



BSI Standards Publication

European Professional Ethics Framework for the ICT Profession (EU ICT Ethics)

National foreword

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English Version

European Professional Ethics Framework for the ICT Profession (EU ICT Ethics)

Europäischer berufsethischer Rahmen für den IKT-
Beruf (EU ICT Ethics)

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CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents

European foreword	5
Introduction	6
1 Scope	7
2 Normative references	8
3 Terms and definitions.....	8
4 Structure of the Professional Ethics Framework.....	10
4.1 Introduction.....	10
4.2 Basic Definitions.....	10
4.2.1 How to define ICT professional ethics	10
4.2.2 EN 16234-1 (e-CF) definitions of ICT and ICT professional	10
4.2.3 CEPIS definition of ICT professionals.....	11
4.2.4 IFIP and ACM definition of ICT professionals.....	11
4.2.5 Professionalism in related e-Skills projects	11
4.2.6 ICT professional ethics in related e-Skills projects	11
4.2.7 Professional ethics.....	12
4.2.8 ICT Professional ethics.....	13
4.3 The history of the EC and European values in terms of ethics.....	13
4.3.1 Introduction.....	13
4.3.2 Human dignity	13
4.3.3 Freedom	14
4.3.4 Democracy.....	14
4.3.5 Equality.....	14
4.3.6 Rule of law.....	14
4.3.7 Human rights.....	14
4.4 European values of ICT ethics - prior research and policy work.....	14
4.5 Framework content and structure.....	17
4.6 ICT Professional Ethical Responsibilities.....	20
4.7 Language and the Ethics Framework	21
4.8 Standards and frameworks, the liaison with ethics.....	22
5 Ethical theories, models and frameworks in ICT fields	23
5.1 Introduction.....	23
5.2 Exploitation of theories, models and frameworks.....	24
5.2.1 Ethical theories and models.....	24
5.2.2 Ethical frameworks	24
5.2.3 Methodology and scope	25
5.2.4 Ethics reflection from theory to ICT practice, the role of Case Studies cases	25
5.3 Challenges and solutions to real settings implementation.....	46
5.3.1 ICT related challenges	47
5.3.2 Strengths and weaknesses of the implementation process.....	47
5.3.3 Effective components of the framework	47
5.3.4 Professionalism and organisational ethics	48

6	ICT professional ethics as part of competence and knowledge.....	48
6.1	<i>Introduction</i>	48
6.2	<i>How to use with EN 16234-1 (e-CF).....</i>	49
6.3	<i>How to use with CWA 16458 (EU Role Profiles).....</i>	49
6.4	<i>How to use with other ethics codes.....</i>	50
6.5	<i>How to use with tools/methods.....</i>	50
7	Taking the framework into the organisation: context, culture and leadership	50
7.1	<i>Introduction</i>	50
7.2	<i>What is the value proposition?.....</i>	51
7.3	<i>The five main ICT business areas and their connection to EN 16234-1 (e-CF).....</i>	52
7.4	<i>Organisational steps to implement ICT ethics within an organization.....</i>	53
7.5	<i>Implementation of the framework in the daily life of an organisation.....</i>	54
7.5.1	<i>Leadership and Organizational structure.....</i>	54
7.5.2	<i>Implementation method.....</i>	55
8	Implementation: ICT Ethics framework (ICTEF) in practice	56
8.1	<i>ICTEF implementation guidelines.....</i>	56
8.2	<i>Guidelines for code of ethics implementation.....</i>	56
8.2.1	<i>Drafting Code of Ethics</i>	57
8.3	<i>Guidelines for Ethics Committee/Ethics Board Implementation</i>	60
8.3.1	<i>Scope</i>	60
8.3.2	<i>Independence</i>	61
8.3.3	<i>Transparency.....</i>	61
8.3.4	<i>Composition</i>	61
8.3.5	<i>Ethics Committee - Tasks</i>	62
8.4	<i>Guidelines for the Ethical Dialogue.....</i>	62
8.5	<i>Guidelines for Ethics Canvas.....</i>	63
8.6	<i>Guidelines to use ICT Ethics framework in an ICT Professional body.....</i>	65
8.7	<i>Procedures.....</i>	65
8.7.1	<i>Internal procedure to trigger ICT ethics issues.....</i>	66
8.7.2	<i>Public procedure to trigger ICT ethics issues.....</i>	66
8.8	<i>Register.....</i>	67
8.9	<i>Ethics by design tools.....</i>	67
8.9.1	<i>The life cycle of technology: The entire value chain.....</i>	67
8.9.2	<i>Ethical Operating System OS Toolkit (Ethical OS Toolkit).....</i>	68
8.10	<i>How to use with other frameworks.....</i>	69
9	How to use ICT Professional Ethics Framework in education and training.....	70
10	Assessment of the development and engagement with ICT ethics.....	71
10.1	<i>Introduction</i>	71
10.2	<i>Ethics assessment in ICT Professionalism.....</i>	71

10.2.1	European initiatives of e-competences' assessment	72
10.2.2	Specific indicators of ethics performance in ICT professional environments	74
10.2.3	Design of a Life Cycle Readiness Assessments	80
10.3	<i>The benefit of digital toolkits for ICT ethics competences and skills' assessment</i>	<i>81</i>
10.4	<i>Specific ICT Use case development as a "proof of concept" for assessment toolkits</i>	<i>82</i>
10.4.1	Use Cases for assessment.....	82
11	Ethics in ICT Professional roles.....	86
11.1	<i>Benefits of thinking ethically in ICT professional environments</i>	<i>86</i>
11.2	<i>ICT profiles aligned to ethical attitudes: factors affecting this alignment</i>	<i>87</i>
Annex A (informative) Overview of EN 16234-1 (e-CF) competences compared with Berlin Declaration ethics values		89
Bibliography		98

European foreword

This document (CEN/TS 17834:2022) has been prepared by Technical Committee CEN/TC 428 “ICT Professionalism and Digital Competences”, the secretariat of which is held by UNI.

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Introduction

The current document, the European Professional Ethics Framework for the ICT Profession (EU ICT Ethics), provides a foundation for defining practical guidelines to improve ethics for different organisations across all technical areas. In addition, it provides a basis for aligning existing guidelines and initiatives and establishing comparisons to support the vision of an ICT professional workforce. It offers the possibility to coalesce other ethics focused initiatives around a common structure.

Professional ethics is an essential component of any profession; mutual understanding leads to improved outcomes and differentiates professions from jobs. A professional ICT workforce across European society and industry (founded on the four building blocks of ICT professionalism: Professional Ethics; Education and training; Bodies of Knowledge; Competences) will support and enhance the exchange of ICT resources and services throughout Europe and internationally.

This document is related to EN 16234-1 e-Competence Framework (e-CF) – A common European Framework for ICT Professionals in all sectors – Part 1: Framework and incorporates its structural concept. It describes a blueprint of requirements and highlights connections to the competences, skills and knowledge required to identify and address the ethical challenges that ICT professionals face in daily activities.

This strong association with the EN 16234-1 (e-CF) naturally extends to the ethics principles described in the Transversal Aspects of the EN 16234-1 (e-CF) and enables ethics related requirements and procedures to be defined and implemented in the context of specific ICT professional roles and environments.

This document organises Professional Ethics into a manageable structure and provides guidance on practical use through a methodology and application guide to support implementation through a range of methods and contexts. It also provides a platform for universities and vocational training institutions to design and improve ICT ethics courses specifically for ICT professionals. This makes qualification attainment more transparent in European internal markets and, in addition, it offers input into accreditation processes provided by relevant national ICT professional bodies.

The European Professional Ethics Framework for the ICT Profession benefits all ICT Professionals and all stakeholders reliant upon the capability of ICT Professionals. This includes wider society and a trusted, ethical and professional ICT workforce that contributes to enabling the goal of an economically vibrant, socially just and sustainable Europe.

The document is based on a fixed structure, which is intended to ensure the uniformity of such CEN documents and their reliable placement in the context of other standards, specifications and reports.

The following recommendations are given to support the readability of the document.

- **Newbie / Beginner:** If new to the topic of professional ethics and for example an ICT professional or a manager in an organisation primarily interested in the basic aspects, it is recommended to first read Clauses 4.3 and 4.4 as an introduction. Then read Clause 5.2.4 and especially the Case Studies in Clause 5.2.5 before reading Clause 5 in total and the rest of the document from the start.
- **ICT Ethics in the European Context:** If interested in the embedding of the Framework in the European context, then read Clause 4.4 before reading the rest of Clause 4 in context.
- **Ethics and organisational culture:** If interested in the connection between organisational culture and ICT ethics and want to know how you can implement this topic in your organisation, it is recommended to jump directly to Clause 7.
- **Practical application:** If already on the way to take some practical first steps in the field of ICT professional ethics in an organisation and you are interested in practical help and tools, it is recommended to jump directly to Clause 8.

1 Scope

This document contains basic information and fundamental considerations on embedding ICT in European values. It includes concepts and structures for using the framework and practical suggestions for the concrete implementation of organisational and individual aspects as scoped by the European ICT Professionalism framework and its basic underlying references.

The scope of occupations associated with Information and Communication Technology is very wide and therefore, to define a boundary, this document is based upon the target audience of the EN 16234-1 “e-Competence Framework (e-CF) – A common European Framework for ICT Professionals in all sectors – Part 1: Framework”.

Beneficiaries and users of this document include educational institutions embracing universities and VET, public and private, certification providers, industry, including HR departments, large companies and SMEs, and the ICT professional community.

An extended benefit of a common ethics framework is the enhanced perception of ICT as a ‘professional’ career. The overall attractiveness of employment within ICT from the perspective of potential employees will be improved by the establishment of a recognised ICT Profession in which ethics play a significant role.

EN 16234-1 (e-CF) is the starting point and guiding document for this technical publication, being closely connected with the other deliverables and references for a shared European language for ICT professional development.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 16234-1:2019, *e-Competence Framework (e-CF) – A common European Framework for ICT Professionals in all sectors – Part 1: Framework*

CEN/TS 17699:2022, *Guidelines for developing ICT Professional Curricula as scoped by EN16234-1 (e-CF)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

Information and Communication Technology (ICT)

<technical> digital computers and internet (communication) systems, including software, hardware and networks

[SOURCE: EN 16234-1:2019, definition 3.1]

3.2

Information and Communication Technology (ICT)

<economic and political> cross sector of enterprises, including manufacturers, product suppliers or service providers relating to the ICT field

[SOURCE: EN 16234-1:2019, definition 3.2]

3.3

ICT professional

person having the competence to plan, build, run, enable and/or manage ICT and having a professional ICT qualification and/or ICT occupational experience; they include both employees of ICT companies and ICT employees of organisations in all other sectors; they are all in the scope of this document

[SOURCE: EN 16234-1:2019, definition 3.3]

3.4

competence

demonstrated ability to apply knowledge, skills and attitudes for achieving observable results

[SOURCE: EN 16234-1:2019, definition 3.5]

3.5**knowledge**

body of facts which can be applied in a field of work or study (know what to do)

[SOURCE: EN 16234-1:2019, definition 3.6]

3.6**skill**

ability to carry out managerial or technical activities and tasks, and this may be cognitive or practical (know how to do it)

[SOURCE: EN 16234-1:2019, definition 3.7]

3.7**attitude**

representing the human element of an e-competence and reflecting the way a Person integrates knowledge and skills and applies them in a contextually appropriate manner

[SOURCE: EN 16234-1:2019, definition 3.8]

3.8**transversal aspects**

cross-cutting topics that are relevant to all competences defined by the EN 16234-1 (e-CF); each transversal aspect is provided by a title and a generic description that may be applied, dependent upon context by, 'being aware of' or 'behaving proactively' with regard to the transversal aspect description; awareness and proactivity influence attitude linking with knowledge and skills as applied in the definition of competence in EN 16234-1 (e-CF)

[SOURCE: EN 16234-1:2019, definition 3.9]

3.9**behavioural skills**

interactive skills used to successfully engage with situations in the workplace, they may refer to work quality, social interaction or emotion. Examples include, communication, empathy, attention to detail and integrity

[SOURCE: EN 16234-1:2019, definition 3.10]

3.10**learning level**

level indicating a grading and may be represented by a formal qualification; they generally derive from an education system or indicate a grading in a taxonomy of intellectual or learning behaviours (like memorising, applying, interpreting) and have a relationship with proficiency levels but are to be distinguished from these

[SOURCE: EN 16234-1:2019, definition 3.12]

4 Structure of the Professional Ethics Framework

4.1 Introduction

This clause provides an overview of the key components of the ICT Professional Ethics Framework. Firstly, it provides some definitions and contextual information on the history of the European Community and European values in terms of ethics; further it explains the more recent Berlin Declaration [1] on Digital Society and Value-based Digital Government and other international contributions on ICT and ethics. It then provides Table 3 showing how these foundational documents can be adapted and refined to develop clear ethical guidance for ICT professionals by articulating the nature of ICT professional ethical obligations into more detailed ethical knowledge items (EKIs).

4.2 Basic Definitions

4.2.1 How to define ICT professional ethics

This requires definition firstly of ethics and then of the ICT profession. Ethics is generally understood as normative value-based activity or discussion i.e. what should be done, what is the 'right' thing to do, what values should be used to guide action? It is not purely descriptive. Ethics is often quite closely connected to regulations and the law e.g. the General Data Protection Regulation reflects the ethical value placed on privacy and the ethical disapproval of the misuse of personal data. Ethics, though, is distinct from the law as it includes personal conscience and values. The law can only imperfectly capture these and can indeed contradict them in some cases. It is possible for the law to be unethical (e.g. racial segregation is unethical but it has been legal in the past). Claiming a law is unethical in terms of flouting commonly, even if not necessarily universally agreed, ethical values of, for example, equality is not in itself a legal defence if one breaks the law though it would count as a valid ethical position. Law also has the power of state sanction which ethical guidelines generally do not or only in quite a weak form. In terms of professional ethics this varies quite considerably between professions. A doctor can be struck off the medical register and no longer allowed to practise but an IT professional cannot.

The ICT Profession must then also be defined followed by an elaboration of how this can be defined in terms of ethical aspects. The following clause reiterates the definition in the EN 16234-1 (e-CF) and includes additional detail from CEDEFOP, CEPIS. CEDEFOP and CEPIS are included as additional important contributors to discussion on ICT skills and professionalism within the European context. International examples are provided mainly from IFIP and ACM and some other sources are also included. It should be noted that the recently published IFIP code is very much based on the ACM code with some modifications.

4.2.2 EN 16234-1 (e-CF) definitions of ICT and ICT professional

4.2.2.1 Information and Communication Technology ICT

<technical> digital computers and internet (communication) systems, including software, hardware and networks

[SOURCE: EN 16234-1:2019, definition 3.1]

<economic and political> cross sector of enterprises, including manufacturers, product suppliers or service providers relating to the ICT field

[SOURCE: EN 16234-1:2019, definition 3.2]

4.2.2.2 ICT professional

Person having the competence to plan, build, run, enable and/or manage Information and Communication Technology and having a professional ICT qualification and/or ICT occupational experience; they include both employees of ICT companies and ICT employees of organisations in all other sectors; they are in the scope of this document

[SOURCE: EN 16234-1:2019, definition 3.3]

4.2.3 CEPIS definition of ICT professionals

This provides information about wider professional standards, knowledge, attitude and identity.

ICT professionals:

- Possess a comprehensive and up-to-date understanding of a relevant body of knowledge.
- Demonstrate on-going commitment to professional development via an appropriate combination of qualifications, certifications, work experience, non-formal and/or informal education.
- Adhere to an agreed code of ethics/conduct and/or applicable regulatory practices.
- Deliver value for stakeholders through competent practice.

4.2.4 IFIP and ACM definition of ICT professionals

- Professional ethics is about what is expected of a professional in a field. As we act, all of us in the ICT Profession must remember that every choice that impacts others is an ethical decision and that those decisions need to be guided by professional ethics.
- The competent application of ICT technical skills is necessary for the wellbeing of contemporary society; our technical skills are important, but how we apply them is what distinguishes us as professionals. Professionals are asked to promote good while working within ethical constraints.

4.2.5 Professionalism in related e-Skills projects

Professionalism as it relates to ICT has been defined and discussed in much previous work on e-Skills, defined in summary as the skills needed to apply, develop and make use of ICT, and the related work of CEN/TC 428 (McLaughlin et al., 2012) [2]. It includes the building blocks of knowledge, competence, ethics, and accreditation. A profession can be understood as group of people with specialised knowledge in a particular area who profess they are competent and able to perform specialist work. In many professions it is strictly regulated how one can profess to be professional e.g. in order to claim one is a doctor one has to complete training to a fixed standard, and one is then put on register (from which one can be removed). There is generally and explicitly within the EU a distinction made between regulated and unregulated professions. At present in most cases the ICT profession is unregulated i.e., there is no enforced entry requirements and no or limited sanction in terms of being forced not to practice. This situation may, of course, change in the future or be applied to certain aspects of the ICT profession.

4.2.6 ICT professional ethics in related e-Skills projects

As discussed in the previous clause some of the foundational work on e-Skills in the European context consolidated the view that ethics is a key building block of ICT professionalism. This has been further developed in more recent work. An overview which includes the global context and discusses how professional ethics is connected to the wider issue of ICT professionalism is provided in an article discussing developments up to 2018 [3]. The Final Report on the European Framework for IT Professionalism [4] developed guidelines on statements of professional ethics which are defined as basic

principles which are expected from Statements of Professional Ethics for the IT Profession in Europe and are listed below:

- Protection of Public Interest and Legal Compliance (“The IT Professional acts to protect the safety and interests of the Public, and Society; and at all times acts in compliance with the relevant law.”)
- Responsibility to Employers and Clients (“The IT Professional acts in the best interests of their employer or client, to use their relevant knowledge, skill and capability to provide the best possible solution to the best of their ability.”)
- Professional Dignity and Promotion of Professional Aims (“The IT Professional protects the dignity of the IT Profession, and acts to develop and promote both the Profession and its professionals.”)
- Competence, Responsibility and Impartiality (“The IT Professional acts openly and impartially, within their own competence, taking responsibility for their work, and any work directed by them.”).

4.2.7 Professional ethics and relationship with law and regulation

As not everyone shares expert professional knowledge, there must be a relationship of trust by the client or the public to the ICT profession. In order that this trust should not be misused or misplaced it is important that ICT professionals work in line with ethical values and use their knowledge in an ethical way. There is power differential between the ICT professional and the client in terms of knowledge and in relationships where there is power imbalance there are stronger ethical obligations on the more powerful party. Ethical values can be much discussed but in summary they are normative claims relating actions to generally (not universally) agreed social beliefs about what is “moral” or “good” behaviour. Professional ethics is inextricably linked to the competent and careful use of specialist and bounded expert knowledge. The aim of the knowledge should be the public good. This also shows the importance of knowledge and competence for ICT Professional ethics. Existing standards and ICT professionalism publications that define the scope and structure the content of ICT as professional area are an important part of improving professional ethics within ICT. EN 16234-1 (e-CF), CWA 16458 (ICT Role Profiles) [5], and the EN 17748-1 Body of Knowledge (BoK) [6] are the primary examples in terms of scope definition with metrics and curriculum guidance document (CEN/TS 17699) providing more guidance on how to implement the content of EN 16234-1 (e-CF) and the BoK into practice and education. There is also research indicating that integrating ethics into other ICT professional resources, most notably Bodies of Knowledge, increases the reach and maturity of ethics into the profession [7].

It is important to note the professional ethics is not just about the values and actions of individual professionals but that is also influenced very much by organisational values and actions as well as those of wider society. An emphasis on the role of individuals can itself be unethical and unhelpful as it under emphasises the role of power and organisational and societal structure on the kind of decisions people are able to make. Professional ethics cannot just be the responsibility of individual employees who are required to be heroic whistle blowers at the expense of their ability to earn a living. Protections and procedures must also exist at wider level to enable and foster ethical behaviour, even when it may affect profits or sales, and incorporate ethical considerations into normal business processes and practices. Some aspect of culture or practice that may initially appear ethically neutral, for example rapid development of products with short deadlines, can have important ethical implications in terms of failure to test systems properly with resultant safety issues. There are also wider social and environmental issues such as sustainability which can be negatively affected by business practises that do not immediately appear unethical, e.g. phones that cannot be repaired and have no spare parts. Progress on this could also be improved by including more ethical indicators in the annual reporting of organisations (Armstrong, 2020) [8].

The relationship between ethics and the law is discussed at a more general level in 4.2.1 and this clause provides also more detail in terms of ICT. The content of legal regulation and professional ethics is not

mutually exclusive, au contraire. There are several overlapping strands in legal regulation and professional ethics. Particularly in matters which, due to their importance, are covered in some way by both legal regulation and professional ethics, sometimes even with an impact on non-compliance and possible sanctions.

Sanctions with professional implications for breaches of legal regulation or professional ethics always have in some way the problem of controlling their effectiveness. The effectiveness of sanctions at the professional level is usually closely linked to the existence in the Member States of mechanisms for the official recognition of professional bodies that represent and organise a given profession, and which are responsible for the control of professional practice, including professional ethics and the corresponding sanctioning capacity in the event of bad practices.

In the process of evolution and maturity of ICT Professionalism, this complementarity and relationship between legal regulation and professional ethics should be considered. It is likely to be a source of regulatory novelties and also in terms of professional ethics, both because of the incessant innovation in the ICT field and, above all, because of the growing political and legal activity in relation to areas such as artificial intelligence, autonomous systems, etc., [9] both for their technical regulation and for their ethical aspect.

4.2.8 ICT Professional ethics

This pertains to ethical issues and concerns that arise from the design, development and use of ICT by ICT professionals i.e. ethical use of expert knowledge by professionals in the field. It does not concern general ethical issues that arise from ICT.

This shift in what was termed computer ethics to more of a focus on professional ethics within computing became more widespread from the 1990s with publications from Dan Gotterbarn in 1991 [10] and Ford and Gibbs in 1996 [11]. After that, most professional computing bodies developed codes of ethics and related methods of ethical support material for their members and, in some cases, engaged in raising wider societal awareness of the ethical issues arising from computers.

4.3 The history of the EC and European values in terms of ethics

4.3.1 Introduction

The goals of the treaty of Rome (1957) on the formation of the European Economic Community include specific reference to ethical values, in particular the goals below:

- Pool their resources to preserve and strengthen peace and liberty and call on other peoples of Europe who share this ideal to join them in these efforts.
- Abide by the principles of the UN charter.

More recently European Values have been further articulated. Mainly in the Charter of Fundamental Rights of the European Union, proclaimed on 7 December 2000 by the European Parliament, the Council of Ministers and the European Commission. With a full legal effect with the entry into force of the Treaty of Lisbon on 1 December 2009. The values that are common to the EU countries are a society in which inclusion, tolerance, justice, solidarity, and non-discrimination prevail. These values, as outlined in the following sub clauses, are an integral part of our European way of life.

4.3.2 Human dignity

Human dignity is inviolable. It must be respected, protected, and constitutes the real basis of fundamental rights.

4.3.3 Freedom

Freedom of movement gives citizens the right to move and reside freely within the Union. Individual freedoms such as respect for private life, freedom of thought, religion, assembly, expression, and information are protected by the EU Charter of Fundamental Rights.

4.3.4 Democracy

The functioning of the EU is founded on representative democracy. Being a European citizen also means enjoying political rights. Every adult EU citizen has the right to stand as a candidate and to vote in elections to the European Parliament. EU citizens have the right to stand as candidate and to vote in their country of residence, or in their country of origin.

4.3.5 Equality

Equality is about equal rights for all citizens before the law. The principle of equality between women and men underpins all European policies and is the basis for European integration. It applies in all areas. The principle of equal pay for equal work became part of the Treaty of Rome in 1957. Although inequalities still exist, the EU has made significant progress.

4.3.6 Rule of law

The EU is based on the rule of law. Everything the EU does is founded on treaties, voluntarily and democratically agreed by its EU countries. Law and justice are upheld by an independent judiciary. The EU countries gave final jurisdiction to the European Court of Justice which judgements must be respected by all.

4.3.7 Human rights

Human rights are protected by the EU Charter of Fundamental Rights. These cover the right to be free from discrimination based on sex, racial or ethnic origin, religion or belief, disability, age or sexual orientation, the right to the protection of your personal data, and or the right to get access to justice.

4.4 European values of ICT ethics - prior research and policy work

The Berlin Declaration on Digital Society and Value Based Digital Government is taken as the foundation from which the content of the ICT professional ethics frameworks is developed. It is the most recent EU policy on digital ethics at the time of development of this framework. The Berlin Declaration can be seen as an application of European values to the digital sphere.

This document adapts and modifies the Berlin Declaration principles to show clear connection to the ICT profession. In summary, if the values articulated in the Berlin Declaration are accepted as those that should guide and inspire the ICT profession, exactly what does that mean for ICT professionals? To address this question, the principles of the Berlin Declaration are developed for the purposes of providing guidance to the ICT profession by articulating the specific implications of its principles for ICT professionals. The Berlin Declaration is the primary source but the adaptation and further articulation of its principles considers previous European and international work in ICT ethics. These has been summarised previously but is provided in tables also below for ease of reference. Table 1 shows the core proposal of Guidelines on Statements of Professional Ethics in the Final Report 'European Framework for IT Professionalism' [4].

Table 1 - Guidelines on Statements of Professional Ethics (Source: Final Report 'European Framework for IT Professionalism')

A Professional Ethics Statement There are four general principles of Professional and ethical conduct which form the basis for any statement on Professional Ethics. These principles recognise that activities of a professional nature impose specific duties on professionals; these are to serve: • the interests of the public and of society • the employer or client • the informatics profession • the professional practitioner.
Protection of Public Interest and Legal Compliance "The IT Professional acts to protect the safety and interests of the Public, and Society; and at all times acts in compliance with the relevant law."
Responsibility to Employers and Clients "The IT Professional acts in the best interests of their employer or client, to use their relevant knowledge, skill and capability to provide the best possible solution to the best of their ability."
Professional Dignity and Promotion of Professional Aims "The IT Professional protects the dignity of the IT Profession, and acts to develop and promote both the Profession and its professionals."
Competence, Responsibility and Impartiality "The IT Professional acts openly and impartially, within their own competence, taking responsibility for their work, and any work directed by them."

To add some global research perspective to our choice of principles several ICT professional ethics international references were consulted:

- ACM Code of Ethics and Professional conduct. Association of Computing Machinery, 2018
- Australian Computer Society ACS Code of Professional Conduct, 2014
- Code of Ethics of the IPSJ. Information Processing Society of Japan, 1996
- IEEE, 2019. Ethically Aligned Design (EAD): A Vision for Prioritizing
- Human Wellbeing with Autonomous and Intelligent Systems.
- IFIP Code of Ethics and Professional Conduct. International Federation for Information Processing 2021.

Also the work of Jobin [12] which carried out an international review of documentation about ethical guidelines for AI, was consulted. It synthesised the following shared key ethical principles regarding ethical concerns about AI which are also an indicative source of ethical concerns about emerging ICT developments. The key principles were:

- transparency,
- justice and fairness,
- non-maleficence,
- responsibility, and privacy.

Interestingly, their research found a strong convergence on the principles and some disagreement about where and how they should be applied, further supporting the need for context specific guidelines and analysis approaches. Both the Berlin Principles and the research on more general ICT ethics are broad in scope; thus, the recently updated International Federation of Information Processing IFIP ethics guidelines, which are based on the Association of Computing Machinery ACM guidelines, and other

relevant codes (listed in references) are also used as a source to ensure direct ICT profession relevance. Table 2 summarizes the content of the recently updated IFIP code.

Table 2 - IFIP code of ethics guidelines

IFIP code of ethics and professional conduct 2019, based on the ACM code, 2018	
General Ethical Principles	Contribute to society and to human well-being, acknowledging that all people are stakeholders in computing
	Avoid harm
	Be honest and trustworthy
	Be fair and take action not to discriminate
	Respect the work required to produce new ideas, inventions, creative works, and computing artefacts
	Respect privacy
	Honour confidentiality
Professional Responsibilities	Strive to achieve high quality in both the processes and products of professional work
	Maintain high standards of professional competence, conduct, and ethical practice
	Know and respect existing rules pertaining to professional work
	Accept and provide appropriate professional review
	Give comprehensive and thorough evaluations of computer systems and their impacts, including analysis of possible risks
	Perform work only in areas of competence
	Foster public awareness and understanding of computing, related technologies, and their consequences
	Access computing and communication resources only when authorized or when compelled by the public good
	Design and implement systems that are robustly and useably secure
Professional Leadership Principles	Ensure that the public good is the central concern during all professional computing work
	Articulate, encourage acceptance of, and evaluate fulfilment of social responsibilities by members of the organization or group
	Manage personnel and resources to enhance the quality of working life
	Articulate, apply, and support policies and processes that reflect the principles of the Code
	Create opportunities for members of the organization or group to grow as professionals
	Use care when modifying or retiring systems
	Recognise and take special care of systems that become integrated into the infrastructure of society

In summary, the Berlin Declaration is the primary source, this is further validated through consulting previous European work on ICT professionalism, and relevant research literature. Its direct relevance to

the ICT Profession is also strengthened by adapting and drawing on other international codes and documentation, from the ICT and wider computing profession, for inspiration. The Principles of the Berlin Declaration have been slightly reworded in some cases to emphasise that the framework applies to all sectors of society, not just the government or the public sector.

4.5 Framework content and structure

Table 3 shows the Berlin Declaration and a detailed description of how it applies to ICT professionals. It is a translation of ethical principles to a practical manifestation for ICT professional.

Table 3 - Berlin Declaration and Ethical Components

Ethical Principles Component 1	Berlin Declaration Description	ICT Ethical Knowledge Items (EKIs) Component 2
P1 Validity and respect of fundamental rights and democratic values	All human beings are equally entitled to be treated with respect and fairness - both in the analogue and in the digital sphere. The existing rights, values and the corresponding legal framework of the European Union apply regardless of our means of communication and irrespective of the use of analogue, digital, hybrid or integrated formats. Our common core foundations such as the rule of law, our concern for human dignity, right to autonomy, and shared ethical values must prevail in the digital world. European democracy must be protected from both disinformation and outright attacks on elections with due respect for the freedom of expression. All citizens should be able to verify the authenticity of online information, websites, and applications. Everyone, especially children and young people, needs the best possible protection from malicious cyber activity like cyber bullying, mobbing, or grooming. We strive for a digital transformation in which every Person recognises that fundamental rights and freedoms laid out in the Charter of Fundamental Rights of the European Union as well as shared fundamental values like respect for others, transparency, privacy and authenticity of information forms the cornerstone of all interactions, including in the digital sphere. Transparency, privacy, and authenticity of information forms the cornerstone of all interactions, including in the digital sphere.	The ICT professional has an ethical obligation to ensure, as far as possible, that: P1a: the reliability and veracity of information and data in the systems they design and build P1b: be aware of methods of potential malicious misuse of ICT technology P1c: protections from malicious cyber activities are in place with particular concern for vulnerable groups P1d: be aware of and respect the connection between the communication of information and democracy P1e: be aware of and respect the corresponding rights of freedom of expression and protection from hate speech P1f: be aware of the privacy and confidentiality requirements of information and data in the systems they design and build P1g: recognise that the public good is the overriding factor in professional ethical dilemmas with competing interests P1h: provide transparency in system design and data use/training to enable discovery for review (e.g. decision making processes of Artificial Intelligence (AI) systems)
P2 Social participation and digital inclusion to shape the digital world	All people of Europe should be able to participate in and benefit fully from digital opportunities on an unconditional basis and without discrimination. We recognise the need for equal access to an open Internet for all parts of society, including disadvantaged groups and citizens with disabilities, as a cornerstone of diversity of opinion, pluralism, innovation, and progress. Governments and public authorities at all levels should lead by example and provide digital services, which respond to and evolve with citizens' digital preferences. As the majority of citizens use mobile devices for access to the internet, we need to pay tribute to the paradigm shift from "eGov" (electronic	The ICT professional has an ethical obligation to ensure, as far as possible, that P2a: all work meets or exceeds disability accessibility requirements and regulations P2b: data and information within systems they design, and build does not contain bias which could disadvantage groups who experience negative discrimination P2c: inclusive and participatory methods are used in system design to increase connection with a wide range of user needs P2d: a risk assessment is taken in 'digital by default' initiatives to safeguard against

Ethical Principles Component 1	Berlin Declaration Description	ICT Ethical Knowledge Items (EKIs) Component 2
	Government) to “mGov” (mobile Government) when encouraging inclusion or aiming to provide seamless, transparent, accessible, and user-friendly digital government services. Citizens must be able to use such digital services without having legal knowledge. The members of our societies should have the opportunity to help shape the digital transformation and share their ideas and content with others unimpeded, while respecting the rights of third parties. The public sector should encourage such wider participation in policymaking by involving society in the design of public services through co-creation, experimentation and collaboration.	marginalising or excluding people with reduced access or limited skills to digital technology
P3 Empowerment and digital literacy	Every citizen and business in Europe should be able to navigate the digital world with confidence and in a self-determined manner. Users should be further empowered to manage their digital identity and to protect their personal data and privacy online. They should be made aware of the risk within the digital world resulting from cybercrime and other threats to information security or privacy. Citizens and businesses should have the option of seamless and easily accessible interaction with public administrations following the digital-by-default approach. Aside from fair, transparent and user-friendly digital procedures, and services, that are based on the concept of privacy by design, this demands digital literacy on the part of the user. It is our common interest that the people of Europe maintain autonomy by keeping control over their data and its use. They should be empowered to consistently decide for themselves about the scope, visibility, and existence of their own digital footprint. Life-long learning and the development of digital skills should be promoted and include ethical, technical, legal, ecological, and social aspects.	The ICT professional has an ethical obligation to ensure, as far as possible, that P3a: privacy and confidentiality are designed into systems P3b: users understand and are informed about their data rights P3c: users understand and are informed about risks to their privacy and how to mitigate them P3d: opportunities are taken to inform and re-skill colleagues and the public on technical digital skills P3e: opportunities are taken to inform and re-skill colleagues and the public on the ethical, legal and social and environmental aspects of digital skills
P4 Trust and security in digital interactions	Everyone should be able to navigate the digital world safely, authenticate and be digitally recognised within the EU conveniently. All people of Europe should avail of an easy to use, widely accepted and secure electronic identification conforming to European standards (e-ID), which allows them to securely access public, private and cross-border digital services. As a broad acceptance of digital government depends on trust, we must ensure that citizens and businesses are able to rely on trustworthy and verifiable digital government applications and services, which are in full conformity with high security standards and respond to user needs.	The ICT professional has an ethical obligation to ensure, as far as possible, that P4a: applications conform to high security standards and respond to users’ needs P4b: relevant regulatory frameworks are used to ensure best practices P4c: digital policies and systems are transparent with clear accountability P4d: honour the trust given them and ensure it is always earned and demonstrated P4e: professionals work only in areas that match their competence and expertise and honestly alert employers if they are asked to work on areas they may lack the necessary skills to reliability succeed

Ethical Principles Component 1	Berlin Declaration Description	ICT Ethical Knowledge Items (EKIs) Component 2
	Moreover, in order to ensure a free, open and safe digital domain and enhance social trust, fundamental rights and security should be integrated in all policies with a digital dimension. To foster trust in digital interactions with the public sector, suitable regulatory frameworks must be provided that ensure transparency, predictability, security-by-design and, where necessary, reinforcement or adjustment of existing provisions.	P4f: whistle blowing in cases when professional has an ethical concern is enabled without punishment P4g: professionals commit to continuously improving and updating skills P4h: professionals are honest in dealing with clients, public and colleagues
P5 Digital sovereignty and interoperability	Digital sovereignty is key in ensuring the ability of citizens and public administrations to make decisions and act in a self-determined manner in the digital world. We must ensure that all underlying digital components of ICT solutions (hardware, software, and services) meet European requirements. We must create the right conditions for Europe to develop and deploy our own key digital capacities, including the deployment of secure cloud infrastructure and interoperable services that fully comply with European legal provisions and ethical values. Common standards, modular architectures, and the use of Open-Source Software (OSS) in the public sector are facilitators for deploying and developing strategic digital tools and capacities. We must ensure the availability of diverse and high-performing digital solutions to guarantee freedom of choice and the ability to change IT modules when necessary. Software, data and tools generated by the public sector should be reusable and openly accessible as long as this is compliant with fundamental rights. As explained in the European data strategy, a strengthened interoperability framework, as well as suitable regulatory frameworks are key in helping Europe benefit from the economic value of data, thus creating a single market for data that will ensure Europe's global competitiveness and data sovereignty.	The ICT professional has an ethical obligation to ensure, as far as possible, that P5a: digital solutions are open, flexible, and reusable P5b: clients/users are not unnecessarily bound by (locked into) restrictive contracts that restrict flexibility to respond to changing needs P5c: interoperability and adherence to shared standards is deployed when possible and restrictive practices which constraint client/user choice are avoided P5d: consider and inform users carefully when changing or discontinuing support for system features on which people still depend P5e: maintain current knowledge of standards and engage as appropriate with standard development and improvement
P6 Human-centred systems and innovative technologies	We need to ensure that the European Union further strengthens its pioneering role in the research on secure and trustworthy technology design and that the opportunities of Emerging Disruptive Technologies (EDT) including the Internet of Things (IoT), Artificial Intelligence (AI) systems, distributed ledger technologies, and quantum computing are put at the service of all European Member States' citizens, and businesses. Such technologies carry great potential for evidence-based policymaking and play a key role in providing user centric public services. With reference to the current Presidency	The ICT professional has an ethical obligation to ensure, as far as possible, that P6a: systems that have the potential to become embedded in society or have high safety stakes (e.g. aerospace) are identified P6b: the precautionary principle which enables decision-makers to adopt precautionary measures when scientific evidence about an environmental or human health hazard is uncertain and the stakes are high P6c: the human, social and environmental risks of all new and emerging technologies are analysed and reviewed iteratively as research progresses

Ethical Principles Component 1	Berlin Declaration Description	ICT Ethical Knowledge Items (EKIs) Component 2
	Conclusions on “The Charter of Fundamental Rights in the context of Artificial Intelligence and Digital Change” and related key documents, we aim to promote a human-centred, responsible and common-good oriented development and use of AI and other novel technologies in the public sector. The human-centred approach aims to ensure that such applications are inclusive, help solve societal challenges and do not reproduce harmful social or economic biases. The public sector has a role-model function in ensuring that the development and application of these novel i.e. the Coordinated Plan on Artificial Intelligence (COM(2018) 795 final) and the Ethics Guidelines for Trustworthy Artificial Intelligence presented by the EU High-Level Expert Group on Artificial Intelligence. eu2020.de technologies is firmly rooted in our common fundamental rights and values and underpinned by a regulatory frameworks.	P6d: all new technologies should be reviewed in terms of the risk of their potential to reinforce rather than challenge existing unfair discrimination and marginalisation P6e: the potential for human centred and positive social impacts of new technologies should be the focus of research
P7 A resilient and sustainable digital society	One of the most pressing challenges and responsibilities for Europe is keeping our planet and people healthy and better preserving our natural foundations of life. The COVID-19 pandemic has provided a warning that new crises of unforeseen nature are likely to emerge in the future. In times where healthcare systems are under unprecedented pressure, digital solutions have proved essential in crisis management. We ought to explore and continuously follow up on the “lessons to be learned” from the COVID-19 pandemic and the boost it has given to digital transformation. We also need to make sure that the increasing use of digital technologies does not harm but rather contributes to people’s physical and psychological well-being. In addition, the digital transformation in Europe needs to be closely aligned with the 2030 Agenda for Sustainable Development and the Paris Agreement as well as the goals of the European Green Deal. With reference to the current work on Council Conclusions on “Digitalisation for the Benefit of the Environment”, we need to ensure that a sustainable digital transformation serves our citizens and businesses on an individual level as well as our society as a whole, while at the same time safeguarding the preservation of our natural foundations of life.	The ICT professional has an ethical obligation to ensure, as far as possible, that P7a: the increasing use of digital technologies does not harm but rather contributes to people’s physical and psychological well-being P7b: digital infrastructures and systems are robust enough to handle unexpected crisis events P7c: the environmental harm of ICT is minimised through adherence to relevant standards with reference to wider environmental policy

4.6 ICT Professional Ethical Responsibilities

ICT Professionals’ ethical responsibilities are to more than one stakeholder and are at different levels. In some cases, their obligations may come into conflict e.g. an employer may ask an ICT professional to

perform actions that are against the public good. In a review of existing codes of computing or ICT ethics it is generally the public good that is seen as obligation which has the potential to override all others in case of conflict. This is clearly a complex area, in which one must hesitate to provide overly restrictive guidance due the influence of national and organisational contexts. The best approach is to provide some means to articulate and review any conflicts considering the defined ethical principles, so an informed and considered decision can be made. The aim here is to show some ethical tensions and dilemmas as they may apply to ICT professionals. Table 4 provides a summary approach and Case Studies are provided in 5.2.5 which further elaborate and exemplify some of these issues.

Table 4 - Ethics' responsibilities in ICT professions

ICT professional has ethical responsibilities to	The ICT profession (other ICT professionals)	User/clients	Employer (organisation)	Society
Description of responsibility	To uphold standards and reputation. To know and abide by the relevant professional body code of ethics.	To provide a quality, appropriate and safe service. To inform users of potential risks and how to mitigate them.	To provide quality work of a high standard. To engage only in work for which one has the appropriate level of expert knowledge. To inform or report any ethical concerns that may arise. To request further training and guidance as needed.	To uphold the Rule of law and the public good.
Limits of responsibility	To operate within one's own sphere of knowledge.	Exceptions may be when whistle blowing is necessary as ethical concerns which have been raised have been ignored or suppressed. Conscientious objection by an ICT professional is another potential limit when an ICT professional may refuse to participate in the implementation of ICT products, devices or services to be used in activities against their individual morality.	Exceptions maybe when Human Rights issues are concerned (e.g. privacy and a state that invades privacy).	The ICT professional does not have to sacrifice their own personal safety, which may include justified fears for their livelihood, for societal benefit in most cases.

4.7 Language and the Ethics Framework

Ethics are an unavoidable part of our life that cannot be discarded. They shape the personality of a Person, and help in maintaining decorum, especially at workplace. They are necessary at all workplaces, although inculcating these ethics in ICT can be complicated, as it is a mixture of theory organizational practices, attitudes and aspirations, personal responsibility, critical thinking, and broader societal ethical issues. Issues of attitude and responsibility also need to be discussed thoroughly as they increase the credibility of this profession.

ICT - Information Communication Technologies - supports the modern principles of learning, and language acquisition. This domain includes all kinds of digital, devices and electronic communication.

Common language is important as it facilitates a common view that encourages our learning, development skills, and ethical competencies.

Common reference language operates as a shared reference of the 41 competences defined by EN 16234-1 (e-CF), also in connections with EN 17748-1 (BoK), CWA 16458 ICT Professional Profiles, CEN/TS 17699 Curricula, CEN/TR 17802 [13] Common Metrics, and Performance Indicators. A shared reference that needs to have a scope of grammar, vocabulary, and domain. The lens of ethics is necessary for the development of ICT as a profession.

A common language helps in supporting the navigation in a dynamic informative environment. Common language is also very important as it must support individualization, interactions, and student motivation. The set of moral principles play an important role in governing the actions and choices of individuals and groups. ICT ethics related to computer and internet carry immense significance in the fast-moving world of 21st century that heavily depends on ICT. There are three major domains which are covered: the extent of ethics that contribute to the development of professional identity of ICT practitioners, practices and policies that make the ICT ethics better, and how practices and policies can be useful for international coordination.

Language is an extremely complex system that influences the core of people's lives. Language is culturally transmitted. We learn our language from the people around us and it influences our social reality. Since language plays such an important role in our lives, it is also an essential part of ICT. The use of ICT almost always requires a language system. In addition to its features mentioned above, English appears to be the most common language in the context of computers and the Internet. Since access to the internet is today the most fundamental indicator in terms of digital divide, the language factor is gaining importance at this point.

This means that the language used should be understandable enough to be usable by non-native English speakers. Also, social-cultural differences could translate into interviewer-, confirmation- and/or interpretative bias. These effects should be considered during ethics framework sessions.

Language also works in another way. A study by the Yale School of Management shows that a Person's social status can be deduced from their speaking patterns within five seconds. Although most hiring managers deny that an applicant's socioeconomic position has any influence, it is inferred within the first few seconds.

These are some examples that allow us to state that language is an important factor in an Ethics framework. Therefore, our common language should not unfairly label one thing, or another based on personal bias.

4.8 Standards and frameworks, the liaison with ethics

Ethics navigate the rights and wrongs that involve peoples' everyday lives, while frameworks are conceptual structures that serve as support systems for constructing things that expand a specific structure to useful outcomes. At the most basic level, ethics predict the desirable behaviours while frameworks act as the guidelines to be followed to achieve specifics standards of those behaviours.

The initial step of the framework and standard of making ethical decisions include recognising ethical issues. Positive and negative traits of situations that might inspire specific behaviour are identified. Some of the questions asked at this level is whether specific decisions or situations could be damaging to people or a group of people. It is the pursuit of more good than harm. The goal is to produce decisions that are acceptable to every member of a larger group to reduce possible conflict of interest.

The recognition of ethical issues is followed by getting relevant facts related to an ethical situation. Because ICT is a fast-changing area, the framework must be able to react to emerging challenges and unexpected situations. It includes the need to evaluate a variety of options and how they can meet unexpected needs of an individual or a group of people. The most important aspect of such reasoning is

that there must be openness to the ideas that at least some commonly accepted principles are restrictively applied. This openness ensures that moral change and progress is possible.

While evaluating options, it is vital to determine options that organizations or people support in the image they seek to portray. Organizations must evaluate the desired outcomes of specific situations and build the ethical conducts they believe will bring out the best consequences. For example, research shows that consistent ethic strategies are crucial for the success of organisations. Among the issues involved in ethical ICT strategies is the need to ensure privacy and confidentiality of sensitive data. Such a framework must always be followed to portray a positive picture about the organization. The framework desires an approach that produces the most good. With that, success within the organization can only be achieved when it does not forget its ethical responsibility concerning ICT strategies.

It is important to acknowledge that various organization can have specific ethical needs. The frameworks developed can follow the same structure and all lead to the best personalized results for those organizations.

So, the details of the core elements of the European Professional Ethics Framework for the ICT Profession (EU ICT Ethics) have now been introduced. The following clauses will provide some wider considerations and research, as well as some guidelines and options on how to select and organise these elements to support ICT professionalism in a range of contexts. It will thus provide guidance on how to choose the right elements for your organisation.

5 Ethical theories, models and frameworks in ICT fields

5.1 Introduction

The purpose of this clause is to position the conceptual use of ethical theories, models and frameworks regarding ICT fields so far and the need to elaborate the practical use of future ethical frameworks.

Ethics adapted to specific environments and needs was a prominent feature on the long road of ethics in specific scientific fields and disciplines and in particular theories for ICT ethics' formulation. The moral attitude need in diverse professional groups has a long historical course from Aristotle, Comte and Durkheim where the liaison of professional ethics with moral consciousness as theoretical basis of a generalized practice of their behaviour. As formulated by Lvov and Lutsk Brotherhoods in "Professional Ethics", 1989, moral requirements considered a prerequisite to teaching profession [14].

Philosophical ethics with the three prominent of Kantian deontology [15], utilitarian consequentialism [16] and virtue ethics of Aristotle [17] reflected significantly in computer ethics' theories. From an overall view, deontology (rule-based ethics) and consequentialism (ethics based on evaluating consequences of actions) emphasised on rational decision making; virtue ethics focused on individual character role according to the evaluation of agent ethicality. Nonetheless, these theories are adapted according to specific topics and application domains [18].

Modern research highlights different perspectives of ethics professionalism. In particular, computer ethics brought new ethical challenges regarding the academic research and business practice. In particular, ethical considerations arise about the design and use of computing artefacts and Information Systems (IS) reflected in the area of responsible research and innovation (RRI) as well as in organizational policies.

Moreover, other ethical views related to research on ICT highlighted the importance of "value sensitive design", values turn in thinking about design and vice versa [19], [20]. Additional ethical theories have been developed according to information or technology implications. Information ethics, strongly linked to Luciano Floridi's work [21] introduced ethical positions with liaison to the ontological properties of information.

Conceptual models of ethics contributed to the systematic study of ethics for scholars concerning information technology fields [22]. Moreover, there is an ongoing interactive process among theories

models and frameworks concerning ethics in ICT professionalism. Nonetheless considering that ethics is an integral part of ICT profession, a coordinated and more engaged approach to an ethical identity of ICT professions needs to be implemented for the ICT community as a whole and at the same time taking into consideration the diverse ethical dimension of ICT specialized areas. To this end, past works on ethical theories, models and frameworks in the ICT area indicates that the focus was on the conceptual level whereas attempts aimed to reflect these theoretical constructions on the education area and in particular at the curriculum level. Nonetheless, the recent trend is to explore IT from the lens of care ethics [23] and exploit the pragmatic side of theoretical ethics towards a coherent framework for ICT professions.

This attempt is reflected in the following sub clauses, which are structured as following: 5.2 illuminates the methodology and the process followed to leverage existing models and frameworks of ICT skills or competences in the light of EN 16234-1 (e-CF) objectives in order to frame and implement ethics in the ICT profession. Furthermore, it surveys how ICT innovations brought new challenges for transforming theories, models and frameworks to real Case Studies.

Paradigms of existing theories, models, and frameworks implemented in real Case Studies, challenges, and solutions are provided in 5.3. To highlight with clarity the challenges a diagram of strengths and weaknesses of previous methods/ways is incorporated also to designate the practices that are suggested by the ethics team as more effective to tackle with the challenges.

This clause in overall aims to highlight general ethics theory (Meta-ethics / normative ethics / applied ethics). Nonetheless, the current clause focusses mainly on normative ethics and not too much on applied ethics.

Moreover, this clause is an endeavour to identify how and where the conceptual perspective meets the practical side of ethics in ICT professionalism and through which practices/policies are identified as most effective for the ICT professionals to tackle with the ethical challenges that they face in daily practice.

5.2 Exploitation of theories, models and frameworks

5.2.1 Ethical theories and models

Models support the understanding of science and engineering phenomena. Ethical theories could be also viewed as models providing principles that supports morality understanding. Most traditional perspective of IT ethics emphasise the counteraction of harm to the public. Recent research works indicate the prominent trend of integrating human welfare in technology practice [24] and initiating standards for quality in life through ethical norms for technology use and applications [25]. Life in quality, “a good life” as referred in the literature is part of reliable periods of prosperity and a well-functioning democracy [26]. Another ethical theory is based on rules of deontology which is based on universal application of moral rules. In alignment with well-defined rules, people are guided towards the right action. There is also the Utilitarian or consequentialist approach [16], which supports the process of future consequences’ prediction. It is a model, however, which does not solve the problem of how to resolve challenges and dilemmas. From a global perspective, human consciousness shapes and strengthens ethical engagement [27]. Emphasising on methods for the ethical use of technology, the formulation of systematic principles against technology misuse must be oriented by the innovations in technology adoption to be as a priority useful to societies. In terms of technology advancement, the impact on life and society, is liaison with a wide range of ethical and social inquiries according to the new boundaries that these new advances brought with. Herein, the role of frameworks build upon common principles could be catalytic.

5.2.2 Ethical frameworks

Over the last 20 years, due the tremendous growth in computer-governed services by political and industrial carriers, and considerations about data and interaction processes, implementing ethics in IT

professions was a necessity for a more manageable active framework for IT professional communities [28].

Technology adoption and innovations in digital era highlighted the necessity of integrating ethics in educational models and curricula as well as into organizational strategies.

This need became an imperative due to the shift from closed business-oriented computing environments to more and more open environments governed by complex networks of developers, users and applications. The outcome of this evolution was aside from relevant standards, Bodies of Knowledge (BoKs), code of ethics and conduct, a requirement for proper frameworks that will operate and support proactive actions, indicating the usage of ethics knowledge and codes and supporting wider consistency of ICT professional behaviours and practices of ICT [29].

To this end, frameworks as conceptual models, or sector specific focused on specialized areas (i.e. AI, security etc.) for ICT professionalism have been initiated to operationalize ethics, evaluate professionals' competencies/skills and join effectively theory to practice.

5.2.3 Methodology and scope

In terms of the European Professional Ethics Framework for the ICT Profession (EU ICT Ethics), a systematic mapping of theories and models according to the rapidly evolving field of ICT field at both academic and business environment has been conducted to coalesce ethics-oriented initiatives around a common structure. It also further extends the ethics components and principles as delineated in the EN 16234-1 (e-CF). To this end a list of ethics-related mandatory human elements/components alongside with EN 16234-1 (e-CF) knowledge, skills and attitudes, has been drafted to provide a blueprint for proactive engagement with ethics.

These elements/components are interrelated to the practical materialization of ethical models and theories at ICT corporate or professional level. Concrete ethical competence is defined for evidence "based, empirical and rubrics" related values. In ways similar to what we see in health and care-related fields, human-oriented frameworks that recognise individuals and organizations' needs, along with social and cultural attributes could ensure the component of respect [30].

The applicability of ethics in ICT professionalism has been systematically studied in relation to emerging technological and scientific ICT artefacts, applications and services along with common ethical issues and corresponding strategies to address successfully ethics foresight. For example ethical issues of emerging ICT Applications are documented in ETICA (EThical Issues of emerging iCt Applications) where the social impact of particular technologies is mapped. A thorough study of related sources in literature highlighted the close liaison of concrete emerging technologies such as AI, and overall the digitization in knowledge transformation mainly in force majeure situations as the pandemic, specific terrains such as disruptive technologies (i.e. learning analytics) with ethical challenges. This survey operated as a placeholder to an initial insight in scientific and technological areas that could be meaningful to be provided in Case Studies analysis (5.2.5).

5.2.4 Ethics reflection from theory to ICT practice, the role of Case Studies cases

Ethical perspectives of ICT practice concern processes such as research, development and services' provision along with the outcome of ICT professionalism. The dimension of process is closely related to professional conduct, typically tackled by professional bodies.

Product perspective concerns issues of accessibility and transparency in IT systems. To cover both perspectives, ICT professionals must adhere at the principles of social responsibility. Nonetheless, the most problematic issue according to this adherence is the diversity of professional relationships, which can also entail conflicts [31]. Apart from codes of ethics that inform practice and decision-making process, concrete Case Studies provide valuable ethical guidance to professionals to leverage information derived from real situations and enhance education and efficacy in ethical issues' management [32].

In the context of EN 16234-1 (e-CF) the Case Studies include transversal components which provide basic generic ICT descriptors for successful application of EN 16234-1 (e-CF) competences in a workplace context. Aligned with the work done so far, some illustrative examples of EN 16234-1 (e-CF) areas and dimensions have been selected to identify the proper correspondence between these areas and the most important ethical principle or ethical knowledge item as relates to different dimensions of the EN 16234-1 (e-CF).

Case Studies are undoubtedly a great tool to convey the right message to the right people and bring ethics in practice. In order to highlight the use and implementation of Ethics framework and EN 16234-1 (e-CF) areas in real-world context and problems faced in ICT environments it is considered of high importance to use a range of Case Studies. A set of ethics Case Studies have been selected in alignment with the initial investigations about ICT areas where common and most challenging ethical issues have been identified.

Case Studies are viewed from two perspectives:

- a. a more traditionally approach facing ICT issues such as care of data, data privacy, limitations to use devices for specific target groups and
- b. the innovative aspects of ICT domains such as emerging technologies (e.g. AI, data science and analytics).

The aim is to identify the practical perspective of Ethical Knowledge Items (EKIs), drawing a clear connection of main ethical concerns to ICT professional environments outlining how the ethical framework can operationalize in diverse real contexts. Case Studies are analysed upon a concrete methodology to describe how moral dilemmas or considerations per situation could be resolved successfully by the ICT professional actors implementing ethics framework guidelines and actionable tools and prove its value proposition in professional operation.

More specifically, the added value of the ethical framework is to enrich and add depth to the EN 16234-1 (e-CF) frame by developing its connection to its specific areas as well as the ethical knowledge items and principles of the Ethical Framework. Resources and evidence-based criteria have guided these ethical principles/competences. For instance, the principle of respect is well grounded to be in liaison with system development [33].

The main objectives of Case Studies are to:

- Indicate overall the liaison to the values of the European Professional Ethics Framework for the ICT Profession (EU ICT Ethics);
- Highlight how the ethics framework could support a knowledge system based on recurrence of common errors;
- Resolve or escalate incidents, optimize system or component performance;
- Explore documented situations as 'learning lessons' tools in order to guide professionals and cases where no clear guidelines exist.

Given that Case Studies represent a powerful tool for business and organizations relevant to a wide range of professional environments, it has been considered of high importance to incorporate multiple sources for their elaboration.

More specifically, the survey of Case Studies has been conducted in two phases, drafting potential scenarios from diverse environments/contexts (as a first phase) incorporating real situations successfully implemented in academic and business-oriented environments (i.e. universities, companies, spin offs etc.) (in the second phase).

Concerning the first phase of the study, indicative Case Studies have been drafted taking as a starting point similar situations in relevant literature as well as empirical evidence which could be used as a valuable tool for professional practice. The main criterion for cases' selection was the wideness of the selected areas according to their implementation in diverse environments.

More specifically Case Studies have been examined according to different contexts together with the role of professionals as quoted below:

1. Organizations/companies (e.g. ICT professionals, professional associations, companies)
2. Research and Innovation (e.g. market researchers)
3. Academic institutions/Universities (e.g. educators)
4. Environments which implement cross-cutting topics.

From the beginning of cases' survey the main consideration was to make the links with the specific components of the ethical framework such as the ones below:

- a. ICT Ethical Knowledge Items (EKIs) Components' link to each Case Study
- b. Competences/ per dimension and area that are mandatory as indicated in the framework
- c. Challenges per dimension and area concerning each specific Case Study
- d. Solutions to real settings' implementation and tools to realize the implementation of ethics theories, frameworks, models (how ethical knowledge will be codified in the specific case)
- e. Indicative actions linked to the most prominent in each case ethical principles of the Ethics framework (e.g. provide transparency in system design and data use/training to enable discovery for review)
- f. Business benefit for individuals/organizations/corporate environments of acting ethically in each situation (i.e. mission not clear)
- g. Factors or practices that hinder ethical excellence.

Table 5 is the Case Study template which has been used as a basis for the description and elaboration of ICT Case Studies and relevant ethics issues raised as well as methods that the Ethics Framework proposed in order to handle them successfully.

Table 5 – Case Study template

Title of Case Study: A concise and representative item related to professional roles is provided inhere.
Summary of Case Study: An outline of the specific Case Study stressing the specific domain (e.g. technologies/devices/practices).
Problem/ Ethical Issues: Indicate the specific problem which raise corresponding ethical issues.
Challenges & planned actions to cultivate ethical culture: Concrete challenges that these ethical issues generate and how various actors (individuals/organizations/corporate environments) will benefit acting ethically in each situation.
Overall Practical value of the Ethical Framework: Describing which part of the Ethical framework are the most prominent to be implemented in the resolution of daily ICT problems.
Use of Ethics Framework in the specific Case Study: How each stakeholder will exploit the Ethics Framework manual to progress the required competences and resolve relevant ethical aspects.
Connection of ICT Ethical Knowledge Items (EKIs) per Case Study: Which principles as described in the Ethics Framework context has each actor to place in priority in order to resolve the concrete problem?
Relevant e-competences/demonstrated abilities: Which competences/demonstrated abilities are required per Case Study and ethical issue?
Methods to implement Ethics Framework guidelines: Per Case Study different actionable tools and practices are highlighted in the EU ICT Ethics framework document.
Factors or practices that hinder ethical excellence: Intentional or unintentional beliefs and habits that can provoke tensions or conflicts.

Concerning the selection of specific ICT fields, a number of criteria has been taken into account such as:

- a. the frequency of ethical aspects associated to these fields
- b. the ICT professional or academic/research and business context and the corresponding ethical requirements
- c. likelihood of ethical dimensions that are diverse stakeholders meet in these real world contexts.

In order to approach more systematically Case Studies' drafting the following 16 generic areas have been defined:

1. Risk analysis
2. Legal requirements in services provision
3. Business planning (products' planning) and ethics considerations
4. Technology innovation (i.e. AI products design)
5. Systems/apps/devices/products design & development Sustainable management
6. Digital services and user experience
7. Overall process of ICT system testing
8. Data acquisition/processing/visualization
9. Technological integration design
10. Scalability issues/ management
11. Replicability issues
12. Security standards and protocols
13. Education/Learning and Training in academic/organizational/ research environments
14. Smart Infrastructures
15. Disruptive Technologies (DTs)
16. Smart metering.

The set of ethics Case Studies have been analysed upon the main objective to guide professionals as a conceptual and activity guide. During an extensive study of diverse ICT environments, an interrelation between these generic areas has been identified (i.e. ethics considerations in systems design, deployment, development, implementation, testing etc.). In the context of Case Studies' elaboration the next and final step was to proceed to the specific Case Studies' clustering in the wider system category it refers at, selecting eight Case Studies to be fully developed and portrayed in this clause. The generic along with the specific situation of each Case Study are analysed below per EN 16234-1 (e-CF) area and its dimensions. For example, AI is used to control robotics, common commercial products in a number of companies worldwide.

The analysis of hypothetical scenarios in diverse ICT environments/contexts indicate how legal and ethical consistency will support novices in understanding ethical decision making in relation to individual, corporate and social issues and increase impact for stakeholders' benefit.

The real success stories' development sub-section incorporates also the solution field per Case Study in order to indicate how ethical behaviour is perceived by diverse stakeholders views and which ethical guidelines/principles/values and tools have been used. This Case Study provides an added value to the extremely demanding task of assessing the applicability of the Ethical Framework in real contexts.

Moreover, it supports professionals who are familiarised with ethics to build a 'maturity model' upon core ethical guidelines considered as 'Gold Standard' practice guidelines, despite the diversity of values and cultures.

For each domain, relevant roadmaps have been created with best practices and observation guide, as gold standards guidelines mandatory per case. For example, operationalizing responsible innovation in emerging technologies and mind-sets such as AI and robotics an indicative process is described below. One should be familiar with 'the big picture' acquiring a broad knowledge of the sociomaterial world of robots, ethical inquiry of humans' design, interaction and relation to robots which will shape the later stages of reflection and development [34].

In light of mapping the ethics in the scientific field of data science and learning analytics in the context of academic environments and higher education, some elementary steps need to be followed.

Ethics aware software engineering is among the cross-cutting topics which demands demonstrated abilities to act and influence relevant stakeholders (e.g. developers and users) [35].

Technologies used to acquire, manage, store and visualize individual information in time and space the so-called geospatial real-time information raise ethical and legal considerations. Therefore, ICT professionals should pay attention to specific requirements when designing and implementing products with data tacking capabilities.

Designing and developing smart infrastructures (e.g. through devices, apps) for vulnerable populations, relevant actors/ candidates have to meet a number of criteria according to the development cycle of these systems (e.g. AI systems). A roadmap as quoted below illustrates the prominent guidelines of specific ICT domains.

1 	2 	3 	4 	5 
Technology innovation (robotics)	Education and training	Software Testing	Data management	Human-centred smart infrastructures
Individual awareness	Systematic review of ethics in LAs	Standards and Codes of ethics	Understand in accordance to real-time data tracking	Being familiar
- Perspectives on robot design ethics (Inclusive design) - Individual and organizational motives for robots design/use	- Areas that have been studied thoroughly - Areas that remain underexplored	- User driven - Culturally updated	- Data risks and limitations - Engaging communities in risks' assessment	Conceptual perspectives in each phase of product/systems' design/development
Collaborative awareness	Report research on ethics	Checklists/Catalogs	Assess and manage security risks	Identify hurdles, pervasion incidents
- Robot makers - Affected stakeholders (devel-opers, application experts, end users)	- Indicate knowledge gaps - Understand students' perspectives, attitudes	- Ethics requirements in ST - ST specifications	- Models, frameworks, - Plans, programmes with experts, ethical boards	- Services - Specific target groups
Ethical dialogues	Configure	Map of ethics requirements	Assess & Report	Design & develop
- Expectations - Consequences of robotization	- How ethics are perceived in diverse sociocultural contexts - How ethics are applied in practice	- Ethics design - Traceability and verificatio techniques	- Risks against benefits to relevant communities - Share findings of data where appropriate	- Human-centred artificial intelligence (AI) systems - Plans
Involvement in critical reflection		Testing		
- Ideas - Practices		Verificationof testing against specifications		

Figure 1 – Prominent guidelines of specific ICT domains

5.2.4.1 Hypothetical scenarios from diverse ICT environments

5.2.4.1.1 Overall process of ICT system testing

Table 6 - Overall process of ICT system testing

Overall process of ICT system testing Test-manipulation software
Summary of Case Study A company is sued for using software to manipulate tests on their systems. The most recent examples are those in the car industry to reduce diesel emissions during consumption tests ('defeat devices'), in order to improve the performance during benchmark tests. These tests and benchmarks are the basis for later sales. A car that emits fewer emissions is, in principle, more valuable than one that is less good. The consumer pays more for this product than it would otherwise have done. Better performance can also have advantages for the manufacturer within legal frameworks and in compliance with the current environmental policies. Moreover fewer emissions ensure operation for longer in an environment where environmental requirements are constantly being increased.
Problem/ Ethical Issues The ethical questions with regard to the specific Case Study are more in the area of business management. By using these resources, a company is stronger in relation to its competitors. In the presented example, there are several producers using the same means. One could therefore argue that the producer was forced to use these resources in order not to lose the competition not taking into account possible ethical implications for products' real value and services of quality and cost-effectiveness provided to end-users.
Grey issues The IT employee is part of a larger organization and cannot improve software on his own. Using test software without using other audit possibilities gives the risk of not having an external evaluation procedure, failing to indicate consistency and compliance with legal and ethical requirements. In this example, the ethical dilemmas are at multiple levels: from the employee who builds test-manipulation software, through the board that uses these tools to maintain the market share of their product, to the whole industry that for decades now is "trapped" in the use of these defeat devices.
Planned actions to cultivate ethical culture • Solve ethical conflicts (arising inside or outside the organization). • Establish measures such as yearly report (audit and memory) and supervise their deployment (continuous training, procedures, etc.).
Use of Ethics Framework in the specific Case Study The ethical problems described above are symptoms of business competitiveness rules. Due to economical or environmental requirements an organization whose products cannot compete with the market need to change the products. They have to adapt to the applicable environmental regulations. Using an Ethical Framework in advance helps to anticipate changing (environmental) regulations and to proactively improve the product.
ICT Ethical Knowledge Items (EKI) • P1a: the reliability and veracity of information and data in the systems they design and build. • P1b: be aware of methods of potential malicious misuse of ICT technology. • P1f: be aware of the privacy and confidentiality requirements of information and data in the systems they design and build. • P1g: recognise that the public good is the overriding factor in professional ethical dilemmas with competing interests.
Relevant e-competences/demonstrated abilities The ICT professionals have an ethical obligation to collaborate with internal and external experts in order to shape the companies' values in a supportive IT context. Moreover in order to establish proper development