

# Visual Design Checklist for Graphical User Interface (GUI) Evaluation

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## ABSTRACT

The<sup>1</sup> Graphical User Interface (GUI) design is a major process within the software development lifecycle, because the GUI is the portion of the interface that will be in direct contact with the end-user. There are resources to help make the interface meet recommended usability criteria, but tools focused specifically on the GUI design are lacking. In order to bridge this gap, this study presents the development of a visual design checklist for Graphical User Interface evaluation. The checklist was tested in a two-phase assessment process: the first with HCI professionals and experts, and the second in a make-believe development context. Results show good acceptance among professionals, and suggest the checklist can positively assist development teams meet usability criteria. In conclusion, it is possible to assume the checklist can be a valuable resource to evaluate the Graphical User Interface, thus preventing errors and improving the overall system acceptability by the end-user.

## CCS Concepts

• **Human-centered computing** → **Human computer interaction (HCI)** → **HCI design and evaluation methods** → Usability testing • **Human-centered computing** → **Human computer interaction (HCI)** → HCI theory, concepts and models.

## Keywords

Interface design; visual design; graphical user interface; usability evaluation; usability checklist.

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## 1 INTRODUCTION

Usability must be a priority in the development process of any interface, because it influences the user acceptability level in relation to the system [1]. Resources such as usability criteria and checklists help this process, providing the team with useful recommendations during the interface development. However, there is a lack of tools and resources aimed specifically at helping the usability evaluation of graphic components. Usability heuristics [2] and the Golden Rules [3], for example, do not provide practical recommendations on how to meet the principles. Available checklists (as found in [4, 5, 6]) usually focus on the system general usability, including navigation, non-functional attributes, and even implementation issues. Although such checklists are undeniably helpful for the evaluation of the overall interface, it could be useful to have resources aimed specifically at the intermediate GUI development stage, focused on basic visual elements.

In order to bridge this gap, this study presents the development of a visual design checklist for Graphical User Interface evaluation. The checklist was structured based on related work, and then tested in a two-phase assessment process. The first phase, conducted with professionals and experts, provided feedback on improvements to be performed in the checklist. The second phase had a practical approach, aiming to analyze how the checklist would fit into the design process. The objective of this study is to propose a tool to assist the visual design evaluation, thus supporting design decisions and improving usability.

## 2 LITERATURE REVIEW

Recent studies report a growing number of digital devices being sold every year, especially after 2009 [7], increasing the need for high-quality, user-centered, functional interfaces. Digital devices help people perform simple activities on a daily basis [8]. Interface design aims precisely at planning and designing how the interaction between users and computers should occur, taking into consideration technical characteristics and hardware/software limitation [9]. Approaches such as the User-Centered Design helps interfaces meet functional requirements and usability criteria by involving the user along the design process [10, 11].

The involvement level may vary according to the nature of the approach. Some encourage seeing the user as a “co-author” [12], resulting in a bigger process called User Experience (UX), which is a broad term to describe all the interaction aspects between the end-user and the company, its services and products [13]. The GUI design, in this context, is a process within the interface design, responsible for organizing visual components such as

colors, lines, shapes, textures, modularity, and grid [14, 15, 16], in order to improve the interaction between user and interface.

Design principles, in turn, consider the inter-relationships between elements, that is, their organization and logical arrangement. Principles often emphasized in literature include: unity, balance, rhythm, scale, contrast, consistency, hierarchy, similarity, proximity, continuation, closure, and figure/ground [14, 16, 17, 18]. When used properly, design elements and principles help achieve usability requirements, which is a major concern of the interface design within the software development process. Studies suggest usability is fundamental in supporting the system acceptability by the user [1].

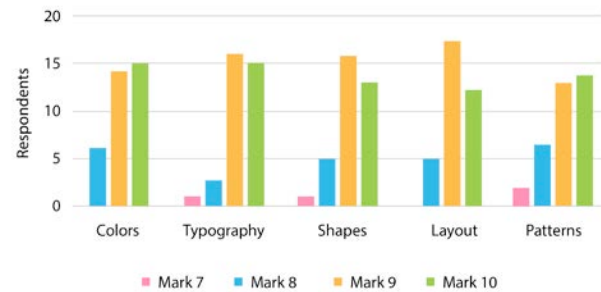
Common usability problems in poorly designed systems include loading time, scrolling, lack of familiarity, poor page layout, and use of old-fashioned media [7]. Interface design should not only create a good “look-and-feel” environment, but also provide users with help performing tasks [17]. Usability criteria [or heuristics] are applied to avoid such problems, including consistency and standardization, flexibility and user control, feedback, error prevention, match between the system and the real world, help, and documentation [2, 3]. Many usability checklists (focused on the interface design) are available both in literature and over the Internet. Development teams can benefit from using such checklists in fixing errors during several development stages, preventing a poor-quality software product to be delivered.

### 3 CHECKLIST DEVELOPMENT

The checklist development was based on largely recommended usability heuristics [2, 3, 22] as well as on visual design fundamental principles and elements [14, 15, 16, 17, 18]. In addition to that, 7 related checklists [4, 5, 6, 11, 19, 20, 21] were consulted and analyzed as part of the development process, which helped define guidelines for the work. The checklist should: (a) help the GUI usability evaluation; (b) be a useful and easy-to-use resource for development teams; (c) provide activity and evaluation control; and (d) be applicable to a variety of desktop interfaces, regardless of the target audience.

The checklist was first structured including 6 major topics, which in turn were subdivided in 37 verification items. The items description included practical recommendations on how to perform the activities. Checkboxes were placed on the side of each item, in order to provide the team with control over the evaluation process. The checklist is aimed at the evaluation of desktop interfaces and should be applied by professionals with specific theoretical background. Ideally, its application takes place after the GUI design and prior to implementation, providing error prevention and fixing (such as contrast problems, poor legibility, failing metaphors, standardization issues, lack of overall consistency and unity, among others) before coding starts.

Initial feedback on the checklist was collected through a questionnaire applied at a university with 35 professors and experts. Respondents were aged 18 to 45, and their professional experience with interface design varied between 1 and 12 years. All respondents reported that development teams could significantly benefit from using the proposed checklist, and that the topics included were relevant. Questions 5 to 11 asked participants to rank the relevance of the topics using a scale from 1 to 10 (1 meaning “not relevant” and 10 meaning “completely relevant”). Figure 1 summarizes the feedback received.



**Figure 1: Marks given to the topics of the checklist**

An updated version of the checklist was designed after the analysis of the reports, taking into consideration the comments provided by professionals in the questionnaire. Six items were included in the checklist. While the first version of the checklist had 37 items, version 2.0 presents 43. The topics and items are synthesized below.

Interfaces are evaluated according to (1) colors: (a) color scheme; (b) target audience suitability; (c) digital environments suitability; (d) contrast; (e) brightness variation/neutral tones; and (f) consistency; (2) typography: (a) font definition; (b) screen reproduction suitability; (c) legibility; (d) flexibility of use; (e) harmony; (f) target audience suitability; and (g) consistency; (3) shapes: (a) use of supportive graphics; (b) icons; (c) icons metaphors; (d) unity; (e) rescaling; and (f) consistency; (4) layout: (a) grid definition; (b) grid flexibility; (c) general layout definition; (d) balance; (e) reading direction; (f) negative space; (g) system feedback, error notifications and help; (h) system localization and status; and (i) standardization; (5) patterns: (a) visual composition style; (b) target audience suitability; (c) best practices for web; patterns for (d) buttons; (e) menus and submenus; (f) forms and data input fields; (g) titles, subtitles, and body text; (h) required and optional fields; (i) feedback, error, and help notifications; (j) hyperlinks; (k) font size; and (l) text alignment, line spacing, and column width; (6) general composition: (a) harmony; (b) hierarchy; and (c) flexibility.

The updated version of the checklist also includes spaces for general information, such as project name, date, designer, and version number, in order to provide documentation and allow later revisions. Spaces for general remarks were added after each major topic, thus allowing the designer to record relevant information.

After the updating process, the checklist was subjected to the second phase of evaluation. This time, the checklist was applied in a practical situation. At the time, the researchers proposed a practical assignment for 19 undergraduate Graphic Design students. Students were divided in two groups. Group A, with 10 students, received a hard copy of the checklist and was taught how to use it. Group B, with 9 students, did not receive the checklist. Students were asked to individually design the home page for the website of a fictional company. They had a week to work on the assignment. During this time the groups worked separately, in order to avoid information exchange between them. After that, the researchers collected the assignments and analyzed the interfaces based on the checklist.

According to the data collected, Group A achieved significantly better results in comparison with Group B. Group A presented good color scheme, correct use of fonts with only minor legibility

problems, good icon metaphors, replicable layout, use of negative space and feedback system and patterns definition for static components. On the other hand, Group B failed to meet most of the evaluation items, being successful only in defining patterns for static components. In relation to interactive components (such as buttons, links, menus and forms), however, both groups failed to meet recommended criteria.

## 4 CONCLUSION AND FUTURE WORK

Results collected in the two-phase assessment suggest positive outcomes in using the checklist. Students who received the checklist were closer to meeting the usability recommendations. In comparison with similar checklists presented in recent studies [such as 5, 11, 17] our checklist presents topic division and practical recommendations, which improves its ease of use. In addition to that, this Visual Design Checklist also provides activity control and documentation input fields to increase the quality of the work. Results leads to the conclusion that development teams can benefit from using the checklist and positively impact on the interface general usability.

Future work includes applying the checklist in the development of a real interface, in order to analyze the checklist behavior in adapting to the workflow and to different software development models. The topic “patterns”, which had the poorest performance during evaluation, should probably be revised. Revision may include detailing the items and adding use directions. It is also possible to expand the checklist to cover mobile interface development, as suggested by the experts in the evaluation. The researchers intend to continuously improve the checklist, in order to increase usability in the interface design.

## 5 REFERENCES

- [1] Holzinger, A., Searle, G., and Wernbacher, M. The effect of previous exposure to technology on acceptance and its importance in usability and accessibility engineering. *Universal Access in the Information Society*, 10 (2010), 254-260.
- [2] Nielsen, J. *Usability engineering*. Morgan Kaufman, 1994.
- [3] Shneiderman, B., and Plaisant, C. *Designing the user interface: strategies for effective human-computer interaction* (4th ed.). Wesley Publishing Company, 2004.
- [4] Hornbæk, K., Høegh, R. T., Pedersen, M. B., and Stage, J. Use case evaluation (UCE): a method for early usability evaluation in software development. *INTERACT* (2007), 578-591.
- [5] IBM. *User interface guidelines*. IBM Cúram Social Program Management, 2012.
- [6] Matias, M. *Checklist: uma ferramenta de suporte à avaliação ergonômica de interfaces*. Master Degree, Dissertation, Santa Catarina Federal University, Florianópolis, SC, 1995.
- [7] Nielsen, J. and Budiu, R. *Usabilidade móvel*. Elsevier, 2014.
- [8] Carvalho, J. O. F. Uma taxonomia para os dispositivos de acesso à informação voltados para o deficiente visual. In *Proceedings of the Seminário Acessibilidade, Tecnologia da Informação e Inclusão Digital*. University of São Paulo, SP, 2003.
- [9] Galitz, W. O. *The essential guide to user interface design: an introduction to GUI design principles and techniques* (3rd ed.). Wiley Publishing, 2007.
- [10] Norman, D. *The design of everyday things: Revised and expanded edition*. Paperback, 2013.
- [11] Firat, M., Sakar, A. N., and Kibakci Yurdakul, I. Web interface design principles for adults’ self-directed learning. *Turkish Online Journal of Distance Education*. 17 (2016), 31-45.
- [12] Abras, C., Maloney-Krichmar, D, and Preece, J. User-centered design. In Bainbridge, W. *Encyclopedia of Human-Computer Interaction*. Thousand Oaks, Sage Publications, 2004 (in press).
- [13] NNG. *The definition of user experience (UX)*, 2016. (2017, June 5) Retrieved from: <https://www.nngroup.com/articles/definition-user-experience/>
- [14] Lauer, D. A., and Pentak, S. *Design basics* (8th ed.). Cengage Learning, 2011.
- [15] Lidwell, W., Holden, K., and Butler, J. *Universal principles of design*. Rockport Publishers, 2010.
- [16] Lupton, E., and Phillips, J. C. *Graphic design: the new basics* (2nd ed.). Princeton Architectural Press, 2015.
- [17] Kamaruddin, N., and Sulaiman, S. Understanding interface design principles and elements guidelines: A content analysis of established scholars. *Proceedings of the 2<sup>nd</sup> Art and Design International Conference (AnDIC 2016)*, 2016, 1-8.
- [18] Arntson, A. E. *Graphic design basics* (6th ed.). Cengage Learning, 2010.
- [19] IBM. *Checklist: user interface design*. (2017, September 21) Retrieved from: [https://www.ibm.com/support/knowledgecenter/en/ssw\\_i5\\_54/nls/rbagsuserinterdeschklist.htm](https://www.ibm.com/support/knowledgecenter/en/ssw_i5_54/nls/rbagsuserinterdeschklist.htm).
- [20] Pierotti, D. Heuristic evaluation: a system checklist. *Usability Techniques*, 12 (2014), 1-12.
- [21] Duda, S. Designing and empirical testing of a checklist for the evaluation of multimedia software for children. In Sutcliffe, A., et al. *Designing Effective and Usable Multimedia Systems*. Springer Science + Business Media, 1998. Pierotti, D. Heuristic evaluation: a system checklist. *Usability Techniques*, 12 (2014), 1-12.
- [22] Cybis, W., Betiol, A. H., and Faust, R. *Ergonomia e usabilidade: conhecimentos, métodos e aplicações* (2<sup>nd</sup> ed.). Novatec, 2010.