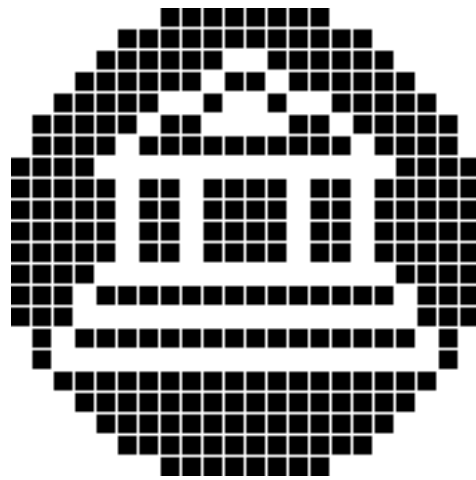


Palm Banking Client

Analysis Report



User Interface Design and Development

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Table of Contents

Introduction	3
1. System Characteristics	3
a) Purpose and Functionality	4
b) Typical Users	8
c) Work Activities	9
d) The Environment	9
2. User Interface Analysis	10
a) Perceptual Aspects	11
b) Attentional Aspects	12
c) Memory Requirements	13
d) General Considerations	15
3. Mental Models	15
4. Learning	17
Conclusion	18
References	20
Online Resources	20
Documentation	20

Introduction

This analysis report describes the prototype design from a HCI perspective and undertakes the system a critical analysis. The project of the Palm Banking client exists only as a lo-fi model made with paper and pencil. The design is based on today's Internet banking solution called UBS Telebanking. The user interface resembles therefore very much the screen layout of the standalone Java application with pull-down menus, which is currently under development.

The goal is to develop a user interface for retail consumers using a wireless, pen-based handheld computer to access financial services. The bestselling 3Com PalmPilot was chosen as the hardware platform, which captured two third of the palmtop market in two years. This battery powered personal digital assistant (PDA) runs the Palm OS and features a 160-pixel-square, black-and-white touch-sensitive screen. The Piloteer (Pilot user) mainly interacts by writing in the Graffiti alphabet or by tapping on the display with a stylus.

The first specification was created by people with great knowledge of electronic banking facilities. However they had insufficient know-how about usability, technical limitations and the PalmPilot magic.

In my opinion, the product should be marketed as a mobile companion to the UBS Telebanking desktop product. Bullet-proofed security, reliable communication and fast transaction performance are very crucial for the success of this innovative software.

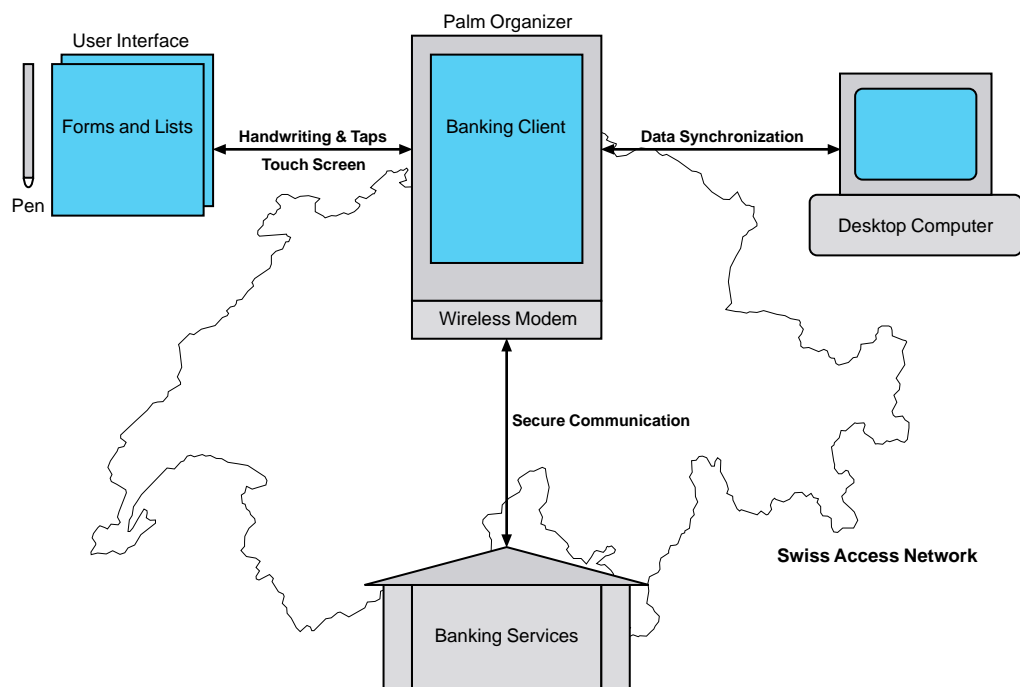


Figure 0.1 The Palm Banking system

1. System Characteristics

a) Purpose and Functionality

The purpose of the system is to provide retail customers an essential set of banking services using a portable Palm organizer equipped with communication capabilities. The functionality is described by showing key user interface elements (actual size screenshots).

The menu bar contains the following four menus:

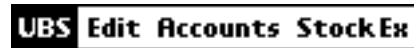


Figure 1.1 Menu bar

The UBS menu to communicate with the bank.

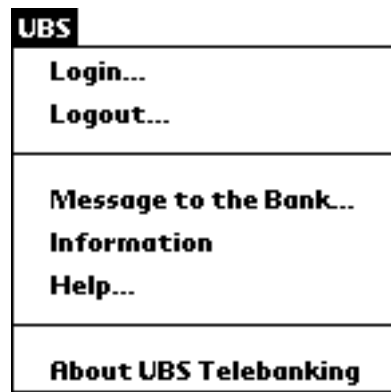


Figure 1.2 UBS menu

The Edit menu to set user preferences.

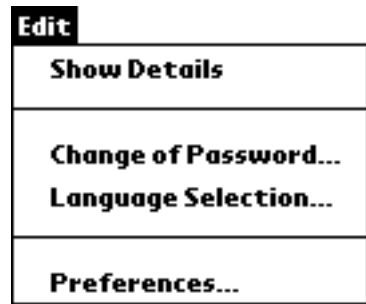


Figure 1.3 Edit menu

The Accounts menu to retrieve account information.

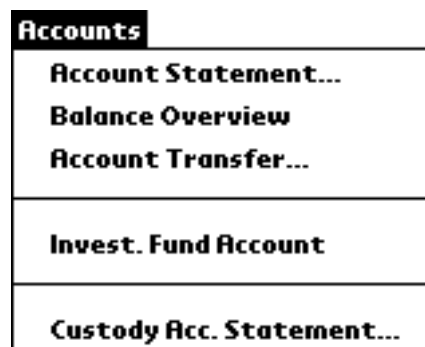


Figure 1.4 Accounts menu

The Stock Ex menu for stock exchange orders and quotes.



Figure 1.5 Stock Exchange menu

Before the user gains access to the system he must connect to UBS and authorize himself:

Login screen when the application is launched.



Figure 1.6 Start-up screen with login

Welcome view after the login with time stamp.

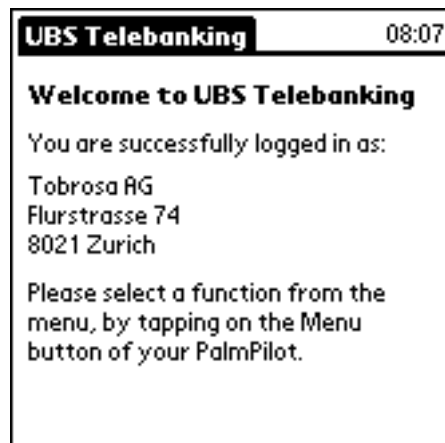


Figure 1.7 Welcome screen presenting the customer address

Important interactions are viewing account statements and transferring money:

Account selection following a menu command.

Account #	Curr.	Balance
230 638.917.01N	CHF	6 139.95
230 638.917.02L	CHF	3'288.60
230 638.917.60D	GBP	540.35
230 638.917.61X	USD	1'904.00

Select Cancel

Figure 1.8 Account selection

Account statement for the selected account.

Account Statement 08:35

Account: 230 638.917.01N CHF

Date	Info	Amount
31.12.97	Safe custody...	-91.15
30.06.97	Balance closing	-7.55
27.06.97	Your order	-186.10
31.03.97	Service charg...	-0.50
27.03.97	Your order	-40.00
26.03.97	Postal transf...	3'111.85
18.03.97	Payment	-53.70

Details Options...

Figure 1.9 Account statement with last transactions

Progress bar displays the status of the input verification.

Account Transfer

Debit Acc.: 230 638.917.01N

Credit Acc.: 230 638.917.61X

Amount: 1500 USD

Exch. Rate: 1.2884

Value: CHF 1'932.60

Exec. Date: 20.11.98

Value Date: 20.11.1998

Messages: -----

Check Submit Reset

Figure 1.10 Account transfer with foreign exchange

Advanced functions allow the consumer to make investments in stocks, bonds and UBS funds as well as to supervise the orders:

The first step of a stock exchange order requires a security (multi-step transaction).

Stock Ex Order

Custody Acc.: 230 638.917.52

Account: 230 638.917.01N

Acc. Holder: Tobrosa AG

Order Type: Buy Sell

Sec#/Symbol: 847092

Continue Quotes Custody Acc.

Figure 1.11 Stock exchange order step 1 (buy or sell)

The order type can be determined based on the entered security.

Select Order Type

Order: Normal Stop Limit

OK Cancel

Figure 1.12 Select order type for stock exchange order

This form is presented in the second step for buying stocks.

Purchase Order SL 15:24

Custody Acc.: 230 638.917.52

Account: 230 638.917.01N

Sec. Code #: 847092.000

Stocks: Reg. shs UBS AG CHF 20

Denom./Lot: 1/10

Number: 100

Limit: 680

Trigger Lim.: 660

Continue Transmit New

Figure 1.13 Stock exchange order step 2 (stop limit buy)

Finally in the third step the order is ready to be submitted.



Figure 1.14 Stock exchange order step 3 (stop limit buy)

The stop limit order gets confirmed.



Figure 1.15 Stock exchange order confirmation

Cancel order alert.



Figure 1.16 Cancellation of a pending order (from the order overview list)

b) Typical Users

The application is intended to be used by existing or potential UBS retail customers with assets in Switzerland. He or she might already have experience with a 24h electronic banking service like the UBS Telebanking. An ordinary consumer will mostly retrieve account and possibly stock quotes information, while a power user will fully exploit the system by managing his portfolio and placing stock exchange orders.

The users are best characterized by variety, living in a multi-cultural society with around 20 percent foreigners. They are located either in the German, French or Italian speaking part of Switzerland.

The differences in educational and working backgrounds are assumed to be less critical, because the target audience will already be familiar with the banking business and computer literate. Most PalmPilot users have a desktop machine to backup their handheld device and download software from the Internet. The experience will certainly vary by age and maybe by gender.

The program will be utilized by private clients in a wide range of emotional conditions, since the 3Com device is highly portable. The user's physical and mental abilities will differ, so visually or hearing impaired customers should be considered as well.

c) Work Activities

With the Palm Banking client customers gain access to banking services and their personal assets. The multi-language application allows the user to:

- view account balances, account statements and transaction details.
- transfer money from one of his or hers accounts to another.
- display the market value and all positions including detail information of portfolios (custody accounts).
- buy or sell securities like stocks, bonds or UBS funds for different stock exchanges.
- cancel pending stock exchange orders.
- see order details of executed orders.
- view on-demand financial information in user defined quote lists.
- access market data in the form of quote details, actual or historical charts and news headlines with the underlying story.
- set upper and lower limits for financial instruments in a quote list.
- open pre-defined quote lists including currency and index overviews.
- maintain and manage quote lists.
- access bank information about new issues, services and products.

The software must be localized in German, French, Italian and English. The original concept is lacking desktop synchronization with the satellite device.

d) The Environment

The inexpensive PalmPilot is designed for everywhere and anytime use. Therefore the working environment can be while traveling in a noisy train or sitting alone in a quiet room at home.

Lightning conditions will vary too, as banking at night or during a bright summer day decreases the readability of the display. The clarity of the LCD screen changes dramatically according to the handheld's temperature and the angle at which the user is viewing it. Adjusting the contrast before a working session improves the screen lucidity. Newer models sport a backlighting feature that unfortunately reduces battery life.

The software is either started indoors, outdoors or while on the move. Unforeseen disturbances and interruptions of the wireless communication or modem connection can restrict the operation.

Organizationally, the device allows password protection and no confidential customer data is stored local. To establish a communication to UBS, a contract number, password and cross-off list number are necessary. The data exchange between the Palm organizer and banking server is encrypted by a strong security protocol.

Customers can obtain support by calling the Telebanking hotline during business hours or by securely exchanging messages.

2. User Interface Analysis

a) Perceptual Aspects

The liquid crystal display of the Palm III is very good in comparison to earlier models but remains quite difficult to see, particularly under bad lightning conditions. The PalmPilot and its successors have a backlighting feature, allowing the user to work even in the dark.



Figure 2.1 PalmPilot with Applications Launcher and Palm Bank icon

The character size for plain text is small (2 mm for Standard font) but acceptable because of the highly readable screen font. Unfortunately the software doesn't take advantage of the Palm OS 3.0 or later ability to let the user change the font style (small, bold or large).



Figure 2.2 Fonts of the Palm OS 3.0

The visual appearance of today's PalmPilot family is black-and-white. Sound feedback is provided only for alerts (adjustable to off, low, medium or high in the system preferences) but is not customizable within the client, e.g. for completed transactions.

An indeterminate progress bar in the upper right corner visualizes transaction processing with a ping-pong movement (similar to Netscape Navigator). A time stamp indicates when a data exchange with the banking server has been finished.



Figure 2.3 Progress bar with different states

The software builds on the standard Palm OS user interface controls with the exception of the progress bar.

b) Attentional Aspects

The stock exchange order and account transfer screens present and require too much information from the customer. To enter an order he or she must step through three screens by tapping the Continue button, and most forms expand over two display screens. The account transfer contains the execution date which cannot be changed and the Messages field which will be rarely used.

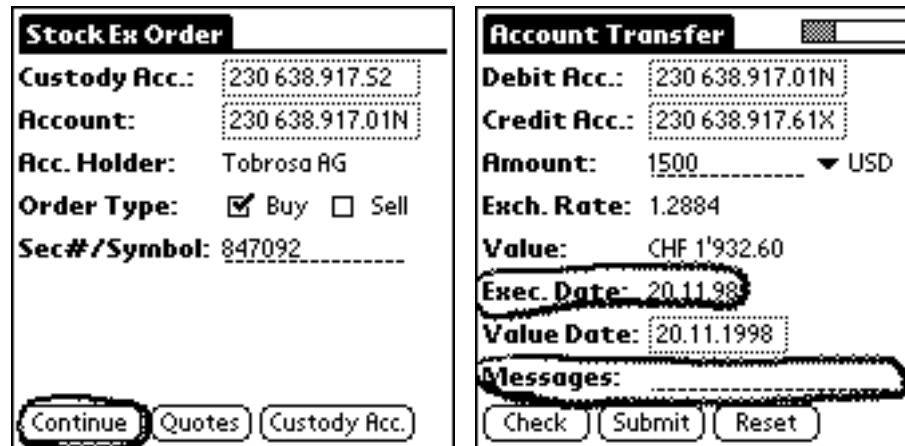


Figure 2.4 Continue button and questionable fields

The user navigates through most functions via the menu and is guided within forms by multiple buttons. He must first check the entered data before he can submit the account transfer (Continue and Transmit button for the purchase order).

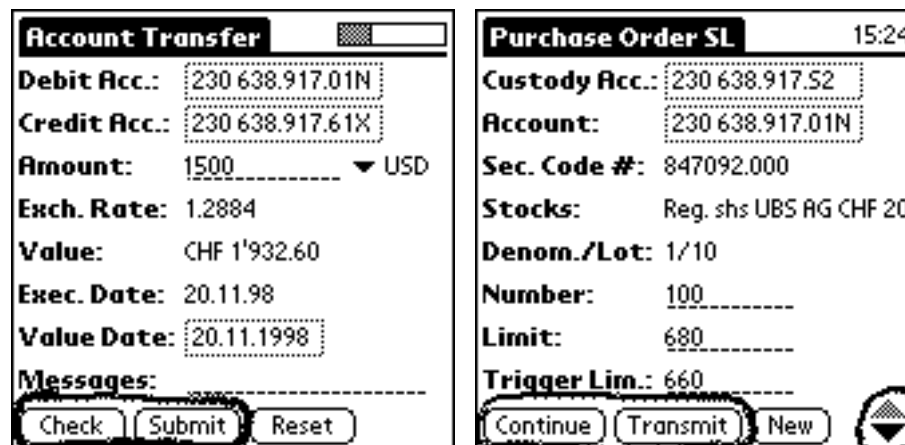


Figure 2.5 "Which button is next?" and scroll buttons to view more data

The valid for one day checkbox and the date range for an investment are separated by the unnecessary restriction code. In addition the range is defined as a to-from date. The ordering and grouping of this elements could be improved.



Figure 2.6 Unordered and ungrouped fields

The list views are well structured and important information is shown in alerts. The order type selection confuses people and no help is given about the consequences for the order. A decision is final.



Figure 2.7 Additional explanations would be helpful for beginners

The login and welcome screen force the user to read long explanations.

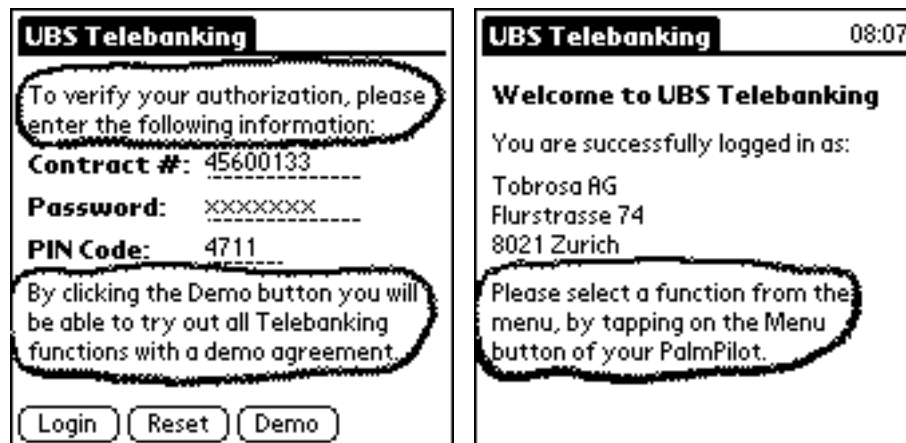


Figure 2.8 Grouped elements but information overload

c) Memory Requirements

The main memory issue is concerned with remembering where to find a particular function. Most commands are hidden in menus, especially after logging in. The user has to learn that some actions are not reversible (e.g. the Reset and New buttons clear all fields without a warning).

The only way to navigate between views is through the menu bar, which requires too many taps. No task related commands are offered in many functions like transferring money from the balance overview.

He or she is forced to store numbers for accounts, custody accounts or securities. Additionally an account selection is invisible kept by system and the user is not prompted again.

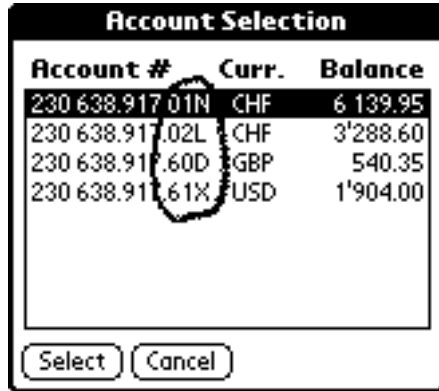


Figure 2.9 Account numbers differ just in the last three characters

The display options are not visualized in both account statements.

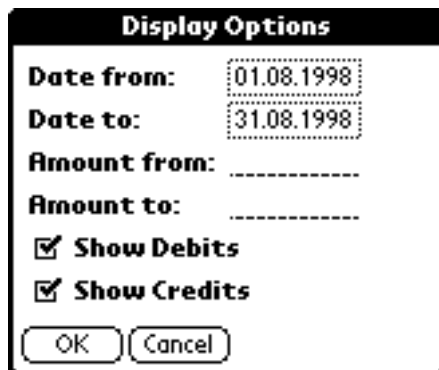


Figure 2.10 Display options for an account statement

The Quotes and Custody Account buttons for a stock exchange order relate to the security input field, but are visually not grouped. No price is given during a stock exchange order.

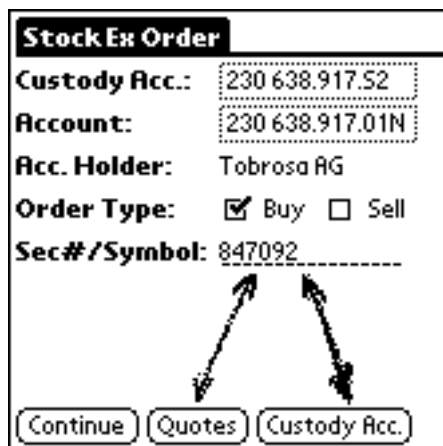


Figure 2.11 Look up security or select a position from a custody account

Placing a stock exchange order requires the user to scroll between two screens to see all data. The customer must know up to which step an entry field is editable. The interface relies heavily on recall rather than recognition.

d) General Considerations

The interface uses still the frame-based approach of the browser applet, introduced by the Videotex solution (dumb teletext terminals) more than ten years ago. The appearance will be familiar for Telebanking users but is not adequate for new customers or palmtop devices. This structure leads to dead end situations where the user doesn't know what to do next, after finishing a task.

The menu organization follows not the Palm OS rules and the naming is occasionally rather confusing. The menus remain fixed and are not form-specific, which causes the loss of input data when e.g. the user switches from an account transfer to the balance overview.

Many verbal abbreviations are employed which are not obvious (e.g. SL for stop limit) and inconsistent wording is applied for actions (Submit vs. Transmit).

The User Interface Guidelines from 3Com must be complemented in some parts, to achieve a consistent look & feel and to comply with the UBS GUI guidelines for desktop applications.

Selector triggers are employed for readily setting dates and selecting accounts.

20.11.1998

Figure 2.12 Selector trigger that opens the date picker to choose a date

The financial information are delayed and the consumer must update the prices manually by pressing an Update button.

3. Mental Models

The mixed mental model of the Palm banking system can be summarized as a bank in your pocket. The structural and functional model represents a mobile ATM (automatic teller machine) or a miniature UBS Telebanking, respectively Multimat (advanced ATM). The software was also characterized as a portable stock trading system.

Most user requested faster access to the functions and criticized the menu-centric structure. The navigation scheme below makes this circumstance clear and further shows the missing connections between each isolated task.

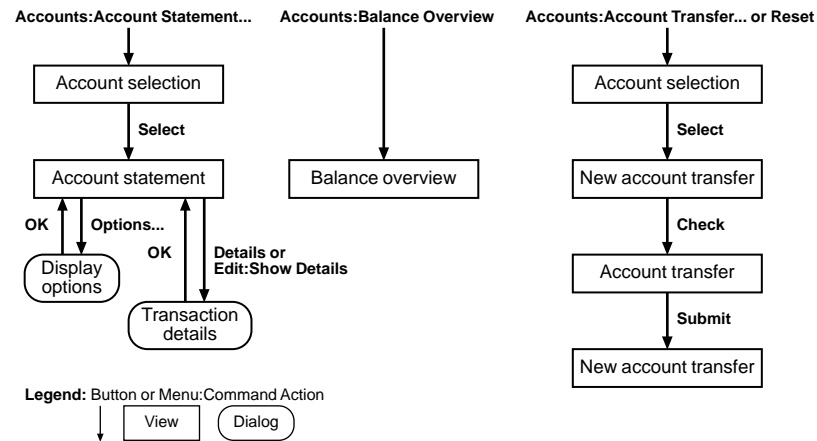


Figure 3.1 Navigation diagram for account functions

People suggested the accustomed register metaphor or an icon representation to categorize and execute functionality.

I obtained the impression that users had difficulty applying their existing knowledge due to their functional model didn't map very well. All automatic banking machines I know have an interface with good visibility and affordance, but not the menu-driven GUI of an application. A combination of knowledge in the world and head helped them to explore the system and form an adopted mental model.

The artificial order with two checkboxes acting as radio buttons because no default state is allowed, mimics the host transaction. Why not simply assist the user's functional mental model and distinguish the order process into buying or selling securities?

Stock Ex Order	
Custody Acc.:	230 638.917.52
Account:	230 638.917.01N
Acc. Holder:	Tobrosq AG
Order Type:	<input checked="" type="checkbox"/> Buy <input type="checkbox"/> Sell
Sec#/Symbol:	847092

Figure 3.2 The first order type selection (see also figure 2.7)

4. Learning

Users receive no formal training after downloading and installing the software on their PalmPilot. The online help covers only basic aspects and no context-sensitive help is available. The help system describes each screen without focusing on task activities. Documentation in electronic or printed form is not provided at all. Support questions will be answered by the present hotline.

Forms for orders as well as lists for account statements are used as metaphors, resembling the paper edition. The system image of the Palm Banking solution is an ATM to fulfill banking transactions, whereas the design model is based on a menu-driven financial services application. The user's model is experienced similar to the system image but clashes principally with the invisible function access.

UBS assumes that retail consumers learn about the "intuitive" program by using it. Unfortunately no undo facilities are offered to support this active process. For expert users no menu shortcuts are defined and the standard Edit and Options menus are missing too.

Novice customers must know the difference between normal, stop limit, stop loss and on stop orders. The help even strongly recommends that he or she contacts an advisor before trading with the later two options.

Conclusion

The current prototype is not designed as a genuine PalmPilot program and clearly lacks the usability and elegance of the built-in software. The user interface still resembles the browser-based solution and requires too many interactions to perform everyday functions, which are largely hidden behind menus.

The navigation between screens is not natural and numerous actions terminate without a path to continue the work flow. The hardware up and down scroll buttons are not supported to maneuver in forms and lists. No data synchronization with the desktop machine is planned and running transactions cannot be stopped.

The application offers too much functionality, is complex and cumbersome to pilot. There is a great opportunity for a redesigned, more usable Palm Banking client. For this 24-hour premium banking service, an easy to use and learn product with a consistent look and feel will be important for its target audience.

The challenge is to design an efficient interface, that delivers a great user experience and reduces the number of stylus taps to accomplish frequently used tasks. Instead of the menu-centric application model, people should be able to work with almost no menu access, demonstrated by the Palm Computing way. Think different, think small!

References

Online Resources

UBS Telebanking, www.ubs.com/e/telebanking.html.

UBS Quotes, quotes.ubs.com.

UBS 24h Banking, www.ubs.com/e/pcc/24h.html.

3Com/Palm Computing, www.palm.com/.

Palm OS Documentation, www.palm.com/devzone/docs.html.

Palm Programming: The Developer's Guide,
www.palm.com/devzone/docs/pptdg/index.html.

Metrowerks CodeWarrior for Palm OS, www.metrowerks.com/pda/palm.

O'Reilly PalmPilot Center, palmpilot.oreilly.com.

Documentation

Palm OS 3.0 Cookbook for Mac OS (1998), 3Com.

Developing Palm OS 3.0 Applications Part I: Interface Management (1998),
3Com.

Palm OS 2.0 Tutorial for Macintosh (1997), U.S. Robotics.

PalmPilot: The Ultimate Guide (1998), David Pogue, O'Reilly.