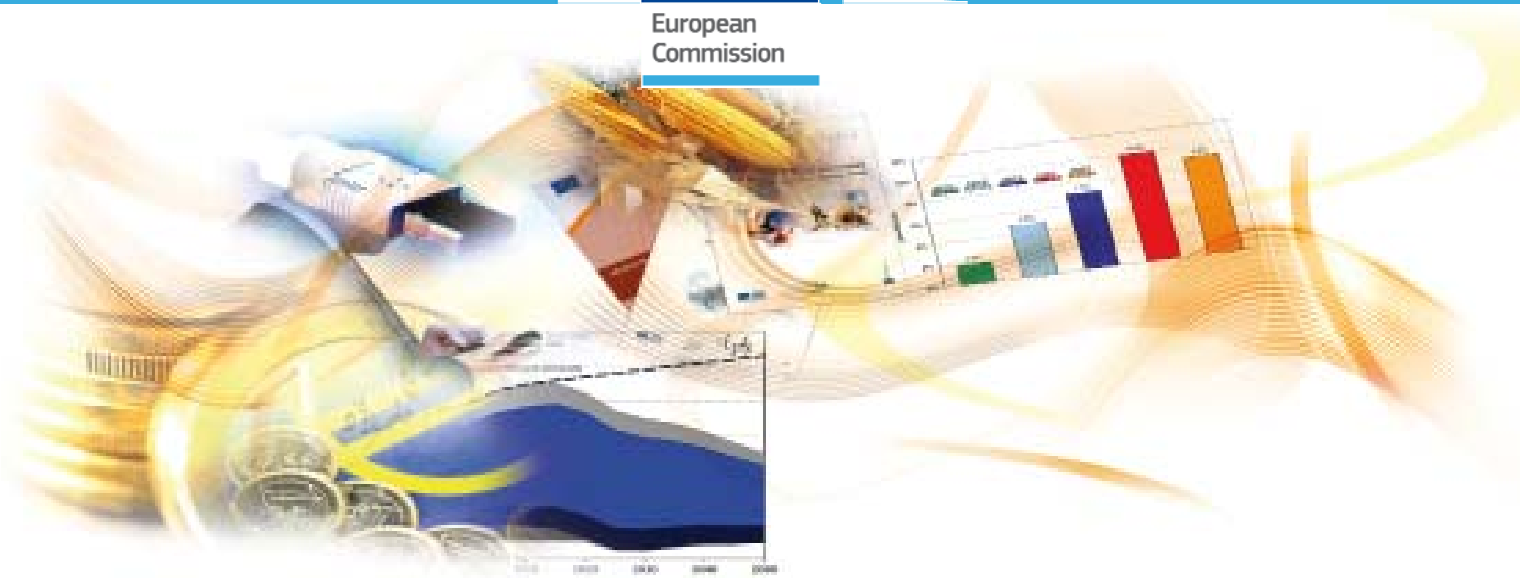J R C   T E C H N I C A L   R E P O R T S

Online Consultation on Experts' Views on Digital Competence

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Preface

In the 2006 European Recommendation on Key Competences,[1] the European Union has acknowledged Digital Competence to be one of the 8 key competences for Lifelong Learning. Digital Competence can be broadly defined as the confident, critical and creative use of ICT to achieve goals related to work, employability, learning, leisure, inclusion and/or participation in society. Digital Competence is a transversal key competence which enables us to acquire other key competences (e.g. language, mathematics, learning to learn, cultural awareness). It is related to many of the 21st Century skills which should be acquired by all citizens, to ensure their active participation in society and the economy.

This report is part of a project on Digital Competence (DIGCOMP), launched by the Information Society Unit at JRC-IPTS[2] under an Administrative Arrangement with DG Education and Culture. The project aims to contribute to better understanding and developing Digital Competence in Europe. The project began in January 2011 and will run until December 2012.[3] The objectives of the project are:

- *To identify* the key components of Digital Competence in terms of the knowledge, skills and attitudes needed to be digitally competent;

- *To develop* Digital Competence descriptors that will feed a conceptual framework/guidelines that can be validated at European level, taking into account relevant frameworks currently available;

- *To propose* a roadmap for the possible use and revision of a Digital Competence framework and descriptors of Digital Competence for all levels of learners.

The project aims to achieve these objectives in collaboration and interaction with stakeholders at European level.

This report contributes to the second work package of the project, in which experts' views on digital competence needs were gathered.

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[1] Official Journal L 394 of 30.12.2006
[2] The Institute for Prospective Technological Studies (IPTS) is one of the seven research institutes that make up the European Commission's Joint Research Centre (JRC).
[3] For more information, see: http://is.jrc.ec.europa.eu/pages/EAP/DIGCOMP.html

Executive summary

Purpose

This report presents the results of an investigation of experts' views on digital competence for all, commissioned by the Joint Research Centre's Institute for Prospective Technological Studies (JRC-IPTS). The objective of this investigation was to provide another perspective on what it means to be digitally competent today, in addition to reviews of literature[4] and current frameworks for the development of digital competence,[5] all of which constitute part of the wider IPTS Digital Competence Project (DIGCOMP). Some common ground exists at a general level in defining digital competence in terms of knowledge, skills, and attitudes, which may be hierarchically organised. However, this does not provide the clarity needed by teachers, employers, citizens – all those who are responsible for digital competence development, be it their own or other people's - to make informed decisions. Further work is needed to create a common language that helps to enhance understanding across the worlds of research, education, training, and work. This will make it easier for citizens and employers to see what digital competence entails and how it is relevant to their jobs and more generally, their lives.

Method

The research methodology used an iterative Delphi survey which allowed a group of experts in the field to first individually provide input to a mapping of digital competence and then validate / comment on the result. The experts were invited to generate as many ideas as possible, completing the sentence "A digitally competent persons is someone who….". The applied method and analyses enabled us to derive an overall expert view on digital competence which was further validated and refined by feeding back the aggregated result to all participants for review. Thus, input was collected from 95 experts across Europe and beyond.

Results

At the outset of the study there was some concern that results might focus on knowledge and skills as they are more concrete and thus more readily brought to mind than attitudes. However, attitudes were in fact abundantly represented in the ideas generated by the experts. Twelve digital competence areas were identified:
1. General knowledge and functional skills
2. Use in everyday life
3. Specialized and advanced skills for work and creative expression
4. Technology mediated communication and collaboration
5. Information processing and management
6. Privacy and security
7. Legal and ethical aspects
8. Balanced attitude towards technology
9. Understanding and awareness of the role of ICT in society
10. Learning about and with digital technologies
11. Informed decisions on appropriate digital technologies
12. Seamless use demonstrating self-efficacy

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[4]   Ala-Mutka, K. (2011). Mapping Digital Competence: Towards a Conceptual Understanding. Seville: JRC-IPTS. Retrieved from http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=4699.

[5]   Ferrari, A. (2012). Digital Competence in Practice: an Analysis of Frameworks. Seville: JRC-IPTS. Retrieved from http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=5099 .

Ideas generated about the meaning of digital competence for various profiles (7 year olds, 14 year olds, senior citizens) indicate that the differences relate to different levels of proficiency or cognitive levels, rather than fundamental issues.

Experts' opinions diverge when it comes to how widely particular knowledge, skills, and/or attitudes should be adopted, ranging from a few to most people. However, high average scores on statements describing digital competence in various areas are indicative of greater consensus about the fact that the knowledge, skills and/or attitudes reflected in them should be acquired by most people. The 'top five' competences considered most widely needed by people are that they should: 1. Be able to communicate through ICT; 2. Be comfortable using a computer, which may be one of many types; 3. Be able to communicate and collaborate with others in line with digital etiquette; 4. Have general computer skills (typing, using computers, getting into a new programme); 5. Be able to download different information types from the Internet.

Conclusions

Digital competence is a conglomerate of knowledge, skills, and attitudes connected to various purposes (communication, creative expression, information management, personal development, etc.), domains (daily life, work, privacy and security, legal aspects), and levels (both cognitive levels and proficiency levels). This is reflected in the picture below which presents the digital competence areas as building blocks.
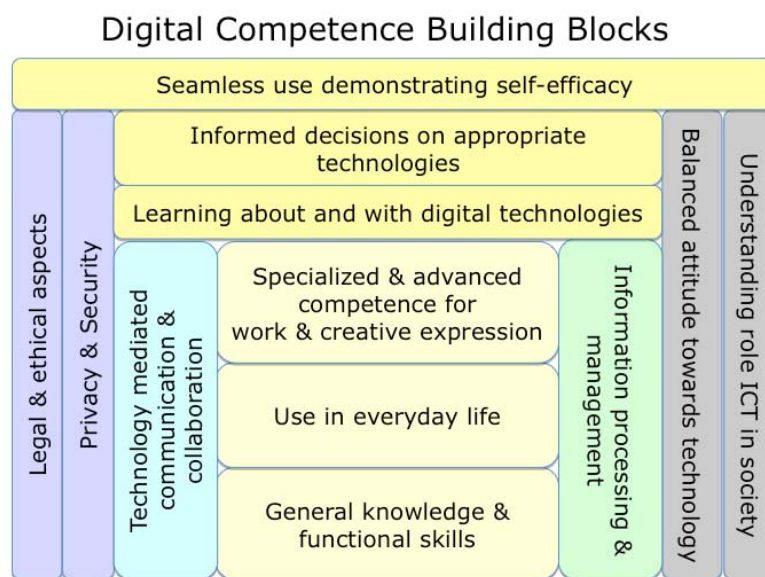
As this report constitutes part of the broader DIGCOMP project, and not its final output, the reader is encouraged to follow the progress and results of the project on the project website: http://is.jrc.ec.europa.eu/pages/EAP/DIGCOMP.html

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Digital Competence for all

1. Introduction

Digital competence – the confident and critical use of information society technology for work, leisure, and communication – is of key importance in warranting participation in society. However, research and practice in the field present a scattered image of digital competence: the knowledge, skills, and/or attitudes it is considered to entail.

In order to inform employers, policy makers, and citizens on what it means to be digitally competent, a common understanding of the concept and its constituent parts needs to be developed - a mission taken on by the European Commission, more particularly its Institute for Prospective Technological Studies (IPTS). The IPTS Digital Competence Project (DIGCOMP - http://is.jrc.ec.europa.eu/pages/EAP/DIGCOMP.html) identifies a number of subsequent steps towards this end, one of them being an investigation of experts' views on digital competence. This final report of that particular step provides a detailed account of the online consultation of experts and practitioners in fields relating to digital competence and digital inclusion, which was carried out by researchers at the Centre for Learning Sciences and Technologies (www.celstec.org) of the Open Universiteit Nederland in close collaboration with the project leader of the DIGCOMP project.

In a nutshell, the online consultation was carried out in two rounds. In the first round experts in the field were asked to generate as many ideas as possible on what it means to be digitally competent. This 'online brainstorm' resulted in a digital competence map which was then presented back to the experts for them to validate the 'collective view'. This report briefly describes the background of the online consultation, before elaborating on the chosen method, procedure, participants and results.

2. Background

Digital competence - the confident and critical use of Information Society Technology (IST) for work, leisure, and communication – is one of the Eight Key Competences for Lifelong Learning as defined by the European Parliament and the Council. [6] This brief description of digital competence makes clear that digital competence relates to many aspects of life (work, leisure, communication) and also reveals that digital competence entails more than technical skills and know-how as it refers to confidence and a critical attitude as well.

What it means to be digitally competent in more practical terms is less evident, as it depends on the background of the individual concerned (e.g. employer, teacher, learner, researcher, policy advisor, senior citizen), the context (e.g. school, business, leisure, participation in society, lifelong learning), and the particular 'language' used (e.g. digital literacy, e-skills, information literacy, media literacy). Time is an additional complicating factor. It affects our understanding and interpretation of what it means to be digitally competent in at least two respects. Firstly, as time passes, our understanding of the concept develops as a result of increased insights gained through research.[7] Secondly, as time passes, the substance of the term changes: being digitally competent meant something different ten years ago than it means now, as new technologies develop and so do the competences needed to use them. This is perhaps the most poignant complication in understanding the concept of digital competence: technological innovations as well as their appropriation by users are hard to predict and even to the extent that future developments can be predicted it is often hard to see exactly how they will affect the way we live.

All in all, the current state of affairs concerning research and practice in the field of digital competence, perhaps inevitably, provides a scattered image. Some common ground exists at a general level in defining digital competence in terms of knowledge, skills, and attitudes,[8] which may be hierarchically organized.[9] However, this does not suffice to provide the transparency needed by teachers, employers, citizens – all those who are responsible for digital competence development, be it their own or other people's - to make informed decisions. Further work is needed to create a common language that helps to enhance understanding across the worlds of research, education, training, and work. This will make it easier for citizens and employers to see what digital competence entails and how it is relevant to their jobs and lives more generally.

The Delphi study described here is part of that further work. Through this study 95 experts[10] of digital competence coming from a range of fields were 'brought together' in order to (a) establish common ground concerning the knowledge, skills and attitudes constituting digital competence; and (b) identifying issues and trends possibly affecting the development of the digital competence framework.

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[6] European Parliament and the Council (2006). Recommendation of the European Parliament and of the Council of 18 December 2006 on key competences for lifelong learning. Official Journal of the European Union, L394/310.

[7] This is nicely illustrated for instance in Cartelli, A. (2010). Frameworks for Digital Competence Assessment: Proposals, Instruments, and Evaluation, Proceedings of Informing Science & IT Education Conference (InSITE) 2010, p. 561-574. This paper describes how in the course of one study concepts and definitions were adapted following insights gained during the process.

[8] Cheetham, G., & Chivers, G. (2005). Professions, Competence and Informal Learning. Cheltenham, Edward Elgar Publishing.

[9] See for instance: Erstadt, O. (2010). Educating the Digital Generation. *Nordic Journal of Digital Literacy, 1*, 56-70 and Beneš, P., Mudrak, D., Prochazka, J., Rambousek, V., and Stipek, J. (2008). Research of ICT education in the Czech Republic. *Problems of Education in the 21th Century*, *5*, 24-34.

[10] 89 of them indicated they appreciated their name to be included in the final report in acknowledgement of their contribution.

3. Method

The research methodology applies an iterative mixed methods Delphi survey to facilitate a group of experts to first individually provide input to a mapping of digital competence and then validate/comment on the collective result. The methodology utilizes both qualitative and quantitative measures, and both online and face-to-face consultations. As the method is complex we provide an overview of subsequent steps of data collection and analysis, before outlining the method in more detail:

1. Idea generation via online questionnaire: "A digitally competent person is someone who…."
2. Selection of unique statements
3. Workshop with experts:
    a. group and label unique statements via card sorting (individual task)
    b. generate collective result via hierarchical cluster-analysis
    c. adapt collective result following feedback from workshop (group task) for initial solution
4. Feedback on initial solution from all experts via second online consultation
5. Adapt initial solution following feedback from second online consultation resulting in final solution.

The first three steps lead to an initial solution of describing digital competence and can be considered the first stage of the study. Steps four and five constitute the second stage leading to the final, validated solution.

3.1 First Stage

An online questionnaire was developed to collect information from the experts (Appendix A).[11] The questionnaire consists of two types of questions: (a) demographic questions covering areas such as age, gender, professional experience, type of organisation (academia, education, business, public sector…) and (b) content related, idea generation questions.

As the idea generation questions are meant to incite a brainstorm they take the form of a trigger statement:

> "A digitally competent person is someone who…."

Besides this general prompt there were three more prompts addressing specific profiles: a 7 year old child, a 14 year old adolescent, and a senior citizen.

Asking open-ended questions through a questionnaire has some advantages over interviews. While both provide details of how respondents see a particular issue (e.g. components of digital competence), open ended questionnaires have a number of advantages such as relatively low cost and greater anonymity which leads to elicitation of more honest responses (Jackson and Trochim, 2002).[12] Open-ended questions are more informative than closed-ended questions, but they pose some challenges regarding the data analysis in comparison with closed-ended questions. These challenges can be summarized as follows: data analysis of open-ended questions is time consuming, bears the risk of over- or under-representation of meaning in the sample (e.g. dominance of some of the respondents), and may be flawed by non-uniform coding decisions. Two main text-analysis methods can be applied in the data analysis: Grounded Theory and Content Analysis. Research suggests that Grounded Theory is more appropriate for longer narrative texts such as interview

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[11] Development of the questionnaire included a pre-test involving 5 experts from the Institute for Prospective Technological studies.

[12] Jackson, K. and Trochim, W. (2002). Concept mapping as an alternative approach for the analysis of open-ended survey responses. Organizational Research Methods, 5 (4), 307-336.

transcripts, comments or journals (Strauss and Corbin, 1994). The sparse character of questionnaires' open-ended items makes Content Analysis the preferred method for their analysis. The main criticism of Content Analysis is that the method relies on researcher-driven predefined coding schemes, which potentially leads to three problems:

(a) different coders have different interpretations of the meaning of the predefined categories for coding;

(b) the coding schemas are not exhaustive; and

(c) the already mentioned misrepresentation (either overrepresentation or under representation) of a particular meaning in the sample.

Specifically in this study, pre-conceived coding schemes could have been that digital competence consists of only knowledge, skills and attitudes; that proficiency levels are not part of digital competence; that 'general competences' should be distinguished from 'pure' digital competence'. Such pre-defined theoretical frameworks potentially restrict the richness and complexity of digital competence to emerge from the data.

For our study of digital competence we have adopted an explorative, bottom-up approach that builds upon the strengths of classical Content Analysis of open-ended questions while trying to mitigate its weaknesses. The approach uses the original open-ended statements generated by the participants of the study. Then it invites the same participants to directly code themselves the text through sorting of statements on similarity in meaning. Finally, the approach quantitatively aggregates individual coding schemas applying multidimensional scaling and hierarchical cluster analysis to allow patterns in the data to emerge. Similar to classical Content Analysis, the participants use their judgement to cluster similarity in the text into themes. However, in contrast to Content Analysis, the codification was done by the respondents (experts) themselves rather than by the researchers. Moreover, Content Analysis was supplemented by hierarchical cluster analysis to aggregate individual judgments into a shared vision on digital competence.

Hierarchical cluster analysis is particularly useful for the purposes of this study as: (1) it integrates various inputs of the panellists into a shared vision on digital competences in a way which ensures that an aggregated, collective view is not 'forced upon', but rather emerges from the data; (2) it provides a visual representation of the results (dendrogram or tree graph) that easily be transformed into a concept map or mind map; and (3) it is a multivariate quantitative technique that complements and, as such, validates the results from the qualitative analysis.

Statements generated in the online brainstorm in reaction to the general prompt were 'cleaned', i.e. checked for identical statements, statements that contain more than one idea, and statements that are insufficiently clear. Throughout this process, carried out by two researchers on the base of mutual agreement, the intention is to use the original wording of the participants as much as possible to maintain a sense of ownership. The remaining statements were sorted and categorised according to similarity of meaning (see appendix B for the instruction) by experts attending a workshop, further described in the Procedure section below. Based on the individual card sorting results, hierarchical cluster analysis was used to derive an overall, 'collective' description of digital competence areas. This result was presented back to the same experts attending the workshop asking them to reflect and comment on it, in order to validate the initial solution. Here the Content Analysis approach was further supplemented by a Grounded Theory[13] approach that was used to interpret and conceptualise the comments and suggestions from the participants on the initial solution.

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[13]   Strauss A. & Corbin J. (1994). Grounded Theory Methodology - An Overview. In: Denzin N K, Lincoln, Y. S
       (eds). *Handbook of Qualitative Research.* Thousand Oaks: Sage Publications, pp. 273-285.

The first stage resulted in a mapping of 14 areas (aspects) of digital competence, including for each area a label, a description and a number of statements illustrating the area in more detail. This mapping served as input for the second stage of the expert consultation.

3.2 Second stage

The questionnaire for the second consultation round (Appendix C) serves two purposes, the first of which is most important:

1. Validate the results from the first round
2. Gain information on the relative importance of the statements, i.e. are the competences described in the statements considered to be necessary for most people, some people, a few people or none.

All experts invited to the first consultation round, were addressed to take part in the second consultation round. They were asked to go through all the competence areas, presented to them including a brief description and statements 'belonging' to each area, and to:

a. Indicate whether in their view the 14 areas present a complete picture of digital competence.
b. Indicate by how wide an audience the various competences should be developed

The qualitative results (comments) provided in a free text format are analysed through a Grounded Theory approach. The scale-type questions are analysed using the mean descriptive statistic.

3.3 Procedure

Selection of experts

As Delphi studies aim to address experts in a particular field, by definition they do not entail representative sampling techniques. The selection of a sample of experts typically involves techniques such as purposive sampling or criterion sampling (Hasson et al., 2000).[14] Since the aim of this study is to develop a common language and understanding across different categories however, representation (rather than representativeness) of a variety of views and opinions is essential. So the purpose was to have a panel of experts reflecting a fair representation of:

- sector groups (education and training, research, IT-business, policy, inclusion practice),
- fields of expertise and practice (formal, non-formal, informal learning / primary, secondary, higher education, VET, adult education, lifelong learning / specific target groups / digital competence frameworks / future trends),
- socio-demographic variables (gender, age, country).

To this end a multifaceted, purposive sampling strategy was adopted. This means that on top of identifying and selecting relevant experts within our own international networks, various search strategies were deployed to identify and select experts according to the sector or field they operate in (academic experts, experts involved in policy, education, IT-business, and digital competence frameworks). For academic experts, for instance, we screened editorial boards of journals as well as lists of presenters at conferences; for experts involved in policy or IT-business we searched websites of relevant companies and organisations etc.

An initial list of 204 experts was created, about half of them provided by the Institute for Prospective Technological Studies and half by the researchers of the Open Universiteit Nederland. The list

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[14] Hasson, F., Keeney, S., & McKenna, H. (2000). Research guidelines for the Delphi survey technique. Journal of Advanced Nursing 32(4), 1008-1015.

includes experts from all countries of the European Union, as well as Norway, Switzerland, Israel, United States, and Australia.

These 204 experts were invited to complete the online questionnaire designed for idea generation. Following a process of data cleaning, involving a check for identical statements, removal of statements that contain more than one idea or that are insufficiently clear, 134 statements were kept to be included in the next steps in the procedure which were carried out during a two day workshop by a smaller number of experts (n=17), some of whom had been invited to take part in the first round of the online consultation as well.

Workshop

On day one of the workshop experts were asked to individually sort and categorise the 134 statements according to similarity of meaning. Based on these categorisations a hierarchical cluster analysis was carried out resulting in a description of digital competence through 15 clusters, i.e. digital competence areas. On day two the experts worked in four small groups to reflect and comment on these 15 digital competence areas as well as the statements describing each of them, and to provide a label and description for each area. Each group was moderated by one of the workshop organisers, who documented the discussion and proposed adaptations. Based on the feedback and suggestions from the groups, some clusters were combined, another split up, some statements were moved and others removed, leading to an initial solution of 14 digital competence areas, illustrated by 125 statements, which was finally presented back to the original group of selected experts for further validation through a second online consultation.

Based on the feedback of experts taking part in the second consultation round the initial description of digital competence areas was adapted in various respects:
- Some labels of digital competence areas were changed,
- A few descriptions of digital competence areas were adapted,
- A number of statements were rephrased, (re)moved, or added,
- Twice two competence areas have been merged, reducing the number of digital competence areas to twelve.

3.4 Participants

As mentioned, 204 experts were selected to take part in the online consultations. The first online questionnaire was completed by 79 experts (38%). Responses were elicited by two reminders and by personally contacting experts whom we knew (either directly or indirectly).

The second online questionnaire was completed by 57 experts (28%), 41 of whom had also provided input for the first round. The other 16 experts had been invited for the first round as well, but had not taken part at that stage. Comments were given in various degrees: depending on the competence area, comments were made by 6 to 30 experts. Besides, 49 experts provided overall comments on the final solution.

All in all, 95 experts contributed to either the first or the second round, or both. This group includes experts from all countries represented in the original list of experts, except Poland, Switzerland and Luxembourg.

4. Results

4.1 First stage

Following the subsequent steps of statement generation, cleaning, sorting and clustering, the first stage resulted in a mapping of digital competence consisting of 14 areas of digital competence, described by 125 statements (See Appendix C for a full description of the areas including related statements and Appendix D for a detailed description of criteria for removal of statements and a list of the statements that were removed).

The statements used in creating the initial mapping were generated in response to the general prompt: *"A digitally competent person is someone who…"*. Analysis of the responses to subsequent prompts addressing specific profiles (7 year old child, 14 year old adolescent, and senior citizen) revealed shifts of accents, but no additional 'new' topics or statements, not already covered by the general response. Appendix E summarizes findings from the analysis of the statements generated for the various profiles.

4.2 Second stage

The online questionnaire used in the second consultation round is provided in Appendix F, including the average ratings for each statement. Based on the feedback of the 57 experts taking part in the second consultation round the number of digital competence areas was reduced from 14 (initial solution) to 12 (final solution). Figure 1 shows a mind map of the twelve digital competence areas.
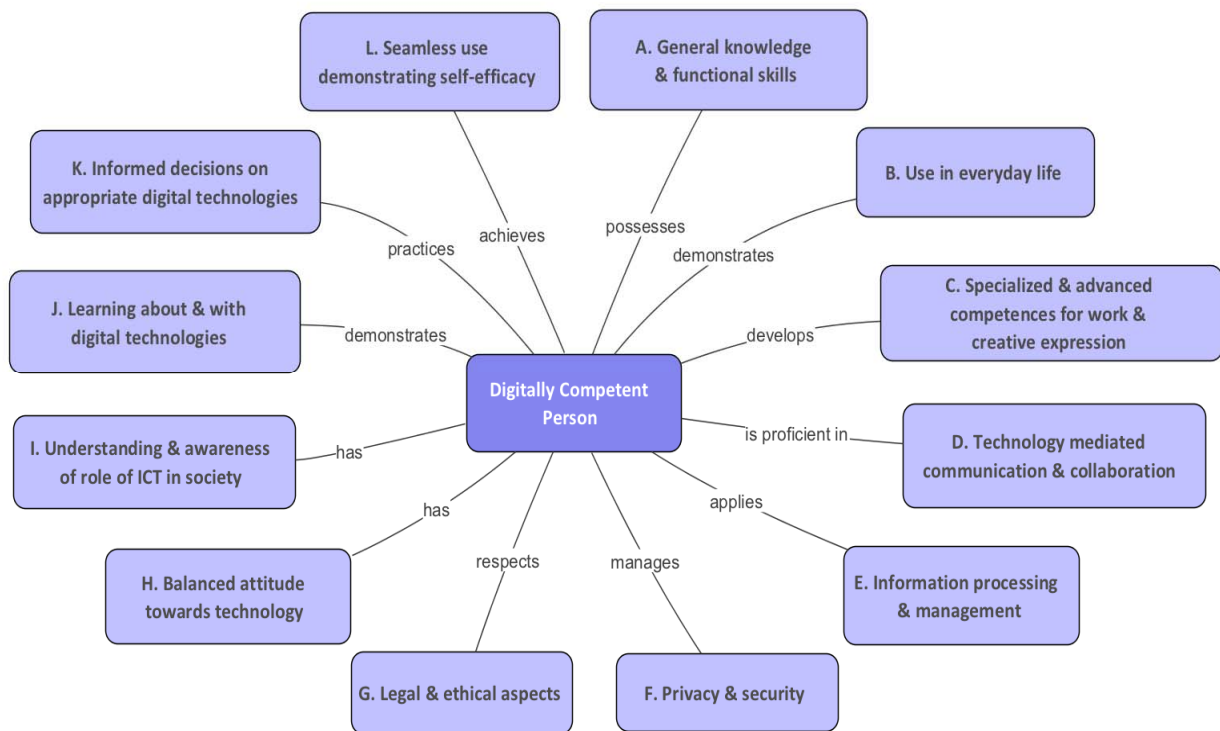
Figure 1: Mind map of digital competence areas

We present each of the twelve competence areas in detail, including a description, and the five main statements illustrating each competence area, i.e. the five statements with the highest average scores within each competence area. It should be noted however that some of the descriptions and statements presented below (and described in more detail in Appendix G), have been adapted in response to the feedback received in the second round.

Following the description of the twelve competence areas, we will illustrate how the 12 digital competence areas of the final solution interrelate.

A. General knowledge and functional skills *The digitally competent person knows the basics (terminology, navigation, functionality) of digital devices and can use them for elementary purposes.*	Is able to use a digital device, which may be one of many types (e.g. Desktop PC, Laptop, Tablet, Smart phone).
	Possesses general computer skills (typing, using computers, getting into a new programme).
	Understands the difference between hardware and software.
	Is familiar with the meaning of terms commonly used in user manuals for the operation of hardware and the installation and configuration of software.
	Knows about the existence of various operating systems.

B. Use in everyday life *The digitally competent person is able to integrate technologies into the activities of everyday life.*	Is able to download and access different information types from the Internet.
	Is able to use at least office applications (or other work related applications) to edit and create content (text, numeric, images).
	Is able to search, collect, process, evaluate, share, store data and information using various devices, applications, cloud services.
	Can conduct transactions online (e.g. pay bills, apply for a job, submit tax declaration, complete online forms, book a hotel, interact with government or local services, shop online, etc.).
	Consults digital resources as a matter of routine across various aspects of life (news, health, sports, travel, entertainment, etc.).

C. Specialized and advanced competence for work and creative expression *The digitally competent person is able to use ICT to express his/her creativity and to improve his/her professional performance.*	Uses technology to improve the quality of his/her work.
	Masters specialized digital skills needed by his/her area of work.
	Is able to create knowledge representations (e.g. mind maps, diagrams) using digital media.
	Is able to use a variety of media to express him/herself creatively (text, images, audio, and movie).
	Is able to remix different existing content into something new.

D. Technology mediated communication and collaboration *The digitally competent person is able to connect, share, communicate, and collaborate with others effectively in digital environments.*	Is able to communicate through ICT (e.g. email, instant messaging, video conferencing.).
	Is able to use social media and participative technology.
	Is able to use digital media to be part of a community.
	Is able to take advantage of digital technology to cooperate and take part in networks and networked learning for personal or professional purposes.
	Can use ICT for team work (collaboration, co-construction of content); to work at a distance.

E. Information processing and management *The digitally competent person uses technology to improve his/her ability to gather, organise, analyse and judge the relevance and purpose of digital information.*	Is able to judge the validity of content found on the Internet, how to find appropriate material, and what sources can be trusted.
	Is able to compare and contrast information from diverse sources (triangulate information) before it is used in a knowledge-making process.
	Is able to gather relevant digital information, e.g. other users' experiences, and to assess the quality of goods based on that information.
	Can integrate, compare and put together different types of information related to multimodal content.
	Is able to structure, classify, and organize digital information/content according to a certain classification scheme or genre.

F. Privacy and security *The digitally competent person has the capacity to protect personal data and take appropriate security measures.*	Understands the risks associated with online use and encounters with unknown persons.
	Is aware of privacy issues when using Internet/mobile Internet and is able to act prudently.
	Is able to protect him/herself from threats of the digital world (fraud, malware, viruses etc.).
	Understands the risk of identity theft and other credentials' thefts and is able to take steps to mitigate risk.
	Knows that many interactive services use information about him or her to filter in commercial messages in more or less explicit manners.

G. Legal and ethical aspects *The digitally competent person behaves appropriately and in a socially responsible way in digital environments, demonstrating awareness and knowledge of legal and ethical aspects on the use of ICT and digital content.*	Is able to communicate and collaborate with others in line with codes of conduct appropriate to the context.
	Considers legal and ethical principles of use and publication of information.
	Understands copyright and licence rules.
	Knows there are different ways of licensing intellectual property production, understands differences between using copyright, public domain, copyleft and/or creative commons licenses.
	Has an advanced sense of suitable behaviour, finely tuned to media context, audience and legal provisions.

| H. Balanced attitude towards technology

The digitally competent person demonstrates an informed, open-minded, and balanced attitude towards Information Society and the use of digital technology. The digitally competent person is curious, aware of opportunities and new developments, and is comfortable to explore and exploit them.	Has a positive but realistic attitude towards the benefits and risks associated with information technologies.
	Has understood that the digital environment we are facing can make things better or worse - it all depends on how we are using it and what rules we find for it.
	Is able to assess and reduce/avoid technology related threats to one's health.
	Sees digital media as enablers rather than inhibitors of choice and action.
	Uses digital media and tools without fear, always aware that digital enablers should serve the human being to have a better life (and not the opposite).

| I. Understanding and awareness of role of ICT in society

The digitally competent person understands the broader context of use and development of information and communication technology.	Understands the role of ICT in everyday life, in social life and at work.
	Understands the wider context of digital tools in a 'digital age' characterised by globalisation and networks.
	Is aware of the general trends within new media even if s/he does not use them.
	Understands where ICT comes from, who develops it and for what purposes.
	Is aware of environmental issues related to the use of digital technologies.

| J. Learning about and with digital technologies

The digitally competent person actively and constantly explores emerging technologies, integrates them in his/her environment and uses them for lifelong learning.	Is able to use digital media to learn (develop oneself).
	Is able to use a digital environment for lifelong learning (formal or informal).
	Can use ICT resources to safely expand own knowledge and connect to the world around.
	Is able to learn how to work with any new digital technology by trying it out, and using its internal guidance and help.
	Is able to adapt smoothly to new technology and to integrate technology into his/her environment.

| K. Informed decisions on appropriate digital technologies

The digitally competent person is aware of most relevant or common technologies and is able to decide upon the most appropriate technology according to the purpose or need at hand. | Understands the potential of digital devices and resources for her/his work. |
|---|---|
	Knows the range of things that can be done using ICT/Internet.
	Is able to use digital services without being completely dependent on them (or: helpless without).
	Chooses the most appropriate technologies according to the task.
	Is aware of the most relevant or popular digital technologies used by others (e.g. peers, reputed experts).

| L. Seamless use demonstrating self-efficacy

The digitally competent person confidently and creatively applies digital technologies to increase personal and professional effectiveness and efficiency.	Is able to arrange and develop his/her personal working environment as an effective and reliable system.
	Can use different ICT in a way that helps to achieve certain results more quickly, or more easily, or to achieve better results.
	Can access technology and uses it without realising that s/he is actually using it.
	Knows how to use digital equipment cost-efficiently and also time-efficiently.
	Can solve a theoretical or practical problem, of individual or collective interest, through or with the support of digital tools.

Figure 2 illustrates how the various digital competence areas relate. A note of caution to make here is that although these results can be considered a validated mapping of the collective views of experts in the field of digital competence, it should not be considered as representing consensus among the experts. Though many of the experts taking part in the second round indicated they agreed with the final mapping, and many of the comments and further suggestions made by them have been followed up, there were some more substantial differences between experts. We will further elaborate on these issues in the Discussion section of this report.

Figure 2 provides a schematic representation of the results and as such can not completely reflect the richness of the results. However, it does reflect the kaleidoscopic nature of the ideas generated by experts. These ideas comprised a mixture of competences, proficiency levels, purposes, technologies, and domains (application areas). Our prior expectation (and concern) was that the ideas generated in the brainstorming would focus on knowledge and skill aspects of digital competence. Much to our surprise attitudes had a relevant part in the input.

Figure 2 illustrates how the various digital competence areas identified through the online consultation can be considered as 'building blocks'. Proficiency levels vary both within and between blocks. Most notably proficiency levels increase as we move up through the centre blocks. Eventually high proficiency levels are reflected in (self-directed) learning about and with technologies, informed decisions on appropriate technologies, and ultimately, smooth, seamless use of these technologies.

'Core' competences related to digital technology usage in every day life and at more advanced levels connected to creative expression and/or work are bolstered on the one hand by technology mediated communication and collaboration competences and competences relating to information processing and management on the other hand.
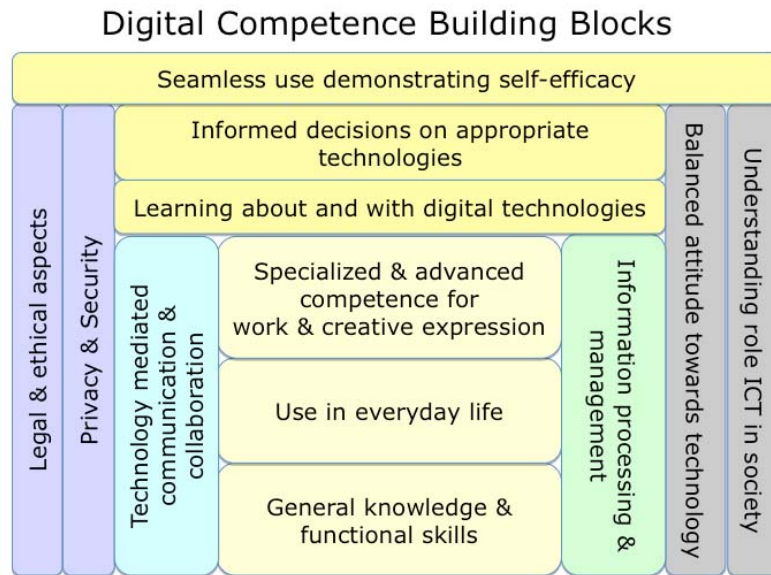
Figure 2 Areas of digital competence: experts' collective view

These digital competence areas involve direct, 'primary', use of digital technology, which must be embedded in or supported by other competences involving awareness and skills relating to the wider implications and impact of using digital technologies. These 'supportive' (but by no means less important) competences are: awareness of legal and ethical aspects, as well as privacy and security issues and the ability to act prudently in these matters on one side, and an understanding of the role of ICT in society together with a balanced attitude towards technology on the other side.

Finally, at an even higher level of reflection and integration, digital competence involves a number of competences which enable the digitally competent person to evaluate both his/her own digital competences and the surrounding digital environment in order to take appropriate decisions for self-development and enhancement of one's personal digital environment, ultimately resulting in a level of proficiency where the digitally competent person demonstrates self-efficacy and seamless use of digital technologies.

Another way of summarizing the data – across competence areas – is to see which of the statements generated the highest average scores, i.e. which statements did most of the experts consider to be important aspects of digital competence that most people should have. Table 1 gives these statements and their average scores. Though the statements are 'examples' rather than competence indicators, this 'top ten' of statements too reveals the rich palette of knowledge, skills, and attitudes we found throughout this study. Statements with low average scores (between 2.00 and 2.30) indicate that most experts consider the competences illustrated by these statements to be needed by few people only. Statements with low average scores were:

- 'Can programme in at least one high-level language',
- 'Is able to create complex models and simulations of the real world using digital information',
- 'Has seen at least once a computer from inside and understands its different parts and components'.

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Table 1 Statements generating the highest average scores (scores ranging from 1 = none to 4 = most)

Statement	Mean
Is able to communicate through ICT.	4.00
Is comfortable using a computer, which may be one of many types (e.g. Desktop PC, Laptop, Tablet, Smartphone).	3.91
Is able to communicate and collaborate with others in line with digital etiquette.	3.91
Possesses general computer skills (typing, using computers, getting into a new programme).	3.89
Is able to download different information types from the Internet.	3.89
Is able to use at least office applications, or other applications that have to do with his/her work.	3.87
Is able to search, collect, process, evaluate, store data, information and concepts.	3.85
Understands the risks associated with online use and encounters with unknown persons.	3.85
Is able to judge content found on the Internet (true/false), how to find appropriate material, and what sources can be trusted.	3.85
Understands basic e-ethics and demonstrates appropriate behaviours when using digital products and online information and communicating with others through digital tools.	3.83

5. Discussion

The rating of statements lead experts to bring issues to the fore that can be characterised as 'open to debate', and which are interesting with a view on development of a framework of digital competence including indicators.

One issue involved the distinction between 'knowing and doing' or as one expert put it *"separating use and ability"*. A number of statements described behaviour rather than ability, and we have solved this by rephrasing these statements to ability. For instance, the statement "Shares photo's/travel reports…" was rephrased to "Is able to share photos and travel reports via applications". However, there may be instances where this distinction can no longer be kept. In this respect consider for example the statement "Consults online sources as a matter of routine in all aspects of life". Rephrasing this statement to "Is able to..." would no longer be describing an attitude but a skill. Now some experts did indeed indicate that in their view the description of digital competence should be restricted to knowledge and skills, as they consider attitudes not to be part of digital competence. This view did not appear wide-spread, but still the example serves to illustrate that we can not claim consensus. The picture of digital competence that emerged from the input of so many experts covers knowledge, skills, and attitudes as well as references to purpose, domain, and level. Some experts prefer a more confined approach to the definition of digital competence. We briefly discuss the most poignant issues of debate.

a. General versus 'pure' digital competence
There were experts who advocated limiting the description to 'pure' digital competence and leaving out related but more general competences such as information processing skills:

> *"Information processing is [also] linked to cognitive processes and it is not necessarily related to digital competence".*

> *"It should be considered what it "pure" digital competence and what is also deriving from other domains".*

In our view a more confined approach to digital competence not only unnecessarily limits the scope of digital competence, but – more importantly – may prevent generation of important hypotheses, e.g. that digital technologies enhance cognitive processes. For example we may postulate that digital note taking or concept mapping significantly improve perception, memory of problem solving. Furthermore, the broader approach to digital competence has resulted in the identification of metacognition as an important component of digital competence, along with knowledge, skills, and attitudes:

> *"Can self monitor personal goals and can diagnose deficiencies of digital competence required for reaching these goals".*

> *"Knows how to self-regulate his/her learning about digital technologies".*

b. Digital competence versus values and attitudes
Some experts suggest making a strong distinction between competence and values/attitudes and to focus on digital competence only:

> *"Ethics and social values are not necessary part of the digital competences"*

> *"Focus on skills/competences that can be taught, measured and assessed"*

This study identified attitudes as an important aspect of digital competence. The taxonomy of learning outcomes in the affective domain[15] is as popular as the taxonomy of learning outcomes in

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[15] Krathwohl, D. R., Bloom, B. S., & Masia, B. B. (1973). *Taxonomy of Educational Objectives, the Classification of Educational Goals. Handbook II: Affective Domain*. New York: David McKay Co., Inc.

the cognitive domain. Besides attitudes can be taught, measured and assessed: there is in fact a long tradition in teaching, learning, changing and measuring attitudes.[16],[17],[18]

c. Digital competence versus digital preference

An important recommendation made by experts is to draw a clear line between digital competence and personal preference, choice, or desire to use particular digital technologies.

> *"It's useful to know how to use social media but that doesn't mean that they have to use it. This is a personal choice. It is OK to not use Twitter, but it's a shame if someone does not know what it is or what it offers".*

The fact that someone is capable of doing something does not necessarily imply that s/he likes it or wants to do it. Or the other way around: someone may be eager to use a particular digital technology without being sufficiently proficient to use it. Early adopters of a technology are not necessarily more proficient than later adopters. Preference and competence are two different types of cognitive constructs and research indicates that they do not correlate.[19]

Finally, we highlight two points to be taken into account in the development of a framework considering recurring comments from experts.

Firstly, in relation to various statements and the question to what extent the knowledge, skills, and/or attitude illustrated by them are needed, experts point out: "it depends", e.g. it depends on where you live (developed countries), what type of work you do, whether you want to… etc. Secondly, there is the notion of different levels of digital competence identified throughout experts' comments. Two different aspects of competence level are hinted at:

• Proficiency level (essential vs. advanced skills)

> *"For general digital competence the ability of gathering, assessing relevant information is the most important. Analyzing, structuring, classifying is perhaps already a higher level".*

• Cognitive level (knowledge vs. understanding vs. application vs. problem solving)

> *"It is important to understand that they (major players such as Google, Facebook, and Twitter) may use personal data for commercial reasons. Know "how" they use data may be highly specialized…"; "Understands how" may be too much to look for - "Understands that" maybe a better phrase".*

For both aspects, there is a suggestion that the lower levels are pre-conditions for the higher levels.

An online consultation as described in this report is a balancing act between the academic (as well as common sense) values of parsimony and conciseness on the one hand and doing justice to the rich variety of ideas and nuances suggested by so many experts. Though this in itself does not constitute a problem, it is good to be aware that validating the results of the first round by means of a second consultation round does not mean that the final result reflects consensus.

---

[16] Keller, J.M. (1987). Development and use of the ARCS model of instructional design. *Journal of Instructional Development*, 10 (3), 2-10.

[17] Miller, M. (2005). Teaching and Learning in Affective Domain. In M. Orey (Ed.), *Emerging perspectives on learning, teaching, and technology*. Retrieved 26.06. 2012, from http://projects.coe.uga.edu/epltt/

[18] Simonson, M. and Maushak, N. (2001). Instructional technology and attitude change. In D. Jonassen (Ed.), *Handbook of research for educational communications and technology* (pp. 984-1016). Mahway, NJ: Lawrence Erlbaum Associates.

[19] Kirton, M.J. (2003). *Adaption – Innovation in the context of diversity and change*. London Routledge.

6. Conclusion

The combination of open-ended questions, Content Analysis, Statistical analysis and Grounded Theory Approach, has proved to work out well in a number of respects:

- The online brainstorm generated abundant and rich ideas
- Leaving the initial coding over to experts gave insight in different points of view and argumentation.
- Hierarchical cluster analyses was very helpful not only in objectively defining thematic areas, but also in identifying 'weak' statements, and in revealing alternative solutions with varying levels of granularity and interpretations. It enabled us to do the card sorting on the first day of a workshop and feed the results back for further interpretation, the next day.
- Applying a Grounded Theory Approach in relation to the comments and feedback from experts during the workshop and in the second consultation round helped to identify conceptual differences as described in the Discussion section.

A common, in the sense of 'unanimous' understanding of digital competence may not be feasible, but this study has contributed to an understanding of the differences, which can then be used for instance to create a framework which may include a 'restricted' and a 'broad' conceptualisation of digital competence.

The way we have come to understand digital competence through the inputs and argumentations from so many experts is that the twelve areas of digital competence identified in the final mapping are highly complementary. Possessing elementary skills is one thing, applying them in everyday life is something else, as is expanding them to more advanced areas. Digital Competence clearly involves more than knowing how to use devices and applications – which is intricately connected with skills to communicate using ICT as well as information management skills. Besides, sensible and healthy use of ICT requires particular knowledge and attitudes regarding legal and ethical aspects, and privacy and security, as well as an understanding of the role of ICT in society and a balanced attitude towards technology. Needless to say, that various levels of proficiency can be identified for each of these areas. Finally, dictated by the nature of information and communication technologies, i.e. their rapid development, digital competence requires the ability to learn about and with digital technologies, to choose the right technology and to do so in confidence.

Acknowledgements

Delphi studies rely heavily on the input of those taking part in it. We are grateful to the varied and very rich input received throughout the study and feel much indebted to all 95 experts taking part in it. The names of 89 experts who indicated to appreciate their name to be included in the acknowledgements are listed below in alphabetical order.

Besides we want to express our thanks to colleagues at IPTS, particularly Anusca Ferrari and Yves Punie, who have not only been helpful in many practical ways but were inspiring sparring partners to work with as well.

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Buchegger	Barbara			Austria
Calvani	Antonio			Italy
Carneiro	Roberto	Prof.	CEPCEP - UPC	Portugal
Cartelli	Antonio	Dr.	University of Cassino and Southern Latium	Italy
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Appendix A - Online Consultation First Round Questionnaire

Online Consultation for a Framework on Digital Competence

This is the first (brainstorming) round of the online consultation for a framework on digital competence. The questionnaire is very short and consists of five demographic questions, followed by four key questions. We ask you to generate as many ideas as possible on what it means to be digitally competent in any possible context: learning, work, leisure, everyday life and participation in society. Your answers will be handled confidentially and will be used for research purposes only. The questionnaire will not take any longer than 20 minutes of your time.

Demographic Questions

1. You are:

   ○ Female
   ○ Male

2. What is your age?

3. Main educational background:

   ○ Educational studies
   ○ Social Sciences
   ○ Maths and Science
   ○ Engineering and Computer Sciences
   ○ Business studies
   ○ Media studies
   ○ Arts and Humanities
   ○ Other:

4. Please identify which of the following best describes your current occupation:

   ○ Policy-maker (at EU, national, regional, local level)
   ○ Researcher
   ○ Teacher / trainer (formal education)
   ○ Trainer / tutor (corporate sector, non-formal)
   ○ Accreditation board representative
   ○ Welfare worker
   ○ Professional development adviser
   ○ IT consultant
   ○ Technology developer
   ○ Representative from industry / entrepreneur
   ○ Other:

5. Overall professional experience

   ○ Less than 5 years
   ○ 6-10 years
   ○ More than 10 years

Your ideas on Digital Competence

6. What does it mean to be digitally competent today? Think of any possible context: learning, work, leisure, everyday life and participation in society. Then complete the following sentence: "A digitally competent person is someone who….". Please try to generate as many ideas as possible.

Now we would like you to consider some specific profiles.

Digital Competence of a 7 year old

7. Think of a 7 year old child. What does it mean to be digitally competent at this age? Please try to generate as many ideas as possible that were not mentioned before.

Digital Competence of a 14 year old adolescent

8. Think of a 14 year old adolescent. What does it mean to be digitally competent at this age? Please try to generate as many ideas as possible that were not mentioned before.

Digital Competence of a senior citizen

9. Think of a senior citizen (someone of retirement age). What does it mean to be digitally competent at this age? Please try to generate as many ideas as possible that were not mentioned before.

10. Please indicate whether you would like your name to appear in the final report as an acknowledgement of your contribution:

   ○ No
   ○ Yes

Thank you for your time and effort.

Appendix B - Card sorting instruction

On the left, you'll see a list of statements. They are results from the first brainstorming round of the Online Consultation for a Framework on Digital Competence study. Please click on the items to drag them onto the empty area in the middle of the screen. Group the statements on how similar in meaning they are to one another and give each group a name that describes its theme or contents. Do not group the statements according to how important they are, how high a priority they have, etc. There is no right or wrong way to group the statements. You will probably find that you could group the statements in several sensible ways. Pick the arrangement that feels best to you. Each statement must be put into only one group. Make sure that every statement is put somewhere. Do not leave any statements out. Do not create "miscellaneous" or "junk" groups. Put a statement alone in its own category if it is unrelated to all the other statements.

Some tips:

Do the sorting at once because saving options are not available.

When finished sorting do not forget to click on the button "I'm done".

You can minimize the groups if you have many groups or groups are too long.

Drop a statement into a group when the border of the group is highlighted, otherwise it can go to other group. If it happens, do not worry, you can always put it at the right place. You can also move statements from one group to another. You might need to move the groups (minimized) around to make some more space.

Appendix C - Online Consultation Second Round Questionnaire

Introduction

The input provided by you and other experts in the first round of the Online Consultation for a Framework on Digital Competence led us to distinguish 14 constituent components of digital competence. We present each of these components back to you now in the following format:

• Label of the digital competence component

• Description

• Statements on specific knowledge, skills, and attitudes relating to this particular aspect of digital competence.

We ask you to go through each of the components and related statements and to:

a. Indicate for each statement whether you think the attributes described are needed by most people, by some people, by few people (e.g. specialists), or not needed at all.

b. Freely comment on the label, description, and/or statements.

Next, an overview of all 14 components will be presented to you in a single picture. We ask you to take a look at the overview and to indicate, whether you think there are aspects of digital competence which remain uncovered by this overview, or the opposite: aspects have been included which don't belong there.

Digital Competence statements
Please consider below components of digital competence and related statements and indicate for each statement whether you find the knowledge, skills, and attitudes described, are needed by: *most* people, *some* people, *few* people, or not needed at all: *none*.

A. General technical knowledge and functional skills

The digitally competent person knows the basics of digital devices and can use one or more of them in a functional way.

Is comfortable using a computer, which may be one of many types (e.g. Desktop PC, Laptop, Tablet, Smartphone).

most	some	few	none
○	○	○	○

Possesses general computer skills (typing, using computers, getting into a new programme in no time).

most	some	few	none
○	○	○	○

Knows the basics about the technology.

most	some	few	none
○	○	○	○

Understands the relations and differences between hardware and software.

most	some	few	none
○	○	○	○

Knows there are several operating systems running out there and understands the differences between them.

most	some	few	none
○	○	○	○

Has seen at least once a computer from inside and understands its different parts and components.

most	some	few	none
○	○	○	○

Please feel free to comment on label, description, and/or statements for this component:

B. Basic use in everyday life

The digitally competent person is able to integrate technologies into his/her everyday life activities and to enhance everyday life by using digital means for a range of routine transactions/processes.

Is able to download different information types from the Internet.

most	some	few	none
○	○	○	○

Is able to use at least office applications, or other applications that have to do with his/her work.

most	some	few	none
○	○	○	○

Is able to search, collect, process, evaluate, store data, information and concepts.

most	some	few	none
○	○	○	○

Can shop online and/or conduct transactions online (e.g. pay bills, submit tax declaration electronically, book a hotel, interact with government or local services).

most	some	few	none
○	○	○	○

Possesses the skills to obtain and process digital information and transform it into knowledge.

most	some	few	none

○   ○   ○   ○

Is able to look for a job online.

most	some	few	none
○	○	○	○

Consults online sources as a matter of routine in all aspects of life.

most	some	few	none
○	○	○	○

Can create and edit content (text, numeric, images...even movies).

most	some	few	none
○	○	○	○

Utilises different digital resources to get information for their leisure time (on sports, equipment, travel).

most	some	few	none
○	○	○	○

Is able to use digital media for entertainment (gaming, culture, tourism, etc).

most	some	few	none
○	○	○	○

Can participate fully in society through engagement in democratic actions (lobbying, parliament, online petitions, etc.)

most	some	few	none
○	○	○	○

Can share content and/or store personal content using cloud services.

most	some	few	none
○	○	○	○

Is able to share photos and travel reports via applications.

most	some	few	none
○	○	○	○

Utilises apps to improve the quality of his/her own life (jogging, health, diet plans).

most	some	few	none
○	○	○	○

Please feel free to comment on label, description, and/or statements for this component:

C. Specialized and advanced skills for work and creative expression

The digitally competent person uses ICT to improve his professional performance and the products of his/her creativity.

Uses technology to improve the quality of his/her work.

most	some	few	none
○	○	○	○

Masters specialized digital skills needed by his/her area of work.

most	some	few	none
○	○	○	○

Is able to express him/herself, to create and understand knowledge representations using digital media.

most	some	few	none
○	○	○	○

Has broadened his/her competence in line with his/her age/job/focus, for example using project management software if s/he is a project manager, using CAD software if s/he is interested in design.

most	some	few	none
○	○	○	○

Is a "digital writer", who understands how meaning is produced through multimedia and transmedia texts, how culture is produced through the Internet and social media in particular.

most	some	few	none
○	○	○	○

Is able to develop something new by using specific tools and software, and is able to remix different existing texts into something new.

most	some	few	none
○	○	○	○

Has broadened his/her competence to database use, editing websites, editing digital images.

most	some	few	none
○	○	○	○

Is able to create complex models and simulations of the real world using digital information.

most	some	few	none
○	○	○	○

Can program in at least one high-level language.

most	some	few	none
○	○	○	○

Please feel free to comment on label, description, and/or statements for this component:

D. Technology mediated communication and collaboration

The digitally competent person is able to communicate, collaborate, and connect with others effectively in digital environments.

Is able to communicate through ICT.

most	some	few	none
○	○	○	○

Is able to use social media.

most	some	few	none
○	○	○	○

Uses digital equipment to keep in touch with friends and others.

most	some	few	none
○	○	○	○

Is able to use digital media to be part of a community.

most	some	few	none
○	○	○	○

Can, if they choose to, engage in social networking either for personal or professional purposes.

most	some	few	none
○	○	○	○

Can use ICT for team work (collaboration, co-construction of content), work at a distance.

most	some	few	none

○   ○   ○   ○

Is able to use digital media to cooperate (productively).

  most   some   few   none
   ○   ○   ○   ○

Shares information with a social network.

  most   some   few   none
   ○   ○   ○   ○

Is able to take advantage of digital technology to cooperate and take part in networks and networked learning.

  most   some   few   none
   ○   ○   ○   ○

Is able to manage his/her professional reputation online.

  most   some   few   none
   ○   ○   ○   ○

Uses Web 2.0 and social networks to promote results of their work.

  most   some   few   none
   ○   ○   ○   ○

Is willing to contribute to the public knowledge domains.

  most   some   few   none
   ○   ○   ○   ○

Please feel free to comment on label, description, and/or statements for this component:

E. Privacy and security

The digitally competent person has the capacity to protect personal data and take appropriate security measures.

Is able to create, share/present, protect and monitor his/her digital identity and footprints.

  most   some   few   none

   ○   ○   ○   ○

Is able to find out who the other person might be (if strangers are met on the internet).

   most   some   few   none

   ○   ○   ○   ○

Understands how major players like Google, Facebook and Twitter use personal data that they collect about users and can act prudently in this knowledge.

   most   some   few   none

   ○   ○   ○   ○

Knows that most major interactive services use information about him or her to filter in commercial messages in more or less explicit manners.

   most   some   few   none

   ○   ○   ○   ○

Understands the risks associated with online use and encounters with unknown persons.

   most   some   few   none

   ○   ○   ○   ○

Is able to protect him/herself (at least to some extent) from threats of the digital world (fraud, malware, viruses etc.).

   most   some   few   none

   ○   ○   ○   ○

Understands the risk of identity theft and is able to take steps to mitigate risk.

   most   some   few   none

   ○   ○   ○   ○

Has an understanding of security implications related with ICT.

   most   some   few   none

   ○   ○   ○   ○

Is aware of privacy issues when using Internet/mobile Internet and is able to act prudently.

   most   some   few   none

   ○   ○   ○   ○

Is aware of the impact and longevity of digital information that s/he considers for publishing.

   most   some   few   none

   ○   ○   ○   ○

Please feel free to comment on label, description, and/or statements for this component:

F. Legal and ethical aspects

The digitally competent person behaves appropriately and in a social acceptable way in digital environments, demonstrating awareness and knowledge of legal and ethical aspects on the use of ICT and digital content.

Never uses digital applications in a way that adversely affects others (from abuse to the unnecessary use of 'reply all').

most	some	few	none
○	○	○	○

Is able to communicate and collaborate with others in line with digital etiquette.

most	some	few	none
○	○	○	○

Fosters awareness of his/her own personal responsibilities and the respect of reciprocal rights/obligations in building shared and collaborative knowledge.

most	some	few	none
○	○	○	○

Understands basic e-ethics and demonstrates appropriate behaviours when using digital products and online information and communicating with others through digital tools.

most	some	few	none
○	○	○	○

Considers legal and ethical principles of use and publication of information.

most	some	few	none
○	○	○	○

Understands the rights of others and behaves ethically, e.g. in relation to piracy/copyright and truthfulness in general.

most	some	few	none
○	○	○	○

Understands and abides by copyright and licence rules.

most	some	few	none
○	○	○	○

Knows there are different ways of licensing intellectual property production, understands differences between using copyright, public domain, copyleft and/or creative commons licenses.

most	some	few	none

○   ○   ○   ○

Has an advanced sense of suitable behaviour, finely tuned to media context, audience and legal provisions.

   most   some   few   none

   ○   ○   ○   ○

Understands the ethics and possibilities implied by using either a closed source operating system or an open source one.

   most   some   few   none

   ○   ○   ○   ○

Please feel free to comment on label, description, and/or statements for this component:

G. Information processing and management

The digitally competent person demonstrates the ability to gather, organise, analyse, and assess information using digital technology and can judge the relevance and purpose of digital information.

Can integrate, compare and put together different types of information related to multimodal content.

   most   some   few   none

   ○   ○   ○   ○

Is able to structure, classify and organize information according to a certain classification scheme or genre.

   most   some   few   none

   ○   ○   ○   ○

Is able to gather relevant digital information, e.g. other users' experiences, and to assess the quality of goods based on that information.

   most   some   few   none

   ○   ○   ○   ○

Is able to judge content found on the Internet (true/false), how to find appropriate material, and what sources can be trusted.

   most   some   few   none

   ○   ○   ○   ○

Is able to compare and contrast information from diverse sources (triangulate information) before it

is used in a knowledge-making process.

most	some	few	none
○	○	○	○

Please feel free to comment on label, description, and/or statements for this component:

[ ]

H. Informed and flexible decision-making

The digitally competent person is aware of most relevant or common technologies and is able to decide upon the most appropriate technology according to the purpose or need at hand.

Knows more about the tools s/he daily uses than just where to click.

most	some	few	none
○	○	○	○

Understands the potential of digital devices and resources for her/his work.

most	some	few	none
○	○	○	○

Knows the range of things that can be done using ICT/Internet.

most	some	few	none
○	○	○	○

Is aware of the most relevant or popular digital technologies used by peers.

most	some	few	none
○	○	○	○

Has reasonable knowledge of available technologies, their strengths and weaknesses and whether and how they might support the achievement of personal goals.

most	some	few	none
○	○	○	○

Chooses the most appropriate technologies according to the task.

most	some	few	none
○	○	○	○

Will not opt for a particular technology because it is the latest or most trendy/sexy one, but instead seeks to find the best solution for the problem at hand.

most   some   few   none

○   ○   ○   ○

Will use a widely diverse and well-balanced mix of digital and non-digital technologies for different problems and will dynamically change options over time, consciously contributing to and adapting to change in the world around.

most   some   few   none

○   ○   ○   ○

Is able to use digital services without being completely dependent on them (or: helpless without).

most   some   few   none

○   ○   ○   ○

Can determine if appropriate and safe digital means are available, that are efficient and cost-effective in comparison with other means.

most   some   few   none

○   ○   ○   ○

Understands the technologies s/he is using at a level that is sufficient to underpin good purchasing decisions, e.g., about devices or Internet Service Providers.

most   some   few   none

○   ○   ○   ○

Knows which digital technologies are used by (reputed) experts in his/her field.

most   some   few   none

○   ○   ○   ○

Has first-hand knowledge and expertise of the major digital technologies used in his/her field.

most   some   few   none

○   ○   ○   ○

Has a comprehensive mental map of how the online world works.

most   some   few   none

○   ○   ○   ○

Understands the environmental impact of computers and electronic devices and how s/he can make them last longer by recycling parts of it (such as changing hard disks).

most	some	few	none
○	○	○	○

Is able to make informed decisions (with human or technological assistance where appropriate) about whether and how to use technologies to pursue goals that have personal meaning and relevance to his/her life.

most	some	few	none
○	○	○	○

Please feel free to comment on label, description, and/or statements for this component:

I. Exploration of digital opportunities and adaptation to own needs

The digitally competent person actively explores emerging technologies and integrates them in his/her environment.

Is able to adapt very quickly to new advanced technology and to integrate technology into his/her environment.

most	some	few	none
○	○	○	○

Is able to learn how to work with any new digital technology by trying it out, and using its internal advice, guidance and help.

most	some	few	none
○	○	○	○

Possesses the skills to constantly update knowledge about which digital instruments are available.

most	some	few	none
○	○	○	○

Is able to learn the new technologies that emerge.

most	some	few	none
○	○	○	○

Please feel free to comment on label, description, and/or statements for this component:

J. Self-directed learning with digital technologies

The digitally competent person uses ICT for lifelong learning.

Is able to use digital media to learn (develop oneself).

most	some	few	none
○	○	○	○

Is able to use a digital environment for lifelong learning (formal or informal).

most	some	few	none
○	○	○	○

Continuously self-monitors personal goals and diagnoses deficiencies of competencies required for reaching these goals.

most	some	few	none
○	○	○	○

Knows how to self-regulate his/her technology enhanced learning.

most	some	few	none
○	○	○	○

Can use ICT resources to safely expand his/her knowledge and connect to the world around him/her including both people and resources.

most	some	few	none
○	○	○	○

Is able to use learning management systems, information management systems, etc.

most	some	few	none
○	○	○	○

Is capable of exploiting technological potentials in order to represent and solve problems.

most	some	few	none
○	○	○	○

Has sufficient social and cultural capital so that technology use is supported and encouraged in the

communities to which s/he belongs.

most	some	few	none
○	○	○	○

Please feel free to comment on label, description, and/or statements for this component:

K. Understanding and awareness of role of ICT in society

The digitally competent person understands the broader context of use and development of information and communication technology.

Understands the wider context of digital tools in a 'digital age' characterised by globalisation, networks and flows i.e. can 'read the world' as well as 'read the word/texts'.

most	some	few	none
○	○	○	○

Understands where ICT comes from, who develops it and for what purposes, and knows about the historical evolution of internet, the web and its basic architectural principles.

most	some	few	none
○	○	○	○

Is aware of the general trends within new media even if s/he does not use them.

most	some	few	none
○	○	○	○

Understands the role of ICT in everyday life, in social life and at work.

most	some	few	none
○	○	○	○

Has a deep and transversal competency in how digital devices, media and networks play together.

most	some	few	none
○	○	○	○

Please feel free to comment on label, description, and/or statements for this component:

L. Effective & efficient use

The digitally competent person increases personal and professional effectiveness and efficiency through the use of digital technologies.

Is able to arrange and develop his/her personal working environment as an effective and reliable system.

  most   some   few   none

   ○   ○   ○   ○

Includes more and more digital instruments in every day life to increase the quality of life and personal involvement in overall social life.

  most   some   few   none

   ○   ○   ○   ○

Is able to stay informed and evaluate information delivered through pull and push technology.

  most   some   few   none

   ○   ○   ○   ○

Can use different ICT in a way that helps to achieve certain results more quickly, or more easily, or to achieve better results.

  most   some   few   none

   ○   ○   ○   ○

Demonstrates fluent application of general digital devices available in her/his surroundings and digital resources transmitted through Internet or other communication tools, for daily life and life-long learning needs.

  most   some   few   none

   ○   ○   ○   ○

Knows how to use digital equipment cost-efficiently and also time-efficiently.

  most   some   few   none

   ○   ○   ○   ○

Can solve a theoretical or practical problem, of individual or collective interest, through or with the support of digital tools.

  most   some   few   none

   ○   ○   ○   ○

Is able to safely use digital standard technologies for learning, solving problems, communication and collaboration, creative activities, work.

  most   some   few   none

○   ○   ○   ○

Please feel free to comment on label, description, and/or statements for this component:

M. Seamless use and appropriation of technology

The digital competent person uses technology naturally and confidently, demonstrating self-efficacy.

Can access technology and uses it without realising that s/he is actually using it.

  most   some   few   none
   ○   ○   ○   ○

Reaches for technological tools as easily and as unselfconsciously as s/he might reach for a pencil.

  most   some   few   none
   ○   ○   ○   ○

Knows the language of new media (exactly the same way as being proficient in one or more human languages makes our life easier).

  most   some   few   none
   ○   ○   ○   ○

Is able to manage several virtual identities in different contexts.

  most   some   few   none
   ○   ○   ○   ○

Is a digital native, who makes natural use of participative technology and of social media.

  most   some   few   none
   ○   ○   ○   ○

Please feel free to comment on label, description, and/or statements for this component:

N. Balanced attitude towards technology

The digitally competent person demonstrates an informed, open-minded, and balanced attitude towards Information Society and the use of digital technology. The digitally competent person is curious, aware of opportunities and new developments, and is comfortable to explore and exploit them.

Has a critical view about information technologies.

most	some	few	none
○	○	○	○

Has (often implicit) views on the benefits and drawbacks of each major digital technology used in his/her field.

most	some	few	none
○	○	○	○

Has a positive but realistic attitude towards the benefits and risks associated with using technologies.

most	some	few	none
○	○	○	○

Sees digital media as enablers rather than inhibitors of choice and action.

most	some	few	none
○	○	○	○

Uses digital media and tools without fear, always aware that digital enablers should serve the human being to have a better life (and not the opposite).

most	some	few	none
○	○	○	○

Is self-motivated to seek and share information, to learn new skills, and – at least initially – experience new information with an open mind.

most	some	few	none
○	○	○	○

Holds a positive attitude to learn about emerging digital technologies.

most	some	few	none
○	○	○	○

Is always open to new ideas and willing to learn new technologies.

most	some	few	none
○	○	○	○

Has a general level of confidence, meaning that s/he is willing to experiment with new technologies, but also to reject inappropriate technologies.

most	some	few	none
○	○	○	○

Feels part of the current discourse on the opportunities afforded by new media.

most	some	few	none
○	○	○	○

Is able to assess and reduce/avoid technology related threats to one's health.

most	some	few	none
○	○	○	○

Is able to manage the potentially distracting aspects of working digitally.

most	some	few	none
○	○	○	○

Has understood that the digital environment we are facing can make things better or worse - it all depends on how we are using it and what rules we find for it.

most	some	few	none
○	○	○	○

Please feel free to comment on label, description, and/or statements for this component:

Digital Competence Map

Please take a look at the overview of digital competence components (URL to picture below) and carefully consider the following questions:

Do you think the map provides a concise and complete description of digital competence? Is there something missing in this map, or does it contain things that you would say do not belong there?

Your comments:
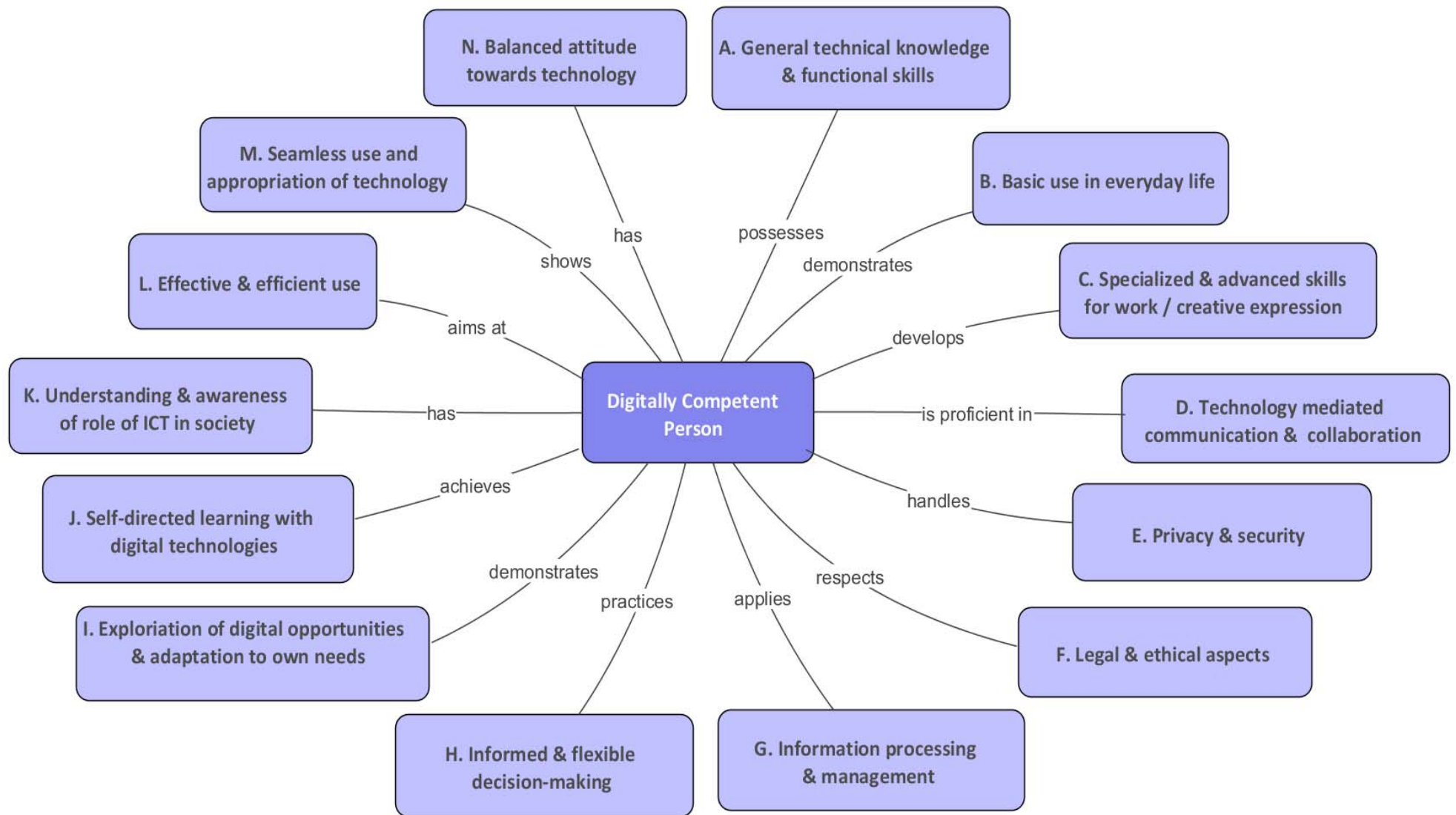
Finally, please indicate whether you would like your name to appear in the final report as an acknowledgement of your contribution:

○ No
○ Yes

(If you do want your name to appear you will receive an email allowing you to specify how you want it to appear, e.g. first name or initials, titles etc.)

Thank you for your time and effort.

Appendix D - Removal of statements following workshop feedback

Removal of statements was based on one or more of the following criteria:

a. The statement was not grouped either in the cluster analysis or by several experts.

b. The statement had a high bridging value (indicating that the way the statement was grouped by the experts varied widely).

c. The statement was considered unclear.

d. The statement was considered redundant.

e. The statement was considered not to fit well with the other statements in the cluster.

Statements that were removed following the cluster analysis and feedback from the workshop:

• Is able to critically use ICT (use ICT when necessary)

• Will only write you expensive text messages if Twitter is down.

• Has trust in a bright future and less fear about the present.

• Is able to create creative works/products, using digital technologies.

• Is likely to use digital media to structure and raise awareness of his/her life experiences in order to amplify his/her sense of coherence in life (an example of this is the personal digital photo collection or the ongoing formation of files in a work portfolio).

• Derives an overall sense of meaning and joy of life by building and formatting an identity on the net.

• Is not only aware of things that s/he does not yet know about, but is also aware that there are even more things that s/he 'doesn't know s/he doesn't know'.

Appendix E - Digital competence related to various profiles

Apart from asking experts the general question to generate as many ideas as possible completing the sentence "A digitally competent person is someone who....", experts were also asked to think of three different profiles – that of a 7 year old, a 14 year old and a senior citizen – and to generate further ideas in connection with these profiles.

Despite the explicit request to only generate ideas not mentioned before, many of the statements provided here were no different from the general question. Apparently one expert became aware of this in the process: "I started adding specific items, but found then that they applied in general, so no specific competences here".

However, despite this overall conclusion, some interesting notes can be made drawing on the statements generated for each specific profile. Though not basically different from competences mentioned in general, thinking of specific profiles does prompt some of the experts to be much more detailed regarding particular competences. The following particularities were generated in association with the various profiles:

Seven year olds:
a. Understanding a graphical user interface/icons, knowing how to enter/end a game, etc. (cf. General technical knowledge and functional skills).

Seven and fourteen year olds:
b. The ability to distinguish between reality and the virtual world (cf. Balanced attitude).

Fourteen years olds:
c. Use touch interfaces (cf. General technical knowledge and functional skills).
d. Visit every part of the world using technology (cf. Self-directed learning).

Senior citizens
e. Accent on e-participation, e-services, e-health, e.g, train your brain apps. (cf. Basic use in everyday life).

These examples can all be considered to further specify the statements formulated at the general level. Use of touch screens and understanding GUI's, clearly are aspects of general technical knowledge and functional skills, which are relevant to digital competence per se and not restricted to seven or fourteen year olds. Still it is interesting to see how these particular specifications come to the surface in connection with various profiles.

A further, more obvious observation to make in summarizing the data generated for the different profiles, concerns the fact that 7 year olds are considered to basically use the same technology and the same functionality albeit:

a. With a stronger accent on play and creative expression.
b. In a supervised context.

One of the experts illustrates this stating:
"Digital competence, to some degree, stretches across different age groups, and there are shared skills and knowledge between them. Seven year olds differ from seventy year olds in particular regarding the context and content of their interaction with technology, but both groups still need to be able to manage files and data, work with text, use a browser to navigate around the web etc. Difference will exist in areas such as the degree of autonomy that a seven year old will have, which will be more restrictive. This might mean that, for example, they do not need to be aware of some security considerations (e.g. virus checking, securely managing data) because the environments in which they operate should be much

more controlled. Conversely, there may be aspects of secure online behaviour that are more important for seven-year-olds, such as appropriate types of communication."

However, one of the experts also refers to supervision with respect to senior citizens:
"Depending on their personal circumstances and experience with using computers and devices, they may have the potential to display their competence in a more autonomous way and after gaining experience they will be comfortable carrying out the majority of their tasks with limited supervision."

Apparently, the profile of a digitally competent senior citizen depends on the level of digital competence assumed already present, as is illustrated by the following observation of another expert:
"It (..) varies considerably across individuals. Recently retired people in the western world will have been exposed to the use of digital technologies in their work environment long enough to have given up resisting them. They will thus continue using them in retirement. The truly competent will minimally be conversant with computer use for communication (email), access to information (doing Web searches and, ideally, making judgements about validity of information), processing of text, images and video. (…) Seniors who retired 20 years ago will not have been exposed to digital media in their work environment. Those among them who became digitally competent will mostly be conversant with email and chat options."

Apparently, the senior citizen profile is the only profile which prompts answers saying
"It depends...".

Of course, the above quote makes clear that this is not so much related to this particular age group as to the fact that current cohorts within this age group still reflect the shift within society at large towards increased use of technology.

However, one expert opposes the idea of setting senior citizens apart stating:
"There is nothing specific about senior citizens except for some concepts of usability, sorry. Being old and ignorant about digital issues doesn't make you more a freak than being young and ignorant..."

A. General technical knowledge and functional skills

The digitally competent person knows the basics of digital devices and can use one or more of them in a functional way.

	Mean
Is comfortable using a computer, which may be one of many types (e.g. Desktop PC, Laptop, Tablet, Smartphone).	3.91
Possesses general computer skills (typing, using computers, getting into a new programme in no time).	3.89
Knows the basics about the technology.	3.18
Understands the relations and differences between hardware and software.	3.14
Knows there are several operating systems running out there and understands the differences between them.	2.82
Has seen at least once a computer from inside and understands its different parts and components.	2.27
Averaged mean	3.20

B. Basic use in everyday life

The digitally competent person is able to integrate technologies into his/her everyday life activities and to enhance everyday life by using digital means for a range of routine transactions/processes.

	Mean
Is able to download different information types from the Internet.	3.89
Is able to use at least office applications, or other applications that have to do with his/her work.	3.87
Is able to search, collect, process, evaluate, store data, information and concepts.	3.85
Can shop online and/or conduct transactions online (e.g. pay bills, submit tax declaration electronically, book a hotel, interact with government or local services).	3.71
Possesses the skills to obtain and process digital information and transform it into knowledge.	3.54
Is able to look for a job online.	3.54
Consults online sources as a matter of routine in all aspects of life.	3.52
Can create and edit content (text, numeric, images...even movies).	3.48

Utilises different digital resources to get information for their leisure time (on sports, equipment, travel).	3.48
Is able to use digital media for entertainment (gaming, culture, tourism, etc).	3.38
Can participate fully in society through engagement in democratic actions (lobbying, parliament, online petitions, etc.)	3.36
Can share content and/or store personal content using cloud services.	3.29
Is able to share photos and travel reports via applications.	3.15
Utilises apps to improve the quality of his/her own life (jogging, health, diet plans).	2.96
Averaged mean	3.50

C. Specialized and advanced skills for work and creative expression

The digitally competent person is uses ICT to improve his professional performance and the products of his/her creativity.

	Mean
Uses technology to improve the quality of his/her work.	3.78
Masters specialized digital skills needed by his/her area of work.	3.49
Is able to express him/herself, to create and understand knowledge representations using digital media.	3.35
Has broadened his/her competence in line with his/her age/job/focus, for example using project management software is s/he is a project manager, using CAD software if s/he is interested in design.	3.15
Is a "digital writer", who understands how meaning is produced through multimedia and transmedia texts, how culture is produced through the internet and social media in particular.	3.11
Is able to develop something new by using specific tools and software, and is able to remix different existing texts into something new.	3.04
Has broadened his/her competence to database use, editing websites, editing digital images	2.70
Is able to create complex models and simulations of the real world using digital information.	2.20
Can program in at least one high-level language.	2.02
Averaged mean	2.98

D. Technology mediated communication and collaboration

The digitally competent person is able to communicate, collaborate, and connect with others effectively in digital environments.

	Mean
Is able to communicate through ICT	4.00
Is able to use social media.	3.75
Uses digital equipment to keep in touch with friends and others.	3.69
Is able to use digital media to be part of a community.	3.60
Can, if they choose to, engage in social networking either for personal or professional purposes.	3.55
Can use ICT for team work (collaboration, co-construction of content), work at a distance.	3.43
Is able to use digital media to cooperate (productively).	3.41
Shares information with a social network.	3.37
Is able to take advantage of digital technology to cooperate and take part in networks and networked learning.	3.31
Is able to manage his/her professional reputation.	3.17
Uses Web 2.0 and social networks to promote results of their work.	2.93
Is willing to contribute to the public knowledge domains.	2.91
Averaged mean	3.42

E. Privacy and security

The digitally competent person has the capacity to protect personal data and take appropriate security measures.

	Mean
Understands the risks associated with online use and encounters with unknown persons.	3.85
Is aware of privacy issues when using Internet/mobile Internet and is able to act prudently.	3.81
Is able to protect him/herself (at least to some extent) from threats of the digital world (fraud, malware, viruses etc.).	3.80
Has an understanding of security implications related with ICT.	3.71
Understands the risk of identity theft and is able to take steps to mitigate risk.	3.70

Knows that most major interactive services use information about him or her to filter in commercial messages in more or less explicit manners.	3.69
Is aware of the impact and longevity of digital information that s/he considers for publishing.	3.69
Understands how major players like Google, Facebook, and Twitter use personal data that they collect about users and can act prudently in this knowledge.	3.64
Is able to create, share/present, protect and monitor his/her digital identity and footprints.	3.60
Is able to find out who the other person might be (if strangers are met on the internet).	3.43
Averaged mean	3.69

F. Legal and ethical aspects

The digitally competent person behaves appropriately and in a socially acceptable way in digital environments, demonstrating awareness and knowledge of legal and ethical aspects on the use of ICT and digital content.

	Mean
Is able to communicate and collaborate with others in line with digital etiquette.	3.91
Understands basic e-ethics and demonstrates appropriate behaviours when using digital products and online information and communicating with others through digital tools.	3.83
Never uses digital applications in a way that adversely affects others (from abuse to unnecessary use of 'reply all').	3.76
Considers legal and ethical principles of use and publication of information.	3.74
Understands the rights of others and behaves ethically, e.g. in relation to piracy/copyright and truthfulness in general.	3.69
Understands and abides by copyright and licence rules.	3.50
Fosters awareness of his/her own personal responsibilities and the respect of reciprocal rights/obligations in building shared and collaborative knowledge.	3.47
Knows there are different ways of licensing intellectual property production, understands differences between using copyright, public domain, copyleft and/or creative commons licenses.	3.24
Has an advanced sense of suitable behaviour, finely tuned to media context, audience and legal provisions.	3.18
Understands the ethics and possibilities implied by using either a closed source operating system or an open source one.	3.07
Averaged mean	3.53

G. Information processing and management

The digitally competent person demonstrates the ability to gather, organise, analyse, and assess information using digital technology and can judge the relevance and purpose of digital information.

	Mean
Is able to judge content found on the Internet (true/false), how to find appropriate material and what sources can be trusted.	3.85
Is able to compare and contrast information from diverse sources (triangulate information) before it is used in a knowledge-making process.	3.64
Is able to gather relevant digital information, e.g. other users' experiences, and to assess the quality of goods based on that information.	3.43
Can integrate, compare and put together different types of information related to multimodal content.	3.28
Is able to structure, classify and organize information according to a certain classification scheme or genre.	3.25
Averaged mean	3.49

H. Informed and flexible decision making

The digitally competent person is aware of most relevant or common technologies and is able to decide upon the most appropriate technology according to the purpose or need at hand.

	Mean
Understands the potential of digital devices and resources for her/his work	3.62
Knows the range of things that can be done using ICT/Internet.	3.57
Is able to use digital services without being completely dependent on them (or: helpless without).	3.57
Knows more about the tools s/he daily uses than just where to click.	3.53
Chooses the most appropriate technologies according to the task.	3.51
Is aware of the most relevant or popular digital technologies used by peers.	3.45
Has reasonable knowledge of available technologies, their strengths and weaknesses and whether and how they might support the achievement of personal goals.	3.44
Is able to make informed decisions (with human or technological assistance where appropriate) about whether and how to use technologies to pursue goals that have personal meaning and relevance to his/her life.	3.39

Can determine if appropriate and safe digital means are available, that are efficient and cost-effective in comparison with other means.	3.35
Will not opt for a particular technology because it is the latest or most trendy/sexy one, but instead seeks to find the best solution for the problem at hand.	3.32
Understands the technologies s/he is using at a level that is sufficient to underpin good purchasing decisions, e.g., about devices or Internet Service Providers.	3.31
Will use a widely diverse and well-balanced mix of digital and non-digital technologies for different problems and will dynamically change options over time, consciously contributing to and adapting to change in the world around.	3.22
Understands the environmental impact of computers and electronic devices and how s/he can make them last longer by recycling parts of it (such as changing hard disks).	3.11
Knows which digital technologies are used by (reputed) experts in his/her field.	2.98
Has first-hand knowledge and expertise of the major digital technologies used in his/her field.	2.85
Has a comprehensive mental map of how the online world works.	2.63
Averaged mean	3.30

I. Exploration of digital opportunities and adaptation to own needs

The digitally competent person actively explores emerging technologies and integrates them in his/her environment.

	Mean
Is able to learn how to work with any new digital technology by trying it out, and using its internal advice, guidance and help.	3.31
Is able to learn the new technologies that emerge.	3.29
Is able to adapt very quickly to new advanced technology and to integrate technology into his/her environment.	3.22
Possesses the skills to constantly update knowledge about which digital instruments are available.	3.08
Averaged mean	3.22

J. Self-directed learning with digital technologies

The digitally competent person uses ICT for lifelong learning.

	Mean
Is able to use digital media to learn (develop oneself).	3.76
Is able to use a digital environment for lifelong learning (formal or informal).	3.71
Can use ICT resources to safely expand his/her knowledge and connect to the world around him/her including both people and resources.	3.46
Knows how to self-regulate his/her technology enhanced learning.	3.20
Has sufficient social and cultural capital so that technology use is supported and encouraged in the communities to which s/he belongs.	3.19
Is capable of exploiting technological potentials in order to represent and solve problems.	3.15
Continuously self-monitors personal goals and diagnoses deficiencies of competencies required for reaching these goals.	3.08
Is able to use learning management systems, information management systems, etc.	2.91
Averaged mean	3.30

K. Understanding and awareness of role of ICT in society

The digitally competent person understands the broader context of use and development of information and communication technology.

	Mean
Understands the role of ICT in everyday life, in social life and at work.	3.67
Understands the wider context of digital tools in a 'digital age' characterised by globalisation, networks and flows i.e. can 'read the world' as well as 'read the word/texts'.	3.26
Is aware of the general trends within new media even if s/he does not use them.	3.00
Understands where ICT comes from, who develops it and for what purposes, and knows about the historical evolution of internet, the web and its basic architectural principles.	2.78
Has a deep and transversal competency in how digital devices, media and networks play together.	2.78
Averaged mean	3.09

L. Effective & efficient use	
The digitally competent person increases personal and professional effectiveness and efficiency through the use of digital technologies.	

	Mean
Is able to safely use digital standard technologies for learning, solving problems, communication and collaboration, creative activities, work.	3.46
Is able to arrange and develop his/her personal working environment as an effective and reliable system.	3.43
Can use different ICT in a way that helps to achieve certain results more quickly, or more easily, or to achieve better results.	3.41
Knows how to use digital equipment cost-efficiently and also time-efficiently.	3.30
Demonstrates fluent application of general digital devices available in her/his surroundings and digital resources transmitted through Internet or other communication tools, for daily life and life-long learning needs.	3.27
Can solve a theoretical or practical problem, of individual or collective interest, through or with the support of digital tools.	3.27
Is able to stay informed and evaluate information delivered through pull and push technology.	3.25
Includes more and more digital instruments in every day life to increase the quality of life and personal involvement in overall social life.	3.08
Averaged mean	3.30

M. Seamless use and appropriation of technology	
The digital competent person uses technology naturally and confidently, demonstrating self-efficacy.	

	Mean
Reaches for technological tools as easily and as unselfconsciously as s/he might reach for a pencil.	3.36
Can access technology and uses it without realising that s/he is actually using it.	3.25
Is a digital native, who makes natural use of participative technology and of social media.	3.10
Knows the language of new media (exactly the same way as being proficient in one or more human languages makes our life easier).	2.98
Is able to manage several virtual identities in different contexts.	2.89
Averaged mean	3.11

N. Balanced attitude towards technology

The digitally competent person demonstrates an informed, open-minded, and balanced attitude towards Information Society and the use of digital technology. The digitally competent person is curious, aware of opportunities and new developments, and is comfortable to explore and exploit them.

	Mean
Has a critical view about information technologies.	3.65
Has a positive but realistic attitude towards the benefits and risks associated with using technologies.	3.63
Has understood that the digital environment we are facing can make things better or worse - it all depends on how we are using it and what rules we find for it.	3.57
Is able to assess and reduce/avoid technology related threats to one's health.	3.56
Has a general level of confidence, meaning that s/he is willing to experiment with new technologies, but also to reject inappropriate technologies.	3.53
Sees digital media as enablers rather than inhibitors of choice and action.	3.52
Uses digital media and tools without fear, always aware that digital enablers should serve the human being to have a better life (and not the opposite).	3.52
Is self-motivated to seek and share information, to learn new skills, and – at least initially – experience new information with an open mind.	3.41
Has (often implicit) views on the benefits and drawbacks of each major digital technology used in his/her field.	3.38
Is able to manage the potentially distracting aspects of working digitally.	3.37
Holds a positive attitude to learn about emerging digital technologies.	3.35
Is always open to new ideas and willing to learn new technologies.	3.25
Feels part of the current discourse on the opportunities afforded by new media.	3.04
Averaged mean	3.44

Appendix F - Final Result Digital Competence Areas

A. General knowledge and functional skills

The digitally competent person knows the basics (terminology, navigation, functionality) of digital devices and can use them for elementary purposes.

Is able to use a digital device, which may be one of many types (e.g. Desktop PC, Laptop, Tablet, Smart phone).

Possesses general computer skills (typing, using computers, getting into a new programme).

Understands the difference between hardware and software.

Is familiar with the meaning of terms commonly used in user manuals for the operation of hardware and the installation and configuration of software.

Knows about the existence of various operating systems.

Understands the differences between operating systems.

Understands the different parts and components of a computer and/or other digital devices.

B. Use in everyday life

The digitally competent person is able to integrate technologies into the activities of everyday life.

Is able to download and access different information types from the Internet.

Is able to use at least office applications (or other work related applications) to edit and create content (text, numeric, images).

Is able to search, collect, process, evaluate, share, store data and information using various devices, applications, cloud services.

Can conduct transactions online (e.g. pay bills, apply for a job, submit tax declaration, complete online forms, book a hotel, interact with government or local services, shop online, etc.).

Consults digital resources as a matter of routine across various aspects of life (news, health, sports, travel, entertainment, etc.).

Is able to participate in society through online engagement in democratic actions (e.g. lobbying, petitions, parliament).

C. Specialized and advanced competence for work and creative expression

The digitally competent person is able to use ICT to express his/her creativity and to improve his/her professional performance.

Uses technology to improve the quality of his/her work.

Masters specialized digital skills needed by his/her area of work.

Is able to create knowledge representations (e.g. mind maps, diagrams) using digital media.

Is able to use a variety of media to express him/herself creatively (text, images, audio, and movie).

Is able to remix different existing content into something new.

Is able to build meaningful knowledge through interaction with digitally available resources

Understands how meaning is produced through multimedia (text, images, audio, video) and how culture is produced through the Internet and social media in particular.

Is able to broaden/update digital competences according to personal/professional needs (e.g. database use, editing websites, editing digital images).

Is able to create complex models and simulations of the real world using digital information.

Is able to program ranging from using block building code tools to a high-level programming language.

D. Technology mediated communication and collaboration

The digitally competent person is able to connect, share, communicate, and collaborate with others effectively in digital environments.

Is able to communicate through ICT (e.g. email, instant messaging, video conferencing.).

Is able to use social media and participative technology.

Is able to use digital media to be part of a community.

Is able to take advantage of digital technology to cooperate and take part in networks and networked learning for personal or professional purposes.

Can use ICT for team work (collaboration, co-construction of content); to work at a distance.

Is able to manage several virtual identities in different contexts.

Knows how to use social media and social networks to promote results of their work.

Is able to contribute to the public knowledge domain (e.g. wikis, public forums, reviews).

E. Information processing and management

The digitally competent person uses technology to improve his/her ability to gather, organise,

analyse and judge the relevance and purpose of digital information.

Is able to judge the validity of content found on the Internet, how to find appropriate material, and what sources can be trusted.

Is able to compare and contrast information from diverse sources (triangulate information) before it is used in a knowledge-making process.

Is able to gather relevant digital information, e.g. other users' experiences, and to assess the quality of goods based on that information.

Can integrate, compare and put together different types of information related to multimodal content.

Is able to structure, classify, and organize digital information/content according to a certain classification scheme or genre.

F. Privacy and security

The digitally competent person has the capacity to protect personal data and take appropriate security measures.

Understands the risks associated with online use and encounters with unknown persons.

Is aware of privacy issues when using Internet/mobile Internet and is able to act prudently.

Is able to protect him/herself from threats of the digital world (fraud, malware, viruses etc.).

Understands the risk of identity theft and other credentials' thefts and is able to take steps to mitigate risk.

Knows that many interactive services use information about him or her to filter in commercial messages in more or less explicit manners.

Is aware of the impact and longevity of digital information that s/he considers for publishing.

Is able to protect and monitor his/her digital identity and footprints.

Understands the terms of use of online services (i.e. the fact that service providers may use personal data that they collect about users) and can act prudently in this knowledge.

G. Legal and ethical aspects

The digitally competent person behaves appropriately and in a socially responsible way in digital environments, demonstrating awareness and knowledge of legal and ethical aspects on the use of ICT and digital content.

Is able to communicate and collaborate with others in line with codes of conduct appropriate to the context.

Considers legal and ethical principles of use and publication of information.

Understands copyright and licence rules.

Knows there are different ways of licensing intellectual property production, understands differences

between using copyright, public domain, copyleft and/or creative commons licenses.

Has an advanced sense of suitable behaviour, finely tuned to media context, audience and legal provisions.

H. Balanced attitude towards technology

The digitally competent person demonstrates an informed, open-minded, and balanced attitude towards Information Society and the use of digital technology. The digitally competent person is curious, aware of opportunities and new developments, and is comfortable to explore and exploit them.

Has a positive but realistic attitude towards the benefits and risks associated with information technologies.

Has understood that the digital environment we are facing can make things better or worse - it all depends on how we are using it and what rules we find for it.

Is able to assess and reduce/avoid technology related threats to one's health.

Sees digital media as enablers rather than inhibitors of choice and action.

Uses digital media and tools without fear, always aware that digital enablers should serve the human being to have a better life (and not the opposite).

Has a general level of confidence, meaning that s/he is willing to experiment with new technologies, but also to reject inappropriate technologies.

Is self-motivated to seek and share information, to learn new skills, and – at least initially – experience new information with an open and critical mind.

Is able to manage the potentially distracting aspects of working digitally.

Holds a positive attitude to learn about emerging digital technologies.

Feels part of the current discourse on the opportunities afforded by new media.

I. Understanding and awareness of role of ICT in society

The digitally competent person understands the broader context of use and development of information and communication technology.

Understands the role of ICT in everyday life, in social life and at work.

Understands the wider context of digital tools in a 'digital age' characterised by globalisation and networks.

Is aware of the general trends within new media even if s/he does not use them.

Understands where ICT comes from, who develops it and for what purposes.

Is aware of environmental issues related to the use of digital technologies.

Knows about the historical evolution of internet, the web and its basic architectural principles.

Has a deep and transversal competency in how digital devices, media and networks play together.

J. Learning about and with digital technologies

The digitally competent person actively and constantly explores emerging technologies, integrates them in his/her environment and uses them for lifelong learning.

Is able to use digital media to learn (develop oneself).

Is able to use a digital environment for lifelong learning (formal or informal).

Can use ICT resources to safely expand own knowledge and connect to the world around.

Is able to learn how to work with any new digital technology by trying it out, and using its internal guidance and help.

Is able to adapt smoothly to new technology and to integrate technology into his/her environment.

Is able to learn and integrate the new technologies that emerge.

Possesses the skills to update knowledge about the availability of digital tools.

Can self monitor personal goals and can diagnose deficiencies of digital competence required for reaching these goals.

Knows how to self-regulate his/her learning about digital technologies.

Is able to use learning management systems, information management systems, etc.

Is capable of exploiting technological potentials in order to represent and solve problems.

Is able to solve a technical problem or to decide what to do when technology does not function.

K. Informed decisions on appropriate digital technologies

The digitally competent person is aware of most relevant or common technologies and is able to decide upon the most appropriate technology according to the purpose or need at hand.

Understands the potential of digital devices and resources for her/his work.

Knows the range of things that can be done using ICT/Internet.

Is able to use digital services without being completely dependent on them (or: helpless without).

Chooses the most appropriate technologies according to the task.

Is aware of the most relevant or popular digital technologies used by others (e.g. peers, reputed experts).

Has reasonable knowledge of available technologies, their strengths and weaknesses and whether and how they might support the achievement of personal goals.

Is able to make informed decisions (with human or technological assistance where appropriate) about

whether and how to use technologies to pursue personally relevant goals.

Can determine if appropriate and safe digital means are available, that are efficient and cost-effective in comparison with other means.

Does not opt for a particular technology because it is the latest or most trendy/sexy one, but instead seeks to find the best solution for the problem at hand.

Understands the technologies s/he is using at a level that is sufficient to underpin good purchasing decisions, e.g., about devices or Internet Service Providers.

Uses a widely diverse and well-balanced mix of digital and non-digital technologies for different problems and will dynamically change options over time.

Understands the environmental impact of computers and electronic devices and how s/he can make them last longer by recycling parts of it (such as changing hard disks).

Has first-hand knowledge and expertise of the major digital technologies used in his/her field.

Has a comprehensive mental map of how the online world works.

L. Seamless use demonstrating self-efficacy

The digitally competent person confidently and creatively applies digital technologies to increase personal and professional effectiveness and efficiency.

Is able to arrange and develop his/her personal working environment as an effective and reliable system.

Can use different ICT in a way that helps to achieve certain results more quickly, or more easily, or to achieve better results.

Can access technology and uses it without realising that s/he is actually using it.

Knows how to use digital equipment cost-efficiently and also time-efficiently.

Can solve a theoretical or practical problem, of individual or collective interest, through or with the support of digital tools.

Is able to stay informed using a combination of active search and personalised, automated delivery of information.

Includes more and more digital instruments in every day life to increase the quality of life.

Is familiar with the language of new media comparable to the way proficiency in one or more human languages makes our life easier.

Digital competence map
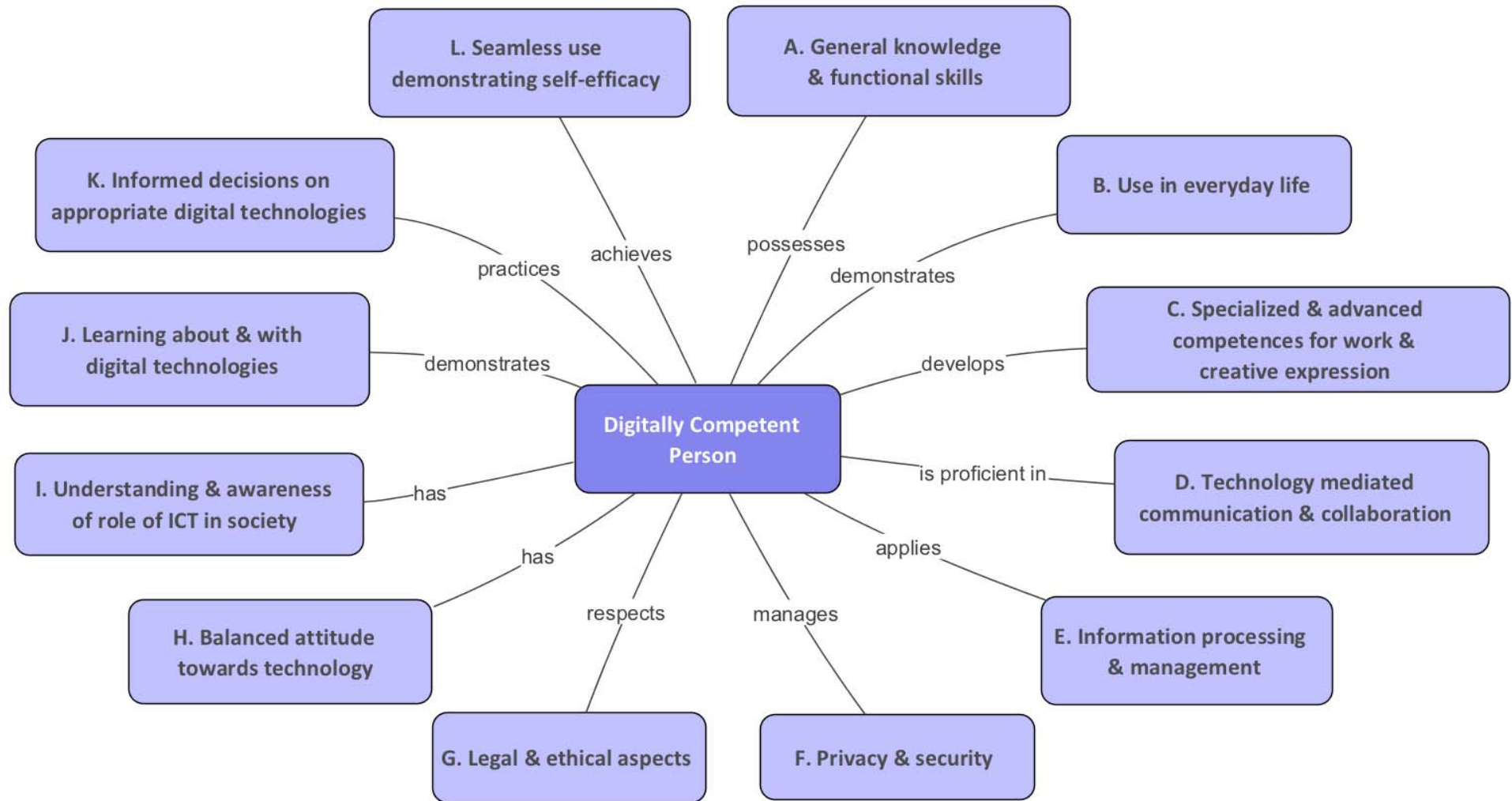
Abstract
This report describes experts' views on what it means to be digitally competent today. Although experts' views vary, the method applied in this study enables us to derive an aggregated view on digital competence. The report identifies twelve areas of digital competence, of which some relate to specific purposes (e.g. communication and collaboration), and others to domains (e.g. privacy and security). The twelve areas are presented through a brief description and further illustrated by statements describing a rich palette of knowledge, skills and attitudes related to each area.

As the Commission's in-house science service, the Joint Research Centre's mission is to provide EU policies with independent, evidence-based scientific and technical support throughout the whole policy cycle.

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Key policy areas include: environment and climate change; energy and transport; agriculture and food security; health and consumer protection; information society and digital agenda; safety and security including nuclear; all supported through a cross-cutting and multi-disciplinary approach.