

Heuristic Evaluation Checklist for mobile ERP- Version 1.0

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1. Visibility of system status:

“The system should always keep user informed about what is going on, through appropriate feedback within reasonable time” [1].

1.1. System status feedback

System must inform the end user about the internal status of the system [2].

- 1) Is there some form of feedback for system failures? (It represents any operation that the mobile system is unable to complete, not failures caused by user) (adapted from [3]).
- 2) Is there some form of feedback for non-availability of resources to execute certain operation? (adapted from [3])
- 3) Is there some form of feedback whether there is a problem with an external resource that is used by the system? (adapted from [3])

1.2. User interaction feedback

“For every user action, there should be system feedback. For frequent and minor actions, the response can be modest, whereas for infrequent and major actions, the response should be more substantial” [4].

- 4) Is there some form of feedback for every user action? (adapted from [5])
- 5) Is there some form of warning feedback for user action and its consequences? (adapted from [2])

1.3. Content Feedback

The mobile UI content (information and UI elements) should support overall system visibility through appropriate feedback and denotations [authors].

1.3.1. Information

- 6) “Are high informative contents placed in high hierarchy areas?” [6, 7]
- 7) Is the system capable of updating only content that has actually changed, such as news updates?[1]
- 8) Is the system only showing dates and times for time-sensitive information only? [8]

1.3.2. UI Elements

- **Page Feed back**

- 9) “Does every display begin with a title or header that describes screen contents?” [5]
- 10) “In multipage data entry screens, is each page labeled to show its relation to others?” [5]

11) For articles which spans several pages, is pagination shown at the bottom? Is there a link to each individual page, rather than just to the previous and the next ones? [6, 9]

12) If a page is programmed to 'time out', is there a form of warning users before time expires so they can request additional time? [10]

- **Colour Feed Back**

13) Could the color-coding scheme be quickly and easily understood? [10]

- **Pop-up**

14) "If pop-up windows are used to display error messages, do they allow the user to see the field in error?" [5]

- **List Items**

15) "Do all the items on a list are on the same page? Are they sorted in an order that matches the needs of the task?" [6, 9]

16) "If a list of items can be sorted according to different criteria, does it provide the option sort them according to all those criteria?" [6, 9]

17) "If a list contains items that belong to different categories, are there filters for users to narrow down the number of elements that they need to inspect?" [6, 9]

18) "If the list contains only one item, is the user taken directly to that item?" [6, 9]

19) "If the list contains items that download slowly (e.g., images), is the list split into multiple pages to show just one page at a time?" [6, 9]

20) Are lists formatted to support ease scanning? [10]

21) "Do menu instructions, prompts, and error messages appear in the same place(s) on each menu?" [5]

22) "If multiple options can be selected in a menu or dialog box, is there visual feedback about which options are already selected?" [5]

- **Visibility of links**

23) "Are links recognizable?" [6, 7]

24) "Is there any characterization according to the state (visited, active,...)?" [6, 7]

25) For longer pages with multiple content sections, is there a short and clickable list of the sections at the top of the page? [10]

- **Data entry fields**

26) Are data entry fields large enough to show all of the entered data without scrolling? [10]

- **Visibility of charts**

27) Is the chart data and axes visible? [11]

28) Is the system capable of providing a visually-rich chart of information and relevant to? [12]

- **Buttons**

29) Do app's buttons have been designed in a non-uniform sizes or colour to give an indication of which button is more important? For example, end call button [13]

30) "Is a single, selected icon clearly visible when surrounded by unselected icons?" [5]

- **Menus**

31) "Do GUI menus make obvious which item has been selected?" [5]

32) "Do GUI menus make obvious whether deselection is possible?" [5]

1.4. Visibility of Navigation:

33) Is the main navigation located in a highly noticeable place? [8]

34) Is the main navigation menus placed in the left panel of tablet UI? (adapted from [10])

35) Are items in the navigation area grouped so that similar items are next to each other? [8]

36) Is the system capable of providing navigational options? [10]

37) Is there any type of feedback on user's location within the application? [10]

38) Are tabs presented effectively? [10]

39) Are tabs using descriptive labels? [10]

1.5. Location Information:

40) "Is the logo meaningful, identifiable, and sufficiently visible?" [6, 7]

41) "Is there any link to detailed information about the enterprise, web site, webmaster...?" [6, 7]

42) "Are there ways of contacting with the enterprise?" [6, 7]

43) "In articles, news, reports... Are the author, sources, dates and review information shown clearly?" [6, 7]

44) "For physical location information on the website, is a link to a map provided and the directions clearly accessible?" [6, 9]

1.6. Response Times

45) "Are response times appropriate for the users cognitive processing?" [5]

46) "Are response times appropriate for the task?" [5]

47) "If there are observable delays (greater than fifteen seconds) in the system's response time, is the user kept informed of the system progress?" [5]

48) "Is latency sufficiently reduced?" [6, 14]

49) "Are splash screens too long avoided?" [6, 15]

50) "If download time is greater than 20 seconds, are progress bar offered instead of non-informative download screens?" [6, 15]

1.7. Selection/ input of data

- 51) “Is there visual feedback in menus or dialog boxes about which choices are selectable?” [5]
- 52) “Is the current status of an icon clearly indicated?” [5]
- 53) “Is there visual feedback when objects are selected or moved?” [5]
- 54) “Are low discoverable areas as touch buttons well identifiable?” [6, 15]
- 55) “When swiping gesture is possible, is a visible clue offered to users? Is swiping used with a unique meaning in the same screen?” [6] [15]
- 56) “Are expandable menus used sparingly? Do menu labels clearly indicate that they expand to a set of options?” [6, 7]
- 57) “Is there visual feedback in menus or dialog boxes about which choice the cursor is on now?” [5]

1.8. Presentation Adaptation

- 58) “When users access to the site from a mobile phone, are they directed to the mobile version of the site?” [6, 7]
- 59) “Is a link to the mobile site provided on the desktop version of site?” [6, 7]
- 60) “Is a link to the full site included on the mobile page?” [6, 9]

2. Match between system and the real world (Mental model accuracy)

“The system should speak the user’s language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order” [1].

2.1. Metaphors/Mental models

- 61) “Are metaphors properly used as visual clues?” [6, 14]
- 62) “Are icons concrete and familiar?” [5]
- 63) “If shape is used as a visual cue, does it match cultural conventions?” [5]
- 64) “Do the selected colours correspond to common expectations about colour codes?” [5]

2.2. Navigational Structure

- 65) “If the site uses hierarchical structure, are depth and height balanced?” [6, 7]
- 66) “Is a navigation map or table of contents included on the app?” [6, 16]
- 67) “Is too much navigation avoided?” [6]
- 68) Is the main navigation located in a highly noticeable place? [8]
- 69) Are the primary navigation menus located in the left Panel? [10]

- 70) Are secondary and tertiary menus placed together? [10]
- 71) Are tabs presented effectively? [10]
- 72) Are tabs using descriptive labels? [10]
- 73) Are the items in the navigation area grouped so that similar items are next to each other? [8]

2.3. Menus

- 74) "Are menu choices ordered in the most logical way, given the user, the item names, and the task variables?" [5]
- 75) "Do menu choices fit logically into categories that have readily understood meanings?" [5]
- 76) "Are menu titles parallel grammatically?" [5]
- 77) "If there is a natural sequence to menu choices, has it been used?" [5]
- 78) "In navigation menus, are the number of items and terms by item controlled to avoid memory overload?" [6, 7]

2.4. Simplicity

- 79) "Do related and interdependent fields appear on the same screen?" [5]
- 80) "For question and answer interfaces, are questions stated in clear, simple language?" [5]
- 81) "Is the language used the same target users speak?" [6, 7]
- 82) "Is the menu-naming terminology consistent with the user's task domain?" [5]
- 83) "Is the language clear and concise?" [6, 7]
- 84) Are made-up words avoided for category navigation choices? [8]
- 85) Is an imperative language used for mandatory tasks or qualify the statement appropriately, such as "Enter a City or Zip Code"? [8]
- 86) Are standard abbreviations used? Such as p.m. or P.M. [8]
- 87) Is the system spell out the month or use its abbreviations, not numbers? [8]
- 88) Are abbreviations and acronyms clarified? [8]
- 89) "Does the site follow the rule "1 paragraph=1 idea"?" [6, 7]

2.5. Output of numeric information

- 90) "Does the system automatically enter leading or trailing spaces to align decimal points?" [5]
- 91) Does the system automatically enter a currency sign and decimal for monetary entries? (adapted from [5])
- 92) "Does the system automatically enter commas in numeric values greater than 9999?" [5]

93) “Are integers right-justified and real numbers decimal-aligned?” [5]

2.6. Lists

94) Are all items sorted in an order that matches the needs of the task and best facilitates efficient and successful user performance? [6, 9]

95) Are lists formatted to support ease scanning? [10]

96) If most of the users will be looking for the same item, will the item be placed at the top of the list? [10]

97) Is a series of related items displayed in a vertical list rather than as continuous text? [10]

98) Is the type of list chosen appropriately? [10]

2.7. Page Structure

99) Are important or clickable items consistently placed in order to estimate their location clearly? [10]

100) For longer pages with multiple content sections, is there a short and clickable list of the sections at the top of the page? The sections at the top of the page? [10]

2.8. Information

101) Is information organized at each level of the application (App level, page level, and paragraph or list level) in order to show a clear, consistent and logical structure to typical users? (adapted from [10, 12])

102) Is the significance of the priority levels understood easily by the user? [17]

103) Is there inappropriate usage of spaces and punctuation? [8]

104) “Have uncommon letter sequences been avoided whenever possible?” [5]

105) Is the system only showing dates and times for time-sensitive information only? [8]

3. User control and freedom

“Users often choose system functions by mistake and will need a clearly marked “emergency exit” to leave the unwanted state without having to go through an extended dialogue. Support undo and redo” [1].

3.1. Explorable interfaces

106) “Can users move forward and backward between fields or dialog box options?” [5]

107) “If the system has multipage data entry screens, can users move backward and forward among all the pages in the set?” [5]

108) “If the system uses a question and answer interface, can users go back to previous questions or skip forward to later questions?” [5]

109) “Are exits clearly marked?” [6, 18]

- 110) “Is the general web site structure user-oriented?” [6, 7]
- 111) “Is there any way to inform user about where they are and how to undo their navigation?” [6, 7]
- 112) “Is accidental activation avoided or foreseen (a back button is offered)?” [6, 15]
- 113) “In mobile websites, is navigation on the homepage provided?” [6, 15]
- 114) “If setting up windows is a low-frequency task, is it particularly easy to remember?” [5]
- 115) “In systems that use overlapping windows, is it easy for users to rearrange windows on the screen?” [5]
- 116) “In systems that use overlapping windows, is it easy for users to switch between windows?” [5]

3.2. Some level of personalization

- 117) “Can users set their own system, session, file, and screen defaults?” [5]

3.3. Process confirmation

- 118) “When a user's task is complete, does the system wait for a signal from the user before processing?” [5]
- 119) “Are users prompted to confirm commands that have drastic, destructive consequences?” [5]

3.4. Undo/Cancelation

- 120) “Can users easily reverse their actions?” [5]
- 121) “Is there an “undo” function at the level of a single action, a data entry, and a complete group of actions?” [5]
- 122) “Can users cancel out of operations in progress?” [5]
- 123) “If the system allows users to reverse their actions, is there a retracing mechanism to allow for multiple undos?” [5]

3.5. Menus control

- 124) “If the system has multiple menu levels, is there a mechanism that allows users to go back to previous menus?” [5]
- 125) “Are menus broad (many items on a menu) rather than deep (many menu levels)?” [5]
- 126) “If users can go back to a previous menu, can they change their earlier menu choice?” [5]

3.6. Data Entry

- 127) “Can users reduce data entry time by copying and modifying existing data?” [5]

- 128) “Are character edits allowed in data entry fields?” [5]
- 129) Does the system provide the user the option to turn on or turn off the AutoFill function for data entry fields? [19]
- 130) Are measurement systems initiated by the user? [19]

4. Consistency and standards

“Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions” [1].

4.1. Orientation

- 131) “Is constraining orientation avoided? (Users tend to switch orientation when an impasse occurs and, if the app doesn’t support them, their flow is going to be disrupted and they are going to wonder why it’s not working)” [6, 15]
- 132) “Is navigation (horizontal and vertical) consistent across orientations? (Some applications use a different navigation direction in the two orientations; for instance, they use horizontal navigation in landscape and use vertical navigation in portrait).” [6, 15]
- 133) “Is content consistent across orientations?” [6, 15]

4.2. Designing consistency

- 134) “Are attention-getting techniques used with care?” [5]
- 135) “Are attention-getting techniques used only for exceptional conditions or for time-dependent information?” [5]
- 136) “Is intensity maintained in two levels only?” [5, 6]
- 137) “Is the number of colour used constrained up to two or three colours (trichromatic design) [1]? Are additional colours saved for occasional use only?” [5, 6]
- 138) “Are the colour far apart along the visible spectrum?” [5, 6]
- 139) “Is a legend provided if color codes are numerous or not obvious in meaning?” [5]
- 140) “Have pairings of high-chroma, spectrally extreme colors been avoided?” [5]
- 141) “Are high-value, high-chroma colors used to attract attention?” [5]
- 142) “Are saturated blues avoided for text or other small, thin line symbols?” [5]
- 143) “Is the most important information placed at the beginning of the prompt?” [5]
- 144) “Do field-level prompts provide more information than a restatement of the field name?” [5]
- 145) Is the font size appropriate? [20]
- 146) “Are soft tones used for regular positive feedback and harsh for rare critical conditions?” [5, 6]
- 147) “If the system has multipage data entry screens, do all pages have the same title?” [5]

- 148) “Do on-line instructions appear in a consistent location across screens?” [5]
- 149) “Have industry or company formatting standards been followed consistently in all screens within a system?” [5]
- 150) “Have industry or company standards been established for menu design, and are they applied consistently on all menu screens in the system?” [5]
- 151) “Are there no more than twelve to twenty icon types?” [5]
- 152) “Has a heavy use of all uppercase letters on a screen been avoided?” [5]
- 153) “Is there a consistent icon design scheme and stylistic treatment across the system?” [5]
- 154) “Do abbreviations not include punctuation?” [5]
- 155) “Are integers right-justified and real numbers decimal-aligned?” [5]
- 156) “Are icons labeled?” [5]
- 157) “Are there salient visual cues to identify the active window?” [5]
- 158) “For question and answer interfaces, are the valid inputs for a question listed?” [5]
- 159) “Do abbreviations follow a simple primary rule and, if necessary, a simple secondary rule for abbreviations that otherwise would be duplicates?” [5]
- 160) “Are abbreviated words all the same length?” [5]
- 161) “If the system has multipage data entry screens, does each page have a sequential page number?” [5]

4.2.1. Menus

- 162) “Are menu choice lists presented vertically?” [5]
- 163) “If “exit” is a menu choice, does it always appear at the bottom of the list?” [5]
- 164) “Are menu titles either centred or left-justified?” [5]

4.2.2. Input fields

- 165) “Are field labels consistent from one data entry screen to another?” [5]
- 166) “Do field labels appear to the left of single fields and above list fields?” [5]
- 167) “Are field labels and fields distinguished typographically?” [5]

4.3. Naming convention consistency

- 168) “Is the structure of a data entry value consistent from screen to screen?” [5]
- 169) “Are system objects named consistently across all prompts in the system?” [5]
- 170) “Are user actions named consistently across all prompts in the system?” [5]

4.4. Menu/task consistency

- 171) “Are menu choice names consistent, both within each menu and across the system, in grammatical style and terminology?” [5]

172) “Does the structure of menu choice names match their corresponding menu titles?” [5]

173) “Does the menu structure match the task structure?” [5]

174) “When prompts imply a necessary action, are the words in the message consistent with that action?” [5]

4.5. Functional goals consistency

175) “Where are the web site goals? Are they well defined? Do content and services delivered match these goals?” [6, 7]

176) “Does the look & feel correspond with goals, characteristics, contents and services of the web site?” [6, 7]

177) “Is the web site being updated frequently?” [6, 7]

4.6. System response consistency

178) “Is system response after clicking links predictable?” [6, 7]

179) “Are nowhere links avoided?” [6, 7]

180) “Are orphan pages avoided?” [6, 7]

5. Error prevention

“Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action” [1].

181) “Are menu choices logical, distinctive, and mutually exclusive?” [5]

182) “Are data inputs case-blind whenever possible?” [5]

183) “Does the system warn users if they are about to make a potentially serious error?” [5]

184) “Does the system prevent users from making errors whenever possible?” [5]

185) “Do data entry screens and dialog boxes indicate the number of character spaces available in a field?” [5]

186) “Do fields in data entry screens and dialog boxes contain default values when appropriate?” [5]

187) “Is accidental activation avoided or foreseen (a back button is offered)?” [6, 15]

188) “If the system displays multiple windows, is navigation between windows simple and visible?” [5]

5.1. Fat-finger syndrome

189) “Are touchable areas sufficiently big? (Research has shown that the best target size for widgets is 1cmx1cm for touch devices)” [6, 15]

- 190) “Is crowding targets avoided? (When targets are placed too close to each other, users can easily hit the wrong one)” [6, 15]
- 191) “Although the visible part of the target may be small, is there some invisible target space that if a user hits that space, their tap will still count?” [6, 15]
- 192) “When several items are listed in columns, one on top of another, can users hit anywhere in the row to select the target corresponding to that row?” [6, 15]
- 193) “Is downloading of software that is inappropriate for the user phone avoided?” [6, 9]
- 194) “Are JavaScript and Flash use avoided?” [6, 9]

6. Recognition rather than recall

“Minimize the user’s memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate” [1].

6.1. Memory load reduction

- 195) “Are high levels of concentration not required and remembering information doesn't take more than two to fifteen seconds?” [5]
- 196) “Are all data a user needs on display at each step in a transaction sequence?” [5]
- 197) “If users have to navigate between multiple screens, does the system use context labels, menu maps, and place markers as navigational aids?” [5]
- 198) “After the user completes an action (or group of actions), does the feedback indicate that the next group of actions can be started?” [5]
- 199) “Are optional data entry fields clearly marked?” [5]
- 200) “Do data entry screens and dialog boxes indicate when fields are optional?” [5]
- 201) “Is page length controlled?” [6, 7]
- 202) “Do the task flow should start with actions that are essential to the main task? And can the users start the task as soon as possible?” [6, 15]
- 203) “Are the controls that are related to a task grouped together and reflect the sequence of actions in the task?” [1,14]
- 204) “Are symbols used to break long input strings into "chunks"?” [5]
- 205) “Have large strings of numbers or letters been broken into chunks?” [5]
- 206) “Are borders used to identify meaningful groups?” [5]
- 207) “Has the same color been used to group related elements?” [5]
- 208) “Is color coding consistent throughout the system?” [5]
- 209) “Is color used in conjunction with some other redundant cue?” [5]
- 210) “Does the system provide mapping: that is, are the relationships between controls and actions apparent to the user?” [5]

211) “Have frequently confused data pairs been eliminated whenever possible?” [5]

6.2. General visual cues

212) “For question and answer interfaces, are visual cues and white space used to distinguish questions, prompts, instructions, and user input?” [5]

213) Does the data display start in the upper-left corner of the screen for LTR languages and from the upper-right corner of the screen for RTL languages?(adapted from [6, 7])

214) “Have prompts been formatted using white space, justification, and visual cues for easy scanning?” [6, 7]

215) “Are prompts, cues, and messages placed where the eye is likely to be looking on the screen?” [5]

216) “Do text areas have “breathing space” around them?” [6, 7]

217) “Is white space used to create symmetry and lead the eye in the appropriate direction?” [5]

218) “Are there “white” areas between informational objects for visual relaxation?” [6, 7]

219) “Does the system provide visibility: that is, by looking, can the user tell the state of the system and the alternatives for action?” [5]

220) “Are size, boldface, underlining, colour, shading, or typography used to show relative quantity or importance of different screen items?” [5]

221) “Is colour used in conjunction with some other redundant cue?” [5]

222) “Is there good colour and brightness contrast between image and background colours?” [5]

223) “Have light, bright, saturated colours been used to emphasize data and have darker, duller, and desaturated colours been used to de-emphasize data?” [5]

224) “Is the visual page space well used?” [6, 7]

6.3. Input/output data

225) “On data entry screens and dialog boxes, are dependent fields displayed only when necessary?” [5]

226) “Are field labels close to fields, but separated by at least one space?” [5]

227) “Are multiword field labels placed horizontally (not stacked vertically)?” [5]

6.4. Menus

228) “Is the first word of each menu choice the most important?” [5]

229) “Are inactive menu items grayed out or omitted?” [5]

- 230) “Are there menu selection defaults?” [5]
- 231) “Is there an obvious visual distinction made between "choose one" menu and "choose many" menus?” [5]
- 232) “Have items been grouped into logical zones, and have headings been used to distinguish between zones?” [5]
- 233) Are zones width and height reasonable? (adapted from [5])
- 234) “Have zones been separated by spaces, lines, color, letters, bold titles, rules lines, or shaded areas?” [5]
- 235) “If the system has many menu levels or complex menu levels, do users have access to an on-line spatial menu map?” [5]
- 236) “Do GUI menus offer affordance: that is, make obvious where selection is possible?” [5]
- 237) “Are there salient visual cues to identify the active window?” [5]

6.5. Navigation

- 238) Is there a breadcrumbs on sites with a deep navigation structure (many navigation branches)? And, is it avoided on sites with shallow navigation structures? [h,24]

7. Flexibility and efficiency of use

“Accelerators-unseen by the novice user-may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions” [1].

- 239) “Does the system allow novices to use a keyword grammar and experts to use a positional grammar?” [5]
- 240) “Does the system automatically enter leading zeros?” [5]

7.1. Search

- 241) “Is the searching box easily accessible?” [6, 7]
- 242) “Is the searching box easily recognizable?” [6, 7]
- 243) “Is there any advanced search option?” [6, 7]
- 244) “Are search results shown in a comprehensive manner to the user?” [6, 7]
- 245) “Is the box width appropriated?” [6, 7]
- 246) “Is the user assisted if the search results are impossible to calculate?” [6, 7]
- 247) “Is there a search box on the mobile site homepage?” [6, 9]
- 248) “Is the length of the search box at least the size of the average search string? Or better, is it the largest possible size that will fit on the screen?” [6, 9]

- 249) “Are search strings preserved between searches? Are there auto-completion and suggestions?” [6, 9]
- 250) “Are several search boxes with different functionalities on the same page avoided?” [6, 9]
- 251) “If the search returns zero results, is some alternative searches offered or a link to the search results on the full page?” [6, 9]
- 252) “Does the system offer “find next” and “find previous” shortcuts for database searches?” [5]

7.2. Navigation

- 253) “Are links with good information scent (that is, links which clearly indicate where they take the users)?” [6, 9]
- 254) “Are there links to related content to help the user navigate more quickly between similar topics?” [6, 9]

8. Aesthetic and minimalist design

“Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility” [1].

- 255) “Is the time to acquire a target is a function of the distance to and size of the target following Fitts Law?” [6, 14]
- 256) “Is only (and all) information essential to decision making displayed on the screen?” [5]
- 257) “Are field labels brief, familiar, and descriptive?” [5]
- 258) “Are prompts expressed in the affirmative, and do they use the active voice?” [5]
- 259) “Is layout clearly designed avoiding visual noise?” [6, 7]
- 260) “Are application icons recognizable enough to be found in the crowded list of applications?” [6, 15]
- 261) “Are meaningful groups of items separated by white space?” [5]
- 262) “Does each data entry screen have a short, simple, clear, distinctive title?” [5]

8.1. Multimedia content

- 263) “Does the use of images and multimedia content add value?” [6, 7]
- 264) “Are images well sized? Are they understandable? Is the resolution appropriate?” [6, 7]
- 265) “Are cyclical animations avoided?” [6, 7]

- 266) “Is flash content avoided?” [6, 15]
- 267) Is the use of animated carousels avoided? And if they exist, can users control them?
[6, 9]
- 268) “Are image sizes smaller than the screen? (The entire image should be viewable with no scrolling)” [6, 9]
- 269) “For cases where customers are likely to need access to a higher resolution picture, is a screen-size picture initially displayed and is there a separate link to a higher resolution variant?” [6, 9]
- 270) “When using thumbnails, can the user distinguish what the picture is about?” [6, 9]
- 271) Does captions help to understand images meaning that are part of an article if their meaning is not clear from the context of the article? [6, 9]
- 272) “Are moving animation avoided?” [6, 9]
- 273) “When using videos, is there a textual description of what the video is about?” [6, 9]
- 274) “Do clicking on the thumbnail and clicking on the video title both play the video?”
[6, 9]
- 275) “Is video length indicated?” [6, 9]
- 276) “If the video cannot be played on the user’s device, is there a message shown with this information?” [6, 9]
- 277) When using videos, does the user able to choose the appropriate display quality? Does the app choose the appropriate display quality that matches the available internet speed and the features of the device? [authors]
- 278) Is the whole screen surface used to place information efficiently (specially for popovers and modals)? [6, 9]

8.2. Icons

- 279) “Has excessive detail in icon design been avoided?” [5]
- 280) “Is each individual icon a harmonious member of a family of icons?” [5]
- 281) “Does each icon stand out from its background?” [5]
- 282) “Are all icons in a set visually and conceptually distinct?” [5]

8.3. Menus

- 283) “Is each lower-level menu choice associated with only one higher level menu?” [5]
- 284) “Are menu titles brief, yet long enough to communicate?” [5]
- 285) “If the system uses a standard GUI interface where menu sequence has already been specified, do menus adhere to the specification whenever possible?” [5]

8.4. Orientation

286) “Desktop websites have a strong guideline to avoid horizontal scrolling. But for touch screens, horizontal swipes are often fine. Is this option taken into account?” [6, 21]

8.5. Navigation

287) “Is the site designed to avoid a large number of persistent navigation options across all pages?” [6, 9]

9. Help users recognize, diagnose and recover from errors

“Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution” [1].

288) When signalling an input error in a form, is the text box that needs to be changed specifically marked? [6, 9]

289) Is sound or another reaction like device vibrating used to signal an error? (adapted from [5])

290) “Are prompts stated constructively, without overt or implied criticism of the user?” [5]

291) “Do prompts imply that the user is in control?” [5]

292) “Are prompts brief and unambiguous?” [5]

293) “Are error messages worded so that the system, not the user, takes the blame?” [5]

294) “If humorous error messages are used, are they appropriate and inoffensive to the user population?” [5]

295) “Are error messages grammatically correct?” [5]

296) “Do error messages avoid the use of exclamation points?” [5]

297) “Do error messages avoid the use of violent or hostile words?” [5]

298) “Do error messages avoid an anthropomorphic tone?” [5]

299) “Do all error messages in the system use consistent grammatical style, form, terminology, and abbreviations?” [5]

300) “Do messages place users in control of the system?” [5]

301) Does the command language avoid arbitrary, non-English or another language use of punctuation, except for symbols that users already know? (adapted from [5])

302) “If an error is detected in a data entry field, does the system place the cursor in that field or highlight the error?” [5]

303) “Do error messages inform the user of the error's severity?” [5]

304) “Do error messages suggest the cause of the problem?” [5]

- 305) “Do error messages provide appropriate semantic information?” [5]
- 306) “Do error messages provide appropriate syntactic information?” [5]
- 307) “Do error messages indicate what action the user needs to take to correct the error?” [5]
- 308) “If the system supports both novice and expert users, are multiple levels of error-message detail available?” [5]
- 309) Does the app preserve the user's work in order to correct errors by editing their original action instead of having to do everything over again? [22]
- 310) Does the app reduce the work of correcting the error? Does it guess the correct action and let users pick it from a small list of fixes? [22]
- 311) If an error is detected, does the app provide contact options for any assistance? (adapted from [23])

10. Help and documentation

“Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user’s task, list concrete steps to be carried out, and not be too large” [1].

- 312) “Are on-line instructions visually distinct?” [5]
- 313) “Do the instructions follow the sequence of user actions?” [5]
- 314) “If menu choices are ambiguous, does the system provide additional explanatory information when an item is selected?” [5]
- 315) “If menu items are ambiguous, does the system provide additional explanatory information when an item is selected?” [5]
- 316) “Is the help function visible; for example, a key labeled HELP or a special menu?” [5–7]
- 317) “Is the help system interface (navigation, presentation, and conversation) consistent with the navigation, presentation, and conversation interfaces of the application it supports?” [5]
- 318) “Navigation: Is information easy to find?” [5]
- 319) “Presentation: Is the visual layout well designed?” [5]
- 320) “Conversation: Is the information accurate, complete, and understandable?” [5]
- 321) “Is the information relevant? It should be relevant in the following aspects: Goal-oriented (What can I do with this program?), Descriptive (What is this thing for?), Procedural (How do I do this task?), Interpretive (Why did that happen?) and Navigational (Where am I?).”
- 322) “Is there context-sensitive help?” [5–7]
- 323) “Can the user change the level of detail available?” [5]

- 324) “Can users easily switch between help and their work?” [5]
- 325) “Is it easy to access and return from the help system?” [5]
- 326) “Can users resume work where they left off after accessing help?” [5]
- 327) “If a FAQs section exists, is the selection and redaction of questions and answers correct?” [6, 7]
- 328) “Is the design focused on one single feature at a time? (Only those instructions that are necessary for the user to get started should be presented at a time).” [6, 15]
- 329) Does the app contain the panel of tips and tricks or orientation screens for the app?
- 330) “Are data entry screens and dialog boxes supported by navigation and completion instructions?” [5]
- 331) “If users are working from hard copy, are the parts of the hard copy that go on-line marked?” [5]
- 332) Does the app provide the user with an interactive help? [authors]
- 333) Does app provide the user with gesture interaction guidelines? [25, 26]

11. Skills

The system should support, extend, supplement, or enhance the user’s skills, background knowledge, and expertise ---not replace them [24].

- 334) “Is the word "default" avoided and replaced with "Standard," "Use Customary Settings," "Restore Initial Settings," or some other more specific terms describing what will actually happen?” [6, 14]
- 335) Does the system provide a brief explanation for technical jargon and confusing acronyms if been used? [authors]
- 336) Does mobile app's user interface tailored to serve different user groups with different intentions, ages and levels of expertise? for example novice, expert users and older people [13][authors]
- 337) “If users are experts, usage is frequent, or the system has a slow response time, are there fewer screens (more information per screen)?” [5]
- 338) “If users are novices, usage is infrequent, or the system has a fast response time, are there more screens (less information per screen)?” [5]
- 339) “If the system supports both novice and expert users, are multiple levels of error message detail available?” [5]
- 340) “If the system supports both novice and expert users, are multiple levels of detail available?” [5]
- 341) “Are users the initiators of actions rather than the responders?” [5]
- 342) “Do the selected input device(s) match user capabilities?” [5]

- 343) Are the important buttons designed in a way to give an indication of their importance?(adapted from [5])
- 344) “Does the system correctly anticipate and prompt for the user's probable next activity?” [5]
- 345) Are UI operations easy to learn and use? (adapted from [5])
- 346) “Does the system automatically color-code items, with little or no user effort?” [5]
- 347) “Does the system perform data translations for users?” [5]
- 348) “When the user enters a screen or dialog box, is the cursor already positioned in the field users are most likely to need?” [5]
- 349) “Can users move forward and backward within a field?” [5]
- 350) “Has auto-tabling been avoided except when fields have fixed lengths or users are experienced?” [5]
- 351) Does the app support a Multi-Layered Interface in order to improve its learnability? [27]

12. Pleasurable and Respectful interaction with the user

“The user’s interactions with the system should enhance the quality of her or his work-life. The user should be treated with respect. The design should be aesthetically pleasing- with artistic as well as functional value” [5].

12.1. User Interaction

- 352) Does the mobile app’s UI able to nominate the most appropriate interaction modality that match environmental constraints of a mobile context of use? [authors]
- 353) “Does the interface provide performance feedback about how close the user is to achieving the goal?” [28]
- 354) “Does the interface embody emotionally appealing fantasies?” [28]
- 355) Are the mobile app’s UI elements and layout tailored to correctly render for the dominant mobile devices and platforms? [authors]
- 356) Are the mobile app’s UI gestures being intuitively discoverable? [29]
- 357) Does the mobile app’s UI provide an alternative method of interaction in the case if the primary method failed? [29]
- 358) Does the mobile app’s UI use modal alerts in a case of serious wrong? [29]
- 359) Does the mobile app’s UI use modal confirmations when the app needs to confirm an action by the user? [29]
- 360) Are mobile app's UI elements placed at a comfortable and ideal position? [13]
- 361) “Are the most frequently used function keys in the most accessible positions?” [5]
- 362) Does the mobile app's UI keep the total number of touchable UI elements to less than 10 per view? [13]

- 363) Does the app maintain the accessibility for users with various physical special needs?
For example: people with disabilities or left handed people [13][Authors]
- 364) “Is the number of submissions (and clicks) minimized for the user going through in order to input information on the site?” [6, 9]
- 365) “If users are working from hard copy, does the screen layout match the paper form?” [5]

12.2. Input data

- 366) “Do the selected input device(s) match environmental constraints?” [5]
- 367) “Is the users' work protected? [14] For example, for data entry screens with many fields or in which source documents may be incomplete, can users save a partially filled screen?” [5, 6, 14] Do data entry screens allow users to save partially completed tasks? [s]
- 368) Are typing requirements minimal for specific types of UIs and more specifically for question-and-answer interfaces? (adapted from [5, 6])
- 369) “Users dislike typing. Is information computed for the users? For instance, ask only for the zip code and calculate state and town; possibly offer a list of towns if there are more under the same zip code.” [6, 15]
- 370) “Does the system complete unambiguous partial input on a data entry field?” [5]
- 371) “Is the input data tolerant of typos and offers corrections? (Don't make users type in complete information. For example, accept “123 Main” instead of “123 Main St.”)” [6, 15]
- 372) “Can users save history and select previously typed info?” [6, 15]
- 373) “Does default information make sense to the user?” [6, 15]
- 374) Is the mobile app's UI rotated to enhance the completion of user task? For example: If the user interface requires a lot of typing, does the app rotate to a landscape orientation? [29]

12.3. Authentication and authorization

- 375) “If the app does not store any information that is sensitive (e.g. credit card), is the user kept logged in (with log out clearly presented)?” [6, 15]
- 376) “When logging in must be done, are graphical passwords used at least some of the time, to get around typing?” [6, 9]
- 377) Is registration not mandatory? Is skipping registration the default option? [6, 9]
- 378) “When logging in must be done, is there an option that allows the user to see the password clearly?” [6, 9]
- 379) Does the app provide the user an alternate method of authentication? [authors]

380) Does the app help the user to retrieve the login data in case of they have been forgotten? [authors]

12.4. Colour

381) “Has colour been used with discretion?” [5]

382) “Has color been used specifically to draw attention, communicate organization, indicate status changes, and establish relationships?” [5]

383) “Can users turn off automatic colour coding if necessary?” [5]

12.5. Shopping

384) “When a list of products is presented, are image thumbnails big enough for the user to get some information out of them?” [6, 9]

385) “On a product page, does image size fit the screen? Is there a link to a higher resolution image when the product requires closer inspection?” [6, 9]

386) “Is there the option to email a product to a friend?” [6, 9]

387) “Is there the option to save the product in a wish list?” [6, 9]

388) “On an e-commerce site, are salient links included on the homepage to the following information: — locations and opening hours (if applicable), — shipping cost, — phone number, — order status, and — occasion-based promotions or products?” [6, 9]

12.6. Banking and Transactions

389) Whenever users conduct transactions on the phone, can they save confirmation numbers for that transaction by emailing themselves? If the phone has an embedded screen-capture feature, are there instructions about how to take a picture of their screen? [6, 9]

13. Privacy

The mobile UI should help the user to protect personal or private information (adapted from [5])

390) Does the mobile app allow the user to prevent mobile phone from connecting automatically to available internet connections or Bluetooth devices? And notify the user with available connections? [authors]

391) “Are protected areas completely inaccessible?” [5]

392) Can protected or confidential areas be accessed with a certain authentication methods (log-in, two-step log-in, QR, biometric, etc.)? (adapted from [5])

393) “Is this feature effective and successful?” [5]

394) Is there information about how personal data is protected and about contents copyright? [6]

- 395) “For multiuser devices: Is permanently signing in on an app avoided?” [6, 15]
- 396) If the app does store any information that is sensitive (e.g., credit card), Can the app allow users to decide if they want to be kept logged-in or if they want to log-in again each time they use the app? [6, 15]
- 397) In case keep log-in has been selected, Will the user be informed of the possible risks? [6, 15]
- 398) Does the app instantly notify the user about any suspicious activity in using the app? [authors]
- 399) Before downloading and installing the app: Does the mobile app inform the user about the existence of privacy policy? [authors]
- 400) After downloading and installing the app: Does the mobile app contain privacy policy? [authors]
- 401) Does the privacy policy explain what mobile data and resources that the app access, use, collect and share? [authors]
- Mobile data (Device ID, phone numbers, contacts, call log, calendar, etc.)
 - Mobile resources (phone call, Sending SMS or MMS, camera, microphone, network connection, geolocation, storage etc.)
- 402) Does the mobile app briefly explain the purpose of accessing to such mobile data and resources? [authors]
- 403) Does the link to privacy policy located in a prominent location? [authors]
- 404) Does the mobile app privacy policies have been written in a clear language and readable form (not combined)? [authors]
- 405) Does it provide a full explanation if the user needs more explanation? [authors]
- 406) Does the mobile app UI inform the user to whom the mobile data is being sent or shared? [authors]
- 407) Does the mobile app UI allow the user to manage permissions like disabling the access to the mobile data or resources? [authors]
- 408) Does the user be informed about the new policies or that have been changed in case if the app has been updated? [authors]
- 409) Does the app UI respect the privacy of the community that uses it? [authors]
- 410) Does the app accept to the remote commands such as log out in case of loss?
- 411) Does the mobile app UI allow to its user to generate a backup in a safe place and recover it? [authors]
- 412) Does the mobile app’s UI log out if the user doesn’t interact with the app for a long-time (idle time)? [authors]

14.Navigation and Access to Information

“The ability to identify and access appropriate information, menus, reports, options, and elements accurately and efficiently”. [30]

- 413) Is information easy to find? [30]
- 414) Can functionality be found quickly and easily (e.g. Transactions)? [30]
- 415) Is there sufficient help provided for finding the correct functionality, information and screens? [30]
- 416) Can the system can guide the user through the correct sequence of transactions to complete a business process? [30]
- 417) Is the GUI easy to understand to enable efficient and accurate navigation of the system? [30]
- 418) Is there a search functionality? [30]
- 419) Does the search functionality support finding information? [30]
- 420) Does the information found from the search functionality match the information required? [30]
- 421) Does the navigation suit different interaction styles of the users? [30]
- 422) Are there alternative ways of navigating the system? [30]
- 423) Is Guidance-type information always available? [30]
- 424) Are the next sequence steps for a transaction clear? [30]

15.Presentation of Screen and Output

“The appropriateness of layout of menus, dialog boxes, controls, and information on the screen for data entry and output generation” [30].

- 425) Is the visual layout well designed? [30]
- 426) Is information timely, accurate, complete and understandable? [30]
- 427) Is the output easy to understand and interpret? [30]
- 428) Is the output comprehensive? [30]
- 429) Is the output well structured? [30]
- 430) Does the information presented support informed decision making? [30]
- 431) Does the output provided by the system provide clear visibility into the various other business units and departments? [30]
- 432) Has the system an intuitive GUI? [30]
- 433) Does the system present the user with complex and busy GUIs, resulting in information overload? [30]

16.Appropriateness of Task Support

“Accurate alignment of user tasks between system and real world to ensure effective task support and efficient task completion.” [30].

- 434) Is the terminology used consistent with the terminology of the user? [30]
- 435) Does the system provide real-time information? [30]
- 436) Is the response from the system quick and efficient? [30]
- 437) Does the system support efficient completion of user tasks? [30]
- 438) Does the system improve user productivity? [30]
- 439) Does the system automate routine and redundant tasks and data? [30]
- 440) Is easy to operate and use the system? [30]
- 441) Does the system support improved information flow between the various organisational units and departments? [30]

17.Intuitive Nature of System

“The degree of ease required to learn how to use the system effectively” [30].

- 442) Can the user learn how to use the system without a long introduction? [30]
- 443) Can the user figure out the various functions of the system by trying them? [30]
- 444) Is there sufficient on-line help to support the learning process? [30]
- 445) Is it easy to become skilful at using the system within a short amount of time? [30]
- 446) Is the system intimidating and complex to learn and use? [30]
- 447) Does the system contain unnecessary technical jargon and confusing acronyms? [30]

18.Ability to Customise

“How easy it is to customise the system to ensure accurate alignment between the system and business processes, the system and the user, the user and the business processes?” [30].

- 448) Can the system easily be configured to an industry type? [30]
- 449) Does the system support customisation to the level of user preferences? [30]
- 450) Is customisation supported in the way individual users complete a specific transaction or task? [30]
- 451) Can the system be customised to align the ERP transactions with the business processes of the enterprise? [30]
- 452) Can the system be configured to update existing business processes and (or) to include new business processes? [30]
- 453) Can a particular module be customised? [30]
- 454) Does the system support customisation to enable and promote business agility?
- 455) Does the system support customisation of reports? [30]

456) Is the system easy to change and re-configure over a period of time without making the system more complicated? [30]

457) Can the GUI be configured without affecting the underlying business logic? [30]

19. Ability to support adaptive user interfaces

19.1. Content Adaptation

458) Does the application adapt its content automatically to the context of use?

19.2. Presentation Adaptation

459) Does the application adapt its layout presentation automatically to the context of use?

19.3. Navigation Adaptation

460) Does the application adapt its navigation structure automatically to the context of use?

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