

## **Applying User Feedback During the Product Development Cycle**

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### **ABSTRACT:**

The purpose of this paper is to present the user feedback methods which we applied during the development of the Digital Lab System. The Digital Lab System is a large product containing not only a graphical user interface but also many hardware components which the operator must arrange in their working environment to establish an appropriate workflow. As part of this product development, we were responsible for designing and testing the user interface, designing and testing a customized keyboard layout, and analyzing the appropriate arrangement of the system components in the users working environment. This paper will present the various user feedback methods employed and their effect on the product design. Additionally, we will discuss the future study methods.

### **SUMMARY:**

The Human Factors Laboratory at Kodak has been engaged in the product development for the Digital Lab System. Our participation in the development cycle began when the system requirements were being developed and currently continues. The purpose of this paper is to describe the application of various user feedback models to provide input into the product design cycle.

Today when almost all consumers request one hour photo processing for a roll of film, that film will be processed on an optical minilab system. Optical minilab systems have been available for many years and are considered a well known entity. Such systems provide their operators with limited functionality. Digital imaging has recently become a reality. Consumers may now purchase CD-ROMS or floppy discs with their pictures on them, or may own a digital camera. Additionally, many software applications are now available for consumers to manipulate their digital images. As this transition occurs, consumers are requesting more and more options with their processing. Many companies have begun the development of Digital Minilabs. Kodak is one of these companies. Digital Minilabs will provide the film lab operators with numerous options which they could only dream of with optical minilab systems. The inclusion of all these new features as well as product opportunities significantly raises the level of difficulty when using a digital minilab.

Another complicating factor with the development of digital minilabs is the user profile of the operators. The users of these systems may range from a person with a degree in color science and 15 or more years of experience to a high school student or a retiree looking for a part-time job. The levels of education which the users possess can vary widely. This is also true for their experience levels using computers. Many of these users are not computer literate and in some instances are afraid of computers. There is also a high turn-over rate in these types of jobs. Additionally, the types of stores which use such devices can range from a photo specialty store whose customers are Professional or Advanced Amateur photographers to your local Kmart where general consumers may bring their film. Therefore, the system we are designing requires an easy to use, quick to learn user interface which provides all the requested functions.

During the completion of the product specifications document we began our proposed user interface design. Initially this began with the development of a general concept for the look and feel and then we started working through the details of the particular screens. As we continued the development of the screens it was apparent that this product would be significantly more difficult to use than the existing optical minilab systems.

Once we had our initial design concepts and a user interface prototype begun, we decided to hold a participatory design session. We asked five Wegman's Food Market Photo Lab Managers (one was an assistant manager) to participate in the session. The purpose of this participatory design session was to obtain the operator's initial reactions to the proposed user interface design and various features this system would provide. This session lasted four hours and the participants were provided compensation for their time. The session was held in one of the testing laboratories of the Human Factors Lab. During the session, members of the product team were invited to observe the sessions from the observation room. The session began with the introduction of the digital minilab concept and various definitions that would be used throughout the session. The participants were then introduced to a particular scenario by the moderator working through the scenario on the computer. The computer screen was projected onto a screen so that all the participants were able to view the user interface. After the scenario was presented, the participants were asked to spend five minutes writing down their first impressions of the user interface design and scenario steps. After this step, the moderator walked through the scenario again using paper versions of the screens. During this part of the session, the participants were asked to provide any and all feedback they had. During the session two scenarios were completed although three had been planned. The participants in this session provided very useful feedback which we immediately included in the design not only of the user interface but also some of the product features. Since this session influenced the user interface design these changes were incorporated into the user interface prototype.

Upon completion of the prototype user interface development we proceeded with a usability study. This study was conducted over two weeks employing twelve minilab operators from two types of stores. The operators had one of three levels of optical minilab experience; beginner users, intermediate level users and expert operators. Six of the participants were from various Wegman's Good Market stores and the remaining six participants were from photo specialty stores. The participants worked through three order processing scenarios while using the user interface prototype. The presentation of the scenarios was counter-balanced and each participant individually worked with the prototype. The data collected from this study was moderator observations, video recordings, and subjective questionnaire data. The participants were provided training which introduced them to the system and the many new features it contained. The operators minilab operation experience levels ranged from two months to 13 years. As is often the case with commercial product development, we did not have the time or money to run a participant pool large enough to permit a rigorous statistical analysis but we were able to gain valuable information. This study provided insight into the operators expectations of this new system based upon their experiences with optical minilab systems. Additionally, this study again directed design decisions which were incorporated into the actual product user interface development.

Almost every optical minilab system has a custom keyboard in order to improve system throughput. We felt that a custom keyboard was also required for this Digital Minilab. We developed a keyboard design and functional prototype. Our desire was to understand the ergonomics of our keyboard design. The initial keyboard study included thirty-three Kodak employees from the product development team, the Human Factors Laboratory, and our internal photo finishing laboratory. Each participant was asked to use the keyboard in their office environment and the keyboard was not connected to a computer. The moderator told each participant which key to press and how many times. Each participant exercised the same keys at the same frequency. Their total time working with the keyboard was about 10 to 15 minutes. At the completion of the keyboard use, the participants were asked to complete a questionnaire regarding their demographics and the use of the keyboard. While it is true that we had a large enough pool of participants, we did not have time to do a full screening to classify participants properly for a full statistical analysis. This study resulted in many design revisions. The results of this study were directly feed into the development of a dozen paper keyboard prototypes which resulted in three foam model keyboards which had each key caps with functioning switches. These new prototypes were employed to conduct a second ergonomics study. Again the participants were Kodak employees from the product team, the Human Factors Laboratory, and the internal photo finishing laboratory. Ten participants from each area participated in the study. The presentation of the three prototypes was counter-balanced and the participants completed the same scenario on each keyboard. The scenario consisted of 145 steps and the complete study required approximately 75 minutes. After using each keyboard the participants were asked to complete a questionnaire regarding the ease of using the particular keyboard. At the completion of the

study the participants were asked to complete a cross design comparison questionnaire. The results of this study showed that two designs were preferred each with some minor modifications. This information led to our final design which combined aspects of both of the preferred prototypes. This final design will be shipped with the product.

To date our last attempt at obtaining user feedback was a full fledged systems test. Not only are there user interface issues with this product but also environmental workflow issues. The purpose of the systems test was to:

1. Provide further feedback on the final keyboard design,
2. Provide information regarding the optimal component set-up including order bags, film strips, the computer, film scanner, regular keyboard, custom keyboard, bar code reader, and mouse, as well as
3. Gather further usability information regarding the graphical user interface.

This study was to be completed with the actual system software and hardware components. Our first pilot participant was an optical minilab operator for Kodak's internal photo finishing laboratory. During this first pilot session we found that the actual system computer code was not robust enough to handle the possible interactions that minilab operators would attempt. The intent was to recruit ten to twelve minilab operators representing the food market chain and photo specialty stores to participate in this study. We clearly attempted this study too early in the development cycle and therefore canceled it. While it was unfortunate we were not able to reschedule this study due to the program schedule, we were able to gain valuable insight from our one pilot participant. While it is true that changes should not be based upon one participant, the information and observations gathered from working with the pilot participant provided valuable input to the development of Beta testing and trade trial activities.

As we continue our involvement with product development, we anticipate participating in Beta testing and trade trials to gather further information about the product design, workflow issues, and the system's usability. Such testing should be completed in time for inclusion in the final paper. Additionally, we hope to monitor the use of these systems over time to understand how well the users adapt to these systems as well as identify design improvements. Such information will continue to direct the development efforts for carry-on products.

It is true that as a profession we would like to run more studies; include enough participants to conduct a rigorous statistical analysis; and generally obtain more feedback from the users this is not an option in most product development cycles. In fact, some products are lucky if a single usability test was performed for a particular functionality in a time frame which permitted implementation of the findings. We have been fortunate in the development of this product to have the support of the product development team. This support has permitted us to run the number and types of studies presented in this paper. Additionally, the studies have provided valuable feedback to the product team and have directed the product development. This paper will present the types of studies we conducted and their affect on the product development cycle. We feel this is a good example of applying user feedback to the product development cycle.

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