Usability of MP3-Players

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Abstract

Listening to music played by small MP3-players is almost as ubiquituous as talking over mobile phones. In this paper we analyse interaction elements and usabilty of current MP3-players. To determine the usability, an empirical study based on a website that presented three simulated MP3-players was performed with over 1000 participants.

The results show that, despite most marketing claims, some interaction devices are not as intuitive and really suitable for the task as they schould be. Also we found some surprising results concerning erroneous usage of navigation keys.

Keywords

MP3-player, usability, interaction, symbols, sensor, interaction element, iPod, mapping, affordance

1 Introduction

Now that most inhabitants of the industrialised world own and use mobile phones, MP3-players seem to be able to catch up with them in the near future – both in terms of market penetration and usability challenges. Apple's iPod stands out in both regards, with its local market share of up to 80% [BWonline 07], and its advertised „intuitive menues" and „genius features such as the click wheel" [Apple 2007]. Many other manufacturers name "coolness" or "ease of use" as premier feature of their players too e.g.: [Creative 05]. Usability, in this case the ease of storing, finding and playing music, is also one of the topics when testing a player in magazines or when looking for advice in internet forums: A typical test comprises "setting up the player, the quality of the instructions, the convenience of loading or deleting files, and playing music (or video) files in everyday use. Aspects such as the quality of the controls and menus, the quality of the display, the comfort of the headphones and the portability of the player are also taken into consideration." [Which 07].

2 Interaction elements

Interaction elements for MP3 players are not standardized, unlike mobile phones where the ITU guideline E.161 rules the layout and captions of number keys [ITU].

2.1 Symbols

In order to control the music flow, mostly symbols from existing music gadgets, such as CD players, are adopted. But even these symbols are not always used consistently, e.g. each one of the four left symbols in figure 1 is used to depict "previous song" on different player models.

Figure 1: Symbols controlling music flow

2.2 Keys and slider sensors

Most player models still use keys and/or a joystick to select or start functions or to navigate in the displayed menu. But more and more models use additional sensors which react to the touch of the finger allowing both clicking and sliding actions. The latter are used for the selection of menu elements. Sliders can be 1-dimensional (mostly vertical), 2-dimensional and rotational.

Figure 2a,b: Vertical and Rotational Sliders

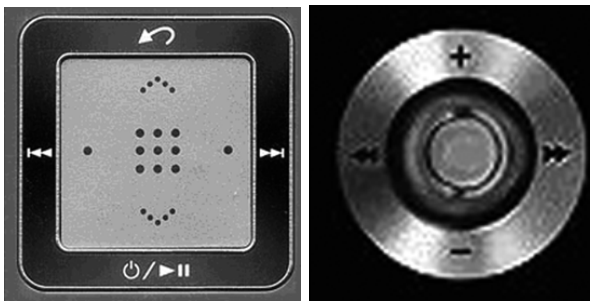

Figure 2c,d: Keys with 2D Slider, Joystick

The sliding interaction has the advantage of smooth movement opposed to repeated pressing of keys, which is particularly useful when scrolling through long lists. The downside is the lack of *affordance*, the apparent characteristics how to use the interaction element (a term introduced to usabilty concepts by Donald Norman [Norman 02]). Sometimes it is not even clear to the average layman that there is an interaction element in the first place. Hence, this widely employed means of interaction with an MP3 player provides quite a *gulf of execution* [Norman 02]: One wants to interact but does not see nor understand, what element to use, let alone, how to use it.

With rotational sliders (figure 2b) there is also a mismapping concerning the movement of the finger and the cursor on the display which on the left hand side of the slider is opposite to the movement of the cursor.

In order to find out the relevance of these theoretically derived usability issues of current MP3 players we defined a study.

3 Internet/Simulation based study

The major aim was to conduct a study with as many participants as possible. We achieved this by providing three MP3 players on a website (www.mp3ergo.de, see Figure 3) in a simulation.

3.1 Internet based simulation

The simulated players are the Apple iPod (due to its market share and its unique "click wheel", figure 2b), the Samsung YP-Z5 (figure 2c) which is used mainly via keys, plus a fictitious player with the appearance and interaction elements of a Creative Zen (figure 2a) and the menu organisation of an iPod.

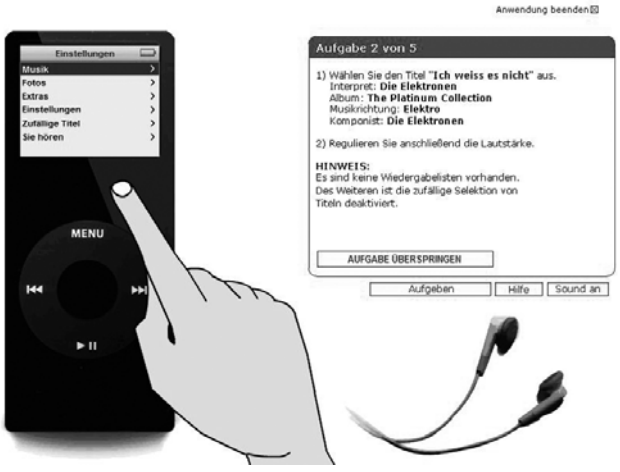

Figure 3: Interactive study www.mp3ergo.de

The client was implemented in Adobe Flash to provide an appealing look and performance that matches the real players. The participants' interactions were recorded on a MySQL/PHP based server which also

provided XML files configuring the menu structures.

3.2 Independent variables

Before solving the tasks, participants were asked to give some anonymous data concerning their age group, sex, expertise with MP3 players, their own player and their preferences of features when having to decide which player to buy.

3.3 Tasks

Participants were given five tasks of a typical usage cycle:

1) Switch the MP3 player on and turn off the key clicks
2) Select a given title and set the volume
3) Display the title information and move forward a few seconds within the title
4) Select the next title
5) Set the sound settings to „classic“ and switch the player off

3.4 Measured Variables

In order to derive the effort, we measured the number of actions (clicks or drags) as well as the elapsed time for each action. Unfortunately, the time varied very much, thus giving no useful results. Therefore, the number of actions was used to measure the user's effort.

3.5 Participants

The study was announced in several internet forums and some bigger institutions. More than 1000 people participated so far, about 80% of which were male, 20% female. 54% were from 21-30 years old, 20% were between 15 and 20 and 20% from 31-50 years old. Most participants ranked themselves as "advanced", 18% as "beginners" and 26% as experts concerning usage of MP3 players.

Most important criteria for choosing a player were about mobility (memory size (94%) and battery life (93%)) closely followed by ease of use (82%) which appeared far more relevant than design (62%), price (65%) or brand (21%).

4 Results

The results are shown here as 3D-graphs in which the horizontal axis shows the effort and the vertical axis shows the percentage of users who completed the task with this effort. The effort is given either in absolute numbers, i.e. the number of clicks/drags – or as a multiple of the minimum effort. The depth axis shows, which player type was used – for the iPod and the Samsung different results are given depending on whether it was used in the simulation by someone who did or did not own this particular player. The notreal player is a non-existing combination of interaction elements and menu structure and is therefore unknown to any user.

4.1 Orientation in the menu hierarchy

Although similar, there are differences in the menu structures between players. In order to evaluate these differences, task 1 (turn on and switch off key clicks) was designed. The results in figure 4 show a clear difference between users which are familiar with the player and its menu structure and the others: The effort is much higher when using an unfamiliar player. With a known menu, more than 50% of the participants use less than 20 actions to complete the task – where 20 actions is actually quite an effort in itself. An unknown menu requires for most users between 20 and 50 actions.

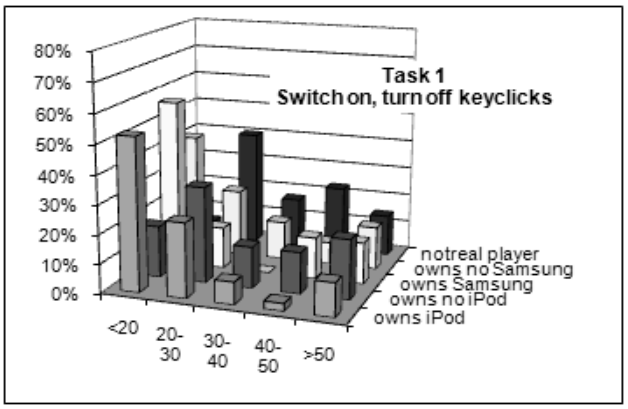

Figure 4: Absolute Effort for Menu Navigation

Also, figure 4 shows disadvantages for participants unfamiliar with an iPod: only 15% succeeded quickly, compared to 39% using an unfamiliar Samsung.

Notable is also the peak at the high end of the effort: up to 20% of the participants apparently got utterly lost and needed more than 50 actions to complete the rather simple task.

4.2 Interaction elements

The way of choosing a music title from the stored database is practically identical for all tested players. The effort of choosing therefore depends on the only difference between the players: the interaction elements.

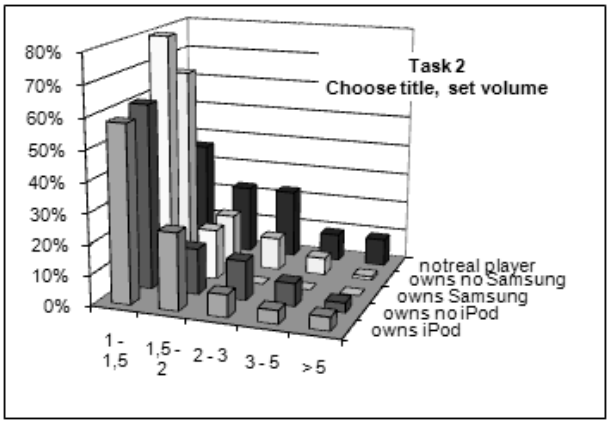

Figure 5: Relative Effort for Interaction

Figure 5 shows an advantage of the key-oriented concept of the Samsung over the special ClickWheel of the iPod: 78% of Samsung owners succeeded quickly i.e. needed only 1-1.5 times the minimal effort, compared to 55% of iPod owners. Also non-owners of a Samsung were faster than non-owners of an iPod (62% compared to 58%).

The results of task 3 (show information of the current title, which works also very similar across player types), also shows this characteristic.

4.3 Fast or slow comprehension

The distribution of efforts for task 4 (play the next title) is shown in figure 6. It shows the typical example of a task that is easliy solved if you are familiar with the solution – and which can take a long time if you have no idea and have to explore the possibilities. If the exploration takes a long time, the interaction methods and/or menu apparently is not self-explanatory. In this example, the quick solution is to search, find and use the special key (sometimes labelled >>). If this key is neither expected nor searched or found, the users searches for a long time in the menu structure and/or the playlist – although the task explicitely says not to use the menu. On the notreal player it was apparently very hard to find the special key – understandably, because it is both very small and labelled with the rather unusual symbol >.

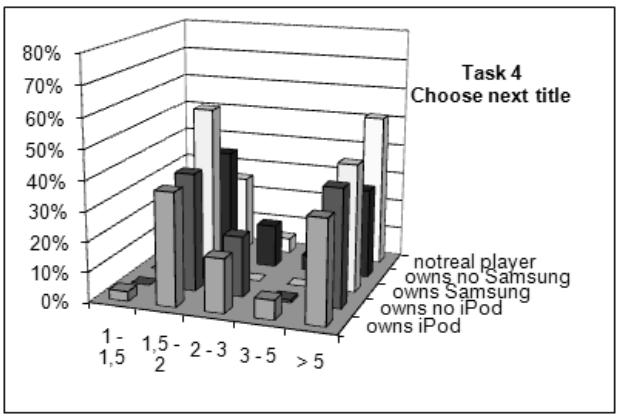

Figure 6: Relative Effort, Effect of Self-Explanation

The logfile shows that the higher effort with the simulated iPod stems from trials to select the next title by turning the click wheel, perhaps trying to make use of this central element as often as possible.

This result shows the importance of self explanation of interaction elements for the ease and speed of use – and the consequences when this feature is missing. About half the participants had difficulties solving this task.

4.4 Navigation within menu

We found surprising results in the evaluation which keys were used for navigating within the menu. For none of the simulated players the key for the activation of a selected menu entry was easy to identify. Also, all displayed menues show a > at the right hand side of the entry, if there are more options to be selected

(see figure 3). Thus we expected the key >> to be used often rather than the correct key.

However, as figure 7 shows, the key >> was indeed used, but participants used mostly (> 80%) the correct key. Also, the amount of false keystrokes fell considerably with each task; apparently the participants learned quickly.

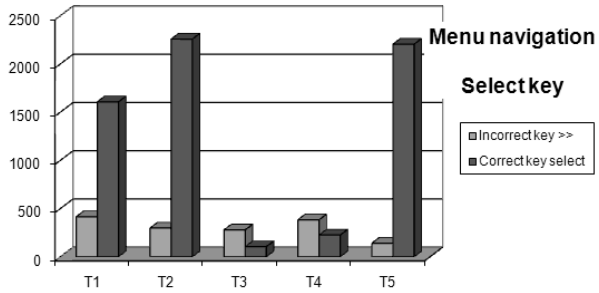

Figure 7:Selection Key in Menu Navigation

On the other hand, unexpectedly many errors were made when returning to the higher menu level in the menu hierarchy. Rather than using the correct key, e.g. „menu", the key << was used quite often, as figure 8 shows.

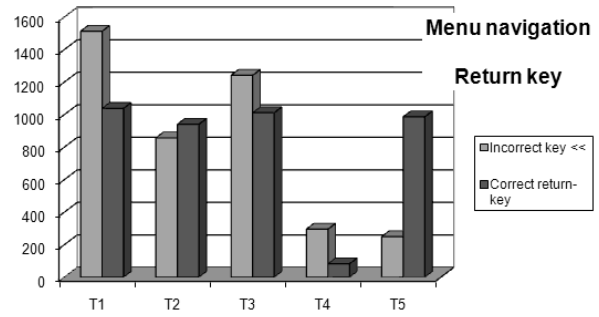

Figure 8: Return Key in Menu Navigation

Apparently, the correct key here was discovered rather lately over the tasks. But a learning effect is apparent here too.

4.5 Reliability of Simulation-based Results

Naturally, handling a Flash-based simulation is different for the participants compared to the hands-on experience with the real devices. Therefore, the results must be interpreted with a grain of salt. In favor of the simulation concept is the big number of participants, which would be impossible to achieve with real devices. A lot of participants means both having a variety of participants as well as evening out deviating inputs of single users.

Also, due to the marketing channels for the study, by far most of the many participants are presumably technophile, i.e. they are rather experienced users of electronic gadgets and computers, which is reflected in the 82% of non-beginner-participants. And still, a considerable number of them have difficulties solving the given tasks. We expect thus that the negative points we identified in this study will transfer validly to less experienced, more casual users of MP3-players.

5 Conclusion

With over 1000 participants in our study, we have shown that current MP3 players provide not only music or a pleasing haptic experience but sometimes also some obstacles in their everyday use.

The difficulties show up in high efforts to achieve even simple tasks for quite a number of participants. Also, wrong keys were frequently used for navigation. Both results show the lack of self explanation which is necessary for the "intuitive" usage which is often advertised. This deficit is also apparent in our findings that even self-declared experts have more difficulties in performing the desired tasks when using an unknown product than those who own this product and are thus more familiar with it. Therefore we deduce that the "expertise" is not about a common concept but that it is punctual knowledge which cannt be transferred across different brands of MP3-players.

The sources of irritation were sometimes the unclear structure and naming of the menues. But also the interaction elements, i.e. keys and sensor elements, add to difficulties. This is caused by the non-standardised symbols and modes on the one hand and missing affordances on the other hand.

A dilemma here is that makers of MP3-players have to differentiate their product in a mass market: apart from exterior design, the interaction elements are the major means to stand out from the crowd – as the most cited product, the Apple iPod, clearly shows. But then, the player using keys for navigation shows somewhat better results that the one with sensor elements. Particularly less experienced participants and those not familiar with the product at hand got along better with keys than with sensor elements.

But why do people buy the more difficult products at all? Usability, although ranked as very important in the study's questionnaire, is apparently not really the critical feature when it comes to a buying decision. Here, the (expected) joy of use and coolness, the design and also haptic experiences are apparently more important.

It is a fair guess, that in the future electronic devices such as mobile phones, PDAs, MP3 players and maybe even navigation support will be integrated in one single small device. But in order to keep the character and conveniance of a mobile device, the displays as well as the keys or sensors cannot grow bigger. This development will provide not only more complicated gadgets but also challenges regarding their usabilty.

Incidentally, the day this paper was submitted, Apple announced its new line of iPods, where the top model no longer sports a click wheel but resembles closely the iPhone in that it provides interaction only via a touch screen: yet another interaction element that calls for further research.

Acknowledgements

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