	456	457	454
Q22-2.3.2.	Correlation Coefficient	,700**	,647**	,709**	,583**	,339**	,600**	,709**	,613**	,613**	1,000	,732**	,420**
	Sig. (2-tailed)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000		0,000	0,000
	N	457	456	452	451	454	450	442	444	456	457	456	452
Q23-2.3.3.	Correlation Coefficient	,661**	,587**	,634**	,564**	,316**	,597**	,684**	,597**	,613**	,732**	1,000	,409**
	Sig. (2-tailed)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000		0,000
	N	458	457	453	451	455	451	443	445	457	456	458	453
Q24-2.3.5.	Correlation Coefficient	,363**	,347**	,493**	,333**	,599**	,497**	,478**	,534**	,297**	,420**	,409**	1,000
	Sig. (2-tailed)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	
	N	455	455	450	448	452	448	440	443	454	452	453	455
Q25-2.4.1.	Correlation Coefficient	,567**	,530**	,591**	,537**	,392**	,567**	,623**	,541**	,491**	,563**	,531**	,489**
	Sig. (2-tailed)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	445	444	440	440	443	440	434	436	444	443	443	440
Q26-2.4.2.	Correlation Coefficient	,445**	,440**	,636**	,563**	,497**	,694**	,638**	,664**	,503**	,561**	,559**	,469**
	Sig. (2-tailed)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	451	450	449	444	448	447	440	441	450	448	449	446
Q27-2.4.3.	Correlation Coefficient	,480**	,440**	,663**	,575**	,594**	,772**	,662**	,686**	,517**	,593**	,597**	,531**
	Sig. (2-tailed)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	453	452	451	446	450	449	441	442	452	450	451	448
Q28-2.5.1.	Correlation Coefficient	,439**	,462**	,259**	,331**	-,192**	,197**	,354**	,164**	,411**	,389**	,374**	0,035

	Sig. (2-tailed)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,001	0,000	0,000	0,000	0,466
	N	451	450	446	446	448	445	436	438	450	448	450	446
Q29-2.5.3.	Correlation Coefficient	,401**	,358**	,505**	,535**	,438**	,516**	,477**	,552**	,423**	,409**	,418**	,414**
	Sig. (2-tailed)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	443	442	440	436	442	438	430	434	442	440	441	439
Q30-2.5.4.	Correlation Coefficient	,592**	,570**	,685**	,561**	,454**	,630**	,670**	,593**	,525**	,599**	,601**	,524**
	Sig. (2-tailed)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	449	448	446	442	446	444	436	439	448	447	448	444
Q31-2.5.5.	Correlation Coefficient	,661**	,651**	,700**	,574**	,320**	,582**	,740**	,560**	,530**	,729**	,669**	,463**
	Sig. (2-tailed)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	443	442	439	438	440	438	429	431	442	441	441	438
Q32-2.6.1.	Correlation Coefficient	,422**	,466**	,523**	,584**	,433**	,516**	,533**	,569**	,470**	,488**	,517**	,359**
	Sig. (2-tailed)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	458	457	453	452	455	451	444	446	457	456	456	453
Q33-2.6.2.	Correlation Coefficient	,545**	,519**	,629**	,599**	,405**	,642**	,651**	,606**	,583**	,575**	,610**	,414**
	Sig. (2-tailed)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	458	457	453	451	455	451	443	445	457	455	456	454
Q34-2.6.5.	Correlation Coefficient	,448**	,499**	,560**	,401**	,394**	,533**	,567**	,536**	,394**	,505**	,478**	,498**
	Sig. (2-tailed)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	432	431	429	426	429	426	420	420	431	430	431	427
Q35-2.6.6.	Correlation Coefficient	,409**	,408**	,658**	,536**	,494**	,641**	,562**	,629**	,429**	,490**	,472**	,403**
	Sig. (2-tailed)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	450	449	446	444	448	446	439	439	449	448	449	445

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 7.32 – Item Correlations for Competence Area 3

Spearman's rho	Q36-3.1.1	Q37-3.1.2	Q38-3.1.3	Q39-3.1.4	Q40-3.2.1	Q41-3.2.2	Q42-3.2.3	Q43-3.2.4	Q44-3.3.1	Q45-3.3.2	Q46-3.3.3	Q47-3.3.4	Q48-3.4.1	Q49-3.4.2	Q50-3.4.3	Q51-3.4.4

Q36-3.1.1	Correlation Coefficient	1,000	,654**	,597**	,604**	,478**	,577**	,643**	,691**	,439**	,505**	,551**	,499**	,354**	,475**	,478**
	Sig. (2-tail)		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	459	453	454	427	418	436	454	455	446	456	450	439	392	445	447	440
Q37-3.1.2	Correlation Coefficient	,654**	1,000	,539**	,531**	,567**	,613**	,704**	,681**	,425**	,472**	,631**	,548**	,407**	,553**	,500**	,490**
	Sig. (2-tail)	0,000		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	453	453	449	422	416	433	449	449	442	450	444	434	389	440	443	438
Q38-3.1.3	Correlation Coefficient	,597**	,539**	1,000	,521**	,420**	,613**	,586**	,617**	,338**	,389**	,448**	,567**	,343**	,499**	,473**	,532**
	Sig. (2-tail)	0,000	0,000		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	454	449	455	423	416	434	451	452	442	452	447	436	389	442	444	438
Q39-3.1.4	Correlation Coefficient	,604**	,531**	,521**	1,000	,474**	,550**	,620**	,559**	,430**	,364**	,495**	,525**	,343**	,464**	,485**	,532**
	Sig. (2-tail)	0,000	0,000	0,000		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	427	422	423	427	397	408	423	423	416	424	418	409	378	417	416	412
Q40-3.2.1	Correlation Coefficient	,478**	,567**	,420**	,474**	1,000	,502**	,617**	,579**	,375**	,348**	,512**	,513**	,460**	,444**	,482**	,514**
	Sig. (2-tail)	0,000	0,000	0,000	0,000		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	418	416	416	397	419	404	416	417	409	417	412	402	372	410	412	408
Q41-3.2.2	Correlation Coefficient	,577**	,613**	,613**	,550**	,502**	1,000	,710**	,618**	,441**	,450**	,610**	,761**	,406**	,576**	,579**	,564**
	Sig. (2-tail)	0,000	0,000	0,000	0,000	0,000		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	436	433	434	408	404	436	433	433	424	434	428	426	379	426	427	421
Q42-3.2.3	Correlation Coefficient	,643**	,704**	,586**	,620**	,617**	,710**	1,000	,758**	,432**	,464**	,655**	,627**	,471**	,616**	,642**	,631**
	Sig. (2-tail)	0,000	0,000	0,000	0,000	0,000	0,000		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	454	449	451	423	416	433	455	453	443	452	447	436	390	442	444	437
Q43-3.2.4	Correlation Coefficient	,691**	,681**	,617**	,559**	,579**	,618**	,758**	1,000	,498**	,449**	,547**	,535**	,415**	,536**	,565**	,610**
	Sig. (2-tail)	0,000	0,000	0,000	0,000	0,000	0,000	0,000		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	455	449	452	423	417	433	453	456	443	453	448	436	391	442	444	437
Q44-3.3.1	Correlation Coefficient	,439**	,425**	,338**	,430**	,375**	,441**	,432**	,498**	1,000	,435**	,352**	,433**	,317**	,409**	,383**	,434**
	Sig. (2-tail)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000		0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	446	442	442	416	409	424	443	443	447	445	439	429	384	434	437	431
Q45-3.3.2	Correlation Coefficient	,505**	,472**	,389**	,364**	,348**	,450**	,464**	,449**	,435**	1,000	,564**	,427**	,431**	,461**	,349**	,450**

	Sig. (2-tail)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000		0,000	0,000	0,000	0,000	0,000	0,000
	N	456	450	452	424	417	434	452	453	445	457	449	439	391	443	446	439
Q46-3.3.3	Correlation Coefficient	,551**	,631**	,448**	,495**	,512**	,610**	,655**	,547**	,352**	,564**	1,000	,591**	,460**	,588**	,540**	,574**
	Sig. (2-tail)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000		0,000	0,000	0,000	0,000	0,000
	N	450	444	447	418	412	428	447	448	439	449	451	436	387	439	442	433
Q47-3.3.4	Correlation Coefficient	,499**	,548**	,567**	,525**	,513**	,761**	,627**	,535**	,433**	,427**	,591**	1,000	,453**	,553**	,583**	,580**
	Sig. (2-tail)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000		0,000	0,000	0,000	0,000
	N	439	434	436	409	402	426	436	436	429	439	436	440	378	430	434	426
Q48-3.4.1	Correlation Coefficient	,354**	,407**	,343**	,343**	,460**	,406**	,471**	,415**	,317**	,431**	,460**	,453**	1,000	,537**	,522**	,557**
	Sig. (2-tail)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000		0,000	0,000	0,000
	N	392	389	389	378	372	379	390	391	384	391	387	378	392	385	383	385
Q49-3.4.2	Correlation Coefficient	,475**	,553**	,499**	,464**	,444**	,576**	,616**	,536**	,409**	,461**	,588**	,553**	,537**	1,000	,683**	,759**
	Sig. (2-tail)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000		0,000	0,000
	N	445	440	442	417	410	426	442	442	434	443	439	430	385	445	437	430
Q50-3.4.3	Correlation Coefficient	,478**	,500**	,473**	,485**	,482**	,579**	,642**	,565**	,383**	,349**	,540**	,583**	,522**	,683**	1,000	,702**
	Sig. (2-tail)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000		0,000
	N	447	443	444	416	412	427	444	444	437	446	442	434	383	437	448	432
Q51-3.4.4	Correlation Coefficient	,534**	,490**	,532**	,532**	,514**	,564**	,631**	,610**	,434**	,450**	,574**	,580**	,557**	,759**	,702**	1,000
	Sig. (2-tail)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	
	N	440	438	438	412	408	421	437	437	431	439	433	426	385	430	432	441

**. Correlation is significant at the 0.01 level (2-tailed).

Table 7.33 – Item Correlations for Competence Area 4

Spearman's rho		Q52-4.1.3	Q53-4.1.4	Q54-4.1.5	Q55-4.1.6	Q56-4.2.1	Q57-4.2.2	Q58-4.2.3	Q59-4.2.4	Q60-4.2.6	Q61-4.3.1	Q62-4.3.3	Q63-4.3.4	Q64-4.4.2	Q65-4.4.3	Q66-4.4.4	Q67-4.4.5
Q52-4.1.3	Correlation Coefficient	1,000	,634**	,641**	,576*	,573*	,615*	,583*	,610*	,478*	,271*	,593*	,546**	,508**	,439**	,546**	,500**
	Sig. (2-tail)		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	457	455	451	446	454	455	451	457	453	453	430	448	449	456	456	455

Q53-4.1.4	Correlation Coefficient	,634**	1,000	,618**	,642*	,620*	,648*	,641*	,664*	,368*	,264*	,577*	,515**	,370**	,530**	,672**	,582**
	Sig. (2-tail)	0,000		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	455	458	452	447	455	456	452	458	455	455	431	450	450	457	457	456
Q54-4.1.5.	Correlation Coefficient	,641**	,618**	1,000	,738*	,686*	,633*	,678*	,552*	,400*	,234*	,666*	,475**	,401**	,438**	,622**	,526**
	Sig. (2-tail)	0,000	0,000		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	451	452	454	445	452	452	449	454	451	450	428	447	447	453	453	452
Q55-4.1.6	Correlation Coefficient	,576**	,642**	,738**	1,000	,714*	,619*	,690*	,609*	,367*	,266*	,639*	,468**	,422**	,484**	,635**	,490**
	Sig. (2-tail)	0,000	0,000	0,000		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	446	447	445	449	448	447	446	449	445	446	423	441	442	448	448	447
Q56-4.2.1	Correlation Coefficient	,573**	,620**	,686**	,714*	1,000	,704*	,696*	,652*	,365*	,340*	,645*	,445**	,391**	,381**	,695**	,518**
	Sig. (2-tail)	0,000	0,000	0,000	0,000		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	454	455	452	448	457	455	452	457	453	454	430	449	450	456	456	455
Q57-4.2.2	Correlation Coefficient	,615**	,648**	,633**	,619*	,704*	1,000	,670*	,716*	,326*	,274*	,623*	,402**	,400**	,398**	,631**	,530**
	Sig. (2-tail)	0,000	0,000	0,000	0,000	0,000		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	455	456	452	447	455	458	453	458	454	454	432	449	450	457	457	456
Q58-4.2.3	Correlation Coefficient	,583**	,641**	,678**	,690*	,696*	,670*	1,000	,630*	,437*	,273*	,688*	,526**	,422**	,446**	,596**	,510**
	Sig. (2-tail)	0,000	0,000	0,000	0,000	0,000	0,000		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	451	452	449	446	452	453	454	454	450	450	430	446	447	453	453	452
Q59-4.2.4	Correlation Coefficient	,610**	,664**	,552**	,609*	,652*	,716*	,630*	1,000	,396*	,271*	,590*	,426**	,405**	,460**	,649**	,530**
	Sig. (2-tail)	0,000	0,000	0,000	0,000	0,000	0,000	0,000		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	457	458	454	449	457	458	454	460	456	456	433	451	452	459	459	458
Q60-4.2.6	Correlation Coefficient	,478**	,368**	,400**	,367*	,365*	,326*	,437*	,396*	1,000	,324*	,450*	,455**	,471**	,395**	,349**	,420**
	Sig. (2-tail)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000		0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	453	455	451	445	453	454	450	456	456	454	430	450	449	455	455	454
Q61-4.3.1	Correlation Coefficient	,271**	,264**	,234**	,266*	,340*	,274*	,273*	,271*	,324*	1,000	,315*	,284**	,354**	,276**	,322**	,373**

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	Sig. (2-tail)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000		0,000	0,000	0,000	0,000	0,000	0,000
	N	453	455	450	446	454	454	450	456	454	456	429	449	449	455	455	454
Q62-4.3.3	Correlation Coefficient	,593**	,577**	,666**	,639*	,645*	,623*	,688*	,590*	,450*	,315*	1,000	,546**	,429**	,408**	,566**	,517**
	Sig. (2-tail)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000		0,000	0,000	0,000	0,000	0,000
	N	430	431	428	423	430	432	430	433	430	429	433	425	425	432	432	431
Q63-4.3.4	Correlation Coefficient	,546**	,515**	,475**	,468*	,445*	,402*	,526*	,426*	,455*	,284*	,546*	1,000	,491**	,456**	,446**	,435**
	Sig. (2-tail)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000		0,000	0,000	0,000	0,000
	N	448	450	447	441	449	449	446	451	450	449	425	451	446	450	450	450
Q64-4.4.2	Correlation Coefficient	,508**	,370**	,401**	,422*	,391*	,400*	,422*	,405*	,471*	,354*	,429*	,491**	1,000	,452**	,371**	,455**
	Sig. (2-tail)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000		0,000	0,000	0,000
	N	449	450	447	442	450	450	447	452	449	449	425	446	452	451	452	450
Q65-4.4.3	Correlation Coefficient	,439**	,530**	,438**	,484*	,381*	,398*	,446*	,460*	,395*	,276*	,408*	,456**	,452**	1,000	,461**	,585**
	Sig. (2-tail)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000		0,000	0,000
	N	456	457	453	448	456	457	453	459	455	455	432	450	451	459	458	457
Q66-4.4.4	Correlation Coefficient	,546**	,672**	,622**	,635*	,695*	,631*	,596*	,649*	,349*	,322*	,566*	,446**	,371**	,461**	1,000	,609**
	Sig. (2-tail)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000		0,000
	N	456	457	453	448	456	457	453	459	455	455	432	450	452	458	459	457
Q67-4.4.5	Correlation Coefficient	,500**	,582**	,526**	,490*	,518*	,530*	,510*	,530*	,420*	,373*	,517*	,435**	,455**	,585**	,609**	1,000
	Sig. (2-tail)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	
	N	455	456	452	447	455	456	452	458	454	454	431	450	450	457	457	458

**. Correlation is significant at the 0.01 level (2-tailed).

Table 7.34 – Item Correlations for Competence Area 5

	Spearman's rho	Q68-5.1.1	Q69-5.1.2	Q70-5.1.3	Q71-5.1.4	Q72-5.2.1	Q73-5.2.2	Q74-5.2.3	Q75-5.2.4	Q76-5.3.1	Q77-5.3.3	Q78-5.3.4	Q79-5.4.2	Q80-5.4.3	Q81-5.4.4	Q82-5.4.5
Q68-5.1.1	Correlation Coefficient	1,000	,659**	,704**	,659**	,690**	,589**	,584**	,536**	,597**	,464**	,583**	,463**	,549**	,578**	,626**
	Sig. (2-tail)		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000

	N	454	454	451	443	448	453	450	444	452	443	429	451	452	453	453
Q69-5.1.2	Correlation Coefficient	,659**	1,000	,690**	,649**	,589**	,717**	,664**	,662**	,618**	,480**	,637**	,445**	,572**	,653**	,639**
	Sig. (2-tail)	0,000		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	454	459	456	447	451	458	455	447	457	448	432	455	457	458	457
Q70-5.1.3	Correlation Coefficient	,704**	,690**	1,000	,757**	,647**	,676**	,694**	,646**	,627**	,570**	,691**	,394**	,587**	,679**	,678**
	Sig. (2-tail)	0,000	0,000		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	451	456	457	446	449	456	453	445	454	448	431	452	455	456	454
Q71-5.1.4	Correlation Coefficient	,659**	,649**	,757**	1,000	,611**	,625**	,629**	,596**	,640**	,538**	,712**	,371**	,579**	,621**	,673**
	Sig. (2-tail)	0,000	0,000	0,000		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	443	447	446	448	442	447	444	438	446	439	425	443	446	448	445
Q72-5.2.1	Correlation Coefficient	,690**	,589**	,647**	,611**	1,000	,614**	,609**	,538**	,606**	,551**	,578**	,490**	,660**	,549**	,599**
	Sig. (2-tail)	0,000	0,000	0,000	0,000		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	448	451	449	442	451	450	447	443	450	441	426	448	450	450	449
Q73-5.2.2	Correlation Coefficient	,589**	,717**	,676**	,625**	,614**	1,000	,726**	,627**	,633**	,507**	,634**	,436**	,577**	,670**	,652**
	Sig. (2-tailed)	0,000	0,000	0,000	0,000	0,000		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	453	458	456	447	450	459	455	446	456	448	432	454	456	458	456
Q74-5.2.3	Correlation Coefficient	,584**	,664**	,694**	,629**	,609**	,726**	1,000	,675**	,631**	,573**	,623**	,432**	,597**	,686**	,667**
	Sig. (2-tail)	0,000	0,000	0,000	0,000	0,000	0,000		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	450	455	453	444	447	455	456	443	453	445	431	451	453	455	453
Q75-5.2.4	Correlation Coefficient	,536**	,662**	,646**	,596**	,538**	,627**	,675**	1,000	,607**	,482**	,620**	,471**	,523**	,646**	,570**
	Sig. (2-tail)	0,000	0,000	0,000	0,000	0,000	0,000	0,000		0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	444	447	445	438	443	446	443	447	446	437	423	444	446	446	445
Q76-5.3.1	Correlation Coefficient	,597**	,618**	,627**	,640**	,606**	,633**	,631**	,607**	1,000	,498**	,617**	,444**	,535**	,598**	,665**
	Sig. (2-tail)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000		0,000	0,000	0,000	0,000	0,000	0,000
	N	452	457	454	446	450	456	453	446	457	446	431	453	455	456	455
Q77-5.3.3	Correlation Coefficient	,464**	,480**	,570**	,538**	,551**	,507**	,573**	,482**	,498**	1,000	,580**	,467**	,614**	,554**	,581**
	Sig. (2-tail)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000		0,000	0,000	0,000	0,000	0,000
	N	443	448	448	439	441	448	445	437	446	449	426	444	447	448	447

Q78-5.3.4	Correlation Coefficient	,583**	,637**	,691**	,712**	,578**	,634**	,623**	,620**	,617**	,580**	1,000	,404**	,541**	,626**	,678**
	Sig. (2-tail)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000		0,000	0,000	0,000	0,000
	N	429	432	431	425	426	432	431	423	431	426	433	428	431	432	430
Q79-5.4.2	Correlation Coefficient	,463**	,445**	,394**	,371**	,490**	,436**	,432**	,471**	,444**	,467**	,404**	1,000	,516**	,524**	,420**
	Sig. (2-tail)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000		0,000	0,000	0,000
	N	451	455	452	443	448	454	451	444	453	444	428	455	454	454	453
Q80-5.4.3	Correlation Coefficient	,549**	,572**	,587**	,579**	,660**	,577**	,597**	,523**	,535**	,614**	,541**	,516**	1,000	,614**	,628**
	Sig. (2-tail)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000		0,000	0,000
	N	452	457	455	446	450	456	453	446	455	447	431	454	457	456	455
Q81-5.4.4	Correlation Coefficient	,578**	,653**	,679**	,621**	,549**	,670**	,686**	,646**	,598**	,554**	,626**	,524**	,614**	1,000	,699**
	Sig. (2-tail)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000		0,000
	N	453	458	456	448	450	458	455	446	456	448	432	454	456	459	456
Q82-5.4.5	Correlation Coefficient	,626**	,639**	,678**	,673**	,599**	,652**	,667**	,570**	,665**	,581**	,678**	,420**	,628**	,699**	1,000
	Sig. (2-tail)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	
	N	453	457	454	445	449	456	453	445	455	447	430	453	455	456	457

**. Correlation is significant at the 0.01 level (2-tailed).

7.6 Cluster Analysis on Participants

In addition to statistical analysis of the items the analysis of participant responses was done by performing cluster analysis. K-means cluster analysis was performed which is considered appropriate for nonparametric data and allows to exclude missing data from the calculations. Answers "This question is unclear to me" were treated as missing values in this case because they gave no additional information about the digital skill level. After the initial cluster analysis has been performed, 5 clusters or participants were identified with a typical behaviour on certain groups of items in the Item Bank. A Mann-Whitney test for hypothesis testing on nonparametric data has been performed on the clusters to judge if the differences in responses between clusters were statistically significant.

Table 7.29 - Clusters of Participants

Cluster	No. of Participants	Explanation
1	93	Higher skilled participants in all competence areas
2	117	Higher skilled participants in all competence areas except competence area 1
3	61	Lower skilled participants with some average scores
4	113	Lower skilled participants in all competence areas
5	76	Average skilled participants

Participants of cluster 1 tend to evaluate their competences in all five competence areas higher than the average for all participant groups together. Participants of cluster 2 tend to evaluate their competences higher than the average for all participant groups together for all competence areas but they tend to choose the highest answer (e.g. "I can do it with confidence") in competence area 1 significantly less often than in other competence areas.

Participants of cluster 3 tend to evaluate their competences lower than that the average for all participant groups together. They tend to be more critical on items in competence areas 1 and 2 by choosing the lowest answer (e.g. I don't know/ I can't do it) more often. Participants of cluster 4 tend to evaluate their competences lower that average for all competence areas.

Participants of cluster 5 tend to evaluate some of their competences higher than average and some lower than average for all participants. The differences in their answers had significant statistical difference to form a separate cluster but this cluster had the most answers that did not differ from the average scores for all participants.

Cluster analysis suggests that competence areas 1 and 2 show the largest difference in average scores for two higher scoring clusters (1 and 2) and two lower scoring clusters (3 and 4). They may act as the best indicator that separates people by their level of digital skills. One of the reasons could be that people understand these competences better and feel more comfortable with evaluating themselves in these competence areas.

The scores for the other competence areas show higher numbers for higher scoring clusters (1 and 2) but one of the lower scoring clusters (cluster 3) shows scores that are average. This may be partially due to the more complex concepts included in the competences which cause the participants to be less precise in their self-evaluation.

7.7. Cluster Analysis Tables

Table 7.35 Average Scores for Clusters of Participants

Answers are coded from 1 (lowest) to 4 highest). Green – score higher than average for all, red – scored lower than average for all.

Item	Average Score Per Item					
	All	**Cluster 1**	**Cluster 2**	**Cluster 3**	**Cluster 4**	**Cluster 5**
Q1-1.1.2.	2,2	**3,0**	**2,4**	2,1	**1,4**	2,2
Q2-1.1.3.	1,8	**2,7**	**2,0**	**1,4**	**1,2**	1,7
Q3-1.1.4.	2,2	**3,2**	**2,6**	**1,8**	**1,3**	**2,0**
Q4-1.1.5.	1,6	**2,5**	**1,9**	**1,2**	**1,1**	1,5
Q5-1.2.1.	2,0	**3,0**	**2,2**	**1,6**	**1,3**	1,8
Q6-1.2.2.	2,0	**2,8**	**2,2**	**1,6**	**1,3**	2,0
Q7-1.2.3.	2,1	**2,9**	**2,3**	**1,7**	**1,5**	2,0
Q8-1.2.4.	1,8	**2,5**	**2,1**	**1,6**	**1,2**	1,8
Q9-1.3.1.	1,7	**2,7**	**2,0**	**1,2**	**1,1**	**1,6**
Q10-1.3.2.	1,9	**3,1**	**2,2**	**1,2**	**1,2**	1,8

Q11-1.3.3.	1,8	**3,1**	**2,0**	**1,1**	**1,1**	**1,6**
Q12-1.3.4.	2,4	**3,7**	**2,9**	**1,8**	**1,3**	2,4
Q13-2.1.1.	1,7	**2,7**	**1,9**	**1,2**	**1,0**	**1,3**
Q14-2.1.2.	2,2	**3,1**	**2,5**	**1,7**	**1,4**	**2,0**
Q15-2.1.3.	2,5	**3,8**	**3,0**	**1,8**	**1,4**	2,4
Q16-2.1.4.	2,0	**2,8**	**2,3**	**1,6**	**1,3**	2,0
Q17-2.2.1.	1,9	**2,7**	1,9	**1,4**	**1,5**	**2,1**
Q18-2.2.3.	2,1	**3,4**	**2,5**	**1,5**	**1,2**	2,1
Q19-2.2.5.	2,3	**3,6**	**2,8**	**1,7**	**1,3**	2,2
Q20-2.2.6.	2,1	**3,1**	**2,4**	**1,5**	**1,3**	2,1
Q21-2.3.1.	2,0	**2,8**	**2,3**	**1,6**	**1,4**	**1,8**
Q22-2.3.2.	2,0	**3,1**	**2,5**	**1,4**	**1,2**	1,9
Q23-2.3.3.	1,9	**2,8**	**2,1**	**1,5**	**1,1**	**1,7**
Q24-2.3.5.	1,9	**2,9**	**2,2**	**1,3**	**1,3**	1,9
Q25-2.4.1.	2,0	**3,1**	**2,3**	**1,3**	**1,3**	**2,2**
Q26-2.4.2.	2,8	**3,7**	**3,0**	**2,2**	**2,2**	3,0
Q27-2.4.3.	2,1	**3,4**	**2,3**	**1,2**	**1,2**	**2,4**
Q28-2.5.1.	2,4	**3,0**	**2,6**	2,5	**1,9**	**2,0**
Q29-2.5.3.	2,0	**2,8**	**2,1**	**1,6**	**1,4**	1,9
Q30-2.5.4.	2,3	**3,6**	**2,8**	**1,7**	**1,4**	**2,0**
Q31-2.5.5.	2,3	**3,5**	**2,8**	**1,8**	**1,4**	**2,1**
Q32-2.6.1.	1,8	**2,5**	**2,0**	**1,5**	**1,2**	1,8
Q33-2.6.2.	2,0	**2,9**	**2,2**	**1,6**	**1,3**	1,9
Q34-2.6.5.	2,3	**3,3**	**2,7**	**1,7**	**1,3**	2,3
Q35-2.6.6.	2,0	**3,0**	**2,4**	**1,4**	**1,2**	1,9
Q36-3.1.1.	2,3	**3,4**	**2,9**	**1,6**	**1,3**	2,4
Q37-3.1.2.	2,7	**3,6**	**3,2**	2,5	**1,7**	**2,4**

Q38-3.1.3.	2,8	**3,8**	**3,3**	**2,3**	**2,0**	2,7
Q39-3.1.4.	2,4	**3,5**	**3,0**	**2,1**	**1,5**	**2,2**
Q40-3.2.1.	2,9	**3,7**	**3,5**	**2,6**	**1,9**	2,9
Q41-3.2.2.	2,7	**3,7**	**3,3**	**2,3**	**1,5**	**2,5**
Q42-3.2.3.	2,3	**3,4**	**2,7**	**1,8**	**1,2**	**2,1**
Q43-3.2.4.	2,5	**3,2**	**2,8**	**2,2**	**1,9**	**2,3**
Q44-3.3.1.	2,8	**3,5**	**3,3**	**2,5**	**2,1**	2,7
Q45-3.3.2.	2,0	**2,6**	**2,2**	1,8	**1,3**	1,9
Q46-3.3.3.	2,6	**3,5**	**3,1**	**2,3**	**1,5**	**2,4**
Q47-3.3.4.	2,5	**3,1**	**2,9**	2,5	**1,8**	2,4
Q48-3.4.1.	2,8	**3,6**	**3,2**	2,8	**1,7**	2,6
Q49-3.4.2.	2,8	**3,7**	**3,2**	2,8	**1,8**	**2,5**
Q50-3.4.3.	3,1	**3,8**	**3,6**	3,0	**2,1**	3,1
Q51-3.4.4.	2,4	**3,2**	**2,7**	2,2	**1,5**	2,2
Q52-4.1.3.	2,0	**2,7**	**2,3**	2,0	**1,2**	1,9
Q53-4.1.4.	3,0	**3,9**	**3,5**	3,0	**1,8**	**2,6**
Q54-4.1.5.	2,6	**3,7**	**3,0**	2,6	**1,4**	**2,4**
Q55-4.1.6.	2,3	**3,5**	**2,7**	2,2	**1,2**	**1,9**
Q56-4.2.1.	3,3	**4,0**	**3,8**	**3,5**	**2,2**	3,1
Q57-4.2.2.	2,1	**3,1**	**2,4**	2,0	**1,1**	1,9
Q58-4.2.3.	2,4	**3,4**	**2,9**	**2,2**	**1,3**	**2,3**
Q59-4.2.4.	1,8	**2,6**	**2,0**	1,8	**1,1**	**1,7**
Q60-4.2.6.	2,7	**3,2**	**3,0**	2,6	**2,1**	**2,5**
Q61-4.3.1.	2,3	**2,8**	2,4	2,1	**1,9**	2,2
Q62-4.3.3.	2,4	**3,3**	**2,8**	2,3	**1,5**	**2,1**
Q63-4.3.4.	2,6	**3,2**	**2,8**	**2,4**	**2,0**	2,4
Q64-4.4.2.	2,7	**3,3**	**3,0**	**2,5**	**1,9**	2,8

Q65-4.4.3.	2,0	**2,6**	**2,2**	**1,8**	**1,5**	2,0
Q66-4.4.4.	2,0	**3,0**	**2,2**	**1,8**	**1,2**	**1,7**
Q67-4.4.5.	2,3	**3,1**	**2,5**	2,1	**1,6**	**2,1**
Q68-5.1.1.	2,1	**3,1**	**2,5**	2,0	**1,3**	**1,9**
Q69-5.1.2.	2,0	**2,9**	**2,3**	1,9	**1,2**	**1,8**
Q70-5.1.3.	2,3	**3,5**	**2,8**	**2,1**	**1,3**	**2,1**
Q71-5.1.4.	2,3	**3,1**	**2,6**	2,1	**1,5**	**2,1**
Q72-5.2.1.	2,7	**3,8**	**3,2**	2,7	**1,7**	**2,3**
Q73-5.2.2.	1,9	**2,8**	**2,2**	**1,6**	**1,1**	1,8
Q74-5.2.3.	2,1	**3,0**	**2,5**	**1,8**	**1,3**	2,0
Q75-5.2.4.	2,2	**3,1**	**2,5**	**2,0**	**1,4**	**2,1**
Q76-5.3.1.	2,2	**3,0**	**2,5**	**1,9**	**1,4**	**2,0**
Q77-5.3.3.	3,0	**3,7**	**3,4**	**2,5**	**2,3**	**2,8**
Q78-5.3.4.	2,8	**3,8**	**3,4**	**2,6**	**1,7**	2,7
Q79-5.4.2.	2,3	**3,1**	**2,5**	**1,9**	**1,8**	2,3
Q80-5.4.3.	2,4	**3,1**	**2,7**	**2,2**	**1,6**	**2,2**
Q81-5.4.4.	2,0	**3,1**	**2,3**	**1,5**	**1,2**	**1,8**
Q82-5.4.5.	2,4	**3,3**	**2,8**	**2,2**	**1,6**	**2,1**

Annex 8 - Scoring SAT results

Scoring for SAT answers, on which feedback to respondents was based, was calculated and communicated on an area-by-area basis. Underlying to this, average scores of all the items belonging to an individual competence were calculated for each competence, especially in order to identify those weaker competences, if any, that respondents would be recommended to strengthen in the SAT feedback. Then, the competence area score was calculated as the average score of all the items belonging to the competence area. The score intervals used for the respondent feedback report in Pilot 2 were identified based on Pilot 1 results as follows: Low (0-29%), Foundation (30-47%), Intermediate (48-80%) and Advanced (81-100).

Feedback and recommendations to SAT users

As just mentioned, test-takers in Pilot 2 received a report file at the end of the SAT showing their results. The screenshot below shows an extract of that file, called "Digital Competences SAT report". All competences and competence areas are covered in the report, with colour-coding indicating which competences the users should focus upon with simple associated statements.

SAT users received feedback on their self-perceived digital proficiency level for all 5 areas according to the following scale: Foundation, Intermediate and Advanced level. The level was calculated based on the scores assigned to SAT answers and the threshold levels indicated before.

Visualising the 5 areas and 21 competences of DigComp as in the table above is important given that the SAT is intended to offer an opportunity to its users to make sense and become aware of digital competence from

the DigComp framework's perspective. In the new SAT implementation, users will become aware of the 5 Areas, as the platform will highlight to the users when they move from one Area of the test to another one. But while taking the test, they are never aware that the SAT items they are dealing with are related to some specific competence. The feedback table is therefore the first and only opportunity for them to get an overall view of the DigComp areas and competences, but with scores only for areas.

Besides the result at area level, a qualitative feedback at competence level will be provided only if/when the respondents' score on a given competence is below a given threshold. Without mentioning the score or threshold itself, and using DigComp's dimension 2 descriptor as content, a message like the following one will be displayed (in this case referring to 1.2) "You need to learn more on competence 1.2 Interacting through digital technologies, in order to enhance your ability to interact through a variety of digital technologies and to understand appropriate digital communications means for a given context."

Annex 9 – Pilot 2: User Experience Survey and Results

9.1 User Experience Survey

The following was asked of participants in an online survey after completion of the SAT.

_____

Thank you for testing the DigCompSAT system. We hope that you found the process and results valuable. You can help us further by answering this simple survey about your experience.

1. How did you rate the *overall experience*?

Excellent	Good	Average	Poor	Very Poor

2. What did you feel about the *length* of the test?

Much too short	A little short	Just right	A bit too long	Far too long

3. What did you feel about the *wording* overall?

Far too simplistic language	Somewhat easy to understand	Neither easy nor hard	Somewhat hard to understand	Far too hard language

4. What did you feel about the *difficulty* of the test?

Far too difficult	A little bit difficult	Neither easy nor difficult	A bit too easy	Far too easy

5. What did you feel about the details of the *results* of the test?

Far too little detail	A little short of detail	Just right	A bit too much detail	Far too much detail

6. If this system was publicly available, would you recommend it to a friend or family member?

| Yes, definitely	Yes, probably	Don't know either way	Probably not	Definitely not

7. Do you think that you understand more about the **range of digital competences** now that you have completed the test?

| Yes, definitely	Yes, probably	Don't know either way	Probably not	Definitely not

8. Any other comments, problems or suggestions you would want to tell us about?

9.2 User Experience Survey Results

There were 101 completions of the voluntary User Experience survey. The survey was linked at the end of the SAT, and so most participants who completed it would have done so immediately after completing. Some may have followed a link in follow up emails. A total of 560 people completed the SAT (although more than 100 were later excluded from the statistical analysis for a variety of reasons). So this sample represents about 18% of the total number who completed the SAT. Some of those completing this survey may have been excluded from the statistical analysis, but we have no way of knowing whether they are represented here, since this survey and SAT were independent of each other.

Overall

- Excellent — 12%
- Good — 69%
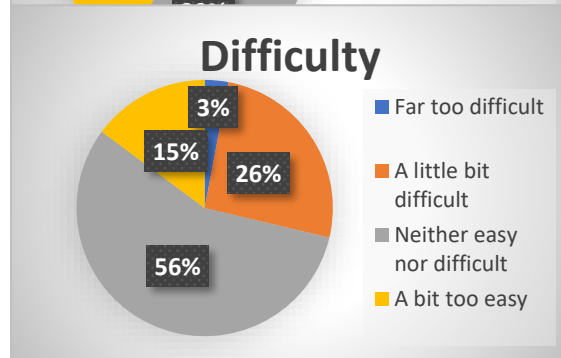- Average — 17%
- Poor — 2%
- Very Poor — 0%
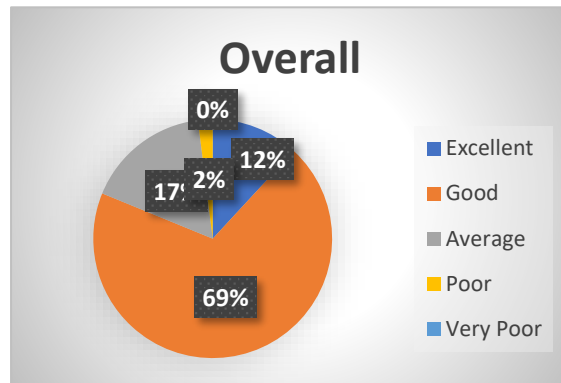
Overall, the results were predominantly good. 81% felt that the SAT was good or excellent with only 17% feeling that it was average, and only 2% thinking it was poor. These are very strong overall indicators.

Length

- Just right — 51%
- A bit too long — 42%
- Far too long — 7%
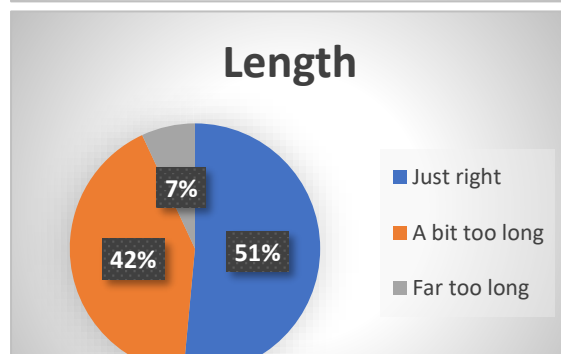
A very significant majority of 93% felt that its length was "just right" or a "bit too long", which in the light that the SAT could then be subsequently shortened is again very positive. Despite some comments recorded by coordinators about the SAT being too long, only 7% felt that it was "far too long". No one felt it was too short.

Language

- Far too hard language — 1%
- Somewhat hard to understand — 30%
- Just right — 40%
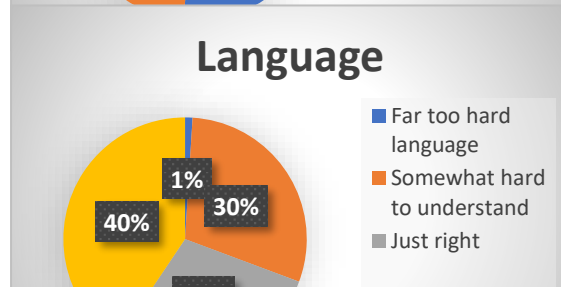
The "wording" question was far more evenly split, between "Just right" "Somewhat hard to understand" and "Somewhat easy to understand". This could be connected to the perceived level of 'difficulty' of the items in the users' mind, but it could also indicate a relatively even spread across literacy/ education levels, which is also good.

Difficulty

- Far too difficult — 3%
- A little bit difficult — 26%
- Neither easy nor difficult — 56%
- A bit too easy — 15%

The 'Difficulty' question is also split, but with a clear majority feeling that it was 'neither easy nor difficult'. Just over a quarter felt that it was 'a little bit difficult', which could indicate that the survey was perhaps completed more by lower skilled participants, than higher skilled participants.

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Report detail

Far too little detail
A little short of detail
Just right
A bit too much detail
Far too much

2%
4%
19%
13%
62%
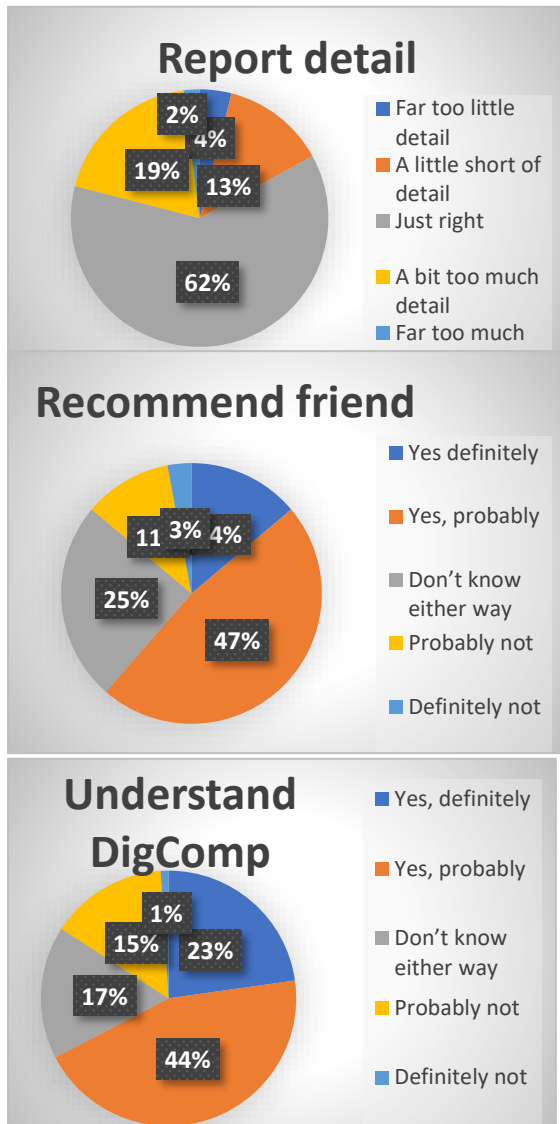
The SAT report was largely welcomed with 62% feeling that it was "just right", and then relatively similar proportions feeling there was too much or too little detail.

Recommend friend

Yes definitely
Yes, probably
Don't know either way
Probably not
Definitely not

11
3%
4%
25%
47%

A good majority of 62% felt they would definitely or probably recommend it to a friend, a quarter being undecided and about 14% feeling that they wouldn't recommend it.

Understand DigComp

Yes, definitely
Yes, probably
Don't know either way
Probably not
Definitely not

1%
15%
23%
17%
44%

Finally, with quite a strong indicator, 68% of respondents felt that it helped them to understand DigComp better.

Annex 10 – Partner Feedback on Pilot 2

Preparation

Before the start of the piloting process clear instructions about the tool, piloting process, target groups and deadlines were sent to the coordinators, all important issues were explained and clarified during an online meeting before the start of the process.

Selection

In Latvia, BDA felt that the time for carrying out piloting (June-July) was not seen as ideal as people were not keen to get involved and spend time on the SAT in the summer. As a result, some refused mentioning 'lack of time', 'being away from home' and some who filled in the initial questionnaire did not then do the SAT.

A significant level of effort was required by BDA to find people who matched the following specific demographic criteria:

- young people (aged 16-24) with higher education and basic digital skills;
- age group 55-65 people with low education and advanced digital skills.

In Spain, Ibermática found that some types of users were very difficult to find or directly impossible:

- Older people with low education and high digital skills

For a number of users, receiving the second reminder mail from Ibermática was a surprise, as they thought that the SAT was already done with the sampling survey. Difficulties in reaching the expected number of users forced Ibermática to personally phone people who had left the questionnaire unfinished to encourage them to complete it.

At the end of July, Ibermática found a new group of users: the staff who do telemarketing and call handling for various customers within Ibermática itself. These belonged to groups 16-24 and 25-54 and were not IT technicians. Thanks to the agreement with their supervisors, we were able to reach the expected number of users. Ibermática felt that receiving this task from their supervisor might have affected their view of the SAT, even though they were explicitly informed that the SAT was anonymous.

Observations about Sampling and Selection

In Latvia, in the initial survey people tended to indicate a higher level of education than they had. For those participants who were close to finishing their degree of education they indicated it as already finished. Also because of delay between the initial survey and the self-assessment test (May /June / July) some of the participants had actually finished their degrees during that time period and would fall into a different education group.

Some of the participants with higher digital skills were very critical about their skill level because they understood the skill better and realised how much knowledge they are still missing. So they would score themselves lower.

Some of the people who filled in the initial questionnaire in the centres afterwards discussed the meaning of the question "Troubleshooting your printer" and "Managing websites with content management systems". Obviously, each respondent depending on their skills had own understanding of the complexity of the question.

People who considered their digital skills to be better were more responsive to participating. People who thought their digital skills were lower were anxious to participate, even though they later achieved good results in the self-assessment test.

Some of the participants who participated were contacted via their managers. Although they were instructed that this is purely self-assessment and nobody will judge them, they still felt a bit nervous about the test and some confessed that when in doubt they chose the more desirable answer just to make sure there was to be no implication of "failing".

Observations (when present) of participants by coordinators In Latvia

Generally, people who agreed to participate in the SAT were positive about it and we did not receive any negative remarks about the process or tool itself.

Male respondents were less responsive and needed more effort than female respondents.

Some of the respondents argued that the tool is too long. The consensus was that about 40 questions would be the ideal number.

The participants liked the idea of assessing their own digital skills and used the tool to gather new knowledge about themselves or in some cases to compare the results to the results acquired from a different digital skills measurement tool they had used recently.

The participants found it interesting to participate in the pilot because it was presented as a project on European level. It felt like they have been a part of something bigger.

The coordinators found it interesting to participate in the pilot because they hope to use the finished product somewhere in the future as a tool to measure digital skills and provide advice to people based on the results.

Perception of the SAT from Ibermática

In Spain one of the elements that produced the most discomfort when entering the SAT was the map of questions on the right side of the screen. Seeing the number of questions that remained unanswered produced a high desire to leave the test.

Ibermática believes that because some candidates completed the tests in close family circles, there may have been an important 'helping hand' between family members.

Contacts have conveyed that the final report of the SAT also requires some effort of understanding: the results must be read in long sentences and are not conclusive.

Ibermática made an effort to communicate that the questionnaire could be completed in more than one session, as this strategy has usually obtained good results with the Ikanos test when working with corporate clients.

During the piloting process no *technical* problems with the tool were encountered in either country.

Comments about Specific Items

A number respondents in Latvia, especially with lower digital skills, after taking the SAT asked whether there is such a "right to be forgotten" as they considered the question about it might be some trick to check their attention.

The report of digital skills level at the end was a good argument why some of the participants agreed to be in the pilot. They wanted to assess their own digital skills.

Observation of User Experience Survey

Initially, there was a low number of participants completing the user experience questionnaire after the test. The participants from Latvia did not notice it as it was not clearly and strongly highlighted. The instructions in an e-mail sent to the participants were changed to stress that there is additional questionnaire at the end of the test. It would be advisable to highlight in some special way the most important information for the reader, as we observed that people read rather superficially.

Annex 11 – Main subcomponents/topics of DigComp's 21 competences

ItemID	Competence components
1.1	To articulate **information needs**
1.1	To **search** for data, information and content in digital environments
1.1	To **access** them and to **navigate** between them
1.1	To create and update **personal search strategies**
1.2	To analyse, compare and critically evaluate the credibility and reliability of **sources** of data, information and digital content
1.2	To analyse, interpret and critically evaluate the **data,** information and digital content.
1.3	To organise, **store and retrieve** data, information, and content in digital environments.
1.3	To organise and **process** them in a structured environment.
2.1	To interact through a **variety of digital technologies**
2.1	To understand **appropriate** digital communication means for a given **context.**
2.2	To **share** data, information and digital content with others through **appropriate** digital technologies
2.2	To act as an **intermediary** (for sharing information and content through digital technologies)
2.2	To know about **referencing and attribution** practices
2.3	To participate in society through the use of **public and private digital services**
2.3	To seek opportunities for **self-empowerment** and for **participatory citizenship** through appropriate digital technologies
2.4	To use digital tools and technologies for **co-construction and co-creation** of data, resources and knowledge.
2.5	To be aware of **behavioural norms and know -how** while using digital technologies and interacting in digital environments
2.5	To adapt communication strategies to the specific **audience**
2.5	To be aware of **cultural and generational diversity** in digital environments
2.6	To create, and manage one or **multiple** digital identities
2.6	To be able to protect one's own **reputation**
2.6	To **deal with** the data that one produces
3.1	To create and edit digital content in **different formats**
3.1	To **express** oneself through digital means
3.2	To modify, refine, improve and integrate information and content into an **existing** body of knowledge to create **new,** original and relevant content and knowledge.
3.3	To understand how **copyright and licenses** apply to data, digital information and content.
3.4	To plan and develop a sequence of **understandable instructions for a computing system** to solve a given problem or perform a specific task
4.1	To **protect** devices and digital content
4.1	To understand **risks and threats** in digital environments
4.1	To know about **safety** and **security**
4.1	To have a due regard to **reliability** and **privacy**
4.2	To **protect** personal data and privacy in digital environments
4.2	To understand how to use and **share personally identifiable** information while being able to protect oneself and others from damages
4.2	To understand that digital services use a "**Privacy policy**" to inform how personal data is used
4.3	To be able to avoid **health-risks and threats** to physical and psychological well-being while using digital technologies
4.3	To be able to protect oneself and others from possible **dangers** in digital environments (e.g. cyber bullying)
4.3	To be aware of digital technologies for **social well-being and social inclusion**
4.4	To be aware of the **environmental impact** of digital technologies and their use.

5.1	To **identify** technical problems when operating devices and using digital environments
5.1	To **solve** technical problems when operating devices and using digital environments (from trouble-shooting to solving more complex problems)
5.2	To assess **needs** and to identify, evaluate, select and use digital tools and possible **technological responses** to solve them
5.2	To **adjust and customise** digital environments to personal needs (e.g. accessibility)
5.3	To use digital tools and technologies to **create** knowledge and to **innovate** processes and products
5.3	To engage individually and collectively in **cognitive processing** to understand and resolve **conceptual problems and problem situations** in digital environments.
5.4	To understand where one's **own digital competence needs** to be improved or updated
5.4	To be able to **support others** with their digital competence development
5.4	To seek opportunities for **self-development and to keep up-to-date** with the digital evolution.

Annex 12 – Item Bank used in Pilot 1

Question n°	DigComp	STATEMENT	Proficiency level F = foundation I = intermediate A = advanced	Type K = knowledge S = skill A = attitude
3	1.1.1	I know how to identify useful sources of information online	I	S
4	1.1.2	I am aware that different search engines may give different search results, because they are influenced by commercial factors	F	K
5	1.1.3	I know which words to use in order to find what I need quickly (e.g. to search online or within a document)	I	K
6	1.1.4	When I use a search engine, I can take advantage of its advanced features	A	S
7	1.1.5	I know how to find a website I have visited before	F	S
8	1.1.6	I am interested in trying out new tools and ways to search for information and content	A	A
9	FAKE	I know how to access media apps to update personal search strategies	FAKE	S
10	1.2.1	I know how to differentiate promoted or advertised content from other content I find or receive online	F	S
11	1.2.2	I know how to identify what is the purpose of an online information source (e.g. to inform, influence, entertain, or sell)	A	S
12	1.2.3	I critically check if the information I find online is reliable	I	A
13	1.2.4	I am aware that some information on the internet is false (e.g. fake news)	F	K
14	1.3.1	I know about different storage media (e.g. internal or external hard disk, USB memory, pen drive, memory card)	F	K

15	**1.3.2**	I know how to organise digital content (e.g. documents, images, videos) using folders or tagging in order to be able to find them later	I	S
16	**1.3.3**	I know how to copy and move files (e.g. documents, images, videos) between folders, devices or on the cloud	F	S
17	**1.3.4**	I know how to manage and analyze data using software (e.g. sorting, filtering, calculations)	A	S
18	**3.1.1**	I know how to create and edit digital text documents	F	S
19	**3.1.2**	I know how to express myself by creating digital content on the internet (e.g. blog post, video on Youtube)	I	S
20	**3.1.3**	I know how to produce multimedia content using the right tool for the task	A	S
21	**3.1.4**	I think it is important to choose the right digital media to create and convey meaning for a given purpose (e.g. sometimes a photo can tell more than a thousand words)	I	A
22	**3.2.1**	I am keen to explore digital resources that can be modified and integrated to generate new digital content	I	A
23	**3.2.2**	I am aware that some digital content can be reused and reworked legally (e.g. public domain or with Creative Commons licences)	F	K
24	**3.2.3**	I know how to edit or improve digital content that other people have created (e.g. editing a wikipedia article)	I	S
25	**3.2.4**	I know how to create something new by mixing different types of content (e.g. video and music)	A	S
26	**3.3.1**	I am respectful of the copyrights and usage licenses of resources that I find in digital environments	I	A
27	**3.3.2**	I know that downloading or sharing digital content (e.g. music, software, films) may have ethical or legal consequences	F	K
28	**3.3.3**	I can detect when an online service might offer illegal access to digital content (e.g. software, movies, music, books, TV)	A	S

29	**3.3.4**	I know which different types of licences apply to the use of digital content (e.g. Creative Commons licences)	I	S
30	**3.4.1**	I proactively figure out how a task might be broken down into elementary steps so that it can be automated	I	A
31	**3.4.2**	I understand the process that leads to the development of a sequence of understandable instructions that will be implemented in a given programming language	I	K
32	**3.4.3**	I can write scripts, macros and simple stand-alone applications to automate the execution of a task	A	S
33	**3.4.4**	I know that there could be different algorithmic solutions to accomplish a specific computational task (e.g. sorting and searching)	A	K
34	**FAKE**	I know how to use spelling checker to speedup software execution	FAKE	S
35	**4.1.1**	I am concerned about the threats if I do not protect my devices and online accounts with a strong password	I	A
36	**4.1.2**	I know how to install or activate protection software and services (e.g. antivirus) on my devices	I	S
37	**4.1.3**	I undertand the benefits and also the safety risks when using internet-connected devices or systems (e.g. smart watches, smart home devices)	I	K
38	**4.1.4**	I know about the importance of keeping the operating system, antivirus and other software up-to-date in order to prevent security issues	F	K
39	**4.1.5**	I know how to configure the settings of a firewall on my computer and other devices	A	S
40	**4.1.6**	I know how to recover digital information and other content (e.g. photos, contacts) from a backup	I	S
41	**FAKE**	I know I have to keep the windows closed when I enter the password to access my personal computer	FAKE	K
42	**4.2.1**	I know how to restrict or refuse access to my geographical location	I	S
43	**4.2.2**	I know how to identify suspicious e-mail messages that try to obtain my personal data	I	S

44	4.2.3	I know how to check that the website where I am asked to provide personal data is secure (e.g. https sites, safety logo or certificate)	I	S
45	4.2.4	I know which personal data I should and shouldn't share and display online	F	K
46	4.2.5	I know how to change my privacy settings (e.g. on a social networking site)	A	S
47	4.2.6	I am aware of the importance of checking the privacy policies of the digital services that I use	I	A
48	4.3.1	I am concerned about maintaining a balance between my online and offline activities	F	A
49	4.3.2	I know the potential damage to my body and mind from an inappropriate use of technology	F	K
50	4.3.3	I know how to protect myself and others from unwanted online encounters and materials	I	S
51	4.3.4	I know about digital solutions that can help elderly people or people with special needs	A	K
52	4.4.1	I am concerned about the environmental impact of the increasing use of digital technologies and services	F	A
53	4.4.2	I seek out ways in which digital technologies could help me to live and consume in a more environmentally friendly way	I	A
54	4.4.3	I know that old digital devices and consumables (e.g. computers, smartphones, batteries) must be appropriately disposed to minimise their environmental impact	F	K
55	4.4.4	I know how to reduce the energy consumption of my devices (e.g. change settings, close apps, turn off wifi)	I	S
56	4.4.5	I know 'green' behaviours to follow when buying or using digital devices (e.g. purchase devices with Eco-label, restrain from unnecessary printing, do not leave chargers connected without the device)	I	K
57	5.1.1	When I face a technical problem, I do not give up easily and try step-by-step to identify the problem	I	A

58	5.1.2	I have a basic understanding of how my digital devices work, which enables me to explain the problem to get assistance.	F	K
59	5.1.3	When I face a technical problem, I am able to find solutions on the Internet	I	S
60	5.1.4	I am able to edit the configurations of my digital tools to solve technical problems (e.g. automatic stop/start of services, modify registry keys)	A	S
61	FAKE	I know how to use the ProblemSolver app that has a solution for all technical problems with digital devices	FAKE	S
62	5.2.1	I usually try to find out if there is a technology solution that might help me address a personal or professional need	I	A
63	5.2.2	I can describe my needs when I buy digital devices, applications and services	F	S
64	5.2.3	I know how to assess the pros and cons and choose the right tool, device or service to perform a new task	I	S
65	5.2.4	I know technical solutions that can improve the access and use of digital tools such as language translation, magnification or zoom and text-to-voice functionality	I	K
66	5.3.1	I know that digital technology can be used as a powerful tool to innovate processes and products	F	K
67	5.3.2	I am aware that technologies can be used creatively (e.g. for tinkering and for prototyping new products like in the maker movement)	I	K
68	5.3.3	I enjoy engaging in challenges and contests aimed at solving intellectual, social or practical problems with digital technologies	A	A
69	5.3.4	I can use data tools that manage and organize complex information to make decisions and solve problems	A	S
70	5.4.1	I know why digital skills are essential for work and to fully participate in society	F	K
71	5.4.2	I am able to help people in my community improve their digital skills	I	S

72	5.4.3	I am curious about new digital devices and applications and like to experiment with them whenever I find the opportunity	I	A
73	5.4.4	I know how to use online learning platforms to assess and improve my digital skills	I	S
74	5.4.5	I know about new trends in the digital world and how they impact on my personal or professional life	I	K
75	5.4.6	I actively try to keep up to date with the digital evolution, including its underlying business models, algorithms and data uses	A	A
76	2.1.1	I know how to send, reply and forward e-mails	F	S
77	2.1.2	I am aware that many communication services and social media are free of charge because they are paid for by advertising	I	S
78	2.1.3	I know how to use advanced videoconferencing features (e.g. moderating , recording audio and video)	A	S
79	2.1.4	I know which communication tools and services (e.g. phone, email, video conference, text message) are approriate to use in different circumstances	I	K
80	2.2.1	I actively share digital content that I think might be interesting or useful to others	F	A
81	2.2.2	I know how to use e-mail to share digital content	F	S
82	2.2.3	I know how to use cloud services (e.g. Google Drive, DropBox and OneDrive) to share my files.	I	S
83	2.2.4	I know which information I should and shouldn't share online	I	K
84	2.2.5	I know how to change who I share content with (e.g. friends, friends of friends, everyone)	A	S
85	2.2.6	I know how to provide the correct attribution (e.g. authorship, URL) for works in a digital environment	I	S
86	2.3.1	I know how to apply for a job using a digital platform (e.g. fill in a form, upload my CV and photo)	F	S

87	2.3.2	I know that many public services are available on the internet (e.g. booking a health visit, submitting tax declaration, requesting birth, marriage, residence and other certificates)	I	K
88	2.3.3	I know how to pay for goods and services that I buy online (e.g. using direct bank transfer, credit/debit cards and other online payment systems)	A	S
89	2.3.4	I know how to submit a complaint or suggestion online to a government body	F	S
90	2.3.5	It matters to me to express opinions on social or political issues on discussion forums or in social media (e.g. Facebook, Twitter)	A	S
91	2.4.1	I know the benefits of using applications and digital platforms for remote collaboration	F	A
92	2.4.2	I know how to edit online a document shared with someone else	F	S
93	2.4.3	I know how to invite others and give appropriate permissions to collaborate on a shared document	I	S
94	2.4.4	I know how to use a wiki platform to collaboratively work on content	A	S
95	2.5.1	I am aware that I ought to ask permission from a person before publishing or sharing photos about him or her	F	K
96	2.5.2	I know that it is important to read my messages before sending them to ensure that they are clear and accurate	F	K
97	2.5.3	I know how to recognise online messages and behaviors that attack certain groups or individuals (e.g. hate speech)	I	S
98	2.5.4	I know how to act if someone behaves inappropriately online (e.g. an offensive comment, threats)	A	S
99	2.5.5	I know how to behave online according to the situation (e.g. formal vs informal)	I	K
100	2.5.6	I acknowledge the differences in cultural background and the age of people I communicate with in digital environments	I	A

101	2.6.1	I know my digital identity is everything that identifies me in online environments (e.g. usernames, likes and posts on social media, petitions signed online)	I	K
102	2.6.2	I know how to create a profile in digital environments for personal or professional purposes	F	S
103	2.6.3	I am concerned about how my online activities and digital identity may affect my everyday life, reputation and even my career	F	A
104	**FAKE**	I can manage my online reputation using SmartR(r) application	FAKE	S
105	2.6.4	I know how to manage my personal and professional reputation in the digital environment through appropriate sharing of information and other resources online	A	S
106	2.6.5	I know that right to be forgotten has been introduced by European Union regulation	I	K
107	2.6.6	I know how to configure the settings in my internet browser to prevent or limit cookies	A	S

Annex 13- Item Bank used in Pilot 2

Question n°	Dig Comp	STATEMENT	Type K = knowledge S = skill A = attitude	Proficiency level F = foundation I = intermediate A = advanced
4	1.1.2	I know that different search engines may give different search results, because they are influenced by commercial factors.	K	I
5	1.1.3	I know which words to use in order to find what I need quickly (e.g. to search online or within a document).	K	F
6	1.1.4	When I use a search engine, I can take advantage of its advanced features.	S	I
7	1.1.5	I know how to find a website I have visited before.	S	F
10	1.2.1	I know how to differentiate promoted or advertised content from other content I find or receive online.	S	I
11	1.2.2	I know how to identify the purpose of an online information source (e.g. to inform, influence, entertain, or sell).	S	I
12	1.2.3	I critically check if the information I find online is reliable.	A	I
13	1.2.4	I know that some information on the Internet is false (e.g. fake news).	K	F
14	1.3.1	I know about different storage media (e.g. internal or external hard disk, USB memory, pen drive, memory card).	K	I
15	1.3.2	I know how to organise digital content (e.g. documents, images, videos) using folders or tagging to find them back later.	S	F
16	1.3.3	I know how to copy and move files (e.g. documents, images, videos) between folders, devices or on the cloud.	S	F

17	**1.3.4**	I know how to manage and analyze data using software (e.g. sorting, filtering, calculations).	S	I
18	**3.1.1**	I know how to create and edit digital text files (e.g. Word, OpenDocument, Google Docs).	S	I
19	**3.1.2**	I know how to express myself by creating digital content on the Internet (e.g. blog post, video on Youtube).	S	I
20	**3.1.3**	I know how to produce a multimedia presentation with text, images, audio and video elements.	S	A
21	**3.1.4**	To express myself, I am careful to choose the right type of digital media knowing that it may depend on the audience and my aim.	A	I
22	**3.2.1**	I am keen to create new digital content by mixing and modifying existing resources.	A	I
23	**3.2.2**	I know that some digital content can be reused and reworked legally (e.g. public domain or with Creative Commons licences).	K	A
24	**3.2.3**	I know how to edit or make changes to digital content that others have created (e.g. insert a text into an image, edit a wiki).	S	A
25	**3.2.4**	I know how to create something new by mixing different types of content (e.g. text and images).	S	F
26	**3.3.1**	I am careful to follow the rules about copyrights and licenses of digital content that I find.	A	I
27	**3.3.2**	I know that downloading or sharing digital content (e.g. music, software, films) may have ethical or legal consequences.	K	I
28	**3.3.3**	I can detect when digital content is made available illegally (e.g. software, movies, music, books, TV).	S	I
29	**3.3.4**	I know which different types of licences apply to the use of digital content (e.g. Creative Commons licences).	S	A
30	**3.4.1**	I am interested in understanding how a task can be broken down into steps so that it can be automated.	A	A

31	3.4.2	I know that programming languages (e.g. Python, Visual Basic, Java) are used to provide a digital device instructions to carry out a task.	K	F
32	3.4.3	I can write scripts, macros and simple applications to automate the execution of a task.	S	A
33	3.4.4	I know that there could be different algorithmic solutions to accomplish a specific computational task (e.g. sorting and searching).	K	A
37	4.1.3	I understand the benefits and also the safety risks when using Internet-connected devices or systems (e.g. smart watches, smart home devices).	K	I
38	4.1.4	I know about the importance of keeping the operating system, antivirus and other software up-to-date in order to prevent security issues.	K	I
39	4.1.5	I know how to configure the settings of a firewall on different devices.	S	A
40	4.1.6	I know how to recover digital information and other content (e.g. photos, contacts) from a backup.	S	I
42	4.2.1	I know how to restrict or refuse access to my geographical location.	S	I
43	4.2.2	I know how to identify suspicious e-mail messages that try to obtain my personal data.	S	I
44	4.2.3	I know how to check that the website where I am asked to provide personal data is secure (e.g. https sites, safety logo or certificate).	S	I
45	4.2.4	I know which personal data I should not share and display online (e.g. on social media).	K	I
47	4.2.6	I am careful about checking the privacy policies of the digital services that I use.	A	I
48	4.3.1	I am aware that I should manage the time I spend on my digital devices	A	I
50	4.3.3	I know how to protect myself from unwanted online encounters and materials.	S	I
51	4.3.4	I know about digital tools that can help older people or people with special needs.	K	A

53	4.4.2	I seek out ways in which digital technologies could help me to live and consume in a more environmentally friendly way.	A	A
54	4.4.3	I know that old digital devices and consumables (e.g. computers, smartphones, batteries) must be appropriately disposed to minimise their environmental impact.	K	I
55	4.4.4	I know how to reduce the energy consumption of my devices (e.g. change settings, close apps, turn off wifi).	S	F
56	4.4.5	I know 'green' behaviours to follow when buying or using digital devices (e.g. purchase devices with Eco-label, restrain from unnecessary printing of digital files, do not leave mobile phones and laptop chargers connected without the device).	K	I
57	5.1.1	When I face a technical problem, I do not give up easily and try step-by-step to identify the problem.	A	I
58	5.1.2	I know some reasons why a digital device may fail to connect online (e.g. wrong wifi password, airplane mode on).	K	F
59	5.1.3	When I face a technical problem, I am able to find solutions on the Internet.	S	I
60	5.1.4	I am able to edit the configurations of the operating system of my digital devices to solve technical problems (e.g. automatic stop/start of services, modify registry keys).	S	A
62	5.2.1	I usually try to find out if there is a technology solution that might help me address a personal or professional need.	A	I
63	5.2.2	I know the main functions of the most common digital devices (computer, tablet, smartphone).	K	F
64	5.2.3	I know how to select the right tool, device or service to perform a given task (e.g. select a smartphone for my needs, choose a tool for a professional videocall).	S	A
65	5.2.4	I know technical solutions that can improve the access and use of digital tools such as language translation, magnification or zoom and text-to-voice functionality.	K	I
66	5.3.1	I know that digital technology can be used as a powerful tool to innovate processes and products.	K	I

68	5.3.3	I am willing to take part in challenges and contests, aimed at solving intellectual, social or practical problems through digital technologies.	A	A
69	5.3.4	I can use data tools that manage and organize complex information to make decisions and solve problems.	S	A
71	5.4.2	I am willing to help people in my community improve their digital skills.	A	I
72	5.4.3	I am curious about new digital devices and applications and like to experiment with them whenever I find the opportunity.	A	I
73	5.4.4	I know how to use online learning tools to improve my digital skills (e.g. video tutorial, online courses).	S	I
74	5.4.5	I know about new trends in the digital world and how they impact on my personal or professional life.	K	I
76	2.1.1	I know how to send, reply and forward e-mails.	S	F
77	2.1.2	I know that many communication services and social media are free of charge because they are paid for by advertising.	S	F
78	2.1.3	I know how to use advanced videoconferencing features (e.g. moderating, recording audio and video).	S	I
79	2.1.4	I know which communication tools and services (e.g. phone, email, video conference, text message) are appropriate to use in different circumstances.	K	F
80	2.2.1	I am open towards sharing digital content that I think might be interesting and useful to others	A	I
82	2.2.3	I know how to use cloud services (e.g. Google Drive, DropBox and OneDrive) to share my files.	S	I
84	2.2.5	I know how to change who I share content with (e.g. friends, friends of friends, everyone).	S	I
85	2.2.6	I know how to reference the source of documents (e.g. the author or web address) that I found online.	S	I
86	2.3.1	I know how to apply for a job using a digital platform (e.g. fill in a form, upload my CV and photo).	S	F

87	2.3.2	I know that many public services are available on the Internet (e.g. booking a health visit, submitting tax declaration, requesting birth, marriage, residence and other certificates).	K	I
88	2.3.3	I know how to pay for goods and services that I buy online (e.g. using direct bank transfer, credit/debit cards, other online payment systems).	S	F
90	2.3.5	It matters to me to debate social or political issues online (e.g. in online forums, news sites, Facebook, Twitter).	A	I
91	2.4.1	I understand the benefits of remote collaboration (e.g. reduced commuting time).	A	I
92	2.4.2	I know how to edit a shared, online document.	S	I
93	2.4.3	I know how to invite others and give appropriate permissions to collaborate on a shared document.	S	I
95	2.5.1	I am aware that I should ask permission from a person before publishing or sharing photos about them.	K	F
97	2.5.3	I know how to recognise online messages and behaviors that attack certain groups or individuals (e.g. hate speech).	S	F
98	2.5.4	I can take the right measures if someone is doing the wrong thing online (e.g. an offensive comment, threats).	S	I
99	2.5.5	I know how to behave online according to the situation (e.g. formal vs informal).	K	F
101	2.6.1	I know my digital identity is everything that identifies me in online environments (e.g. usernames, likes and posts on social media, petitions signed online).	K	I
102	2.6.2	I know how to create a profile in digital environments for personal or professional purposes.	S	I
106	2.6.5	I know that the EU introduced regulation on The Right to Be Forgotten	K	I
107	2.6.6	I know how to configure the settings in my Internet browser to prevent or limit cookies.	S	A

Annex 14 – Final Item Bank in English, Latvian and Spanish

The three scales are articulated as follows:

Knowledge

    0. I have no knowledge of this / I never heard of this

    1. I have only a limited understanding of this and need more explanations

    2. I have a good understanding of this

    3. I fully master this topic/issue and I could explain it to others

Skills

    0. I don't know how to do it

    1. I can do it with help

    2. I can do it on my own

    3. I can do it with confidence and, if needed, I can support/guide others

Attitude

    0. Not at all

    1. Not much / very little

    2. Yes / Yes I am /Yes I do

    3. Very much!

14.1 Final Item Bank – English

LEGEND:

TYPE: K = knowledge; S = skill; A = attitude

LEVEL: F = foundation; I = intermediate; A = advanced

Question	DigComp ID	Statements	Type	Level
Q1	**1.1**	I know that different search engines may give different search results, because they are influenced by commercial factors.	K	I
Q2	**1.1**	I know which words to use in order to find what I need quickly (e.g. to search online or within a document).	K	F
Q3	**1.1**	When I use a search engine, I can take advantage of its advanced features.	S	I
Q4	**1.1**	I know how to find a website I have visited before.	S	F
Q5	**1.2**	I know how to differentiate promoted content from other content I find or receive online (e.g. recognising an advert on social media or search engines).	S	I
Q6	**1.2**	I know how to identify the purpose of an online information source (e.g. to inform, influence, entertain, or sell).	S	I
Q7	**1.2**	I critically check if the information I find online is reliable.	A	I
Q8	**1.2**	I know that some information on the Internet is false (e.g. fake news).	K	F
Q9	**1.3**	I know about different storage media (e.g. internal or external hard disk, USB memory, pen drive, memory card).	K	I
Q10	**1.3**	I know how to organise digital content (e.g. documents, images, videos) using folders or tagging to find them back later.	S	F
Q11	**1.3**	I know how to copy and move files (e.g. documents, images, videos) between folders, devices or on the cloud.	S	F

Q12.	1.3	I know how to manage and analyse data using software (e.g. sorting, filtering, calculations).	S	I
Q13	2.1	I know how to send, reply and forward e-mails.	S	F
Q14	2.1	I know that many communication services and social media are free of charge because they are paid for by advertising.	S	F
Q15	2.1	I know how to use advanced videoconferencing features (e.g. moderating, recording audio and video).	S	I
Q16	2.1	I know which communication tools and services (e.g. phone, email, video conference, text message) are appropriate to use in different circumstances.	K	F
Q17	2.2	I am open towards sharing digital content that I think might be interesting and useful to others	A	I
Q18	2.2	I know how to use cloud services (e.g. Google Drive, DropBox and OneDrive) to share my files.	S	I
Q19	2.2	I know how to change who I share content with (e.g. friends, friends of friends, everyone).	S	I
Q20	2.2	I know how to reference the source of documents (e.g. the author or web address) that I found online.	S	I
Q21	2.3	I know how to apply for a job using a digital platform (e.g. fill in a form, upload my CV and photo).	S	F
Q22	2.3	I know that many public services are available on the Internet (e.g. booking a health visit, submitting tax declaration, requesting birth, marriage, residence and other certificates).	K	I
Q23	2.3	I know how to pay for goods and services that I buy online (e.g. using direct bank transfer, credit/debit cards, other online payment systems).	S	F
Q24	2.3	It matters to me to debate social or political issues online (e.g. in online forums, news sites, Facebook, Twitter).	A	I
Q25	2.4	I understand the benefits of remote collaboration (e.g. reduced commuting time).	A	I
Q26	2.4	I know how to edit a shared, online document.	S	I
Q27	2.4	I know how to invite others and give appropriate permissions to collaborate on a shared document.	S	I

Q28	2.5	I am aware that I should ask permission from a person before publishing or sharing photos about them.	K	F
Q29	2.5	I know how to recognise online messages and behaviours that attack certain groups or individuals (e.g. hate speech).	S	F
Q30	2.5	I can take the right measures if someone is doing the wrong thing online (e.g. an offensive comment, threats).	S	I
Q31	2.5	I know how to behave online according to the situation (e.g. formal vs informal).	K	F
Q32	2.6	I know my digital identity is everything that identifies me in online environments (e.g. usernames, likes and posts on social media, petitions signed online).	K	I
Q33	2.6	I know how to create a profile in digital environments for personal or professional purposes.	S	I
Q34	2.6	I know that the EU introduced regulation on The Right to Be Forgotten (i.e. to have one's private information removed from the Internet).	K	I
Q35	2.6	I know how to configure the settings in my Internet browser to prevent or limit cookies.	S	A
Q36	3.1	I know how to create and edit digital text files (e.g. Word, OpenDocument, Google Docs).	S	I
Q37	3.1	I know how to express myself by creating digital content on the Internet (e.g. blog post, video on YouTube).	S	I
Q38	3.1	I know how to produce a multimedia presentation with text, images, audio and video elements.	S	A
Q39	3.1	To express myself, I am careful to choose the right type of digital media depending on the audience and my aim (e.g. using social media to promote a project).	A	I
Q40	3.2	I am keen to create new digital content by mixing and modifying existing digital resources (e.g. a presentation with photos and a soundtrack found on the Internet).	A	I
Q41	3.2	I know that some digital content can be reused and reworked legally (e.g. public domain or with Creative Commons licences).	K	A
Q42	3.2	I know how to edit or make changes to digital content that others have created (e.g. insert a text into an image, edit a wiki).	S	A
Q43	3.2	I know how to create something new by mixing different types of content (e.g. text and images).	S	F

Q44	3.3	I am careful to follow the rules about copyrights and licenses of digital content that I find.	A	I
Q45	3.3	I know that downloading or sharing digital content (e.g. music, software, films) may have ethical or legal consequences.	K	I
Q46	3.3	I can detect when digital content is made available illegally (e.g. software, movies, music, books, TV).	S	I
Q47	3.3	I know which different types of licences apply to the use of digital content (e.g. Creative Commons licences).	S	A
Q48	3.4	I am interested in understanding how a task can be broken down into steps so that it can be automated, for example in software or by a robot	A	A
Q49	3.4	I know that programming languages (e.g. Python, Visual Basic, Java) are used to provide a digital device instructions to carry out a task.	K	F
Q50	3.4	I can write scripts, macros and simple applications to automate the execution of a task.	S	A
Q51	3.4	I know that there could be different algorithmic solutions to accomplish a specific computational task (e.g. sorting and searching).	K	A
Q52	4.1	I understand the benefits and also the safety risks when using Internet-connected devices or systems (e.g. smart watches, smart home devices).	K	I
Q53	4.1	I know about the importance of keeping the operating system, antivirus and other software up-to-date in order to prevent security issues.	K	I
Q54	4.1	I know how to configure the settings of a firewall on different devices.	S	A
Q55	4.1	I know how to recover digital information and other content (e.g. photos, contacts) from a backup.	S	I
Q56	4.2	I know how to restrict or refuse access to my geographical location.	S	I
Q57	4.2	I know how to identify suspicious e-mail messages that try to obtain my personal data.	S	I
Q58	4.2	I know how to check that the website where I am asked to provide personal data is secure (e.g. https sites, safety logo or certificate).	S	I
Q59	4.2	I know which personal data I should not share and display online (e.g. on social media).	K	I

Q60	4.2	I am careful about checking the privacy policies of the digital services that I use.	A	I
Q61	4.3	4.3.1 I am aware that I should manage the time I spend on my digital devices	A	I
Q62	4.3	4.3.3 I know how to protect myself from unwanted and malicious online encounters and materials (e.g. spam messages, identity theft e-mails).	S	I
Q63	4.3	I know about digital tools that can help older people or people with special needs.	K	A
Q64	4.4	I seek out ways in which digital technologies could help me to live and consume in a more environmentally friendly way.	A	A
Q65	4.4	I know that old digital devices and consumables (e.g. computers, smartphones, batteries) must be appropriately disposed to minimise their environmental impact.	K	I
Q66	4.4	I know how to reduce the energy consumption of my devices (e.g. change settings, close apps, turn off wifi).	S	F
Q67	4.4	I know 'green' behaviours to follow when buying or using digital devices (e.g. purchase devices with Eco-label, restrain from unnecessary printing of digital files, do not leave mobile phones and laptop chargers connected without the device).	K	I
Q68	5.1	When I face a technical problem, I try step-by-step to identify the problem.	A	I
Q69	5.1	I know some reasons why a digital device may fail to connect online (e.g. wrong wifi password, airplane mode on).	K	F
Q70	5.1	When I face a technical problem, I am able to find solutions on the Internet.	S	I
Q71	5.1	I am able to edit the configurations of the operating system of my digital devices to solve technical problems (e.g. automatic stop/start of services, modify registry keys)	S	A
Q72	5.2	I usually try to find out if there is a technology solution that might help me address a personal or professional need.	A	I
Q73	5.2	I know the main functions of the most common digital devices (computer, tablet, smartphone).	K	F
Q74	5.2	I know how to select the right tool, device or service to perform a given task (e.g. select a smartphone for my needs, choose a tool for a professional videocall).	S	A

Q75	5.2	I know technical solutions that can improve the access and use of digital tools such as language translation, magnification or zoom and text-to-voice functionality.	K	I
Q76	5.3	I know that digital technology can be used as a powerful tool to innovate processes and products.	K	I
Q77	5.3	I am willing to take part in challenges and contests, aimed at solving intellectual, social or practical problems through digital technologies.	A	A
Q78	5.3	I can use data tools (e.g. databases, data mining and analysis software) that manage and organize complex information to make decisions and solve problems.	S	A
Q79	5.4	I am willing to help people in my community improve their digital skills.	A	I
Q80	5.4	I am curious about new digital devices and applications and I am keen to experiment with them whenever I find the opportunity.	A	I
Q81	5.4	I know how to use online learning tools to improve my digital skills (e.g. video tutorial, online courses).	S	I
Q82	5.4	I know about new trends in the digital world and how they impact on my personal or professional life.	K	I

14.2 Final Item Bank – Latvian

LEGEND:

TYPE: K = knowledge; S = skill; A = attitude

LEVEL: F = foundation; I = intermediate; A = advanced

Question	DigComp ID	Statements	Type	Level
Q1	1.1	Es zinu, ka dažādas meklētājprogrammas var sniegt atšķirīgus meklēšanas rezultātus, jo tos ietekmē komerciāli faktori.	K	I
Q2	1.1	Es zinu, kurus vārdus lietot, lai ātri atrastu nepieciešamo (piem., meklēt tiešsaistē vai dokumentā).	K	F
Q3	1.1	Kad es izmantoju meklētājprogrammu, es spēju izmantot tās uzlabotās iespējas.	S	I
Q4	1.1	Es zinu, kā atrast tīmekļa vietni, kuru esmu apmeklējis jau iepriekš.	S	F
Q5	1.2	Es zinu, kā atšķirt reklamēto saturu no cita, kuru atrodu vai saņemu tiešsaistē (piemēram, atpazīstu reklāmu sociālajos medijos un meklētājos).	S	I
Q6	1.2	Es zinu, kā noteikt tiešsaistes informācijas avota mērķi (piem., informēt, ietekmēt, izklaidēt vai pārdot).	S	I
Q7	1.2	Es kritiski pārbaudu, vai tiešsaistē atrodamā informācija ir ticama.	A	I
Q8	1.2	Es zinu, ka daļa internetā pieejamās informācijas ir nepatiesa (piem., viltus ziņas).	K	F
Q9	1.3	Es zinu par dažādiem informācijas nesējiem (piem., iekšējo vai ārējo cieto disku, USB atmiņu, atmiņas karti).	K	I
Q10	1.3	Es zinu, kā organizēt digitālo saturu (piem., dokumentus, attēlus, video), izmantojot mapes vai marķēšanu ar tagiem, lai tos atrastu vēlāk.	S	F

Q11	1.3	Es zinu, kā kopēt un pārvietot failus (piem., dokumentus, attēlus, video) starp mapēm, ierīcēm vai mākoņpakalpojumiem.	S	F
Q12.	1.3	Es zinu, kā pārvaldīt un analizēt datus, izmantojot programmatūru (piem., veikt šķirošanu, filtrēšanu, aprēķinus).	S	I
Q13	2.1	Es zinu, kā sūtīt, pārsūtīt e-pastus un atbildēt uz tiem.	S	F
Q14	2.1	Es zinu, ka daudzi komunikāciju pakalpojumi un sociālie mediji ir bezmaksas, jo tajos ir apmaksātās reklāmas.	S	F
Q15	2.1	Es zinu, kā izmantot uzlabotās videokonferenču iespējas (piem., moderēt, ierakstīt audio un video).	S	I
Q16	2.1	Es zinu, kuri komunikācijas līdzekļi un pakalpojumi (piem., tālrunis, e-pasts, video konference, īsziņa) ir piemēroti izmantošanai dažādos apstākļos.	K	F
Q17	2.2	Esmu gatavs dalīties ar digitālo saturu, kas, manuprāt, varētu būt interesants un noderīgs citiem.	A	I
Q18	2.2	Es zinu, kā izmantot mākoņpakalpojumus (piem., Google Drive, DropBox un OneDrive), lai koplietotu savus failus.	S	I
Q19	2.2	Es zinu, kā mainīt personas, ar kurām koplietot saturu (piem., draugiem, draugu draugiem, visiem).	S	I
Q20	2.2	Es zinu, kā atsaukties uz tiešsaistē atrastās informācijas avotu (piem., autoru vai tīmekļa vietni).	S	I
Q21	2.3	Es zinu, kā pieteikties darbam, izmantojot digitālo platformu (piem., aizpildīt veidlapu, augšupielādēt manu CV un fotoattēlu).	S	F
Q22	2.3	Es zinu, ka internetā ir pieejami daudzi publiskie pakalpojumi (piem., pieraksts pie ārsta, gada ienākumu deklarācijas iesniegšana, dzimšanas, laulības, dzīvesvietas un citu izziņu pieprasīšana).	K	I
Q23	2.3	Es zinu, kā norēķināties par precēm un pakalpojumiem, ko pērku tiešsaistē (piem., izmantojot tiešos bankas pārskaitījumus, kredītkartes/debetkartes, citas tiešsaistes maksājumu sistēmas).	S	F
Q24	2.3	Man ir svarīgi tiešsaistē diskutēt par sociāliem vai politiskiem jautājumiem (piem., tiešsaistes forumos, ziņu vietnēs, Facebook, Twitter).	A	I
Q25	2.4	Es saprotu attālinātās sadarbības priekšrocības (piem., samazinās ceļā pavadītais laiks).	A	I
Q26	2.4	Es zinu, kā rediģēt koplietotu tiešsaistes dokumentu.	S	I

Q27	2.4	Es zinu, kā uzaicināt citus un piešķirt atbilstošas tiesības, lai sadarbotos kopīga dokumenta izstrādē.	S	I
Q28	2.5	Es apzinos, ka pirms citu personu fotoattēlu publicēšanas vai koplietošanas, man vajadzētu lūgt viņu atļauju.	K	F
Q29	2.5	Es zinu, kā atpazīt tiešsaistes ziņojumus un uzvedību, kas uzbrūk noteiktām grupām vai indivīdiem (piem., naida kurināšana).	S	F
Q30	2.5	Es varu veikt pareizos pasākumus, ja kāds tiešsaistē rīkojas nepareizi (piem., izsaka aizskarošus komentārus, draudus).	S	I
Q31	2.5	Es zinu, kā rīkoties tiešsaistē atkarībā no situācijas (piem., formāla vai neformāla).	K	F
Q32	2.6	Es zinu, ka mana digitālā identitāte ir viss, pēc kā mani var identificēt tiešsaistes vidē (piem., lietotājvārdi, atzīmes Patīk un ziņas sociālajos medijos, tiešsaistē parakstīti lūgumraksti).	K	I
Q33	2.6	Es zinu, kā izveidot profilu digitālajā vidē personīgiem vai profesionāliem mērķiem.	S	I
Q34	2.6	Es zinu, ka ES ieviesa regulu par tiesībām tikt aizmirstam (t.i. tiesībām pieprasīt dzēst personas informāciju no internet vietnēm).	K	I
Q35	2.6	Es zinu, kā konfigurēt iestatījumus savā interneta pārlūkā, lai bloķētu vai ierobežotu sīkdatnes.	S	A
Q36	3.1	Es zinu, kā izveidot un rediģēt teksta failus (piem., Word, OpenDocument, Google Docs).	S	I
Q37	3.1	Es zinu, kā izteikties, ievietojot digitālo saturu internetā (piem., emuāra ierakstā, video vietnē Youtube).	S	I
Q38	3.1	Es zinu, kā izveidot multimediju prezentāciju ar tekstu, attēliem, audio un video elementiem.	S	A
Q39	3.1	Lai izteiktu sevi, es uzmanīgi izvēlos atbilstošu digitālo mediju, apzinoties, ka tas var būt atkarīgs no auditorijas un mana mērķa (piemēram, popularizējot projektu sociālajos medijos).	A	I
Q40	3.2	Es labprāt radītu jaunu digitālo saturu, apvienojot un mainot esošos digitālos resursus (piemēram, prezentācijas ar foto un mūziku, kas atrasta internetā).	A	I
Q41	3.2	Es zinu, ka daļu digitālā satura var atkārtoti izmantot un likumīgi pārstrādāt (piem., publiski pieejamo vai ar Creative Commons licencēm).	K	A

Q42	3.2	Es zinu, kā rediģēt vai mainīt citu radīto digitālo saturu (piem., pievienot tekstu attēlam, rediģēt viki vietni).	S	A
Q43	3.2	Es zinu, kā radīt kaut ko jaunu, apvienojot dažāda veida saturu (piem., tekstu un attēlus).	S	F
Q44	3.3	Es uzmanīgi sekoju līdzi noteikumiem, kas attiecas uz autortiesībām un digitālā satura licencēm.	A	I
Q45	3.3	Es zinu, ka digitālā satura lejupielādēšanai vai koplietošanai var būt ētiskas pārkāpuma vai juridiskas sekas (piem., mūzikas, programmatūras, filmu).	K	I
Q46	3.3	Es varu noteikt, kad digitālais saturs ir pieejams nelegāli (piem., programmatūra, filmas, mūzika, grāmatas, TV).	S	I
Q47	3.3	Es zinu, kuras dažādu veidu licences attiecas uz digitālā satura izmantošanu (piem., Creative Commons licences).	S	A
Q48	3.4	Man ir interese izprast, kā uzdevumu var sadalīt posmos, lai to varētu atrisināt automātiski, piemēram, ar datorprogrammas vai robota palīdzību.	A	A
Q49	3.4	Es zinu, ka programmēšanas valodas (piem., Python, Visual Basic, Java) tiek izmantotas, lai nodrošinātu digitālās ierīces instrukcijas uzdevuma veikšanai.	K	F
Q50	3.4	Es varu uzrakstīt scenārijus, makro un vienkāršas lietojumprogrammas, lai automatizētu uzdevuma izpildi.	S	A
Q51	3.4	Es zinu, ka var būt dažādi algoritmiskie risinājumi, lai veiktu noteiktu aprēķinu uzdevumu (piem., šķirošanu un meklēšanu).	K	A
Q52	4.1	Es saprotu ieguvumus un arī drošības riskus, lietojot ar internetu savienotas ierīces vai sistēmas (piem., viedpulksteņus, viedās mājas ierīces).	K	I
Q53	4.1	Es zinu, cik svarīgi ir atjaunināt operētājsistēmu, pretvīrusu un citu programmatūru, lai novērstu drošības apdraudējuma riskus.	K	I
Q54	4.1	Es zinu, kā konfigurēt ugunsmūra iestatījumus dažādās ierīcēs.	S	A
Q55	4.1	Es zinu, kā no dublējuma atgūt digitālo informāciju un citu saturu (piem., fotoattēlus, kontaktpersonas).	S	I
Q56	4.2	Es zinu, kā ierobežot vai liegt piekļuvi manai ģeogrāfiskajai atrašanās vietai.	S	I

Q57	4.2	Es zinu, kā atpazīt aizdomīgus e-pasta ziņojumus, kuros kāds mēģina iegūt manus personas datus.	S	I
Q58	4.2	Es zinu, kā pārbaudīt, vai tīmekļa vietne, kurā man lūdz sniegt personas datus, ir droša (piem., https vietnes, drošības logotips vai sertifikāts).	S	I
Q59	4.2	Es zinu, ar kādiem personas datiem nevajadzētu dalīties un publiskot tiešsaistē (piem., sociālajos medijos).	K	I
Q60	4.2	Es uzmanīgi iepazīstos ar izmantoto digitālo pakalpojumu sniedzēju privātuma politiku.	A	I
Q61	4.3	Es apzinos, ka man vajadzētu kontrolēt laiku, ko pavadu pie savām digitālajām ierīcēm.	A	I
Q62	4.3	Es zinu, kā pasargāt sevi no nevēlamiem un ļaunprātīgiem materiāliem un tikšanos tiešsaistē (t.i. mēstulēm, identitātes zādzības e-pastiem).	S	I
Q63	4.3	Es zinu par digitālajiem rīkiem, kas var palīdzēt vecāka gadagājuma cilvēkiem vai cilvēkiem ar īpašām vajadzībām.	K	A
Q64	4.4	Es meklēju veidus, kā digitālās tehnoloģijas varētu man palīdzēt dzīvot un patērēt resursus videi draudzīgākā veidā.	A	A
Q65	4.4	Es zinu, ka vecās digitālās ierīces un palīgmateriāli (piem., datori, viedtālruņi, akumulatori) ir atbilstoši jāiznīcina, lai mazinātu to ietekmi uz vidi.	K	I
Q66	4.4	Es zinu, kā samazināt savu ierīču enerģijas patēriņu (piem., mainīt iestatījumus, aizvērt lietojumprogrammas, izslēgt WiFi).	S	F
Q67	4.4	Es zinu "zaļo" domāšanu, kas jāievēro, pērkot vai izmantojot digitālās ierīces (piem., iegādāties ierīces ar ekomarķējumu, atturēties no nevajadzīgas digitālo failu drukāšanas, neatstāt mobilo tālruņu un klēpjdatoru lādētājus pievienotus elektrotīklam bez ierīces).	K	I
Q68	5.1	Saskaroties ar tehnisku problēmu, es mēģinu soli pa solim to noteikt.	A	I
Q69	5.1	Es zinu dažus iemeslus, kāpēc digitālajai ierīcei var neizdoties izveidot interneta savienojumu (piem., nepareiza WiFi parole, ieslēgts lidmašīnas režīms).	K	F
Q70	5.1	Saskaroties ar tehnisku problēmu, es spēju atrast risinājumus internetā.	S	I

Q71	5.1	Es spēju rediģēt savu digitālo ierīču operētājsistēmas konfigurācijas, lai risinātu tehniskas problēmas (piem., automātiska pakalpojumu apturēšana /sākšana, reģistra atslēgu modificēšana).	S	A
Q72	5.2	Es parasti cenšos noskaidrot, vai ir kāds tehnoloģisks risinājums, kas man varētu palīdzēt risināt personīgās vai profesionālās vajadzības.	A	I
Q73	5.2	Es zinu visbiežāk izmantoto digitālo ierīču galvenās funkcijas (datora, planšetdatora, viedtālruņa).	K	F
Q74	5.2	Es zinu, kā izvēlēties pareizo rīku, ierīci vai pakalpojumu dotā uzdevuma veikšanai (piem., izvēlēties viedtālruni manām vajadzībām, izvēlēties rīku profesionālam video zvanam).	S	A
Q75	5.2	Es zinu tehniskos risinājumus, kas var uzlabot piekļuvi digitālajiem rīkiem un to izmantošanu, piemēram, valodas tulkošana, palielināšana vai tālummaiņa un funkcionalitāte teksta-balss nolasīšanai.	K	I
Q76	5.3	Es zinu, ka digitālās tehnoloģijas var izmantot kā spēcīgu instrumentu inovatīvu procesu un produktu radīšanai.	K	I
Q77	5.3	Es vēlos piedalīties izaicinājumos un konkursos, kuru mērķis ir ar digitālo tehnoloģiju palīdzību risināt intelektuālas, sociālas vai praktiskas problēmas.	A	A
Q78	5.3	Es varu izmantot rīkus, ar kuriem pārvaldīt datus un analizēt sarežģītu informāciju, lai pieņemtu lēmumus un risinātu problēmas (piemēram, datubāzes, datu ieguves un analīzes programmatūru).	S	A
Q79	5.4	Es vēlos palīdzēt savas kopienas cilvēkiem uzlabot viņu digitālās prasmes.	A	I
Q80	5.4	Man ir interese par jaunākajām digitālajām ierīcēm un lietojumprogrammām, un es labprāt eksperimentētu ar tām, kad vien iespējams.	A	I
Q81	5.4	Es zinu, kā izmantot tiešsaistes mācību rīkus, lai uzlabotu savas digitālās prasmes (piem., video pamācības, tiešsaistes kursi).	S	I
Q82	5.4	Es zinu par jaunākajām tendencēm digitālajā pasaulē un to ietekmi uz manu personīgo vai profesionālo dzīvi.	K	I

14.3 Final Item Bank – Spanish

LEGEND:

TYPE: K = knowledge; S = skill; A = attitude

LEVEL: F = foundation; I = intermediate; A = advanced

Question	DigComp ID	Statements	Type	Level
Q1	**1.1**	Sé que los distintos buscadores pueden dar resultados diferentes, porque están influidos por factores comerciales.	K	I
Q2	**1.1**	Sé qué palabras utilizar para encontrar rápidamente lo que necesito (por ejemplo, para buscar en internet o dentro de un documento).	K	F
Q3	**1.1**	Cuando utilizo un buscador, puedo aprovechar sus características avanzadas.	S	I
Q4	**1.1**	Sé cómo encontrar un sitio web que he visitado antes.	S	F
Q5	**1.2**	Sé cómo diferenciar el contenido promocionado de otros contenidos que recibo o encuentro por internet (p.ej. reconocer un anuncio en los medios sociales o en los buscadores).	S	I
Q6	**1.2**	Sé cómo identificar la intención de una fuente de información online (por ejemplo, informar, influir, entretener o vender).	S	I
Q7	**1.2**	Compruebo críticamente si la información que encuentro en internet es fiable.	A	I
Q8	**1.2**	Sé que algunas informaciones en internet son falsas (por ejemplo, las "*fake news*").	K	F
Q9	**1.3**	Sé que hay diferentes medios de almacenamiento (por ejemplo, disco duro interno o externo, memoria USB, pen drive, tarjeta de memoria).	K	I
Q10	**1.3**	Sé cómo organizar contenidos digitales (por ejemplo, documentos, imágenes, vídeos) utilizando carpetas o etiquetas para encontrarlos más tarde.	S	F

Q11	1.3	Sé cómo copiar y mover archivos (por ejemplo, documentos, imágenes, vídeos) entre carpetas, dispositivos o en la nube.	S	F
Q12.	1.3	Sé cómo gestionar y analizar los datos utilizando programas informáticos (por ejemplo, clasificar, filtrar, calcular).	S	I
Q13	2.1	Sé cómo enviar, responder y reenviar correos electrónicos.	S	F
Q14	2.1	Sé que muchos servicios de comunicación y medios sociales son gratuitos porque se pagan con publicidad.	S	F
Q15	2.1	Sé cómo utilizar las funciones avanzadas en una videoconferencia (por ejemplo, moderación, grabación de audio y vídeo).	S	I
Q16	2.1	Sé qué herramientas y servicios de comunicación (por ejemplo, teléfono, correo electrónico, videoconferencia, mensaje de texto) son las apropiadas para utilizarlas en diferentes situaciones.	K	F
Q17	2.2	Estoy dispuesto a compartir contenidos digitales si creo que pueden ser interesantes y útiles para otros.	A	I
Q18	2.2	Sé cómo usar servicios en la nube (por ejemplo, Google Drive, Dropbox y OneDrive) para compartir mis archivos.	S	I
Q19	2.2	Sé cómo establecer con quién comparto contenidos en cada caso (por ejemplo, amigos, amigos de amigos, todos).	S	I
Q20	2.2	Sé cómo referenciar la fuente de los documentos (por ejemplo, el autor o la dirección web) que encuentro en internet.	S	I
Q21	2.3	Sé cómo solicitar un empleo utilizando una plataforma digital (por ejemplo, rellenando un formulario, subiendo mi CV y una foto).	S	F
Q22	2.3	Sé que muchos servicios públicos están disponibles en internet (por ejemplo, reservar una visita médica, presentar la declaración de impuestos, solicitar certificados de nacimiento, matrimonio, residencia y otros).	K	I
Q23	2.3	Sé cómo hacer los pagos de los bienes y servicios que compro por internet (por ejemplo, mediante transferencia bancaria directa, tarjetas de crédito/débito, otros sistemas de pago en línea).	S	F
Q24	2.3	Me importa participar en debates sobre cuestiones sociales o políticas en internet (por ejemplo, en foros en línea, sitios de noticias, Facebook, Twitter).	A	I
Q25	2.4	Comprendo los beneficios de la colaboración a distancia (por ejemplo, la reducción del tiempo de desplazamiento).	A	I

Q26	2.4	Sé cómo editar un documento compartido en algún servicio online.	S	I
Q27	2.4	Sé cómo invitar a otros y dar los permisos apropiados para colaborar en un documento compartido.	S	I
Q28	2.5	Soy consciente de que debo pedir permiso a una persona antes de publicar o compartir fotos en las que aparece.	K	F
Q29	2.5	Sé cómo reconocer los mensajes y los comportamientos en internet que atacan a ciertos grupos o individuos (por ejemplo, los discursos de odio).	S	F
Q30	2.5	Puedo tomar las medidas adecuadas si alguien está haciendo algo malo en internet (por ejemplo, comentarios ofensivos, amenazas).	S	I
Q31	2.5	Sé cómo comportarme en internet según la situación (por ejemplo, formal o informal).	K	F
Q32	2.6	Sé que mi identidad digital es todo aquello que me identifica en los entornos online (por ejemplo, nombres de usuario, gustos y publicaciones en medios sociales, peticiones firmadas online).	K	I
Q33	2.6	Sé cómo crear un perfil en los entornos digitales con fines personales o profesionales.	S	I
Q34	2.6	Sé que la Unión Europea introdujo una regulación sobre el derecho al olvido (p.ej. que la información privada de una persona sea eliminada de Internet).	K	I
Q35	2.6	Sé cómo configurar los ajustes de mi navegador de internet para evitar o limitar las cookies.	S	A
Q36	3.1	Sé crear y editar archivos digitales de texto (por ejemplo, Word, OpenDocument, Google Docs).	S	I
Q37	3.1	Sé cómo expresarme mediante la creación de contenidos digitales en internet (por ejemplo, entradas de blog, vídeos en YouTube).	S	I
Q38	3.1	Sé cómo producir una presentación multimedia con texto, imágenes y elementos de audio y vídeo.	S	A
Q39	3.1	Para expresarme, tengo cuidado de elegir el tipo de medio digital adecuado en función de la audiencia y de mi objetivo (p. ej., utilizar los medios sociales para promover un proyecto).	A	I
Q40	3.2	Estoy interesado en crear nuevos contenidos digitales mezclando y modificando los recursos digitales existentes (p.ej. una presentación con fotos y una banda sonora que encuentro en internet).	A	I

Q41	3.2	Sé que algunos contenidos digitales pueden ser reutilizados y reelaborados legalmente (por ejemplo, el dominio público o con licencias Creative Commons).	K	A
Q42	3.2	Sé cómo editar o modificar los contenidos digitales que otros han creado (por ejemplo, insertar un texto en una imagen, editar un wiki).	S	A
Q43	3.2	Sé cómo crear algo nuevo mezclando diferentes tipos de contenido (por ejemplo, texto e imágenes).	S	F
Q44	3.3	Tengo cuidado de seguir las normas sobre derechos de autor y licencias de los contenidos digitales que encuentro.	A	I
Q45	3.3	Sé que la descarga o el intercambio de contenidos digitales (por ejemplo, música, programas informáticos, películas) puede tener consecuencias éticas o jurídicas.	K	I
Q46	3.3	Puedo detectar cuando un contenido digital es accesible ilegalmente (por ejemplo, software, películas, música, libros, TV).	S	I
Q47	3.3	Conozco los diferentes tipos de licencias que se aplican a la utilización de los contenidos digitales (por ejemplo, las licencias Creative Commons).	S	A
Q48	3.4	Me interesa comprender cómo dividir una tarea en pasos de forma que se pueda automatizar con un programa informático o un robot.	A	A
Q49	3.4	Sé que los lenguajes de programación (por ejemplo, Python, Visual Basic, Java) se utilizan para dar instrucciones a los ordenadores para que realicen tareas.	K	F
Q50	3.4	Puedo escribir scripts, macros y aplicaciones simples para automatizar la ejecución de una tarea.	S	A
Q51	3.4	Sé que puede haber diferentes algoritmos para llevar a cabo una tarea de cálculo específica (por ejemplo, clasificación y búsqueda).	K	A
Q52	4.1	Comprendo las ventajas y los riesgos de seguridad cuando se utilizan dispositivos o sistemas conectados a internet (por ejemplo, relojes o dispositivos domésticos inteligentes).	K	I
Q53	4.1	Conozco la importancia de mantener actualizados el sistema operativo, el antivirus y otros programas informáticos para evitar problemas de seguridad.	K	I
Q54	4.1	Sé cómo configurar los parámetros de un firewall en diferentes dispositivos.	S	A

Q55	4.1	Sé cómo recuperar datos, información y contenido digital (por ejemplo, fotos, contactos) a partir de una copia de seguridad.	S	I
Q56	4.2	Sé cómo restringir o denegar el acceso a mi ubicación geográfica.	S	I
Q57	4.2	Sé cómo identificar los mensajes de correo electrónico sospechosos que tratan de obtener mis datos personales.	S	I
Q58	4.2	Sé cómo comprobar que un sitio web en el que se me pide que facilite datos personales es seguro (por ejemplo, sitios https, logotipo o certificado de seguridad).	S	I
Q59	4.2	Sé qué datos personales no debo compartir y mostrar en internet (por ejemplo, en redes sociales).	K	I
Q60	4.2	Tengo cuidado al comprobar las políticas de privacidad de los servicios digitales que utilizo.	A	I
Q61	4.3	Soy consciente de que debo administrar el tiempo que paso utilizando mis dispositivos digitales.	A	I
Q62	4.3	Sé cómo protegerme de encuentros y materiales no deseados y maliciosos en internet (p.ej. mensajes de spam, correos para robar mi identidad).	S	I
Q63	4.3	Sé que hay herramientas digitales que pueden ayudar a las personas mayores o con necesidades especiales.	K	A
Q64	4.4	Busco formas en las que las tecnologías digitales puedan ayudarme a vivir y consumir de forma más respetuosa con el medio ambiente.	A	A
Q65	4.4	Sé que los dispositivos y consumibles digitales (por ejemplo, computadoras, teléfonos, baterías) deben ser eliminados de manera adecuada para reducir al mínimo su impacto ambiental.	K	I
Q66	4.4	Sé cómo reducir el consumo de energía de mis dispositivos (por ejemplo, cambiar la configuración, cerrar aplicaciones, apagar el wifi).	S	F
Q67	4.4	Conozco los comportamientos "verdes" que debo seguir al comprar o utilizar dispositivos digitales (por ejemplo, comprar dispositivos con etiqueta ecológica, evitar imprimir innecesariamente, no dejar conectados los cargadores sin el dispositivo).	K	I
Q68	5.1	Cuando me enfrento a un problema técnico, trato de identificar el problema paso a paso.	A	I
Q69	5.1	Conozco algunos motivos por las que un dispositivo digital puede no conectarse a internet (por ejemplo, contraseña wifi incorrecta, modo de avión activado).	K	F

Q70	5.1	Cuando me enfrento a un problema técnico, soy capaz de encontrar soluciones en internet.	S	I
Q71	5.1	Soy capaz de modificar la configuración del sistema operativo de mis dispositivos para resolver problemas técnicos (por ejemplo, parada/inicio automático de servicios, modificación de claves de registro).	S	A
Q72	5.2	Por lo general, trato de averiguar si existen soluciones tecnológicas que puedan ayudarme a resolver una necesidad personal o profesional.	A	I
Q73	5.2	Conozco las principales funciones de los dispositivos digitales más comunes (computadora, tableta, teléfono inteligente).	K	F
Q74	5.2	Sé cómo seleccionar la herramienta, el dispositivo o el servicio adecuados para realizar una tarea determinada (por ejemplo, seleccionar un smartphone para mis necesidades, elegir una herramienta para una videollamada profesional).	S	A
Q75	5.2	Conozco soluciones técnicas que pueden mejorar el acceso y la utilización de herramientas digitales como la traducción de idiomas, la ampliación de la pantalla (zoom) o la funcionalidad de texto a voz.	K	I
Q76	5.3	Sé que la tecnología digital puede utilizarse como una poderosa herramienta para innovar procesos y productos.	K	I
Q77	5.3	Estoy dispuesto a participar en desafíos y concursos destinados a resolver problemas intelectuales, sociales o prácticos mediante las tecnologías digitales.	A	A
Q78	5.3	Puedo utilizar herramientas de datos (p.ej. software de base de datos, *data mining* o análisis de datos) que gestionan y organizan información compleja para tomar decisiones y resolver problemas.	S	A
Q79	5.4	Estoy dispuesto a ayudar a las personas de mi entorno a mejorar sus competencias digitales.	A	I
Q80	5.4	Siento curiosidad por los nuevos dispositivos y aplicaciones digitales y me gusta experimentar con ellos siempre que tengo oportunidad.	A	I
Q81	5.4	Sé cómo utilizar las herramientas de aprendizaje online para mejorar mis conocimientos digitales (por ejemplo, video tutoriales, cursos en internet).	S	I
Q82	5.4	Conozco las nuevas tendencias del mundo digital y cómo afectan a mi vida personal o profesional.	K	I

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