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Part 221: Human-centred design process assessment model

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Partie 221: Modèle d'évaluation de processus de conception centrée sur l'opérateur

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 159, *Ergonomics*, Subcommittee SC 4, *Ergonomics of human-system interaction*.

A list of all parts in the ISO 9241 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document focuses on the capability of human-centred design (HCD) processes and the maturity of organizations in implementing HCD.

The primary intended users of this document are internal and external assessors or well-trained UX professionals (such as HCD process managers or HCD quality managers) responsible for assessing HCD processes in organizations that need to specify, assess and improve their HCD processes, according to the process reference model (PRM) described in ISO 9241-220. The professionals responsible for institutionalizing HCD in organizations, the primary intended users of ISO 9241-220, are also important users of this document since this document intends to assess their work.

This document incorporates the processes from ISO 9241-220, as well as the process assessment model (PAM) according to the process measurement framework for the assessment of process capability in ISO/IEC 33020. The full titles of these standards are listed in the Bibliography.

Ergonomics of human-system interaction —

Part 221:
Human-centred design process assessment model

1 Scope

This document specifies the process references model (PRM) for human-centred design (HCD) according to ISO 9241-220, as well as the process assessment model (PAM) for assessing these processes, based on ISO/IEC 33020 and in accordance with the requirements of ISO/IEC 33004.

This HCD PAM contains a set of indicators to be considered while interpreting the intent of the HCD PRM defined in ISO 9241-220. These indicators can also be applied when implementing a process improvement programme post an assessment.

NOTE 1 The PRM in this document focuses on assessing HCD processes rather than system life cycle, for example as in ISO/IEC/IEEE 15288, or software life cycle, as in ISO/IEC/IEEE 12207.

NOTE 2 If processes beyond the scope of ISO 9241-220 are required, appropriate processes from other PRMs, such as ISO/IEC/IEEE 12207, ISO/IEC/IEEE 15288 or ISO/TS 18152, can be added based on the business needs of the organization.

The intended application of this document is computer-based interactive systems. While the processes apply to interactive systems that deliver services, they do not cover the design of those services. The relevant aspects of the processes can also be applied to simple or non-computer-based interactive systems.

NOTE 3 HCD concentrates on the human-centred aspects of design and not on other aspects of design, such as mechanical construction, programming or the basic design of services.

The process descriptions in this document provide the basis for a rigorous assessment of an enterprise's capability to carry out human-centred processes in conformity with the ISO/IEC 33004 and ISO/IEC 33020.

This document is intended for use by organizations that want to address and improve their treatment of human-centred design of either their internal systems or the products and services they provide, and the procurement of systems and parts of systems. The processes can be applied by small- and medium-sized enterprises as well as by large organizations.

NOTE 4 The scope of application of the PAM is the same as that of the PRM, which is described in ISO 9241-220:2019, Clause 1.

2 Normative references

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

ISO 9241-220:2019, *Ergonomics of human-system interaction — Part 220: Processes for enabling, executing and assessing human-centred design within organizations*

ISO/IEC/IEEE 24765, *Systems and software engineering — Vocabulary*

ISO/IEC/IEEE 29119-1, *Software and systems engineering — Software testing — Part 1: General concepts*

ISO/IEC/IEEE 29119-3, *Software and systems engineering — Software testing — Part 3: Test documentation*

ISO/IEC 33001, *Information technology — Process assessment — Concepts and terminology*

ISO/IEC 33020:2019, *Information technology — Process assessment — Process measurement framework for assessment of process capability*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 9241-220, ISO/IEC/IEEE 24765, ISO/IEC/IEEE 29119-1, ISO/IEC/IEEE 29119-3 and ISO/IEC 33001 and the following apply.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1.1
work product
documented information
artefact produced by a process

EXAMPLE Project plan, requirements specification, design documentation, source code, test plan, test meeting minutes, schedules, budgets and incident reports.

Note 1 to entry: Work products are evidence of the achievement of process outcomes and of the performance of the relevant activities.

[SOURCE: 9241-220:2019, 3.49, modified — Additional preferred term, "documented information", added.]

3.2 Abbreviated terms

BP	base practice
GP	generic practice
HCD	human-centred design
HCP	human-centred process
IEEE	Institute of Electrical and Electronics Engineers
PA	process attribute
PAM	process assessment model
PCI	process capability indicator
PPI	process performance indicator
PRM	process reference model
WP	work product
WPC	work product characteristic

4 Conformity

The HCD PAM and PRM conform with ISO/IEC 33004 and can be used as the basis for assessing process capability.

ISO/IEC 33020 is used as an ISO/IEC 33003-conforming measurement framework. A statement of conformity of the PAM and PRM with the requirements of ISO/IEC 33004 is provided in Annex B.

Tailoring shall conform with ISO 9241-220:2019, Clause 6 and Annex B.

5 PAM and capability determination

5.1 General

To determine the capability of human-centredness as part of the PAM, all processes defined by ISO 9241-220 are chosen as the PRM and ISO/IEC 33020 is used as measurement framework.

The measurement framework provides the necessary requirements and rules for the capability dimension (see also ISO/IEC 33020 and/or Annex A). It defines a schema which enables an assessor to determine the capability level of a given process.

5.2 Process capability levels and process attributes

A process capability level is a set of process attributes (PAs) that work together to provide a major enhancement in the capability to perform a process. PAs are features of a process that can be evaluated on a scale of achievement, as a means to measure the capability of the process. PAs are applicable to all processes. Each PA addresses a specific aspect of the capability level. The levels constitute a rational way of progressing through improvement of the capability of any process. These capability levels are defined as part of the measurement framework.

Process capability levels (Table 1) and PAs (Table 2) are identical to those defined in the process measurement framework in ISO/IEC 33020:2019, 5.2.

Table 1 — Process capability levels according to ISO/IEC 33020

Level 0: **Incomplete process purpose**	The process is not implemented or fails to achieve its process purpose.
Level 1: **Performed process**	The implemented process achieves its process purpose.
Level 2: **Managed process**	The performed process is implemented in a managed fashion (planned, monitored and adjusted) and its documented information is appropriately established, controlled and maintained.
Level 3: **Established process**	The managed process is implemented using a defined process which is assured and continually improved.
Level 4: **Predictable process**	The established process is performed predictively. Quantitative management needs are identified and measurement data are collected and analysed to identify assignable causes of variation. Corrective action is taken to address assignable causes of variation.
Level 5: **Innovating process**	The predictable process is continually improved to respond to changes through identified innovative approaches for process innovation.

Within the PAM of this document, the determination of capability is based upon the nine PAs defined in ISO/IEC 33020:2019, Table 2.

Table 2 — Process attributes according to ISO/IEC 33020

Attribute ID	Process attributes
Level 0: Incomplete process	
Level 1: Performed process	
PA 1.1	Process performance
Level 2: Managed process	
PA 2.1	Performance management
PA 2.2	Documented information management
Level 3: Established process	
PA 3.1	Process definition
PA 3.2	Process deployment
PA 3.3	Process assurance
Level 4: Predicted process	
PA 4.1	Quantitative analysis
PA 4.2	Quantitative control
Level 5: Innovative process	
PA 5.1	Process innovation

Assessment indicators are used to identify whether the process outcomes and the process attribute outcomes (achievements) are given in processes of projects in organizational units.

In this document, there are two types of assessment indicators:

— Process performance indicators (PPIs), which apply exclusively to capability level 1. They provide an indication of the extent of fulfilment of the process outcomes.

— Process capability indicators (PCIs), which apply to capability levels 1 to 5. They provide an indication of the extent of fulfilment of the process attribute achievements.

NOTE Assessment indicators are used to confirm that certain practices were performed, as shown by evidence collected during an assessment. All such evidence comes either from the examination of work products of the processes assessed or from statements made by the performers and managers of the processes. The existence of base practices and work products provide evidence of the performance of the processes associated with them. Similarly, the existence of process capability indicators provides evidence of process capability.

The evidence obtained should be recorded in a form that clearly relates to the associated assessment indicator to support the assessor's judgement that can be confirmed or verified as required by ISO/IEC 33002.

5.3 Process performance indicators

Types of PPI are:

— base practices (BPs);

— work products (WPs) [in combination with work product characteristics (WPCs)].

Both BPs and WPs relate to one or more process outcomes. Consequently, BPs and WPs are always process-specific and not generic. BPs represent activity-oriented indicators. WPs represent result-oriented indicators. Both BPs and WPs are used for judging the objective evidence that an assessor is to collect and accumulate in the performance of an assessment.

NOTE The HCD PAM offers a set of WPCs (see Annex C) for each WP. These are meant to offer a good practice and state-of-the-art knowledge guide for the assessor.

5.4 Process capability indicators

There is one type of PCI relevant for this document: generic practices (GPs).

GPs are activity-oriented indicators relating to one or more process attribute achievements. In contrast to PPIs, they are of generic type, i.e. they apply to any process.

The corresponding process capability levels and PAs for levels 0 to 5 are detailed in Clause 7.

NOTE An assessor collects and accumulates evidence supporting PCI during an assessment. In that respect, GPs are alternative indicator sets the assessor can use.

5.5 Process attribute rating

To enable the rating, the measurement framework provides PAs defining a measurable property of process capability. Each PA is assigned to a specific capability level. The extent of achievement of a certain PA is represented by means of a rating based on a defined rating scale. The rules from which an assessor can derive a final capability level for a given process are represented by a process capability level model. The HCD PAM uses the measurement framework defined in ISO/IEC 33020.

NOTE It can be seen as good practice that at least two assessors conduct a representative HCD process assessment: a lead assessor leading the assessment and a co-assessor supporting. It is useful if at least one of the assessors has experience in mapping the HCD processes of the HCD PRM to organizations.

To support the rating of PAs, the ISO/IEC 33020 measurement framework provides a defined rating scale with an option for refinement, different rating methods and different aggregation methods depending on the class of the assessment (e.g. required for organizational maturity assessments). For the rating scale within the process measurement framework, a PA is a measurable property of process capability. A PA rating is a judgement of the degree of achievement of the PA for the assessed process. The rating scale is defined by ISO/IEC 33020, as shown in Table 3.

Table 3 — Rating scale according to ISO/IEC 33020

N	Not achieved	There is little or no evidence of achievement of the defined PA in the assessed process.
P	Partially achieved	There is some evidence of an approach to, and some achievement of, the defined PA in the assessed process. Some aspects of achievement of the PA can be unpredictable.
L	Largely achieved	There is evidence of a systematic approach to, and significant achievement of, the defined PA in the assessed process. Some weaknesses related to this PA can exist in the assessed process.
F	Fully achieved	There is evidence of a complete and systematic approach to, and full achievement of, the defined PA in the assessed process. No significant weaknesses related to this PA exist in the assessed process.

For the rating of the degree of achievement of each process attribute, the rating scale of ISO/IEC 33020 is used: not achieved, partially achieved, largely achieved, fully achieved. This ordinal scale shall be understood in terms of percentage achievement of a process attribute (shown in Table 4).

Table 4 — Rating scale percentage values according to ISO/IEC 33020

N	Not achieved	0 to ≤ 15 % achievement
P	Partially achieved	> 15 % to ≤ 50 % achievement
L	Largely achieved	> 50 % to ≤ 85 % achievement
F	Fully achieved	> 85 % to ≤ 100 % achievement

The ordinal scale may be further refined for the measures P and L as defined in ISO/IEC 33020:2019, Table 5.

The rating shall follow the rating defined in Table 5.

Table 5 — Refinement of rating scale and rating criteria according to ISO/IEC 33020

N	Not achieved	0 to ≤ 15 % achievement	There is little or no evidence of achievement of the defined PA in the assessed process.
P–	Partially achieved	> 15 % to ≤ 32,5 % achievement	There is some evidence of an approach to, and some achievement of, the defined PA in the assessed process. Many aspects of achievement of the PA can be unpredictable.
P+	Partially achieved	> 32,5 % to ≤ 50 % achievement	There is some evidence of an approach to, and some achievement of, the defined PA in the assessed process. Some aspects of achievement of the PA can be unpredictable.
L–	Largely achieved	> 50 % to ≤ 67,5 % achievement	There is evidence of a systematic approach to, and significant achievement of, the defined PA in the assessed process. Many weaknesses related to this PA can exist in the assessed process.
L+	Largely achieved	> 67,5 % to ≤ 85 % achievement	There is evidence of a systematic approach to, and significant achievement of, the defined PA in the assessed process. Some weaknesses related to this PA can exist in the assessed process.
F	Fully achieved	> 85 % to ≤ 100 % achievement	There is evidence of a complete and systematic approach to, and full achievement of, the defined PA in the assessed process. No significant weaknesses related to this PA exist in the assessed process.

Rating and aggregation methods follow ISO/IEC 33020. A process outcome is the observable result of successful achievement of the process purpose. A process attribute outcome is the observable result of achievement of a specified process attribute. Process outcomes and process attribute outcomes may be characterized as an intermediate step to providing a process attribute rating. When performing rating, the rating method employed shall be specified relevant to the class of assessment. The selected rating method(s) shall be specified in the assessment input and referenced in the assessment report.

ISO/IEC 33020 provides three rating methods. Depending on the class, scope and context of the assessment, an aggregation within one process (one-dimensional, vertical aggregation), across multiple process instances (one-dimensional, horizontal aggregation) or both (two-dimensional, matrix aggregation) is performed. When performing an assessment, ratings may be summarized across one or two dimensions. The process attributes and outcomes may be attributed to be mandatory or recommended based on the cross-reference between ISO 9241-210 and ISO 9241-220 as shown in ISO 9241-220:2019, Table C.2.

For further information regarding rating methods, see ISO/IEC 33020.

5.6 Process capability level model

The process capability level model defines the rules for how the achievement of each level depends on the rating of the PAs for the assessed and all lower process capability levels. The process capability levels are defined in detail in Clause 7.

The process capability level achieved by a process shall be derived from the PA ratings for that process according to the process capability level model defined in Table 6.

Table 6 — Detailed process capability level model according to ISO/IEC 33020

Scale	Process attribute	Rating
Level 1	PA 1.1: Process Performance	Largely or fully
Level 2	PA 1.1: Process Performance	Fully
	PA 2.1: Performance Management	Largely or fully
	PA 2.2: Documented Information Management	Largely or fully

Table 6 *(continued)*

Scale	Process attribute	Rating
Level 3	PA 1.1: Process Performance	Fully
	PA 2.1: Performance Management	Fully
	PA 2.2: Documented Information Management	Fully
	PA 3.1: Process Definition	Largely or fully
	PA 3.2: Process Deployment	Largely or fully
	PA 3.3: Process Assurance	Largely or fully
Level 4	PA 1.1: Process Performance	Fully
	PA 2.1: Performance Management	Fully
	PA 2.2: Documented Information Management	Fully
	PA 3.1: Process Definition	Fully
	PA 3.2: Process Deployment	Fully
	PA 3.3: Process Assurance	Fully
	PA 4.1 Quantitative Analysis	Largely or fully
	PA 4.2: Quantitative Control	Largely or fully
Level 5	PA 1.1: Process Performance	Fully
	PA 2.1: Performance Management	Fully
	PA 2.2: Documented Information Management	Fully
	PA 3.1: Process Definition	Fully
	PA 3.2: Process Deployment	Fully
	PA 3.3: Process Assurance	Fully
	PA 4.1: Quantitative Analysis	Fully
	PA 4.2: Quantitative Control	Fully
	PA 5.1: Process Innovation	Largely or fully

As indicated in Table 6, to reach the next capability level all prior PAs of the former capability levels shall be achieved fully.

As a general rule, the achievement of a given level requires a large achievement of the corresponding PAs and a full achievement of any lower-lying PA.

A process assessment is a disciplined evaluation of an organizational unit's processes against a PAM. The PAM offers process indicators that provide guidance for assessors in accumulating the necessary objective evidence to support judgements of the capability of the processes. They are not intended to be regarded as a mandatory set of checklists to be followed. To judge the presence or absence of process outcomes and process achievements, an assessment obtains objective evidence. All such evidence comes from the examination of work products and repository content of the assessed processes, and from testimony provided by the performers and managers of the assessed processes. This evidence is mapped to the process indicators to allow the establishment of the correspondence to the relevant process outcomes and PA achievements.

Although Level 1 capability of a process is only characterized by the measure of the extent to which the process outcomes are achieved, the measurement framework requires each level to reveal a PA, and thus requires the PAM to introduce at least one PCI for each capability level. Therefore, the only PCI for capability Level 1 (PA.1.1) has a single generic practice (GP 1.1.1) pointing as an editorial reference to the respective PPIs (see Figure A.1 in Annex A).

Detailed information about performing an assessment can be found in ISO/IEC 33002 regarding assessment activities, roles, responsibilities and competences, assessment types and assessment documentation. An example of how an assessment for information technology works in detail can be

found in ISO/IEC TS 33030. ISO/IEC TS 33060 contains a process assessment model for general system life cycle processes.

The terminology used to plan, perform and document an assessment can be found in the following sources:

a) ISO/IEC 33001 for assessment-related terminology;

b) ISO/IEC/IEEE 24765 and ISO/IEC/IEEE 29119 terminology (contained in Annex C);

c) terms introduced by ISO/TC 159/SC 4 (contained in Annex C).

6 Process reference model (PRM) and process performance indicators (PPIs) (Level 1)

6.1 General

Figure 1 summarizes the HCD process categories and illustrates the different levels in an organization and their responsibilities for human-centred quality.

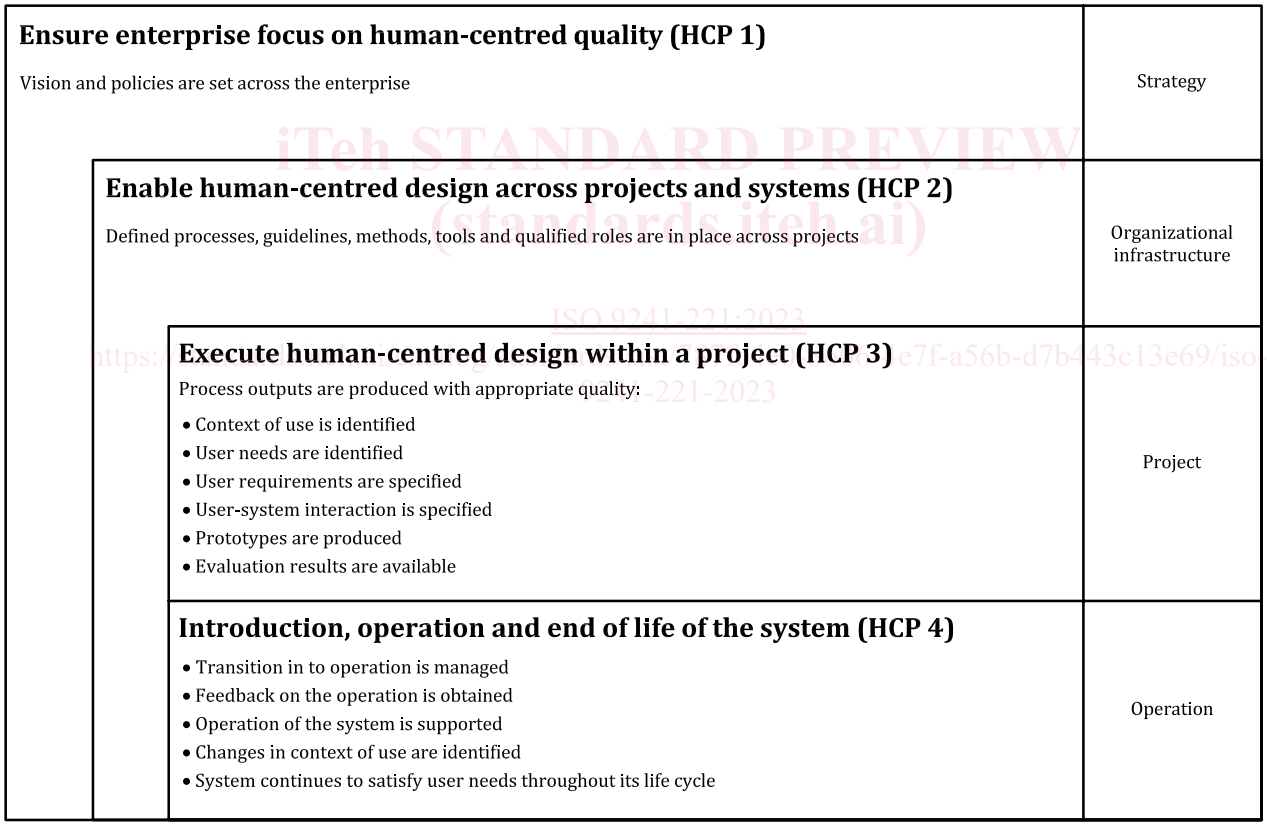

Figure 1 — HCD processes

It is a responsibility of the top management in an organization to set vision and policies for how human-centred quality can be addressed by HCD (HCP.1). HCD across projects and systems is enabled by those responsible for (project) programme management and/or the operation of systems (HCP.2). The execution of HCD within projects and the introduction, operation and end of life of systems is carried out by people with the necessary competence within each project (HCP.3 and HCP.4). It is possible that each process category is carried out by a different organizational entity or by a combination of entities. The HCD PRM from ISO 9241-220 contains HCD processes for the process groups HCP.1 to HCP.4 (Table 7).

Table 7 — HCD process reference model from ISO 9241-220

Unique identifier	Process name	Primary audiences
HCP.1	**Ensure enterprise focus on human-centred quality**	Executive responsible for human-centred quality Ensures: executive management
HCP.1.1	Incorporate human-centred quality in business strategy	
HCP.1.2	Institutionalize human-centred quality	
HCP.2	**Enable human-centred design across projects and systems**	Those responsible for (HCD) processes used by the organization Ensures: project, product and usability management
HCP.2.1	Integration of human-centred design	
HCP.2.2	Resources for human-centred design	
HCP.2.3	Authorization and control of human-centred quality	
HCP.3	**Execute human-centred design within a project**	Technical leadership responsible for HCD Ensures: project and product management
HCP.3.1	Plan and manage human-centred design for the project	
HCP.3.1.1	Establish human-centred quality objectives	
HCP.3.1.2	Manage threats and opportunities that can arise from use of the interactive system	
HCP.3.1.3	Define extent of human-centred design in the project	
HCP.3.1.4	Plan each HCD process activity	
HCP.3.1.5	Manage HCD process activities within the project	
HCP.3.2	Identify the context of use	
HCP.3.2.1	Identify the intended user population and differentiate groups of users	
HCP.3.2.2	Identify other aspects of the context of use and reported issues	
HCP.3.3	Establish the user requirements	
HCP.3.3.1	Identify the user needs	
HCP.3.3.2	Specify the user requirements	
HCP.3.3.3	Negotiate the user requirements in the context of a project	
HCP.3.4	Design solution that meets user requirements	
HCP.3.4.1	Specify the user-system interaction	
HCP.3.4.2	Produce and refine user interface design solutions	
HCP.3.5	User-centred evaluation	
HCP.3.5.1	Plan for evaluation throughout the project	
HCP.3.5.2	Plan each evaluation (what to evaluate and how)	
HCP.3.5.3	Carry out each evaluation	
HCP.4	**Introduction, operation and end of life of a system**	Technical leadership responsible for HCD Ensures: service and support management
HCP.4.1	Introducing the system	
HCP.4.2	Human-centred quality in operation	
HCP.4.3	Human-centred quality during upgrades	
HCP.4.4	Human-centred quality at the end of life of a system	