Contribution on ODD (Operational Design Domain)

"Operational Design Domain: definition, quality model and relation to trustworthiness"

This contribution is proposed in order to get preliminary feedbacks on the concept of ODD. ODD is cross-cutting, data governance, trustworthiness characteristics, risk management, and quality management.

ODD stems from two critical areas for safety (automotive and aeronautics). In the EU AI regulatory context, the notion of safety is being extended from the safety of people and property to the protection of fundamental rights, the environment and democracy. Therefore, the concept of ODD is considered to be applicable to all high-risk systems, as no AI system can be designed and verified for any environment.

Therefore, for AI systems, the concept can be seen as the boundaries or operating conditions for which an AI system is specified, designed, and verified. Functioning boundaries of an AI system can be of any type: temperature, location, age, gender, weather conditions, internet traffic,

In the following pages, the Operational design domain (ODD) refers to the set of operating conditions for an AI system (e.g., self-driving cars, transports, ships, robots). It is used by manufacturers to indicate where their product will operate safely[1]. As mentioned before, the notion of safety is being extended to more than just the safety of people and properties.

Defining an ODD is important for developers and regulators to establish clear expectations and communicate the intended operating conditions of automated systems. For instance, the framework document for automated vehicles published by UNECE work forum for harmonization of vehicle regulations[2] states the following:

> *For the assessment of the vehicle safety, the vehicle manufacturers should document the ODD available on their vehicles and the functionality of the vehicle within the prescribed ODD. The ODD should describe the specific conditions under which the automated vehicle is intended to drive in the automated mode. The ODD should include the following information at a minimum: roadway types; geographic area; speed range; environmental conditions (weather as well as day/night time); and other domain constraint.*

This document is a first contribution to a future horizontal standard section:

- that addresses requirements for the safety of AI systems, at the process level (ODD specification), at the characteristics level (ODD quality model), at the assurance level (ODD

[1] Excerpts from Wikipedia (https://en.wikipedia.org/wiki/Operational_design_domain)
[2] https://unece.org/info/publications/pub/365097

evaluation model), and at the management level (impacts on trustworthiness and quality management);

- that enables the interplay with vertical standards;

  Example 1 Integration with ISO/PAS 8800 (Safety and artificial intelligence) for road vehicles;

  Example 2 Integration with ISO 31700-1 (Privacy-by-design for consumer goods and services) for automated consumer products;

- that can be used jointly with other AI standards

  Example 3 Extending ISO/IEC 25059 (Quality model for AI systems), with a quality in design model that complements the quality in use model and the quality product model of the 250XX serie.

Operational Design Domain: definition, quality model and relation to trustworthiness

Summary

1. Terms and definitions

operational domain
OD
real-world conditions that an AI system may experience
Note to entry: real world means physical and digital environments
Source: ISO/DIS 34503: Modified with replacement of "Automated Driving System (ADS)" by "AI system"

operational design domain
ODD
Operating conditions under which a given AI- system is specifically designed to function as intended, in line with its intended purpose
Note to entry: Operating conditions includes but is not limited to environmental, geographical, gender, and/or time-of-day restrictions, age, knowledge and health conditions of users.
SOURCE: SAE J3016 [modified]

intended purpose
intended goal
AI system high-level goal requirements understandable by stakeholders

intended domain of use
AI system high-level domain of use requirements understandable by stakeholders

2. Operational Design Domain

2.1 Introduction

AI systems will be operating more and more in open and complex environments, whether physical or digital, where sources of risks are growing, potentially leading to harms to individuals, workers, organizations, the environment and to society. AI risk mitigation can be achieved by many ways, including human oversight, risk management, quality management... Still, managing the intended purpose and intended domain of use (e.g., its operating environment) of an AI system is often necessary for quality assurance of AI systems performances, since the performance of an AI system cannot be guaranteed for "any environment".

The elicitation of an AI system intended goal and intended domain of use is essential to risk management, quality management and conformity assessment of AI systems. The intended domain of use is translated into engineering terms with technical properties and called ODD. Operational design domains are not limited to physical environments but may also include digital environments of the concerned AI system.

For AI systems, "intended goal"/"intended purpose" and "intended domain of use" are very high-level requirements that have to be translated into "engineering terms". The engineered "intended domain of use" is called Operational Design Domain (ODD). The ODD is the operational conditions for which an AI system is specified, designed, verified, assessed, operated, and disposed.

Operational Design Domain originates from the automotive industry, first evoked in 2016 in the SAE J3016 standard “Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles”. With the rapid emergence of Advanced Driving Assistance Systems (ADAS) and automated driving, the automotive industry needed an engineering artefact that allows delimiting the

operating conditions in which the driving automation system (potentially based on AI) would be able to handle part or all of the dynamic driving activities, taking into account technological limitations. It has to be noted that aeronautics is starting to adopt that concept which fits very well to safety issues in the "physical" environment.

While AI system risks are now recognized as going beyond safety and security concerns, the ODD concept can be extended from human safety to the protection of fundamental rights, the environment and civil society. In the context of worldwide AI regulation, a multi-sectorial ODD approach is developed.

2.2 Concept

The operational design domain (ODD) is a voluntary restriction of the operational domain (OD) within which the expected nominal functioning of an AI system is ensured.

The ODD is a description of measurable foreseeable operating conditions within which a system/component shall operate. A traceability property shall be assured between the different levels of ODD (system, subsystem or component).

Measurable foreseeable conditions refer to the specification of the system or component application domain. The application domain is defined as the technical representation of the operational domain for which the system is designed, e.g., the mission Profile in automotive industry, the flight envelope in aeronautical industry, etc. Initially, the notion was restricted to Systems/Subsystems/Components not integrating AI technologies. In general, this technical information is defined in Datasheets (manufacturer-provided documents) that explain what an electronic component does, provide a summary of an AI component technical characteristics, and describe how and when to use the AI component.

ODD is a domain-agnostic concept. Still, to flexibly adapt to application and sectorial practices this concept is expected to cover a wide range of sectors, it is encouraged to refine, adapt and modify it when considering specific sectorial demands

2.3 ODD specification

Several approaches may be used to define an ODD depending on the maturity of the system development process for the considered application:

- At the prototyping stage, the data used for AI model training are the data that are available or that have been captured by installing and configuring adequately some perception capabilities. When the system is satisfactory in terms of performance, it is necessary to make sensibility studies to evaluate the impact of variations of conditions, and of the representativeness of situations collected to try to establish a characterization of the domain of situations where the system will stay effective beyond the strict conditions where it has been trained. This will give a first version of the ODD.

- When, after such prototypes, one plan to develop a real system, a more structured approach can be applied, where the ODD is specified early during the system definition phase. The process followed is based on a preliminary design specification coming from prototypes, reference knowledge acquired from other existing industrial systems and a gap analysis between the new system features to develop and these references. At this stage, the knowledge and expertise on the components that may be used to implement the system and the knowledge on the constraints

these components require, are analyzed and propagated up to the interfaces of the system. The resulting constraints on the environment constitute an objective ODD (as Target ODD) on which the development and the evaluation of the system will be based. This target ODD may be amended to consider needs or issues appearing during the development process.

- When the domain of application for the type of system has been explored by several actors and in several system realizations, the knowledge used to characterize the operational design domain can be standardized and/or capitalized in dedicated knowledge bases. At this stage of maturity, the process of definition of the ODD of a new system in this domain can leverage the knowledge base to guide the formalization of a novel ODD.

Defining the ODD can be proceed in the other way, from the knowledge-based definition and enriched through available data.

2.4 ODD quality model

2.4.1 Introduction

An Operation Design Domain shall be valid throughout the whole lifecycle of the concerned product. The description of the ODD is used and amended during, for example, the product specification, the safety analysis, the conception, the validation of the system. An ODD quality model may be used to evaluate whether the ODD possesses key properties that can be set into three categories[3]:

- Effectiveness: the ODD meets its intent of defining the conditions under which the system shall operate. This category breaks down into the following properties: completeness, accuracy, consistency and operability.
- Clarity: the ODD describes these conditions in a comprehensive and convenient way for the stakeholders.
- Usability: the ODD representation and the carried information are adapted to the engineering activities that will use the ODD.

2.4.2 Effectiveness

2.4.2.1 Completeness

Completeness refers to the complete elicitation of the concepts that may be used to describe the ODD, and the completeness of the specification of each concept in terms of its characteristics and limits. An ODD is complete if all the physical and digital environmental influence factors that may affect the system functioning have been considered. Each influence factor shall be analyzed, the associated risks shall be identified, the mitigations implying restrictions on the physical and digital environment conditions have

[3] References for ODD key properties:

[IEEE/ISO/IEC 29148-2018]: ISO/IEC/IEEE International Standard - Systems and software engineering -- Life cycle processes -- Requirements engineering

[Vrandecic 2009]: Vrandecic, D. (2009) Ontology Evaluation. In: Staab, S. and Studer, R., Eds., Handbook on Ontologies, Springer, Berlin, 293-313

[Holloway 2019] C. M. Holloway, Understanding the Overarching Properties. National Aeronautics and Space Administration, Langley Research Center, 2019.

been listed, the characteristics to qualify these conditions restrictions have been chosen and the conditions have been expressed in terms of constraints on these characteristics.

There is no obvious way to ensure that the ODD is complete. The ODD definition process shall exploit all the available documentation or models on the subject and put to contribution actors with complementary knowledge and competencies. When knowledge bases of the domain exist, they shall be analyzed, aligned and synthetized, the result should be used as the support for the definition of the ODD. The completeness of the ODD is therefore related to the completeness of the underlying knowledge base used to define it. The completeness of the knowledge base can be defined as the degree to which it contains all relevant concepts necessary to describe the conditions where the system shall operate. And the completeness of the ODD means that every attribute of the underlying knowledge base needs to be considered in the ODD and may be constrained.

When no knowledge base pre-exists, the completeness of the ODD depends on the perfect identification of all the environmental influence factors that may affect the system functioning, the associated risks, the mitigations implying restrictions on the physical and digital environment conditions, and the characteristics to qualify these restrictions. The ODD definition process should capitalize appropriately its findings concerning factors and characteristics in a knowledge base that will be maintained with the ODD.

The ODD shall be expressed in terms of characteristics and limits. Characteristics shall be meaningful for the different stakeholders (client, authorities, designers, validators …) and exploitable by the system to ensure its own awareness of the ODD limits. The possible values for the characteristics shall not be ambiguous. Numeric values unities shall be specified. Qualitative values (for example weak, low, high…) shall be used only if they are formally defined. Symbolic values (types of roads, types a detected object…) shall refer to a specified reference nomenclature.

2.4.2.2 Accuracy

The accuracy is the combination of the notions of precision and coverage (or recall). An ODD description reaches a perfect precision, when it excludes every situation in which the system is not qualified to operate automatically. An ODD description reaches a perfect coverage when it allows every situation where the system will operate.

The accuracy of the ODD relies on the assumption of ODD completeness and deals with the accuracy of the limitation constraints expressed on the concepts defined from the knowledge base. If we call IODD (Ideal ODD) the unknown exact domain (set of situations) where the system is able to operate and ODD the domain that we have characterized, the precision and coverage of the ODD are obtained by the following metrics.

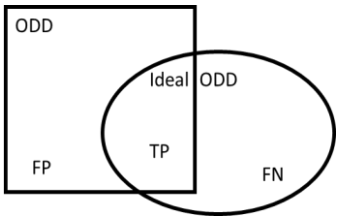

Figure 1

where:

- TP(True Positive)= the set of situations of IODD included in the ODD
- FP(False Positive)= the set of situations outside of IODD included in the ODD
- FN(False Negative)= the set of situations of IODD that are not included in ODD.
- Precision = TP/(TP+FP)=Area(ODD inter IODD)/Area(ODD)
- Coverage=TP/(TP+FN)=Area(ODD inter IODD)/Area(IODD)

In practice: Precision can be evaluated by sampling situations in the ODD and evaluating in terms of TP and FP to obtain the percentage of situations where the system correctly operates. Coverage may be evaluated by sampling situations in an envelope around the ODD, excluding the ODD, and evaluating the capacity of the system in these situations to obtain an approximation of the FN term.

The environment of the system may be complex to handle and the perfection in characterizing when the system is able to operate is not reachable. This means that each chosen characteristic is the best possible choice (among the ones that have been considered) to characterize the conditions that mitigate the negative impact of the corresponding factor, and the choice of limiting constraints optimizes the ratio benefits vs risks.

The optimal constraints can be obtained by following the exploration process:

- Extending coverage: Considering one constraint and the other ones fixed, is it possible to imagine a situation that is excluded by this constraint and where we think the system could operate safely? If yes, is the constraint necessary? Isn't it possible to mitigate the corresponding risk by relaxing this constraint but adding another one that allows the system to operate in this situation but with certain restrictions or in a degraded mode? For example, an autonomous vehicle could tolerate rain provided that the road is wide and the traffic is weak, or by reducing the maximum speed.

- Extending precision: Considering each constraint, is it possible to find a situation that is included in the current ODD, and where a risk associated to the factor corresponding to this constraint is inacceptable? Is this issue due to a too weak constraint? If yes, is it possible to enforce it without limiting the system usefulness? Alternatively, is there another characteristic that could be constrained to exclude the situation? Alternatively, is it possible to extend the system capabilities to mitigate the risk? Alternatively, is it possible to act on another factor that will exclude the situation by a side effect?

In addition to completeness and accuracy, an ODD shall hold a consistency property

2.4.2.3 Consistency

The consistency of the ODD is defined as it exists a set of values such that all conditions of the ODD can be satisfied at the same time. It may be justified formally by analyzing the constraints expressed in the ODD and the underlying knowledge base, or by exhibiting situations that respect these constraints.

2.4.2.4 Operability

The ODD shall be acceptable by all the stakeholders; it shall conform to standards and regulations. The ODD is sufficiently wide to justify the system deployment. The extension of the system capabilities is the mean to enlarge the surface of the ODD. The ODD ensures that the provided service is sufficiently continuous.

2.4.3 Clarity

The ODD description shall facilitate the communication between the stakeholders involved in the development, deployment, and operation of the AI application, and allow understanding the conditions choices, their rationale and their implications. This requirement can be broken down into: Concision, Understandability, Explainability.

2.4.3.1 Concision

The description of the ODD shall be thrifty. Only the characteristics that have been constrained during the ODD definition process and the corresponding constraints are described. Only the best and necessary characteristics corresponding to an influence factor (the one that provide the best accuracy) should be chosen, no redundant or alternative characteristic should be added.

The reader should not be confused between the resulting ODD and the arguments and considerations that have been proposed to obtain it. The argumentation should be added as a complementary document to the ODD artefact.

Only the constraints that are a restriction of the Operational Domain are given in the ODD. The possible values of the characteristics in the Operational Domain should be listed but only in the argumentation document or in a companion knowledge base.

The ODD should be presented in a structured way, introducing the factors, the characteristics, and the constraints.

2.4.3.2 Understandability

The ODD document should use a consistent and clear language and terminology that is understandable by all stakeholders. The usage of a standardized notation or language is recommended to the extent possible, avoiding jargon, technical terms, and acronyms that may be unfamiliar to stakeholders.

The concepts used to represent the ODD factors and characteristics should be commonly understood by the stakeholders. The ease of use for stakeholders also involves minimizing the number of concepts needed to grasp the ODD description. They shall be defined and the references to the documentations that introduce these concepts shall be given to prevent ambiguity and confusion on the concepts' definitions. The ODD document should be structured to enable stakeholders to easily locate relevant information.

The values chosen to qualify the characteristics shall be standardized, e.g., the reference to the standards, the reference to the unit system or to the nomenclature that defines them, shall be given. If some abstract name is used to represent some numeric value range of a characteristic, it shall always be complemented by the definition of the range, in a companion document.

The characteristics and their measures shall be understandable by the different stakeholders. Each stakeholder, in his domain of competency, shall be able to evaluate the implications of each constraint in the ODD.

2.4.3.3 Explainability

Each constraint appearing in the ODD shall be justified and explained:

- To what influence factors each constraint is related
- What the consequences of this factor are on the system functioning, on the system safety

- What the risks that could be faced are if the constraint is not respected
- What characteristics have been considered to act on the factor
- How and why the limits of the characteristics have been chosen

The influence factors that are used commonly for that type of system or that are in pre-existing knowledge base shall be considered during the ODD definition process. If they have not been selected as having an impact on the ODD, a justification of this decision shall be given.

2.4.4 Usability

The ODD description shall be usable by the different system engineering activities. Many stakeholders will use and create the ODD, for example Development Engineer (requirements, specification), Safety Engineer (risk analysis), Validation Engineer (scenario creation, coverage), Data Scientist (Dataset definition, analysis of results, coverage), Simulation engineer… They shall be able to use tools to edit and exploit efficiently and even automatically the ODD descriptions. So, the ODD should be structured and formatted in human-readable and machine-readable formats that facilitate readiness and understanding. This characteristic can be broken down into: verifiability, traceability, measurability, modifiability, reusability, and maintainability.

2.4.4.1 Verifiability

To be able to use efficiently the ODD description, it should be represented in a formal or semi-formal language. This provides the capacity to apply machine treatments on it like comparing different versions, measuring progress… To ensure the quality of this representation the formal language shall come with correction and consistency rules that can be verified or automatically enforced.

The verifiability property would benefit from the availability of a reference formal knowledge base that will represent the concepts, their relations and values used in the ODD. Such a formal knowledge base provides capability to verify the completeness of the ODD, the correction of the constraints and values used upon the definition of specific a measurable criteria. It allows evaluating some metrics on the ODD, like for example the surface of the ODD. For example, the *consistency* of the ODD is defined then as it exists a set of values such that all conditions of the ODD can be satisfied at the same time.

Besides, the ODD factors and their characteristics should be verifiable throughout the entire lifecycle of the AI application using appropriate methods. So, depending of the development phase, the ODD should come with a clear and detailed guidance of the required testing and verification activities.

2.4.4.2 Traceability

The ODD should be structured and modelled to be able to trace each constituting element (factor, characteristic, constraint):

- to the elements in the engineering process that have been involved in its definition (author, requirement, engineering activity, elements of justification, …),
- to the elements in the engineering process that exploit this ODD element (risk analysis argument, system requirement, test scenario, datasets definition criteria …).

The ODD should also be traceable to any relevant industry standards and regulations. Traceability shall establish the relationship between any ODD element, the source for its definition and recipient for its exploitation, as well the relationship to the relevant industry standards and regulations recommendations.

The evolutions of the system functionalities or capabilities and/or of the system environment shall be managed in configurations with the evolution of the corresponding ODD.

2.4.4.3 Measurability

The constraints expressed in the ODD shall be evaluated during the engineering process to explore the ODD to determine whether a certain situation is or is not in the ODD (risk analysis, dataset definition, validation …). The constraints expressed in the ODD shall be evaluated by the system itself while operating to determine if the situation it encounters is in the ODD and if the corresponding service should be activated or not.

The constraints shall be expressed therefore on measurable characteristics. Moreover, the procedures to implement the evaluation of these constraints may differ depending on for which activities they are used. The types of data on which they will be applied may differ depending on the activities. The coherence between these different procedures shall be ensured by documenting and comparing their specifications.

2.4.4.4 Modifiability

The ODD should be designed in such a way that it can be easily modified and updated to reflect changes in the operational physical or digital environment or the automated feature itself. Hence, the ODD design process shall support the addition of new attributes and values in a seamless manner. A change management process with version control should be established to ensure that any changes or updates to the ODD document are properly documented and tracked, and that stakeholders are aware of the current version. The overall ODD description should be designed in a modular fashion, with clear sections that can be updated independently of each other.

2.4.4.5 Reusability

The ODD document should be designed in such a way that it can be reused for other similar AI systems. So, it shall capture general principles and concepts that can be applied across different automated features or applications. In addition, the notation and language to capture the ODD concepts shall support gathering multiple ODD into a new wider ODD.

2.4.4.6 Maintainability

The ODD document should be designed in such a way that it can be easily maintained over time, and any changes or updates can be made without disrupting the overall operation of the autonomous feature. This requires modular and hierarchical formatting of the ODD, so that the concepts are organized in into logical sections or modules, with clear and consistent interfaces between them, to enable easy modification and maintenance without disrupting the overall description of the Operational design domain.

2.5 ODD quality evaluation

The definition of the ODD often faces the complexity to capture reality in an open environment. This means that the completeness can never be taken in an absolute sense. The evaluation of the ODD, which will be conducted after its premier definition (as objective ODD or target ODD), cannot definitively close the subject by stating that all the necessary conditions have been identified. This means that all the subsequent activities in the engineering process that will exploit the ODD may find “surprises” and ask for ODD revision. Therefore, each of these subsequent activities in the development process makes a kind of ODD evaluation.

Two types of evaluation may be conducted:

- The validation of the ODD: This typically concerns the “Effectiveness” properties, trying to evaluate whether the ODD satisfies its definition of characterizing the conditions where the system operates safely.
- The verification of the ODD: Typically, it refers to the evaluation that the ODD respects some requirement like being understandable or exploitable. It concerns mostly the “Clarity” and “Usability” categories of properties. However, when the ODD is based on a pre-existing knowledge base, the “validation” is mostly concerned by the evaluation of the completeness of the knowledge base and by the accuracy of the ODD. The evaluation of the completeness of the ODD is in this case a verification that is done against the reference knowledge base.

The evaluation of ODD has to consider the desired properties and judge their satisfaction. The ODD has to reach a consensus between the different stakeholders about their comprehension, their agreement with the limits it imposes, their capacity of exploiting it. A team should conduct its evaluation with the various competencies representing the point of view of these stakeholders.

The evaluation is based mainly on human judgement. It reposes on the inspection of the justification documentation that comes with the ODD and the verification of the quality properties described in the previous chapter considered as a checklist. In addition, it may compare the ODD description with some other source of information that the evaluation team has gathered: ODDs from other systems or providers, reference knowledge bases, component risk analysis, experimentation results, available datasets, etc.

In order to facilitate this process, the Assurance Case (AC) methodology can be used to argue about the quality of the ODD. The AC methodology allows building an argument used to assess identified properties on the ODD. The ultimate goal of the AC is to verify that the ODD is correct, where correct requires being “precise, covering and consistent” in overall. The argument used to demonstrate the different properties is based on either the ODD engineering process itself or the evaluation from experts. The latter is in line with the claim made above about the need for different stakeholders to participate in the verification.

3. Impacts on trustworthiness and quality management

3.1 Introduction

Trustworthiness characteristics can be assessed only if the Operational Design Domain (ODD) is clearly defined. The ODD defines the conditions on the physical and digital environment where the AI sub-system shall operate. Many AI prototypes neglect to describe their ODD or leave it vaguely defined as the domain covered by the distribution of data used during training. However, how to predict the performance or the risks of using this system in an operational context without analyzing and understanding if the real environment will match this training distribution?

Therefore, it is necessary: either to abstract from the data used for training the models a characterization of the situations where this model is performed, and, at the same time, to characterize the situations under which the model should perform, and then construct representative training datasets by covering these situations.

The assessment of many trustworthiness characteristics requires the definition of the ODD and depends on its quality.

3.2 AI system quality management

From a quality management perspective, the ODD leads to the following requirements:

- ODD quality is a characteristic of an AI system quality model
- The ODD of an AI system shall be specified and verified according to an agreed quality model
- The ODD of an AI system shall be part of its technical documentation.
- Monitoring and reporting whether an AI system stays within it ODD shall be required
- Any functioning of the AI systems outside it ODD, even if it has not led to an accident, shall be considered as a major incident, logged and reported. The logging shall give the means to have an explanation of the environment and the reasons for which the AI system has evolved outside its ODD.
- ODD shall be part of the risk management and quality management of an AI system
- The conformity of an AI system to its ODD shall be assessed

3.3 Data quality

The ODD delimits the domains (inside and outside of it), where data will be needed. Defining the ODD support data governance. The ODD frames the definition of the data coverage criteria that are used for data completeness evaluation.

3.4 Dependability

Safety and security analyses need, as input, the definition of the system and in particular its application domain provided by the ODD. To ensure maintainability of the system in case of changing environment, the characteristics of the expected nominal environment conditions are necessary to evaluate the impact of its evolution.

3.5 Operability

In an analogy with design by contract concept, where a system guarantees a functional behavior, provided that the environment (the inputs) respects some precondition, the ODD is the precondition of system nominal functional behavior. The correctness of this behavior shall be evaluated in the situations respecting this precondition. It specifies the input space limits and it contributes to define the variability axes of these inputs.

To be trustable, the accuracy evaluation of the system needs to choose test data that cover rigorously this space. To evaluate the functional completeness, it is necessary to explore the functional cases that are included in the ODD.

3.6 Robustness

An important part of robustness concerns the capacity of the system to tolerate inputs that were not expected. Obviously, the behavior of the system outside of the bounds of the ODD is one of the main aspects that has to be considered.

3.7 Human centered quality

The ODD is also for the user to understand the useful capacity of the system and foresee its behavior. The clarity properties of the ODD are therefore elements of the evaluation of the usability and interpretability of the system.

3.8 Ethics

The transparency attribute will partly rely on the documentation of the ODD and on the justification of the choices that guided its definition. The fairness and absence of bias are often related to the analysis of what characteristics in the data should be neutral regarding the system results. The definition of the ODD helps to focus on these characteristics and ensure that data collection reflects this neutrality.

3.9 Accessibility

The ODD document should be distributed to stakeholders in a timely manner and should be communicated to them effectively in a format that is accessible to them.

3.10 Monitorability, Controllability, Record-keeping

One of the main properties that needs to be monitored is that the system stays in its ODD, since this is the condition that guarantees the system performance. This relies on two properties of the ODD: Its effectiveness that ensures it describes perfectly the conditions where the system is able to perform, its measurability which means that the constraints it expresses on the environment shall be expressed on measurable characteristics and that the procedures to implement the evaluation of these constraints have been specified.

Monitoring efforts should then focus on capturing relevant data and performance metrics within the defined ODD, to detect anomalies or deviations from expected behavior. It may involve monitoring specific sensors, internal states, or decision-making processes within the operational domain. Those monitoring functions enable to capture any potential violations of the AI's system safety requirements before an event of significant loss occurs, which shall trigger the initiation of required mitigation strategies. One additional benefit of ODD monitoring is that data collected during monitoring can be used to identify areas for enhancement or optimization, leading to iterative design iterations.