DIGITISATION: ECONOMIC AND SOCIAL IMPACTS IN RURAL AREAS

D4.2 - ETHICAL CODE

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1 Introduction

DESIRA aims to improve the capacity of society and of political bodies to respond to the challenges that digitalisation generates in rural areas, agriculture and forestry (DESIRA, 2018, p. 5). Digitalisation is the term used to describe the sociotechnical processes surrounding the use of multiple digital technologies. Such technologies have an impact on economic, social and institutional contexts, which in turn increasingly require and depend on these digital technologies (Tilson, Lyytinen, and Sørensen 2010). Options for digital technologies' use are continually increasing, and so are the associated complexities and their potentially negative and positive impacts on society. Several digital tools and technologies have game-changing potential, disrupting existing patterns of interaction and generating a radical redistribution of costs and benefits within society (Rijswijk et al. 2021) Given their potential game-changing nature, digital technologies are a relevant object of discussion in relation to the development of plausible and desirable futures for agriculture, forestry and rural areas. This indicates a need to reflect on how digital tools and technologies can support the achievement of desirable futures.

Building on the concept of responsible innovation, an innovation trajectory is considered 'responsible' if it tries to take societal values and norms into account at an early stage of technology development, which helps to realise products that are broadly accepted and widely used (van der Burg, Bogaardt, and Wolfert 2019; Owen et al. 2013; Von Schomberg 2011). This implies a comprehensive analysis of the concerns, threats, benefits and opportunities raised by use of those digital tools and technologies. Ethical challenges arise when new technologies confront human actors with questions about what would be the good, right, just, required or acceptable action, or what societal goals are worth striving for. These questions arise regularly, but they become problems when the moral norms and values that are available in society provide unsatisfying answers, or no answers at all (Van der Burg, 2019). Adopting an ethical approach to technology development confers a dual advantage; i.e., the advantage of being able to identify and leverage new opportunities that are socially acceptable or preferable, and the advantage of prevention and mitigation of courses of action that turn out to be socially unacceptable and hence rejected, even when legally unquestionable (Floridi et al. 2018).

Ethical and moral aspects have a distinctive role in shaping our society and the ongoing debate on how to be ethical or moral has involved philosophers, anthropologists, sociologists, etc. for centuries (Boddington, 2017). Ethical frameworks and codes have a distinctive role, to be considered as independent from existing and applicable legislation. Compliance with the law is necessary, and is to be considered as the least that is required, but it is not necessarily the most that can be done, meaning that additional effort is sometimes needed to act in a moral or ethical way (Floridi et al. 2018). In particular, when referring to the topic of our concern, we think about the role played by developers and practitioners in designing digital tools for achieving specific goals. While a specific tool could be beneficial for achieving a particular purpose, it can have detrimental effects on other elements, as the case of the Swiss living lab shows:

Impacts of robots in organic farming:

The Swiss living lab provides an example on the benefits and drawbacks of digitalisation. In this living lab the focus is the use of robots for weed management in Swiss organic farming. The use of this technology can improve environmental sustainability as it helps organic farmers reduce costs and can have spillover effects in the conventional sector, where the use of these robots can reduce herbicide use. At the same time, the energy and resource use of these technologies can be harmful to the environment, and it is currently unclear whether the resource use of these robots outweighs the environmental benefit of reducing herbicide use. Equally, ethical aspects arise around the privacy and transparency of this technology. There is currently no legal framework in Switzerland to clarify the legal terms around the use of this technology. Farmers are concerned about the data weeding robots might collect and how this data can be used.

The existence of an ethical code, representing shared and agreed-upon beliefs and values of a certain community, can help in balancing the diverse needs, outcomes and interests that arise when wanting to achieve certain objectives. The objective in DESIRA is clearly stated and shared and the ethical code presented here, represents the willingness of the different actors, that have shared a journey, to set a common ground for the future realisation of the SDGs through digitalisation in agriculture, forestry and rural areas, based on the collected results from the project.

2 Developing the DESIRA ethical code

An ethical code is aimed at developing a set of shared ethical values identified around a specific topic of interest, and agreed upon by the community involved. This is different from a code of conduct, which provides more directive guidance on how to act or behave under certain given circumstances. We opt for an ethical code for two main reasons. First, the broad scope covered by DESIRA clearly reflects that digital technologies produce different impacts in different contexts, which is difficult to represent in a code of conduct. Second, when considering the fact that the development and use of digital tools in agriculture, forestry and rural areas is an ongoing and often rapidly changing process, the ethical code is an instrument that is more adaptive, and can also be used in the future, being shaped to new and different circumstances. An ethical code can thus serve as a framework for reflection and discussion, supporting consideration of ethical aspects during the development process of various digital tools and technologies.

Three main elements were considered as starting points for developing the DESIRA ethical code:

- The ethical code is for digitalisation in agriculture, forestry and rural areas. This encompasses a broad range of technological tools set in diverse socio-cultural contexts linked to digitalisation in agriculture, forestry and rural areas (Bacco et al., 2020).
- The foundation for the ethical code is the RRI framework, and more specifically the four dimensions described by Stilgoe, Owen, and Macnaghten (2013); i.e., –anticipation, inclusion, reflexivity and responsiveness. With its focus on principles, policies, processes and practices for achieving socially acceptable and desirable outcomes of research and innovation activities, there

is growing recognition that responsible innovation might help to proactively address the socio-ethical challenges associated with digitalisation (Jakku et al. 2022)

- The main intended user groups for the DESIRA ethical code are in the first place technology developers/innovators, and managing authorities/policy makers, who can use this ethical code as a *guiding framework* during technology development or when assessing innovation projects. However, this does not exclude other actors impacted by novel digital technologies, since they need to be involved in ethical discussions and reflections already during early stages of technology development, for which the proposed ethical code can serve as a basis.

The conceptual foundations of this ethical code are based on a set of universal values (universal human rights and bioethical principles) and on virtue ethics. We build on this with an elaborated value sensitive design approach, taking inspiration from the value system hierarchy which details how broad and universal values can be turned into specific design requirements.

To further elaborate the ethical code, we first reviewed existing ethical codes, frameworks and codes of conduct or practice in the field of digitalisation, linked to agriculture, forestry and rural areas, and have used those to develop a preliminary overview of main principles and values. This provided the basis for a further reflection using the results and insights collected and elaborated over the course of the project, especially the empirical work done at the level of the Living Labs. In order to gain empirical insights from the DESIRA living labs we coded the DESIRA deliverables that provide empirical data. These deliverables are the D1.3 Taxonomy report, the D2.2 Needs, expectations and impact report, the D3.1 Scenario Report and the D3.2 Policy Briefs. Inductive coding based on the values as understood in value-sensitive design was used in order to gather the values that were expressed in these various documents (existing codes & frameworks and the aforementioned DESIRA deliverables). A workshop at the DESIRA final conference provided input for the value descriptions. Additionally we have provided a number of examples of ethical reasoning in technology design by highlighting the different use cases developed for the DESIRA project. These use cases, part of work package 3, are the first step towards technology development and display how ethical technology design is done at an early stage.

As a result, the ethical code is an integration of the results collected in the 20 DESIRA living labs combined with a broad conceptual framework that highlights how ethical aspects can be considered in digital technology design. Our aim with this ethical code is both to highlight issues around ethics that have been found in the DESIRA project and to provide a basis for technology developers and policy makers in ethical technology design.

3 Conceptual foundations for the ethical code

We base this ethical code on a review of approaches and theories that describe how to introduce ethics in technology design. We use this to develop a conceptual foundation based on virtue ethics, responsible research and innovation (RRI) and value sensitive design. This foundation is used to analyse data from the DESIRA project, existing ethical codes and codes of conduct around digitalisation in agriculture, forestry and rural areas. Based on this collected work we propose practical steps to involve ethical considerations for both managing authorities in assessing project proposals, and technology developers who design and develop new technologies. We base our approach on the view that there are certain universal human values which support these broader ethical reflections. We take these universal human values from bio-ethical principles and universal human rights (UN General Assembly 1948) The four bioethical principles (beneficence, nonmaleficence, autonomy and justice) are increasingly adopted for AI systems research and development and they form a good fit with digital ethics in general (Floridi and Cowls 2022). For digital ethics and AI ethics there is the additional principle of explicability (defining how the technology works and who is responsible for the way it works) (Floridi and Cowls 2022) . We see these as fundamental principles, where values, norms and ethical requirements can be based on these broader rights and principles. In this we take a universalist view, as opposed to a relativist one (Nagengast and Turner 1997).

3.1 Virtue ethics in relation to technological innovations

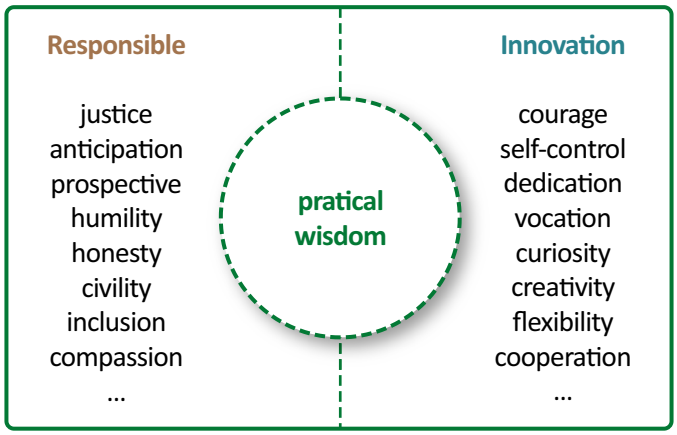
In our examination of ethical approaches for technology design, we considered three major frameworks, virtue ethics, deontologist approaches and consequentialism. Of these three frameworks, virtue ethics is focused on building the capacity for ethical reasoning, consequentialism is focused on consequences of actions and deontology sets out duties and rules for ethical action (Annas, 2007). As Grinbaum and Groves (2013) and Steen et al. (2021) have noted, the deontologist and consequentialist approaches are not entirely suitable for addressing the inherent uncertainties of innovation. This includes uncertainty around the capabilities and effects of an innovation, which are often unknown before adoption and widespread use. They advocate instead for virtue ethics as a useful tool for addressing the uncertainties present in innovation processes. Virtue ethics, rooted in classical Western ethical traditions, can provide an ethical code for responsible innovation by emphasising the virtues that should be possessed by morally good individuals (Annas, 2007). These virtues include traits such as justice, honesty, generosity, courage, and fairness, and are a state or disposition to act in the right way.

Virtue ethics focuses on the moral character of the individual, and posits that a virtuous agent will act in the right way for the right reasons, without conflicting feelings or inner opposition (Annas, 2007). According to this perspective, it is not just the act itself that matters (e.g. not stealing), but rather the agent's inclination or tendency towards that act. This approach is different from other ethical codes, such as deontologist and consequentialist ones, which focus more on the act itself or on the consequences of actions. Central to virtue ethics is the development of virtues and the learning process of becoming a virtuous agent. Virtues cannot just be taught, there is no overnight conversion possible to be a virtuous person, but rather virtues need to be developed, where a person thinks over virtues and how to bring their judgements and practices in coherence with broader virtues. An essential element of virtue ethics

is then also the assumption that ethical thought includes an aspiration to be better than we are. The purpose of a moral education is to develop this capacity for reasoning on how to be a more virtuous agent (Annas, 2007).

This approach is particularly applicable to the domain of responsible innovation. It helps avoid check-list ethics and allows for a context-specific application of ethical reasoning. Additionally, it fits the agency of innovators in innovation processes, highlighting their central role both as the innovators of new technologies and as the virtuous agents that are able to reflect on the ethical aspects of new technologies. This is highlighted in figure 1 which highlights the various virtues that innovators need for being responsible in innovation (Steen et al., 2021). Similar elements can be recognised in responsible innovation frameworks, an example of which can be RRI, where the innovator is guided to be anticipatory, inclusive, reflexive and responsible.

Fig. 1: The different virtues that innovators need in the development of responsible innovations, divided by virtues for being responsible and virtues for being innovative (reprinted from Steen et al., 2021)



3.2 Value Sensitive Design

Any technology contains inscriptions and affordances, determining the potential uses of this technology. Latour (1991) has set out how agency is delegated to things and technologies, where the design of technologies is tailored to the human form while this same technology also contains the ability to prescribe how people use the technology (Tonkinwise 2004) . In the design process, technologies reflect to a certain degree the values of designers and innovators, creating the possibility for a range of values to be inscribed into the technology. In this, there is overlap with the use of virtue ethics for responsible innovation, which recognises this inscription and seeks to use virtue ethics to ensure that the values inscribed enable ethical ways of being, that is, to enable ethical actions on the part of the users (Friedman and Hendry 2019; Tonkinwise 2004).

Value sensitive design (VSD) takes as a starting point the values that a person or group of people find important in life (Friedman and Hendry 2019) . This approach takes as a key goal that technological systems should be judged by how much they advance human flourishing. To determine whether a

new technology will advance human flourishing, VSD highlights the following features for a technology design process:

1. A proactive and early influence of values on the design process
2. Broaden the value arena from the workplace and also include education, the home, commerce, online communities and public life
3. Combine conceptual, empirical and technical investigation to ensure that values are integrated in the design process
4. Include a broad range of values to include all values with moral import, pertaining fairness, justice, human welfare and virtue
5. Distinguish between usability of the technology and human values with ethical import
6. Include direct and indirect stakeholders, both the users and the people affected by the use of the technology
7. Interactional theory that highlights how values are neither purely in the social or in the technical domain but rather that technologies support certain values depending on how people use the technology
8. Starts from several universal values

VSD is intended to be applicable to any socio-technical context, where the set of features is intended to ensure this broad applicability. As a framework it does not highlight any particular ethical commitment to a certain overarching theory of ethics and resists overarching normative directives. This ensures the flexible interpretation of this framework and allows it to be used in a variety of contexts.

Value sensitive design generally uses a tripartite methodology that combines conceptual, empirical and technical investigations. These different forms of investigation can run concurrently and are used to iteratively influence the design of a technology. Conceptual investigations determine which stakeholders use the technology and the stakeholders affected by the technology; the values involved in the technology design process; and analyse how certain ethical choices might influence the design process and trade-offs between choices. Empirical investigations are focused on data collection and the human context of a technology. They are also intended to determine how stakeholders apprehend values and how stakeholders prioritise values and show whether there is a difference between espoused values and actual practice of stakeholders. Finally, technical investigations take existing technology as a starting point; and determine how traits of these technologies hinder or support selected values. They also involve the proactive design of systems to support values identified in the conceptual investigation (Friedman et al. 2013) . In value sensitive design processes these three methods run parallel and each have an effect on the design process, bringing technology in accordance with ethical values. The second step of the technical investigation brings these values in practice through the involvement of values in design and development.

As a framework, value sensitive design centres on values that are important to humans, both users of the technology and those affected by the technology. Friedman et al. (2013) have been reluctant to provide a list of values, as it runs the risk of privileging or reifying the values on the list over others. Ideally, a

list of values is developed for each particular design process, where particular values apply. However, a list of 12 broader values with ethical import has been developed. These values, listed in table I, are focused on universal human values with the addition of several values central to human-computer interaction. A downside, acknowledged by Friedman et al (2013) is that this list privileges human values over broader nonhuman entities. This can for example be seen in environmental sustainability covering the needs of humans from ecosystems, rather than listing this as a value that is worth protecting for the sake of the environment itself.

Tab. 1: overview of important values following Friedman et al. (2013)

Human Value	Definition
Human welfare	Refers to people's physical, material, and psychological well-being
Ownership and property	Refers to a right to possess an object (or information), use it, manage it, derive income from it, and bequeath it
Privacy	Refers to a claim, an entitlement, or a right of an individual to determine what information about himself or herself can be communicated to others
Freedom from bias	Refers to the need to prevent systematic unfairness perpetrated on individuals or groups, including pre-existing social bias, technical bias, and emergent social bias
Universal usability	Refers to making all people successful users of information technology
Trust	Refers to expectations that exist between people who can experience goodwill, extend goodwill toward others, feel vulnerable, and experience betrayal
Autonomy	Refers to people's ability to decide, plan, and act in ways that they believe will help them to achieve their goals
Informed consent	Refers to garnering peoples agreement, encompassing criteria of disclosure and comprehension (for "informed") and voluntariness, competence, and agreement (for "consent")
Accountability	Refers to the properties that ensure that the actions of a person, people, or institution may be traced uniquely to the person, people, or institution
Courtesy	Refers to treating people with politeness and consideration
Identity	Refers to people's understanding of who they are over time, embracing both continuity and discontinuity over time
Calmness	Refers to a peaceful and composed psychological state
Environmental sustainability	Refers to sustaining ecosystems such that they meet the needs of the present without compromising future generations

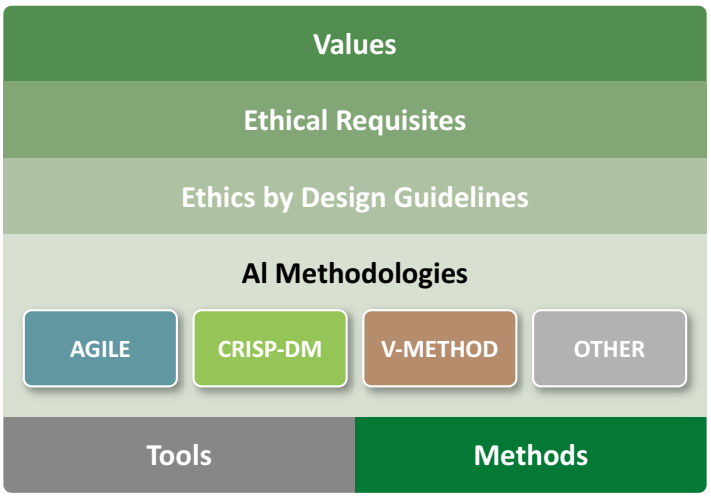
This list of values and the approach of VSD is mainly focused on the identification of values but is limited in providing concrete methodologies to ensure that these values lead to ethical design. In order to make this more concrete we link value sensitive design to ethics-by-design in the next section.

3.3 Ethics-by-Design

The approach to ethics-by-design is a variant on the value sensitive design approach and closely linked to it, but with a specific focus on AI and with some variation compared to the original approach (Brey and Dainow 2020). One key difference is that in ethics-by-design the design process is far more structured and specific than in value sensitive design, with a clearer methodology for technology design. The main aim of ethics-by-design is to prevent ethical issues in the development of new AI projects, ensuring that these issues are addressed at an early stage (Brey & Dainow, 2020). This would ideally prevent ethical issues from arising in the first place, which prevents harm caused by AI systems. To achieve this, ethics-by-design is set to proactively implement moral principles as requirements of newly developed systems.

At the core of ethics-by-design is a 5-layer model, starting out from values (Brey & Dainow, 2020). Each following layer further structures the process of ethics-by-design and is more specific, seeking to enshrine the values into specific methods and tools. As figure 2 indicates, this goes from ethical requisites through design guidelines and methodologies to end up at specific tools and methods.

Fig. 2: The 5-layer model of ethics-by-design (Brey & Dainow, 2020)



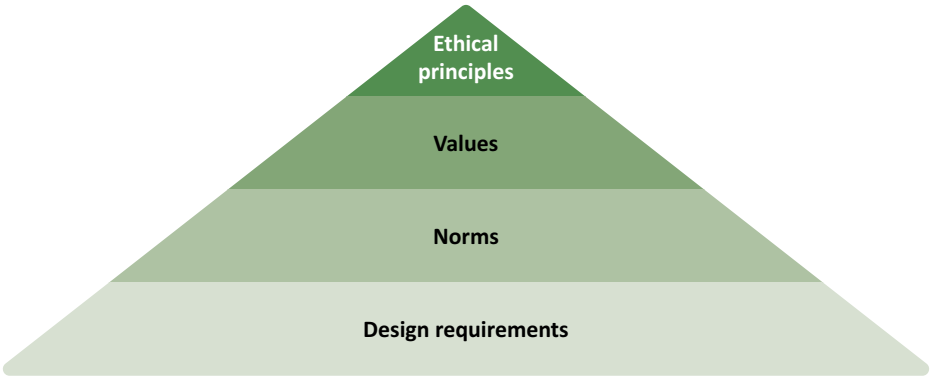
As indicated, the values underpinning ethics-by-design are linked to the values in value sensitive design. In ethics-by-design these values are combined with ethical requisites into 6 categories, namely: 1) respect for human agency, 2) privacy and data governance, 3) fairness, 4) individual, social and environmental well-being, 5) transparency, 6) accountability and oversight. The requisites are the requirements placed on a system in order to express the value, or to give an example, the expression of the value of fairness in the ethical requisite that the system does not exhibit racial bias (Brey & Dainow, 2020).

As a third element, the ethics-by-design guidelines are based on taking general phases in a development process (of AI systems) and mapping the ethical requisites onto these phases. This yields specific guidelines for each of the phases in AI development. This broad step can also be worked out for specific AI development methodologies, as the fourth element of the ethics-by-design approach does. As these next two steps are highly specific to AI and are also linked to mapping the use of values to specific elements in the technology design process, we will not discuss these steps further.

What we take from this approach is a connection of values to specific steps in technology design processes. This allows for the integration of values into norms and requirements for the technology. In order to illustrate how we combine these steps with a broader value sensitive design approach, we use the value hierarchy framework from van de Poel (2013) . Van de Poel (2013) uses norms to specify what ethics-by-design calls guidelines, intending to focus on the same specification of values into prescriptions and restrictions in design. Cawthorne and Robbins-van Wynsberghe (2020) developed figure 3 in order to visualise this process.

The process of going from values to design requirements is by no means an easy task as van de Poel (2013) also highlights. Often an interdisciplinary approach is needed to translate values and norms into design requirements (Van de Poel 2013). An example of this difficulty is the many aspects of human welfare and the balance between these aspects. A range of disciplines cover these aspects and will need to be involved in order to enshrine values in the design requirements of a technology.

Fig. 3: The value hierarchy pyramid, starting at the top from general ethical principles and going towards specific and tailored requirements for a technology at the bottom (Cawthorne and Robbins-van Wynsberghe 2020).



3.4 Responsible Research and Innovation

The responsible research and innovation (RRI) framework has been developed and further refined over the last decade in order to provide a way to ensure that technological developments can be made more ethical while accommodating the difficulties of being responsible for future effects of a technology that might not exist yet (Stilgoe, Owen, and Macnaghten 2013). This is intended as a forward-looking view of responsibility in science and innovation, as a shared form of responsibility of scientists, research funders, innovators and others who have a political responsibility for the technologies developed (Owen and Pansera 2019).

As the RRI framework has been a pillar of DESIRA, we use this framework to show how a commitment to values and the integration of values into design can be effectuated through RI. We do this through linking previous sections (on value sensitive design, ethics-by-design and virtue ethics) to the Anticipation, Inclusion, Reflexivity and Responsiveness (AIRR) framework:

- **Anticipation**
  Anticipation has as a goal to articulate and reflect on potential intended and unintended applications, impacts and interactions of an innovation. “What if” questions are asked to consider what is known, what is likely, possible and plausible. The goal of anticipation is to engage with visions for the innovation and for the impacts of the innovation and to better understand how the technology will interact with existing socio-technical contexts(Owen et al. 2013; Owen and Pansera 2019). This can be most closely linked to the conceptual stage of value sensitive design, where stakeholders are involved at an early stage to understand how the technology might function in society.
- **Inclusion**
  Inclusion is linked to the broad involvement of stakeholders in the innovation process. This is similar to value sensitive design approaches, where stakeholders are involved in order to identify values and to understand the use and context of these values. In the ideal RI process inclusion is more radical than this, as Owen et al. (2013) already indicated, as stakeholders should then be able to have a major impact at an early stage of the innovation process.
- **Reflexivity**
  Reflexivity on the purpose, motivations and values behind an innovation is mainly linked to the virtue ethics aspect of this ethical code. Value sensitive design and ethics-by-design are more focused on how stakeholders values need to be integrated in design, rather than on a reflection on the side of innovators, engineers and other actors involved in the innovation process. Owen et al. (2013) indicates that the involvement of philosophers and social scientists can be helpful in this step in order to help reflect on norms, socio-political contexts, agendas, motivations, purposes and values.
- **Responsiveness**
  Responsiveness is an overarching category which involves the steps of anticipation, inclusion and reflexivity and stresses the need in the innovation process to respond to findings of these steps. This can be the effective integration of values found through inclusive, anticipatory and reflexive processes, as Owen et al. (2013) also highlight. There is similarity with the value sensitive design and ethics-by-design process, which stress the need to integrate values into the final design.

RRI has been critiqued for the potential of instrumentalisation, often linked by critics to a lack of attention to power and politics (van Oudheusden 2014; Valkenburg 2020). This is a risk, and we want to stress that none of the approaches listed above should be approached as a checklist for ethics or as a shortcut in involving ethics in the design of new technologies. Rather, they provide frameworks to think through the design of new technologies, but all require the active work of innovators and other actors in order to develop technologies that do enable human (and non-human) flourishing.

We provided the previous frameworks in order to provide a theoretical backing for the steps that we develop in the next sections of this ethical code. These more practical steps provide a way to ensure that ethical concerns are taken up in digital technology development for rural areas, agriculture and forestry. In this we highlight results from the DESIRA project where ethical issues or considerations arose in order to help others in understanding what needs to be considered for ethical design of technologies.

4 Values from existing ethical codes/codes of conduct

The next sections deal with the values identified in existing ethical codes, codes of conducts and in the DESIRA empirical work through the living labs. Values have to be understood as everything that is found to be important by people and communities. Everything that matters to humans is a value and of value. The things that are important to people in their lives with a focus on ethics and morality are values (Friedman and Hendry, 2019).

In line with the focus of DESIRA, we had a broad scope for looking at existing ethical codes and codes of conduct. We considered a set of key technologies labelled as potential digital game changers (Bacco et al. 2020): social media and social network - web based technology; cloud/edge computing; local and remote sensing; distributed ledger; data analytics; augmented/virtual reality; 3D printing; artificial intelligence; autonomous systems and robotics & connectivity (Bacco et al. 2020), and looking for codes developed for agriculture, forestry and rural areas. This resulted in two main types of documents:

1. a number of documents focusing on ethical aspects in relation to AI use in society, often starting from bioethics principles. One document elaborated more in general on disruptive technologies.
2. specific initiatives about data use in the field of agriculture (smart farming): however, these are rather codes of conduct, and don't have a strong ethical basis. Extensive work was done in the H2020 IoF project specifically on the EU code of conduct, offering suggestions for improvement.

Based on these two criteria a selection of 6 codes and frameworks have been included in the analysis: the New Zealand Farm Data Code of Practice (Farm Data Accreditation LtD 2016); the EU Code of Conduct on Agricultural Data Sharing (Copa-Copega 2018); GODAN - Responsible Data in Agriculture (Ferris and Rahman 2017); Ai4People – Ethical Framework for a Good AI Society (Floridi et al. 2018); Principled artificial intelligence (Fjeld et al. 2020) and WEF - Responsible Use of Technology (Krieger et al. 2019). This selection was made with the intention to cover the selection criteria without being exhaustive. The documents we review provide an overview of the most important ethical issues and were selected to provide a holistic overview of the thinking around ethics for digital agriculture, rural areas and forestry. The documents have been reviewed with a focus on the values expressed in these documents. Table II provides the values that have been identified in the set of documents.

Tab. 2: Human values identified in the various existing ethical codes

Human Value	Origin
Privacy	New Zealand Farm Data Code of Practice - Expressed in setting the requirements for who has access to data, what rights to data are set and how data availability is set. EU Code of Conduct on Agricultural Data Sharing - Explicitly named, both in relation to the GDPR and as it relates to data ownership or data attribution AI4People - Ethical Framework for a Good AI society - They see as a particular concern the prevention of infringements on personal privacy. Fjeld et al (2020) - Principled Artificial Intelligence - AI systems should respect individuals' privacy, both in the use of data for the development of technological systems and by providing impacted people with agency over their data and decisions made with it.
Data Ownership	EU Code of Conduct on Agricultural Data Sharing - Also called data attribution. Data originators (companies or people where the data is produced) are explicitly named in relation to who has control over the use of data.
Agency	EU Code of Conduct on Agricultural Data Sharing - Data originators should be able to move data to other systems and platforms. AI4People - Ethical Framework for a Good AI society - Agency is named as one of the four fundamental points for human dignity and flourishing. The enhancement of agency with technology is explicitly named. Fjeld et al (2020) - Principled Artificial Intelligence - In this document agency is understood as human control of technology, highlighting the need for important decisions to be subject to human review.
Trust	EU Code of Conduct on Agricultural Data Sharing - Named as the result of transparency and responsibility in data sharing.
Equality	GODAN - Responsible Data in Agriculture - Equality is seen as important to the potential use of technologies, where equal access to resources is fundamental. Fjeld et al (2020) - Principled Artificial Intelligence - Equality is named as a value, relating to the potential for people to have the same opportunities and protections with the rise of AI technology.
Access	GODAN - Responsible Data in Agriculture - With the understanding of access in a broad sense. This includes not just open data but also the possibility for actors to use this data for their own needs. Requires the removal of barriers of insufficient scientific data skills, language and literacy and technical skills.
Protecting vulnerable communities	GODAN - Responsible Data in Agriculture - Concern should be given to particularly vulnerable communities, such as indigenous populations, migrant farmers and displaced smallholder farmers who are lacking in basic land rights; women are especially vulnerable in such circumstances. These communities have difficulty accessing the benefits of digital technologies and often also have difficulty in protecting their ownership over data.

Human Value	Origin
Education & Awareness	GODAN - Responsible Data in Agriculture - Increasing awareness is needed for smallholder farmers to defend their rights to data. Information and knowledge is crucial, farmers need to enrich their knowledge and ability to identify effective information in order to adapt to the changes of social development. The role of advisory and extension services is important to provide training for smallholder farmers. AI4People - Ethical Framework for a Good AI society - Referred to as autonomous self-realisation and is one of the four fundamental points for human dignity and flourishing. Fostering the development of AI in supporting new abilities and skills should be supported.
Co-creation and multistakeholder engagement	WEF - Responsible Use of Technology - Cocreation and multistakeholder engagement is seen as a value in and of itself. Stakeholder engagement is emphasised with concern given to vulnerable populations and marginalised groups.
Flexibility and innovation	WEF - Responsible Use of Technology - "The abstract nature of ethical principles allows for flexibility and innovation when analysing the potential risks and opportunities of disruptive technologies that go beyond regulatory compliance." This stresses the opportunities of innovation and of disruptive technology.
Transparency	WEF - Responsible Use of Technology - Ensuring that people can understand a technology is listed as a value. Can be improved by sharing the science behind a technology. Fjeld et al (2020) - Principled Artificial Intelligence - Linked to explicability and explainability. The requirement that AI systems be designed and implemented to allow for oversight, including through translation of their operations into intelligible outputs.
Fairness and the prevention of biases	WEF - Responsible Use of Technology - The value of fairness is stated in relation to concerns about discrimination, bias and a lack of clear decision-making processes in AI. This includes accurate and representative data-sets for AI training. Fjeld et al (2020) - Principled Artificial Intelligence - Fairness and non-discrimination principles calls for AI systems to be designed and used to maximise fairness and to promote inclusivity.
Societal cohesion	AI4People - Ethical Framework for a Good AI society - Refers to the need to have collaboration and societal cohesion in order to meet large societal challenges.
Environmental sustainability	AI4People - Ethical Framework for a Good AI society - Referred to in the section that describes: "The need for technology to be in line with the basic preconditions of life on our planet, ensuring the prospering of mankind and the preservation of a good environment for future generations." Fjeld et al (2020) - Principled Artificial Intelligence - Reference to the principle that AI technology (and its developers) should be held accountable for its ecological impact.
Safety and security	Fjeld et al (2020) - Principled Artificial Intelligence - The express requirements that AI systems be safe, perform as intended and are also secure, resistant to being compromised by unauthorised parties.

5 Values identified through DESIRA empirical work

Much of the work in the DESIRA project has been built on workshops and interviews with stakeholders across the 20 living labs. The rich data gathered across these workshops and interviews highlight ethical values that need addressing in the digital transformation of agriculture, rural areas and forestry. We have collated these values based on the deliverable reports of work packages 1, 2, 3 and 4 in the DESIRA project. Work package 1 entails the taxonomy of impact, where interviews on digital impacts show values as identified by experts. Work package 2, which sets out the needs, expectations and impacts of digitalisation shows the needs and expectations that stakeholders want digitalisation to address. Work package 3 entails the scenario report and the use cases. The scenario report is valuable in highlighting winners and losers of digital transformation and fears and hopes around ethical issues by stakeholders. The use cases in WP3 are especially valuable in that they address technological development itself and are concrete examples of how technology development can be done in a more ethical way. For this reason we use the use cases to show how ethical reasoning can be done in practice, using the framework we developed in this ethical code. The policy briefs (WP3.2) are valuable for the fact that stakeholders were involved in discussing digital policies, which highlights issues that need addressing for technologies to support the flourishing of (human) life.

Table III shows the different values uncovered and discussed in the DESIRA project. We include a short description and refer to where the value is discussed in the DESIRA deliverables. We combine and consolidate table I with the values from value sensitive design in table III. We see this combined list of values as an essential list of values for the ethical digital transformation of agriculture, rural areas and forestry. It is however by no means an exhaustive or definitive list, as different contexts or specific digital technologies might require additional ethical values to be considered.

Tab. 3: Overview of ethical values as set out in the DESIRA deliverables

Human Value	Origin in DESIRA
Privacy	**D1.3 Taxonomy, section 3.4.4** The need for people to be free from surveillance and the need to have transparency in data use and sharing **D3.1 Scenario report, section 4.3** The right to know how data is used, the right to not have data be misused and the right to control data access. **D3.1 scenario report, section 5.1** Data privacy including data sovereignty and data ownership. Should be taken up as a design principle according to many of the living labs. Regulation on data sharing helps build trust in digital tools.

Human Value	Origin in DESIRA
Meaningful employment and labour	**D3.1 Scenario report, section 4.1** An indirect reference to rural and agricultural employment, in that the decline of rural areas is linked to a lack of employment in these areas. This is linked to the fear that increasing use of digital technology might replace labour in rural areas.
Community	**D3.1 Scenario report, section 4.1** There is a need for healthy (rural) communities that can flourish. This depends on reducing isolation between people and requires the creation of open, welcoming and diverse communities **D3.2 Policy Briefs (Poland)** In the negative scenario there is a depopulation of rural communities. **D3.2 Policy Briefs (Greece)** In the positive scenario there is the possibility for young people to enter the agricultural sector which ensures the viability of rural communities (by keeping young people active in rural areas).
Skills & Education (self-actualization/self-development)	**D3.1 Scenario report, section 4.2** It is necessary that people have the possibility to develop new skills and to be educated. This is linked to the possibility to gain digital skills and to the digital divide between those who have digital skills and those who do not. **D3.2 Policy Briefs (Hungary)** The policy brief sets out that there is a need for small-scale farmers to develop digital skills and to use digital agriculture technologies
Diversity	**D2.2 Needs, expectations and impact** To prevent structures and mechanisms in digitalisation that perpetuate and exacerbate existing negative trends in European agri-food systems and rural areas including sexism and transphobia, xenophobia and racism **D3.1 scenario report, section 4.5** A positive scenario entails the potential for diverse groups of people to live a fulfilling life in the same community/region. **D3.2 Policy Briefs (Finland)** The positive scenario makes mention that being part of both rural and urban networks is good as it prevents living in silos in a shared society

Human Value	Origin in DESIRA
Inclusion	**D2.2 Needs, expectations and impact** To prevent structures and mechanisms in digitalisation that perpetuate and exacerbate existing negative trends in European agri-food systems and rural areas including sexism and transphobia, xenophobia and racism **D2.2 Needs, expectations and impact** Include farmers, rural people, local administrators and any relevant stakeholders in setting up research and innovation agendas for digitalisation, as well as its evaluation, dissemination and validation of findings
Equality	**D2.2 Needs, expectations and impact** To ensure a fair distribution of monetary and non-monetary value created by a technology
Agency	**D1.3 Taxonomy, section 3.3.1.1** The need to create trust in digital technologies by providing farmers with agency in setting and controlling automated technologies on their farm **D3.1 Scenario report, section 8** The potential for persons and communities to be involved in (or in control of) shaping their own circumstances and futures. Increased participation and equal power sharing is encouraged **D3.2 Policy Briefs (Netherlands)** Encouraging discussion between residents and local policy makers, enable citizens to have their voices heard **D3.2 Policy Briefs (Italy)** The involvement of rural communities in the use of digital tools, where they use these tools to communicate with governments and digital tools enhance government services provided
Welfare	**D3.2 Policy Briefs (Scotland)** Gross domestic happiness, focus on ensuring mental health and wellbeing at a community level **D3.1 scenario report, section 6.2** shown through actors being able to provide a decent income for themselves **D3.2 Policy Briefs (Belgium)** Supporting fair incomes for farmers, taking into account other values around environmental sustainability of their production systems
Biodiversity	**D3.1 Scenario report, section 7.1** The need for the creation of biodiverse rich habitats enhanced, preserving existing biodiversity and ensuring that a diversity of species can thrive

Human Value	Origin in DESIRA
Environmental Sustainability	**D3.1 scenario report, section 7.2** Ecological sustainability and improved sustainability is important. Both reduced resource use and decreased emissions of pollutants fall under this category. **D3.2 Policy Brief (Austria)** Biodiverse forests that are sustainably managed are a good thing and lead to 'winning' scenarios.
Animal wellbeing	**D1.3 Taxonomy, section 4.2 table 9** Animal wellbeing, including animal health and animal welfare are named as important potential socio-economic impacts of digitalisation
Freedom from bias	**D2.2 Needs, expectations and impact** Listed as a recommendation is the prevention of embedded biases in software and hardware components that influence data collection, analysis and final service and value capturing.
Adaptable technology	**D2.2 Needs, expectations and impact** Listed as a recommendation is the capacity of a digital solution to be used for different purposes without totally modifying its main settings. This includes the capacity for users to modify the rules and design of digital technologies and systems in negotiation and agreement with other stakeholders. **D3.2 Policy Brief (Germany)** The possibility for technology to be adapted to local and specific context to enhance uptake of digital technologies.
Resilience	**D3.2 Policy Brief (Italy)** Through digital technologies rural communities can enhance their resilience, in this case to extreme weather events.

6 An overarching value list for ethical digitalisation in agriculture, rural areas and forestry

Based on the values from value sensitive design and the values from the DESIRA project we have created a new list (Fig 4) that combines and integrates the values listed in Tables 1, 2 & 3. Values are defined here as "what is important to people in their lives, with a focus on ethics and morality" (Friedman & Hendry, 2019)

The integration of the different lists of values has been guided by three key points:

1. Reduce the total number of values so that overlap between values is reduced
2. Ensure that each value is understandable and precise
3. Provide a list of values that covers all ethical issues in agriculture, rural areas and forestry

To achieve these aims we took the empirical data (table III) as the basis for our final list. In discussion between the authors of this report we combined several values. The reasons for combining values and how the final values relate to the three sets of values (from value sensitive design, existing ethical codes and the empirical work in the project) are provided underneath figure 4, where we also describe each of the 12 values. Three of the DESIRA use cases (from Greece, Austria and Germany) provide examples of how these values are brought into practice, including the norms and design requirements that are necessary to ensure these values. Additionally, a workshop at the DESIRA final conference provided input for the value descriptions.

These use cases are the description of a future socio-cyber-physical system in which selected digital solutions are used to achieve certain objectives. The use cases involve both users and broader stakeholders, defined as actors. They are built on input from DESIRA activities and contain a use case statement (defining the main technical solution envisioned and main subjects involved), and an expected output (use case specification detailing the actors, goals, tasks, ICT components, task descriptions, impacts, drivers, barriers). The three use cases that provided input to this ethical code are diverse, and target both different domains (agriculture, rural areas, forestry) but also use different digital technologies to meet their goals. We provide a short description of each of the use cases.

The Austrian use case aimed to provide single-tree roundwood traceability involving loggers, traders and processes in order to strengthen forest ecosystem resilience. This system includes a mobile tagging device and data collected from remote sensing systems in order to trace single trees throughout the value chain. As this case followed a start-up, RRI principles were not yet applied and it is more relevant to focus on the values expressed in the technology. Environmental sustainability, trust, biodiversity and agency were the main values identified.

The German use case has been focused on how the local administration can bring citizens of different generations and backgrounds together to foster communication, exchange of knowledge and joint activities. This system includes a web application that allows for the organisation of events while also connecting to existing digital services in the region. RRI principles of anticipation, inclusion, reflexivity and responsivity are relevant in this case. Anticipation showed through the early involvement of ethical

reasoning in the development of this technology and inclusion was ensured by involving broad target groups, including citizens, administrations and local businesses at this stage.

The Greek use case has been focused on the development of a system for collecting, gathering and analysing data from the wine supply chain (from grape producers through vineyards and wineries to consumers). The system aims at enhancing the traceability and security aspects of the products and also aims to increase resilience in the wine value chain by strengthening the position of farmers and wine producers in the market.

Fig. 4: overview of relevant values to ethical digitalisation in agriculture, rural areas and forestry

Survey on values among the DESIRA living labs:

A survey among the living lab partners of the DESIRA project showed the relevance of the values to digitalisation in agriculture, rural areas and forestry. 13 of the 20 living labs completed the survey. The values of community, trust, environmental sustainability and universal access were highlighted as the most relevant values to the living labs.

Respondents were also asked about the positive and negative impacts of the technologies in the living labs. Privacy is the main value that is negatively impacted by digitalisation, with 5 living lab partners indicating that this value was negatively impacted by the technology in their living lab. However, living lab partners anticipated many more positive impacts. Environmental sustainability, universal access and community, three of the values that are seen as particularly relevant, were all positively impacted in many of the living labs.

Trust is the outlier, as it is indicated as a relevant and important value, but few of the living labs expected a positive impact on trust in their living lab. This might indicate the elusiveness of trust. As a value it is difficult to measure and it might be challenging to indicate how trust is built and reinforced. We explore several options to build trust in the descriptions below, indicating the need for transparency, co-creation and participation by users.

The value of **privacy** is listed in all three tables and is a recurring theme, both in the project and in other work. The value of privacy refers to a claim, an entitlement, or a right of an individual to determine what information about himself or herself can be communicated to others. This is reflected in the DESIRA scenario report, which highlights the importance for actors to know how data is used, the right not to have data be misused and the right to control data access. In a survey of the living labs, privacy was the main value that was seen to be negatively impacted by digitalisation. For this reason we see this as one of the primary design principles that need to be taken up for technology design. In the taxonomy report, privacy is also considered to be important in order to be free from surveillance. At the workshop, participants mainly highlighted the need for awareness which can be taken up in technology design by making users aware of privacy risks. Additionally, it was mentioned that hard limits on data sharing can be taken up in technology design, where certain sensitive data cannot be shared (by limiting the collection of this data).

Human welfare is defined in VSD as people's physical, material and psychological wellbeing and the means to ensure this welfare. Here we also include ownership and property in this value, as this directly relates to people's material wellbeing. Additionally, the issue of data ownership which is reflected in the value of ownership and property is generally also covered by the value of privacy. This value also combines the values of meaningful employment and labour, welfare and wellbeing from the empirical work in this project. These values each cover a separate aspect of material, psychological and physical wellbeing. In Greece the use case covers this value, where a digital tool allows farmers to improve the quality of local wines and can provide additional value to the final product. Data collected through the system can be used to improve the human welfare of farmers.

To achieve this success there is however a need for **self-development and self-actualisation**, as farmers need to have the necessary skills and knowledge to use this data successfully. There is a need to develop this in the Greek use case, which is only an example of broader issues that are encountered by people everywhere. The digital divide is an issue in rural areas, agriculture and forestry and education can help to cross this divide. Digital technologies can also help achieve this value, by supporting the development of skills and knowledge of people and by creating the potential to do so. Examples provided at the workshop were video tutorials, IT coaches and peer-to-peer learning enabled by digitalisation.

Universal usability can help reduce the digital divide as well, by reducing the barrier to entry of using digital technologies. Universal usability also supports the values of equality and diversity & inclusion by ensuring that all people can use technology. In the German use case, universal usability is of importance to ensure that elderly people and people who do not have smartphones are also able to use the application in the use case. Universal usability is ensured by making the application work on desktop PCs and various other devices. The uptake of the value of universal usability is especially relevant for people with disabilities, who might not be able to use digital technologies otherwise. By ensuring that technologies can fit the needs of local populations and local communities, digital technologies can meet the needs of end-users. This also allows end-users to adapt the technology to fit their own needs which was mentioned at the workshop where participants highlighted the need for open source initiatives and for allowing users to modify applications. Equally, co-design, shared testing and customisable graphical interfaces were mentioned as essential.

By ensuring the value of universal usability, developers can also ensure that values of **diversity, inclusion and identity** are met. Diversity and inclusion covers the separate values of diversity and inclusion from table III and also includes the value of protecting vulnerable communities that has been mentioned in other ethical codes. To meet this value it is necessary that racism, sexism and xenophobia are countered where possible and that all people are able to live fulfilling lives in rural communities. Equally, technologies should accommodate the identities of users rather than the other way around, something that is especially relevant for social media which can filter or censor certain lifestyles and identities. The German use case seeks to address this value by facilitating the exchange between groups of people who are usually less likely to interact.

To ensure **diversity, inclusion and identity** there is also a need to ensure that digital technologies are **free from biases**. This is a significant risk in digital technologies, especially for the development of decision support systems and AI systems. Digital technologies are not free from pre-existing social bias, technical bias, and emergent social bias. Developers of technologies will need to prevent embedded biases in software and hardware components that influence data collection, analysis and final service and value capturing. This is closely linked to diversity and inclusion, as the identity of people needs to be respected in a diverse and inclusive society.

By ensuring diversity and inclusion, developers can also help support the value of **community**. Open, welcoming and diverse rural communities are important. There are concerns in rural communities about the threats to their community, brought about by depopulation and the disappearance of services. Digital technologies can help provide opportunities for young people in rural areas so they are more likely to stay or enter these rural communities. At the workshop the participants stressed to start from the needs of local communities and to support and maintain initiatives over a longer period of time. It can also help ensure that services are provided to the people in the community, although so far digitalisation has often been part of austerity measures that work to cut costs and services to rural communities.

Healthy and flourishing rural communities also need to be **resilient**, a value that can be enhanced by digital technologies. In the project, both the Italian and Spanish living lab dealt with this value in relation to climate change and natural disasters. Digital technologies help improve land management in the Italian living lab, reducing flood risks and fire risks. Equally, the Spanish living lab is situated in an area dealing with increasing fire risks. Digital technologies can help reduce these risks and can also reduce the impact when a disaster does happen.

This also allows people to regain **agency** over the digital technologies they are using. Agency is a recurring theme, both in DESIRA and in other ethical codes. Agency ensures that people are in control over their own future and can shape the direction of technology, rather than their future being shaped by the technology. To ensure agency, people need to be involved in the technology design and development. Equally, people need to have agency in deciding which technologies they use or do not use. In the Austrian use case, agency is a value that is taken up by allowing citizens more insight in the tracing of roundwood logs. Improving user agency can be supported by user-oriented design and open innovation platforms. The participation of citizens and community-oriented action were listed at the workshops as further measures that can support this value.

The Austrian use case also makes mention of the values of **environmental sustainability** and biodiversity. Environmental sustainability refers to sustaining ecosystems so that they meet the needs of present and future generations. This is explicitly a human value, as it refers to the need to ensure resources for human populations. This covers both resource use and emissions of pollutants. Digital technologies can both increase environmental sustainability, but developers also need to be aware of the environmental impact of their technologies. Environmental sustainability should also cover non-human needs and then refers to the need to preserve biodiversity in all its forms and the need to preserve and develop habitats that ensure that a diversity of species can thrive. Sensors and increased data usage can also support and optimise land management, which was a case that was highlighted at the workshop of how digitalisation can support environmental sustainability.

We have also included the value of **animal wellbeing**, which we use to refer to the needs of wild animals and livestock populations. In the digital transformation of agriculture this value is especially relevant as the introduction of robots and sensors will impact the wellbeing of livestock. The robot-animal interaction needs to be considered before development. Examples of current impacts are feed and milk robots on dairy farms and harvest robots on chicken farms. Additionally, more and more sensors are in development and use to track livestock health and productivity. In the development of these technologies attention will need to be paid to the potential impact on animal wellbeing, which can be expressed as the recognition that animals have intrinsic worth and can feel both pleasure and pain. For livestock this entails good feed, healthy environments and good health and that there is possibility and space for animals to express natural behaviour.

A last value is **trust**, which is important to ensure that technologies become adopted. The Greek use case named this as one of the most relevant values, as it was the basis for the use of digital technologies in their living lab. This requires the development of technologies that provide accurate and precise information that is useful to the users. The Austrian use case described that trust is also important for a supply chain to adopt a technology for tracing roundwood logs. Different actors need to be sure that they can trust the information from digital technologies so that they know the roundwood log is sourced from a sustainably managed forest. In the workshop at the final conference several methods and tools were listed that can help develop trust, which includes accountability mechanisms in civil society, co-creative methods and participation with transparency about the use of feedback from users.

7 Concluding: using the DESIRA ethical code

As explained before, the DESIRA ethical code is developed as a tool to support reflection and discussion during technology design. The ethical code is now designed as a set of key values, which we believe are essential in the process of digitalisation in agriculture, forestry and rural areas. However, such a value list is not to be considered as exhaustive, and the possible existence of trade-offs between the different values needs to be acknowledged.

Regarding the recommendations for using the ethical code, we stay close to the recommendations and principles proposed by Value Sensitive Design (Friedman and Hendry 2019), in which it is explained that value elicitation in relation to technology development is an ongoing and context-specific process, requiring strong stakeholder involvement. As such, dialogue and discussion around values is essential to strengthen the ethos of actors, institutions and organisations involved, reinforcing its values. This interaction is needed to expose actors to ethical considerations and minimises the chances of unethical behaviour occurring (NCOSS, 2015). So, while we believe the ethical code presents a number of key values, these are merely a starting point for further discussions and considerations during digital technology development.

We see a clear responsibility for both technology developers and policy makers/managing authorities in supporting the implementation of the ethical code, by more explicitly integrating values throughout the design process, or by considering them as selection or evaluation criteria for innovation projects or subsidy programmes. Regarding more specific recommendations for its use, we want to emphasise 3 main principles regarding the use of this ethical code.

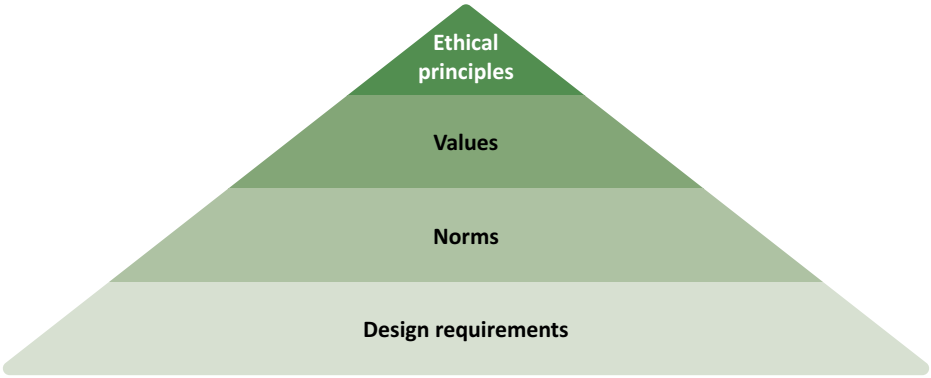
Context specificity: when talking about digitalisation, it is important to recognise that this encompasses a very diverse range of technological tools set in diverse socio-cultural contexts linked to digitalisation in agriculture, forestry and rural areas. This has substantial implications for the values at stake; i.e. developing an online farm shop to support short chain sales is not to be compared to digital tools for wood traceability over the entire process lifecycle, which is again different from robots for weed control in organic production. In general, for each new case, which includes both the design of new digital technologies and the implementation of existing digital technologies in new contexts, an ethical reflection is needed. This can start from the current value list, but in every case, it needs to be decided if all values are relevant, and if other values are missing.

Co-design: the importance of following co-design, co-creation, participatory and inclusive approaches is again reaffirmed. Participatory methods, the RRI approach and other Inclusive Innovation initiatives are well-known in both technology development and among policy-makers. This ethical code builds on these existing initiatives and approaches and encourages the involvement of a broad range of diverse stakeholders in technology development. Specific exercises for direct and indirect stakeholder identification should be an important first step in each case. The main addition of this ethical code is the integration of values in these participatory methods and the concrete steps of values to norms and design requirements for technologies. For this we return to the value hierarchy pyramid (figure 5). While this ethical code shows the values that are important to digitalisation in agriculture, rural areas and forestry, it does not show how these values can be expressed into norms and design requirements.

This is a strategic choice, as norms and design requirements are specific to a given technology and context.

For technology designers, going down the value hierarchy pyramid will be based on both internal discussions and discussions with stakeholders. There are compromises to be made between functionality of a technology and some of the values. An example of how values might be integrated in technology design is provided in the text box below, highlighting the Greek use case, where a system for collecting, sharing and analysing data in the wine supply chain is developed.

Fig. 5: The value hierarchy pyramid (Cawthorne and Robbins-van Wynsberghe 2020).



Greek use case: Living Lab Digital Services for rural and farmer Communities

Following the value hierarchy pyramid, the value of self-development and self-actualisation, mentioned in the DESIRA ethical code is especially relevant to the Greek living lab. The age and digital literacy profile of farmers and producers, combined with their limited experience with digital tools ensured that self-development was essential if digital tools were to be adopted. The digital tool in question is a system that helps with data collection and analysis so that traceability is enhanced and that the position of farmers and wine producers in the wine supply chain is enhanced.

In order to ensure that the value of self-development and self-actualisation was integrated into the technology design, the Greek living lab partners decided to focus on the customisation of the user interface, so that it could serve the target audience. This took into account the digital literacy level and capabilities for operating the tool. While this might simplify certain elements of the technology, this also allows the greatest possible audience to use this technology. Given the specificity of the case, the Greek partners also examined the possibility to add extra training and helpdesk features to benefit the user experience.

This highlights how values can be enshrined in technology design. A value (self-development and self-actualisation) is taken and translated to norms. These norms (ensuring that the maximum number of users can use the technology and that technology provides options for learning) are then translated to specific design elements of the technology (helpdesk features, simplicity, customised user interface).

Expanding the design space: processes of technology design should expand the design space to include social structures integrated with technology, such as policy, law, regulations, organisational practices, social norms, and others. This allows for a broader consideration of impacts of the technology. This can provide new solutions and insights that would not be considered when focusing on the technology alone. The values that should be enshrined in technology design need to come from a broad structure and base, which in turn will help technologies to become fit for use in agriculture, rural areas and forestry. The additions of this ethical code to existing participatory procedures help ensure that ethical discussions do not stay purely in the realm of discussions between stakeholders and technology developers but that inclusion will have a concrete and real impact on the design of a technology.

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