



An Evaluation of the Digital Photo Management Application - Based on Nielsen's Heuristics

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Abstract. Contemporary society has evolved into a world of digital technology. As a digital technology invented by humans, the computer has had a profound impact on both work and life. As an interface between humans and computers and a human-centred methodology to guide system development, human-computer interaction plays an important role in the development of both humans and computers. Human-computer interaction research provides a human-centred system design methodology that enables systems to better meet the needs of users in terms of efficacy and emotion and to improve the quality of interaction and user experience between users and computers. Regarding photo management systems, the management of photos has evolved from the physical albums of the past to electronic albums, driven by digital technology. These applications enable the import and organization of digital photos to be a simple task. In the case of the most prevalent and typical digital photo management system: DigiKam, it allows photos to be organized in albums that can be sorted chronologically, by folder layout or by customized favourites. In addition, the DigiKam image editor offers some common tools such as red-eye correction or colour correction. However, when developing these powerful and advanced features, did the software engineers properly and thoroughly consider the user side of the experience? In this regard, we evaluated and analyzed this representative digital photo management system (DigiKam) based on Nielsen's top ten usability heuristics, via user interviews and data analysis, and summarized what users were dissatisfied with about the system, ranked the problems in order of severity, and at the end offered sensible suggestions for improving the user experience.

Keywords: Component · Formatting · Style · Styling · Insert

1 Introduction

DigiKam is a digital photo management application for Linux, macOS and Windows desktops. DigiKam is suitable for managing large numbers of digital photos and organizing them for easy retrieval using tags (keywords), titles, collections, dates, geographical locations, and search. It has many functions for viewing, organizing, manipulating, and sharing images. As a result, DigiKam is powerful digital asset management (DAM) software that includes powerful image editing features. [2]

Firstly DigiKam, being open-source software, does not have the same rich and robust team support as the Adobe family of products, and the rate of updates is not as stable as this type of non-open-source software.

Secondly, DigiKam has many features. Compared to other similar applications, the other three have specific advantages, such as Connector, which focuses on 3D resource management and XnViewMP, which has the advantage of fast photo viewing. However, DigiKam does not have a particular feature advantage. Although it is a multi-functional image manager, each feature is less potent than the other apps that focus on one specific feature.

Finally, DigiKam's interface design is complex and dull and does not have the same simplicity and beauty as Connector's interface design.

Therefore, this article will not only provide a reference point for identifying problems with photo management applications but also improve the system design of photo management applications for future software developers.

The four main areas in the report are (1) Review of three academic papers. (2) Research method of expert evaluation. (3) Discussion of the problems and suggestions. (4) Conclusion about limitation and future work.

The purpose of the report is to evaluate a piece of software (DigiKam) and document the methodology used for the evaluation, the research process and the results obtained, intending to make recommendations on how to improve the usability or experience of DigiKam and conclude with a conclusion.

2 Review of Three Academic Papers

2.1 An Online Travel Agency Comparative Stud

This article presents some of the issues that often arise when teaching heuristic evaluation methods and discusses the views of novice evaluators on Nielsen's usability heuristics. [8]

The authors of the article make an evaluation heuristic quality scale to investigate the topic of how to validate or evaluate new heuristics, and an experiment was conducted using an online travel agency as a case study by having a group of computer science students who had taken a course in human-computer interaction rate each heuristic individually.

It was found that computer science students are often focused on technical issues rather than thinking from the user's point of view. It was challenging to get them to forget about subjective judgements and empathies with potential users. When students identified usability problems, it was difficult to relate them to usability heuristics. The article also mentions that for future work, they will also analyse the usability problems identified by the students in their experiments, the usability heuristics linked to them, and the way the students assessed the severity of the issues.

2.2 Usability Heuristics on Parental Privacy Controls for Smart Toy

This paper proposes that intelligent toys, with their ability to collect contextual data from users, require the help of usable privacy tools and that the usability of privacy policy

specifications is one of the main challenges to usable privacy [3][4][7]; this research seeks to support the design of more usable parental privacy controls through an enhanced evaluation phase. [1]

The authors conducted experiments to investigate the question ‘what usability heuristics best address the usability issues affecting the privacy policy interface associated with gamers and smart toys’ and, through a snowballing mapping study, concluded that the ITSM heuristic was the most appropriate. Subsequently, the authors also compared it with Nielsen’s heuristic. The results of the final case study confirmed that the ITSM (Information Technology Security Management) heuristic had a greater significant impact in diagnosing usability problems in privacy control of intelligent toys.

The results in this paper make me realize that there are various heuristics, and Nielsen’s heuristic, as the well-known initiation method, is not foolproof. There is not a single heuristic that can cover the solution of all interaction problems. However, this paper has not been researched to create a new heuristic given this specific area of parental privacy control for exploring smart toys.

2.3 The Design of Decisions Nielsen’s Prepare Usability

This paper relates current recommendations for clinical decision support design found in the literature to the Nielsen usability heuristic. Through group discussion, the recommendations are categorized and mapped to design heuristics. The results are reviewed to show that the current clinical decision support literature does not fully satisfy interaction design principles.

This paper is the longest of the three papers I have read on Nielsen’s heuristics and the most complete, in my opinion. Not only does it begin by clearly giving the methodological process used in the study, the results, and findings, as well as briefly mentioning what the author team believes caused the results, but after obtaining the results, the team created a new interaction heuristic. This part of the study was not covered in the previous two articles.

3 Research Method

This section describes used Nielsen’s heuristics for expert evaluation of the application, with me as the expert one and two other experts (two of my fellow course students, expert two and expert three). Heuristic evaluation can be divided into three main stages [5][6].

- Briefing session: briefing session to introduce the user researchers to the objectives of the evaluation. This session was added to the list of tasks given to the experts for testing.
- During the evaluation: the user researchers are guided by heuristics to examine the interface twice. The first time is to follow a list of tasks to go through the flow of the interaction. The second time they are asked to explore all the features available in the interface and identify potential usability issues. This section has been chosen to be presented in a table detailing the problem areas and the reasons for disliking them. [9]

- The debriefing session: where the experts gather to discuss their findings, prioritize the problems they have identified, and give suggestions for solutions. This section will be placed in this report's Findings and Discussion module.

3.1 Methods of Collecting Data

This section describes the methods used to collect data, including creating a task list, a pre-existing knowledge base and inviting people to conduct expert assessments.

3.2 Data Collected During the Evaluation

Following the expert evaluation of the DigiKam application according to the task list, the following table was produced, which detailed what, where and why the experts did not like the application.

Table 1. One of the Experts result.

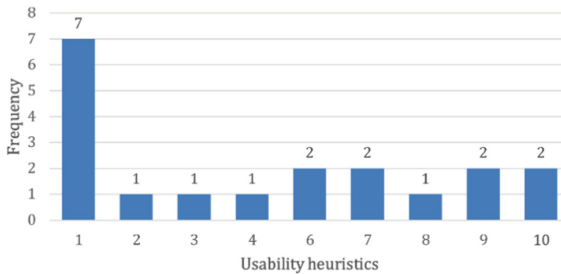
Problem List areas	Reasons	Heuristic Violated	Severity
When zooming in and out of photos, the only way to zoom in and out is to pull the progress bar at the bottom, which is not possible with Apple's two-finger zoom trackpad. It is also challenging to move up and down from side to side.	Rather than pulling the progress bar to zoom in on a percentage of the photo, I, as an Apple system user of over four years, would prefer to have this zooming feature via the quick two-finger control of the trackpad.	7	2
The software is slow to respond, and every time a photo is modified, there is a pause of several seconds before the screen responds accordingly.	When using the software to perform a compact operation, I found that the software could not keep up with my actions, and I could not monitor whether the action had been successfully applied to the photo.	1	2
When performing a similar search function, it does not work properly	When searching for similar images, I was not able to search for similar images accurately. Even though I had placed multiple copies in the album, the system did not give me an error message, and after setting the parameters, the interface did not change when I pressed the search button.	9	4

(continued)

Table 1. (continued)

Problem List areas	Reasons	Heuristic Violated	Severity
All the modifications I make to the photo are recorded but not in detail, and I cannot jump directly to the status of the photo before a certain number of operations.	As a first-time user, the only way I can find to return to multiple actions is to withdraw multiple times, but this requires me to click the withdraw button multiple times to get back to the state of the photo before a specific action.	6	2
Playback in sild show format does not exist	After using the light table to compare the before and after images, I mistakenly clicked on the Show image in ppt form, and when I entered, there was no end and exit button, only a pause button.	3	2

Table 2. Nielsen’s ten usability heuristics frequency chart.



3.3 Data Analysis

This section describes the data analysis work carried out on the data collected, including aggregation, classification, and visual graphs of the data.

- Summarize the data collected from the three expert assessments in an excel spreadsheet.
- Sorting the collected dissatisfaction points into new data sheets based on Nielsen’s ten usability heuristics.
- Data visualization.

Table 2 shows that the issues identified violate 9 of the ten inspirations, with the first one covering the broadest range of issues.

Table 3. Summary of problem types and ranked by severity.

Dissatisfaction	Severity
No preview of the image after processing	4
No feedback to the user at every step of the process, especially when something has to wait to be processed and the user is not informed of the process and whether it has been completed or failed to complete or if the program is stuck	4
Incomplete introduction to complex features and lack of some straightforward and straightforward instruction manuals to enable users to learn new features of the application	4
No preview when selecting fonts	3
Drag and drop to move sub-albums with no interactive feedback	3
No indication of possible user errors	3
Unable to exit quickly from wrong operation	2
Inability to quickly revert to a state prior to multiple operations	2
Not in line with user habits/Inconsistent with user habits	2
No shortcut keys for zooming in and out of images cannot be used with the MacBook trackpad	2
Squares on the border in the Cut function	2

4 Finding and Discussion

4.1 Finding

After collating the tables obtained, several similar unsatisfactory points were identified, such as the application's lack of timely and visible feedback to the user after acting.

Table 3 shows all the issues collated after the summary analysis, ranked from highest to lowest severity.

4.2 Usability Catastrophe that Must Be Fixed

4.2.1 Lack of Manuals

Incomplete introduction to complex features and lack of some simple instruction manuals to enable users to learn new features of the application. Problem 1 and 2 violate user guideline 10 of Nielsen's ten usability heuristics (Help and documentation)

- a) *Problem1*: Remove red-eye function.
- b) *Problem2*: Find similar or duplicate image modules.
- c) *Fix suggestions*: To fix problem 1 and problem 2, you can give a detailed demonstration of how to use the function and place a 'Help' button prominently on the function to help users unfamiliar with it, preferably with a small video tutorial.

4.2.2 No Real-Time Feedback

No feedback to the user at every step of the process, especially when something has to wait to be processed and the user is not informed of the process and whether it has been completed or failed to complete or if the program is stuck. Problem 3 and 4 violate user guideline 1 of Nielsen's ten usability heuristics (Visibility of system status)

- a) *Problem3*: Mouse icon feedback indicating work in progress.
- b) *Problem4*: It is not apparent to the user whether the application has captured the action.
- c) *Fix suggestions*: Replace the static mouse pointer's running icon with a dynamic form. When the user clicks any button, the interface always gives feedback, either in the form of a successful change, a dynamic indication that an icon is running, or a dynamic progress bar showing the current run, rather than nothing changing and simply leaving the user unaware and waiting.

4.2.3 No Preview of the Image After Processing

This can be tedious when users want to change the values to repeatedly achieve the desired effect. They need the preview to show what changes will look like in real-time. Problem 5 and 6 violate user guideline 1 of Nielsen's ten usability heuristics (Visibility of system status)

- a) *Problem5*: No preview of the image after processing.
- b) *Problem6*: No preview of the front.
- c) *Fix suggestions*: Provides a real-time preview of the front with currently contents and photo with the current action change before the user presses the button to confirm the application.

4.3 Major Usability Problem

4.3.1 Drag and Drop to Move Sub-albums with no Interactive Feedback

When moving album locations, there is no indicator line to tell the user which location they are now moved into. Problem 7 and Problem 8 violate user guideline 1 of Nielsen's ten usability heuristics (Visibility of system status)

- a) *Problem7*: No interactive feedback when moving albums position.
- b) *Problem8*: No interactive feedback when mouse pass an icon.
- c) *Fix suggestions*: Add dynamic guidelines; for example, when the user drags a sub-album to the root directory, the visible guideline follows the dragged sub-directory to move below the root directory, giving the user visual and intuitive feedback as to which specific directory the album is currently being dragged to. Add a colour change to a button when the mouse passes over it.

4.3.2 No Indication of Possible User

No indication of brightness overexposure when adjusting images. Problem 9 violate user guideline 9 of Nielsen's ten usability heuristics (Help users recognise, diagnose, and recover from errors)

- a) *Problem9*: No indication of brightness overexposure when adjusting images.
- b) *Fix suggestions*:When the image is overexposed or too dark, a bouncing colour block is added to mark the suspected overexposed area, alerting the user to the overexposure of the area.

4.4 Minor Usability Problem

4.4.1 No Shortcut Keys

No shortcut keys for zooming in and out of images cannot be used with the MacBook trackpad. Problem 10 violate user guideline 7 of Nielsen's ten usability heuristics (Flexibility and efficiency of use)

- a) *Problem10*: Zoom in and out of images.
- b) *Fix suggestions*:Adding a way to integrate with MAC systems, two-finger zoom control for zooming images via touchpad.

4.4.2 Difficult to Withdraw Operations

Inability to quickly revert to a state prior to multiple operations. Problem 11 violate user guideline 6 of Nielsen's ten usability heuristics (Recognition rather than recall)

- a) *Problem11*: Withdraw operations.
- b) *Fix suggestions*:Adding a more detailed record of actions and providing the option to roll back to before multiple actions.

4.4.3 Unable to Exit Quickly from the Wrong Operation

Playback in sild show format does not exist. Problem 12 violate user guideline 3 of Nielsen's ten usability heuristics (User control and freedom)

- a) *Problem12*: Unable to exit quickly from slide show.
- b) *Fix suggestions*:Provide a direct exit button for the slide show, which can pop up to ask the user to confirm the exit to prevent misuse.

4.4.4 Squares on the Border in the Cut Function

In the habit of cutting pictures, it is usually at the border where the mouse is located that the cut border can be adjusted; the presence of 8 small squares in this software is very unnecessary and unattractive. Problem 13 violate user guideline 8 of Nielsen's ten usability heuristics (Aesthetic and minimalist design)

- a) *Problem13*: Cut function.
- b) *Fix suggestions*: Remove the small squares to simplify the design.

4.4.5 Not in Line with User Habits

Inconsistent with user habits. Problem 14 violate user guideline 3 of Nielsen's ten usability heuristics (User control and freedom); problem 15 violate user guideline 2 of Nielsen's ten usability heuristics(Match between system and the natural world), and problem 16 violate user guideline 4 of Nielsen's ten usability heuristics (Consistency and standards)

- a) *Problem14*: Location of Tools.
- b) *Problem15*: Change of stars after rating.
- c) *Problem16*:The company website in the top right corner.
- d) *Fix suggestions*: Provide custom toolbar position adjustment settings. Enhanced star display with a more distinctive colour to distinguish between filled stars and unchecked stars.

5 Conclusions

This report focuses on evaluating a digital resource manager application, using Nielsen's heuristics for expert evaluation method as a guide for a complete evaluation of the application. This evaluation process examined each user principle that may have been violated and gave recommendations for fixing the problem. Through this evaluation process, I learnt the importance of learning human- computer interaction and realized that there is so much information and detail that can be improved when an application is evaluated from a human-computer interaction perspective, even for a stable version of the software that has been updated and upgraded over many versions.

The first limitation of Nielsen's heuristics used in the report is that Nielsen's ten heuristics are in a language familiar to the general public and are easy to understand for the novice assessor, but it takes a lot of practice for the assessor to reach a level of proficiency in the use of heuristics. The second is that it is limited in terms of expertise. It is not the optimal solution to all interaction problems. There are other heuristics that are more comprehensive and effective in solving domain- specific problems.

After the research process described above, I found that I was still lacking in my proficiency and accuracy in identifying each heuristic; each heuristic has a different purpose, so more practice will be needed in the future in order to better understand it properly. Hence, it is essential to research the process of evaluating applications by making more use of heuristics. Further, there are several areas for improvement in the applications evaluated in the report, and further attempts can be made in the future to verify that the proposed changes are reasonable and valid.

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