Prototype of EN 301 549 Decision tree

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1   Introduction

EN 301 549 contains accessibility requirements that can be applied to any type of ICT product and service. For that it has been structured according to a feature-based approach, and each requirement (and recommendation) contains applicability language ("self-scoping" or pre-conditions). This language is intended to identify whether each clause applies to any given ICT product or service.

This feature-based approach can be used as a support mechanism to determine the applicability of the EN requirements and recommendations. A decision tree has been designed for that purpose. Initially, the tree contained a question for any "self-scoping" text, but it was discovered, after a usability test, that the resulting tree was too large to be useful.

The prototype presented as a demonstration in the ETSI HF Workshop shows the result of refining this decision tree so that it only contains questions that have effect on the applicability of at least two requirements or recommendations. This approach has considerably reduced the size of the tree to a maximum of 25 questions.

The prototype shows the behaviour of the decision tree. It is not intended to represent a proper user interface with good levels of usability. The user interface is being developed in the Technical University of Madrid and will include the decision tree shown here.

2   The decision tree

The decision tree has been designed to minimize the number of questions that need to be answered in order to obtain a set of requirements to be considered for a given ICT products of services.

By design, the decision tree only contains questions related to at least two requirements. This implies that the list of "applicable" requirements resulting from the use of the decision tree will probably contain some requirements that might not apply to a particular ICT product or services.

Below is an overview of the current version of the decision tree, which may contain some mistakes as it is still under testing processes. This decision tree represents work in progress, that could be refined in the future.

2.1   Always applicable requirements

There are some generic requirements that have to be considered for any ICT product or services, as the decision tree contains no questions for them:

- 5.2 Activation of accessibility features
- 5.3 Biometrics
- 5.4 Preservation of accessibility information during conversion
- 5.7 Key repeat
- 5.8 Double-strike key acceptance
- 5.9 Simultaneous user actions

2.2   Closed functionality

Some requirements and recommendations of clause 5 apply if the system has closed functionality, that is, if assistive technologies cannot be connected or installed. In that case the applicability of requirements and

recommendations depends on whether visual information is needed, on whether there are auditory or speech outputs used to replace visual information, and on whether the functionality is closed to keyboards.

The decision tree for closed functionality is the following (questions are highlighted in bold and have an identifier to enable cross-referencing):

- **Does the ICT have closed functionality? [Q1]**
  - 5.1.2.1 Closed functionality
  - 5.1.2.2 Assistive technology
  - 5.1.4 Functionality closed to text enlargement
  - 5.1.5 Visual output for auditory information
  - **Is visual information needed to enable the use of those functions of ICT that are closed to assistive technologies for screen reading? [Q1.1]**
    - 5.1.3.1 General (non-visual access)
    - 5.1.3.16 Receipts, tickets and transactional outputs
    - **Is auditory output provided as non-visual access to closed functionality? [Q1.1.1]**
      - 5.1.3.2 Auditory oputput delivery including speech
      - 5.1.3.3 Auditory output correlation
      - 5.1.3.8 Masked entry
      - 5.1.3.9 Private access to personal data
      - 5.1.3.10 Non-interfering audio output
      - 5.1.3.11 Private listening volume
      - 5.1.3.12 Speaker volume
      - 5.1.3.13 Volume reset
      - **Is speech output provided as non-visual access to closed functionality? [Q1.1.1.1]**
        - 5.1.3.4 Speech output user control
        - 5.1.3.5 Speech output automatic interruption
        - 5.1.3.6 Speech output for non-text content
        - 5.1.3.7 Speech output for video information
        - 5.1.3.14 Spoken languages
        - 5.1.3.15 Non-visual error identification
  - **Is ICT functionality closed to keyboards or keyboard interfaces? [Q1.2]**
    - 5.1.6.1 Closed functionality (operation without keyboard interface)
    - 5.1.6.2 Input focus (operation without keyboard interface)

The first question (Q1) is very important for the decision tree, as its answer is also used as an answer for some derived questions related to two-way voice communication and software.

2.3 Operable parts and locking or toggle controls

The requirements under clause 5.5 apply if the ICT has operable parts (hardware- or software-based) and the requirements under clause 5.6 apply if the ICT has locking or toggle controls:

- **Does the ICT have operable parts? [Q2]**
  - 5.5.1 Means of operation
  - 5.5.2 Operable parts discernibility
- **Does the ICT have a locking or toggle control? [Q3]**
  - 5.6.1 Tactile or auditory status (locking or toggle controls)
  - 5.6.2 Visual status (locking or toggle controls)

2.4   Two-way voice communication

If the ICT provides two-way voice communication, then the requirements and recommendations of clause 6 apply as well as the requirements related to access to relay and emergency systems. The applicability of requirements and recommendations of clause 6 depends on whether the ICT has RTT capabilities and whether it includes real-time video communication. And there is one question (whether or not the ICT supports assistive technologies, Q4.1.1) whose answer is derived as the negation of the answer to Q1 (see section 2.2) and that will not be asked to the user.

- **Does the ICT provide two-way voice communication? [Q4]**
    - 6.1 Audio bandwidth for speech
    - 6.2.1.1 RTT Provision
    - 6.2.1.2 Concurrent voice and text
    - 6.3 Caller ID
    - 6.4 Alternatives to voice-based services
    - 13.2 Access to relay services
    - 13.3 Access to emergency services
    - **Does the ICT have RTT capabilities? [Q4.1]**
        - 6.2.2.1 Visually distinguishable display
        - 6.2.3 Interoperability
        - 6.2.4 Real-time text responsiveness
        - **Does the ICT support assistive technologies (i.e. it is not closed)? [Q4.1.1 = not Q1)]**
            - 6.2.2.2 Programmatically determinable send and receive direction
    - **Does the ICT include real-time video functionality? [Q4.2]**
        - 6.5.2 Resolution
        - 6.5.3 Frame rate
        - 6.5.4 Synchronization between audio and video
        - 6.6 Alternatives to video-based services

2.5   Video functionality

The requirements and recommendations of clause 7 only apply if the ICT has video capabilities, such as playing, transmitting, converting or recording video content:

- **Does the ICT have video capabilities (playing, transmitting, converting or recording)? [Q05]**
    - 7.1.1 Captioning playback
    - 7.1.2 Captioning synchronization
    - 7.1.3 Preservation of captioning
    - 7.2.1 Audio description playback
    - 7.2.2 Audio description synchronization
    - 7.2.3 Preservation of audio description
    - 7.3 User controls for captions and audio description

2.6   Hardware

The requirements and recommendations of clause 8 of the EN apply if the ICT is hardware or if the ICT has hardware components. There are three subsets of requirements and recommendations: for ICT that has speech output, for ICT that has physical dimensions that are integral to the ICT and that may restrict physical access, and finally, for ICT that has mechanically operable parts.

- **Is the ICT hardware or does the ICT has hardware? [Q6]**
    - 8.1.2 Standard connections

- o 8.1.3 Colour
- o 8.3.5 Installation instructions
- o 8.4.3 Keys, tickets and fare cards
- o 8.5 Tactile indication of speech mode
- o **Has the ICT hardware speech output? [Q6.1]**
    - 8.2.1.1 Speech volume range
    - 8.2.1.2 Incremental volume control
    - 8.2.2.1 Fixed-line devices
    - 8.2.2.2 Wireless communication devices
- o **Does the ICT have physical dimensions that are integral to the ICT and that may restrict physical access? [Q6.2]**
    - 8.3.2.1 Change in level?
    - 8.3.2.2 Clear floor or ground space
    - 8.3.2.3.1 General (approach)
    - 8.3.2.3.2 Forward approach
    - 8.3.2.3.3 Parallel approach
    - 8.3.2.4 Knee and toe clearance width
    - 8.3.2.5 Toe clearance
    - 8.3.2.6 Knee clearance
    - 8.3.3.1.1 Unobstructed high forward reach
    - 8.3.3.1.2 Unobstructed low forward reach
    - 8.3.3.1.3.1 Clear floor space (obstructed reach)
    - 8.3.3.1.3.2 Obstructed (<510 mm) forward reach
    - 8.3.3.1.3.3 Obstructed (< 635 mm) forward reach
    - 8.3.3.2.1 Unobstructed high side reach
    - 8.3.3.2.2 Unobstructed low side reach
    - 8.3.3.2.3.1 Obstructed (<= 255 mm) side reach
    - 8.3.3.2.3.2 Obstructed (<= 610 mm) side reach
    - 8.3.4 Visibility
- o **Does the ICT have mechanically operable parts? [Q6.3]**
    - 8.4.1 Numeric keys
    - 8.4.2.1 Means of operation of mechanical parts
    - 8.4.2.2 Force of operation of mechanical parts

2.7   Web

The requirements of clause 9 apply to web pages, including documents and software that are web pages, or that are part of web pages. The requirements of clause 9 are the level A and AA success criteria from the W3C Web Content Accessibility Guidelines (WCAG 2.0):

- **Is the ICT a web page or does the ICT have web pages? [Q7]**
    - o 9.2.1 Non-text content
    - o 9.2.2 Audio-only and video-only (pre-recorded)
    - o 9.2.3 Captions (pre-recorded)
    - o 9.2.4 Audio description or media alternative (pre-recorded)
    - o 9.2.5 Captions (live)
    - o 9.2.6 Audio description (pre-recorded)
    - o 9.2.7 Info and relationships
    - o 9.2.8 Info and relationships

- o 9.2.9 Sensory characteristics
- o 9.2.10 Use of colour
- o 9.2.11 Audio control
- o 9.2.12 Contrast (minimum)
- o 9.2.13 Resize text
- o 9.2.14 Images of text
- o 9.2.15 Keyboard
- o 9.2.16 No keyboard trap
- o 9.2.17 Timing adjustable
- o 9.2.18 Pause, stop, hide
- o 9.2.19 Three flashes or below threshold
- o 9.2.20 Bypass blocks
- o 9.2.21 Page titled
- o 9.2.22 Focus order
- o 9.2.23 Link purpose
- o 9.2.24 Multiple ways
- o 9.2.25 Headings and labels
- o 9.2.26 Focus visible
- o 9.2.27 Language of page
- o 9.2.28 Language of parts
- o 9.2.29 On focus
- o 9.2.30 On input
- o 9.2.31 Consistent navigation
- o 9.2.32 Consistent identification
- o 9.2.33 Error identification
- o 9.2.34 Labels or instructions
- o 9.2.35 Error suggestion
- o 9.2.36 Error prevention (legal, financial, data)
- o 9.2.37 Parsing
- o 9.2.38 Name, role, value
- o 9.3 WCAG 2.0 conformance requirements

2.8 Non-web documents

The requirements and recommendations of clause 10 apply to non-web documents. Clause 10 contains WCAG-derived requirements and two additional recommendations related to positioning of captions and to timing of audio descriptions:

- **Is the ICT a non-web document or does the ICT have non-web documents? [Q8]**
  - o 10.2.1 Non-text content
  - o 10.2.2 Audio-only and video-only (pre-recorded)
  - o 10.2.3 Captions
  - o 10.2.4 Audio description or media alternative (pre-recorded)
  - o 10.2.5 Captions (live)
  - o 10.2.6 Audio description (pre-recorded)
  - o 10.2.7 Info and relationships
  - o 10.2.8 Meaningful sequence
  - o 10.2.9 Sensory characteristics
  - o 10.2.10 Use of colour

- o 10.2.11 Audio control
- o 10.2.12 Contrast (minimum)
- o 10.2.13 Resize text
- o 10.2.14 Images of text
- o 10.2.15 Keyboard
- o 10.2.16 No keyboard trap
- o 10.2.17 Timing adjustable
- o 10.2.18 Pause, stop, hide
- o 10.2.19 Three flashes or below threshold
- o 10.2.21 Document titled
- o 10.2.22 Focus order
- o 10.2.23 Link purpose (in context)
- o 10.2.25 Headings and labels
- o 10.2.26 Focus visible
- o 10.2.27 Language of page
- o 10.2.28 Language of parts
- o 10.2.29 On focus
- o 10.2.30 On input
- o 10.2.33 Error identification
- o 10.2.34 Labels or instructions
- o 10.2.35 Error suggestion
- o 10.2.36 Error prevention (legal, financial, data)
- o 10.2.37 Parsing
- o 10.2.38 Name, role, value
- o 10.2.39 Caption positioning
- o 10.2.40 Audio description timing

2.9 Software

The requirements of clause 11 apply in principle to any type of software. Clause 11.2 applies to non-web software, with some requirements applying or not depending on whether the non-web software has closed functionality. Then there are requirements in clause 11.3 dealing with the interoperability with assistive technologies. Finally, there are some requirements that only apply to software that is an authoring tool.

- **Is the ICT software or does the ICT have software? [Q9]**
  - o 11.3.2.04 Assistive technologies
  - o 11.4.2 No disruption of accessibility features
  - o 11.5 User preferences
  - o **Is it non-web software that provides a user interface? [Q9.1]**
    - 11.2.1.03 Captions (pre-recorded)
    - 11.2.1.05 Captions (live)
    - 11.2.1.06 Audio description (pre-recorded)
    - 11.2.1.09 Sensory characteristics
    - 11.2.1.10 Use of colour
    - 11.2.1.11 Audio control
    - 11.2.1.12 Contrast (minimum)
    - 11.2.1.17 Timing adjustable
    - 11.2.1.18 Pause, stop, hide
    - 11.2.1.19 Three flashes or below threshold

- 11.2.1.22 Focus order
- 11.2.1.23 Link purpose (in context)
- 11.2.1.25 Headings and labels
- 11.2.1.26 Focus visible
- 11.2.1.29 On focus
- 11.2.1.30 On input
- 11.2.1.34 Labels or instruction
- 11.2.1.35 Error suggestion
- 11.2.1.36 Error prevention (legal, financial, data)
- **Does the non-web software have functionality that supports access to assistive technologies (i.e. it is not closed)? [Q9.1.1 = not Q1)]**
  - 11.2.1.1 Non-text content (screen reading supported)
  - 11.2.1.2 Audio-only and video-only (pre-recorded)
  - 11.2.1.4 Audio description or media alternative (pre-recorded)
  - 11.2.1.7 Info and relationships
  - 11.2.1.8 Meaningful sequence
  - 11.2.1.13 Resize text
  - 11.2.1.14 Images of text
  - 11.2.1.15 Keyboard
  - 11.2.1.16 No keyboard trap
  - 11.2.1.27 Language of software
  - 11.2.1.33 Error identification
  - 11.2.1.37 Parsing
  - 11.2.1.38 Name, role, value
- **Does the non-web software have closed functionality? [Q9.1.2 = Q1)]**
  - 11.2.2.1 Non-text content
  - 11.2.2.2.1 Pre-recorded audio-only
  - 11.2.2.2.2 Pre-recorded video only
  - 11.2.2.4 Audio description or media alternative (pre-recorded)
  - 11.2.2.7 Info and relationships
  - 11.2.2.8 Meaningful sequence
  - 11.2.2.13 Resize text
  - 11.2.2.14 Images of text
  - 11.2.2.15 Keyboard
  - 11.2.2.27 Language of software
  - 11.2.2.33 Error Identification
  - 11.2.2.37 Parsing
  - 11.2.2.38 Name, role value
- **Is it platform software? [Q9.2]**
  - 11.3.2.1 Platform accessibility service support for software that provides a user interface
  - 11.3.2.2 Platform accessibility service support for assistive technologies
  - 11.4.1 User control of accessibility features
- **Does the software supports access to assistive technologies (i.e. it is not closed)? [Q9.3 = not Q1]**
  - 11.3.2.03 Use of accessibility services
  - 11.3.2.05 Object information

- 11.3.2.06 Row, column, and headers
- 11.3.2.07 Values
- 11.3.2.08 Label relationships
- 11.3.2.09 Parent-child relationships
- 11.3.2.10 Text
- 11.3.2.11 List of available actions
- 11.3.2.12 Execution of available actions
- 11.3.2.13 Tracking of focus and selection attributes
- 11.3.2.14 Modification of focus and selection attributes
- 11.3.2.15 Change notification
- 11.3.2.16 Modifications of states and properties
- 11.3.2.17 Modifications of values and text
- **Does the non-web software have closed functionality? [Q9.4 = Q1]**
  - 11.3.1 Closed functionality (interoperability with assistive technology)
- **Is the ICT an authoring tool? [Q9.5]**
  - 11.6.1 Content technology
  - 11.6.2 Accessible content creation
  - 11.6.3 Preservation of accessibility information in transformations
  - 11.6.4 Repair assistance
  - 11.6.5 Templates

In this section of the decision tree, there are questions whose answer is derived from the answer to Q1 (see section 2.2) and that will not be asked to the user. Questions Q9.1.1 and Q9.4 will have the same answer as Q1. Questions Q9.1.2 and Q9.3 will have the opposite answer.

2.10 Documentation and support services

The requirements in clause 12.1 apply to product documentation and the requirements in clause 12.2 apply to the support services of the ICT:

- **Does the ICT have product documentation? [Q10]**
  - 12.1.1 Accessibility and compatibility features
  - 12.1.2 Accessible documentation
- **Does the ICT have support services? [Q11]**
  - 12.2.2 Information on accessibility and compatibility services
  - 12.2.3 Effective communication
  - 12.2.4 Accessible documentation

2.11 Relay services

The requirements in clause 13.1 apply to ICT that is intended to provide relay services:

- **Is the ICT intended to provide relay services? [Q12]**
  - 13.1.2 Text relay services
  - 13.1.3 Sign relay services
  - 13.1.4 Lip-reading relay services
  - 13.1.5 Captioned telephony services
  - 13.1.6 Speech to speech relay services

3 The process of using the implemented decision tree

The tree described in section 2 has been implemented in a software prototype. The flow of actions using the prototype is very simple:

1. The user writes the name of an ICT product or service
2. The user answers each question of the decision tree. At each step, the next question to be presented depends on the answer given to the current question. The system will be displaying the answers given by the user and the set of applicable clauses (requirements or recommendations).
3. Once all questions have been answered, the system copies the data (answers and applicable clauses) to the clipboard and stops.

4 An example

The user defines "MyApp" as the ICT product or service (Figure 1). It is a mobile app (developed with native code) that does not provide two-way voice communication and that does not have video capabilities.
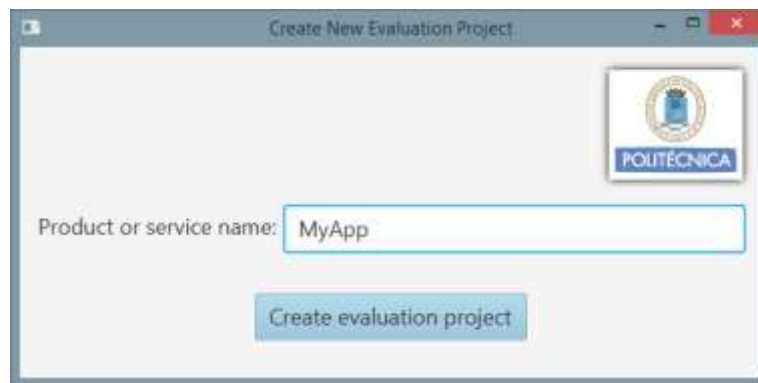

Figure 1. Product or service name written by the user

Then the user is shown the first question: "Does the ICT have closed functionality?" (Figure 2). There are already some applicable clauses, as they should always be considered because they don't depend on any question of the decision tree (see section 2.1 above).

The user answers that first question (in this case the mobile app is not closed) and the system shows the next question (Figure 3).

The process continues until there are no more questions to be presented to the user. At that moment the system explains to the user that there are no more questions and that the results of the process have been copied to the clipboard (Figure 4). There is also a button that opens a new window displaying the results of the decision process (Figure 5).

Section 5 below shows the result of the process, which has been copied to the system's clipboard in HTML format. Some of the answers are shown as "derived". This means that they were not presented to be user but that their answer was derived instead from the answers given to previous questions.
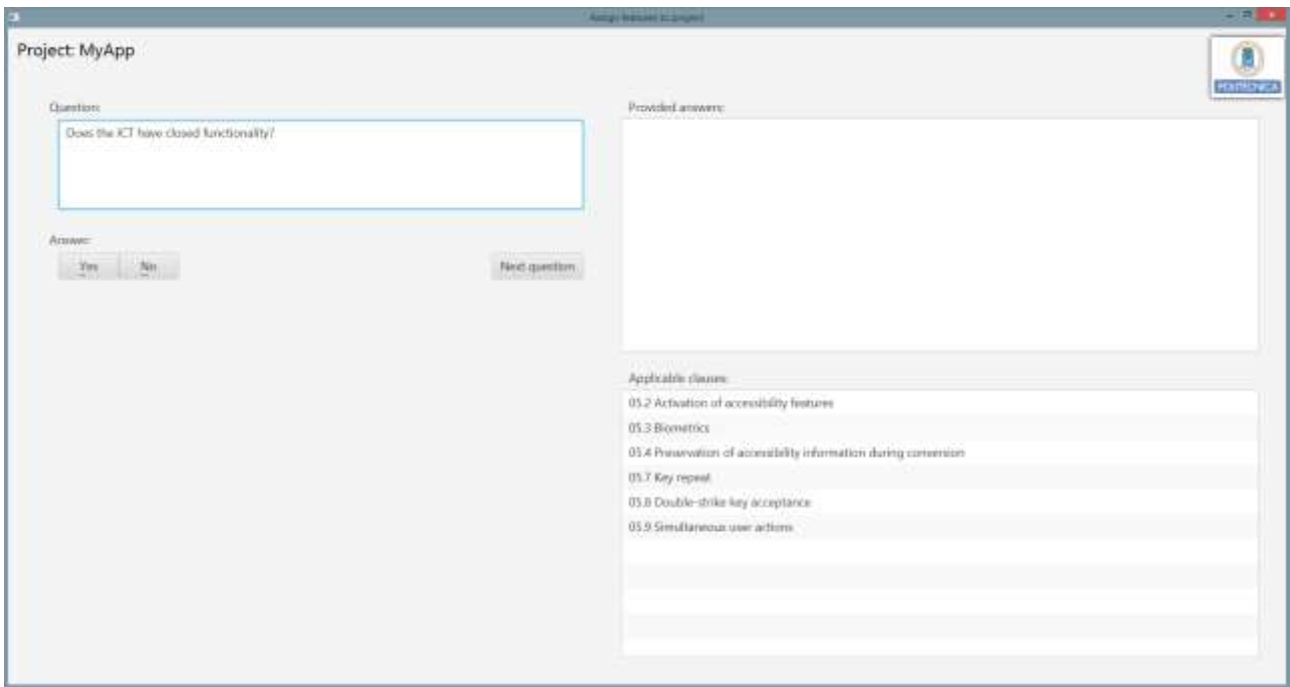
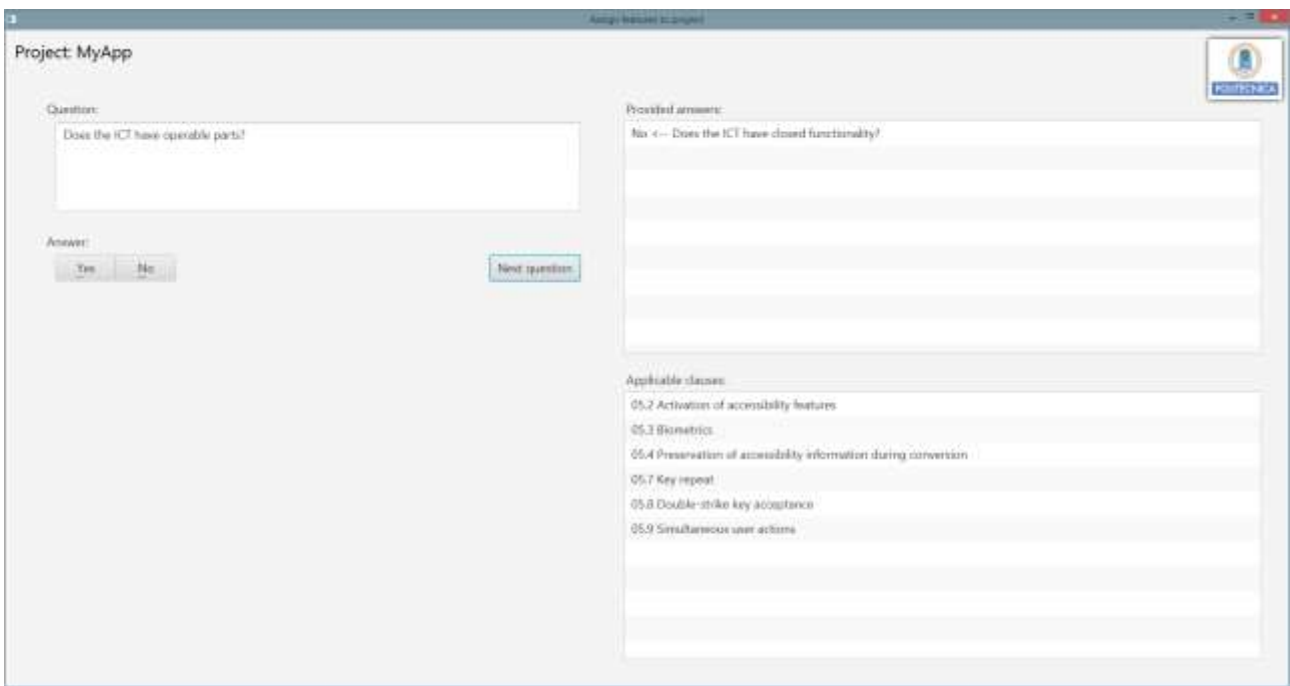*Figure 2. First question presented to the user*

Figure 3. Second question presented if the product or system is not closed
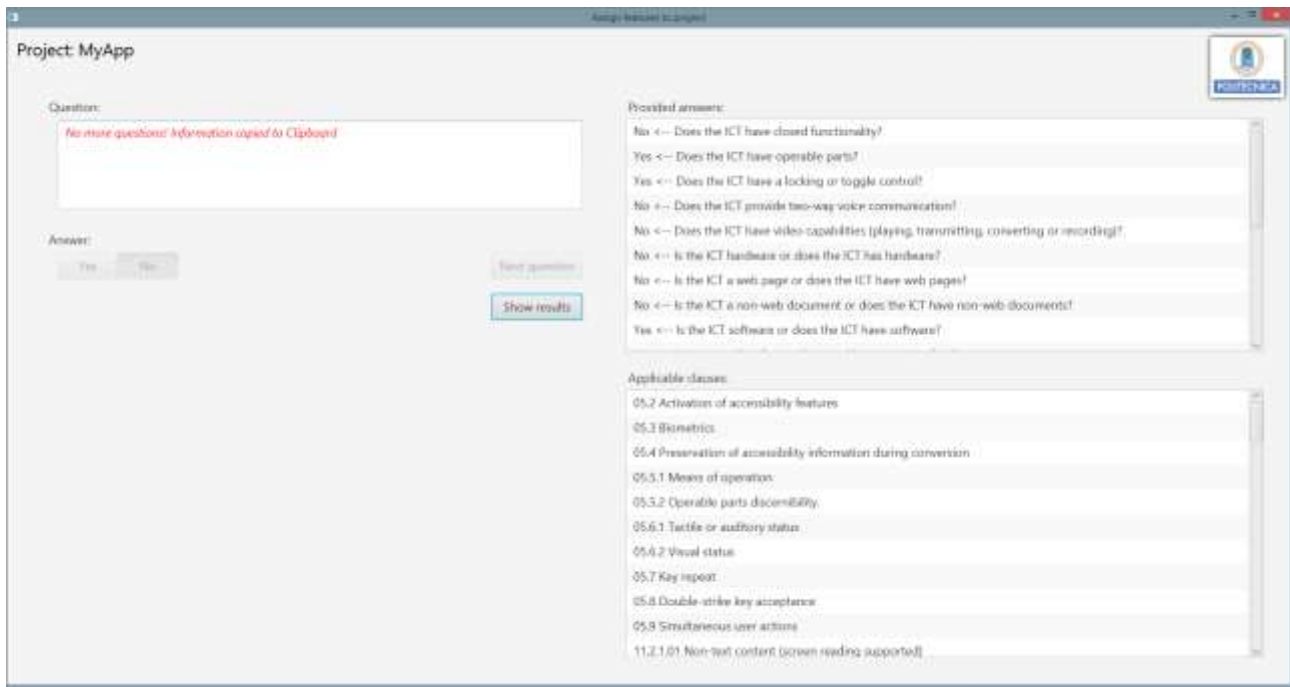
Figure 4. End of the questionnaire. All questions have been answered
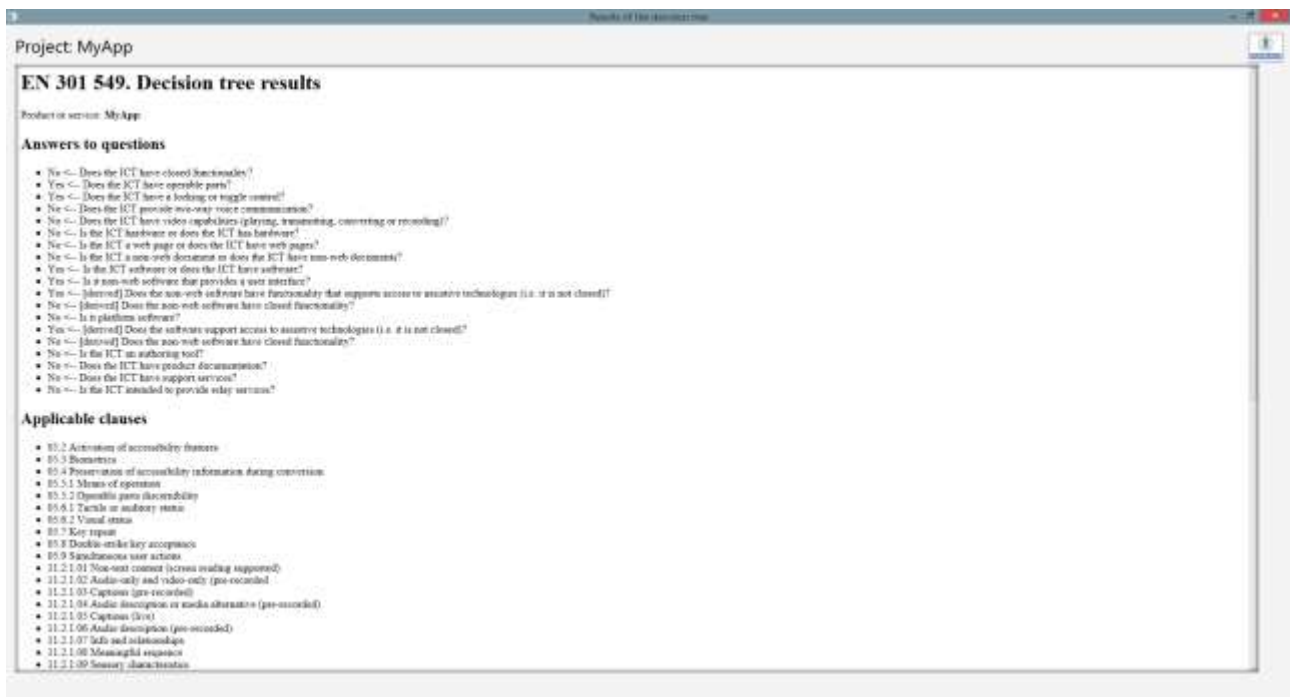

Figure 5. End of the questionnaire. Window showing the results of the decision process

5 Example of results

Here is the resulting information copied into the clipboard by the prototype.

5.1 EN 301 549. Decision tree results

Product or service: **MyApp**

5.1.1 Answers to questions

- No <-- Does the ICT have closed functionality?

- Yes <-- Does the ICT have operable parts?
- Yes <-- Does the ICT have a locking or toggle control?
- No <-- Does the ICT provide two-way voice communication?
- No <-- Does the ICT have video capabilities (playing, transmitting, converting or recording)?
- No <-- Is the ICT hardware or does the ICT has hardware?
- No <-- Is the ICT a web page or does the ICT have web pages?
- No <-- Is the ICT a non-web document or does the ICT have non-web documents?
- Yes <-- Is the ICT software or does the ICT have software?
- Yes <-- Is it non-web software that provides a user interface?
- Yes <-- [derived] Does the non-web software have functionality that supports access to assistive technologies (i.e. it is not closed)?
- No <-- [derived] Does the non-web software have closed functionality?
- No <-- Is it platform software?
- Yes <-- [derived] Does the software support access to assistive technologies (i.e. it is not closed)?
- No <-- [derived] Does the non-web software have closed functionality?
- No <-- Is the ICT an authoring tool?
- No <-- Does the ICT have product documentation?
- No <-- Does the ICT have support services?
- No <-- Is the ICT intended to provide relay services?

5.1.2 Applicable clauses
- 05.2 Activation of accessibility features
- 05.3 Biometrics
- 05.4 Preservation of accessibility information during conversion
- 05.5.1 Means of operation
- 05.5.2 Operable parts discernibility
- 05.6.1 Tactile or auditory status
- 05.6.2 Visual status
- 05.7 Key repeat
- 05.8 Double-strike key acceptance
- 05.9 Simultaneous user actions
- 11.2.1.01 Non-text content (screen reading supported)
- 11.2.1.02 Audio-only and video-only (pre-recorded
- 11.2.1.03 Captions (pre-recorded)
- 11.2.1.04 Audio description or media alternative (pre-recorded)
- 11.2.1.05 Captions (live)
- 11.2.1.06 Audio description (pre-recorded)
- 11.2.1.07 Info and relationships
- 11.2.1.08 Meaningful sequence
- 11.2.1.09 Sensory characteristics
- 11.2.1.10 Use of colour
- 11.2.1.11 Audio control
- 11.2.1.12 Contrast (minimum)
- 11.2.1.13 Resize text
- 11.2.1.14 Images of text
- 11.2.1.15 Keyboard

- 11.2.1.16 No keyboard trap
- 11.2.1.17 Timing adjustable
- 11.2.1.18 Pause, stop, hide
- 11.2.1.19 Three flashes or below threshold
- 11.2.1.22 Focus order
- 11.2.1.23 Link purpose (in context)
- 11.2.1.25 Headings and labels
- 11.2.1.26 Focus visible
- 11.2.1.27 Language of software
- 11.2.1.29 On focus
- 11.2.1.30 On input
- 11.2.1.33 Error identification
- 11.2.1.34 Labels or instructions
- 11.2.1.35 Error suggestion
- 11.2.1.36 Error prevention (legal, financial, data)
- 11.2.1.37 Parsing
- 11.2.1.38 Name, role, value
- 11.3.2.03 Use of accessibility services
- 11.3.2.04 Assistive technology
- 11.3.2.05 Object information
- 11.3.2.06 Row, column, and headers
- 11.3.2.07 Values
- 11.3.2.08 Label relationships
- 11.3.2.09 Parent-child relationships
- 11.3.2.10 Text
- 11.3.2.11 List of available actions
- 11.3.2.12 Execution of available actions
- 11.3.2.13 Tracking of focus and selection attributes
- 11.3.2.14 Modification of focus and selection attributes
- 11.3.2.15 Change notification
- 11.3.2.16 Modifications of states and properties
- 11.3.2.17 Modifications of values and text
- 11.4.2 No disruption of accessibility features
- 11.5 User preferences