

The Evolution of PDA Usability

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1.0 Introduction and Overview

Personal Digital Assistant (PDA) is a term for any small and portable hand-held device providing computing and information storage and retrieval capabilities for personal or business use.ⁱ It often utilizes software for keeping schedule calendars, address book, to-do list, and memo information, which is also called Personal Information Management (PIM). The term “handheld computer” is a synonym used for those popular PDA products from different manufacturers.



Figure 1: Apple's Newton

Most of the PDAs today have touch screens and use pen-like styluses to input data. Sometimes they would have built-in or portable keyboard. They also use wireless connection or wires to transfer data between compatible computing devices. The original handheld computer that used touch-sensitive screen and handwriting recognition was Apple's Newton MessagePAD 130, which was introduced in March 1996. It also introduced the

concept of data synchronization between handheld device and desktop computer.

Unfortunately, this model was later withdrawn from the market for its unaffordable price.

The true PDA phenomenon began in May 1996 when Palm Computing introduced Pilot™ organizer and PIM software, which basically inherited the concept features of Apple's Newton to the market.ⁱⁱ After a year, in 1997, PalmPilot™ organizer was introduced and the term “PalmPilot” became another synonym of PDA devices. Also in this year, Palm Computing was bought by 3Com and began to license its Operating System, known as Palm

ⁱ Definition from www.whatis.com

ⁱⁱ Historical Timeline, palmOne: www.palmone.com/us/company/corporate/timeline.html

OS® Platform. Since then, the standards of PDA and PIM have been settled and evolved. Additionally, Palm is also the first PDA manufacturer introducing wireless internet connection with Palm™ VII in May 1999.



Figure 2: Pilot™ organizer

Figure 3: PalmPilot™ organizer

Figure 4: Palm™ VII Handheld

Today, Palm-powered devices occupy 70% of the handheld computer market in the United States. According to PalmSource™, maker of the Palm OS platform software which became independent from the original Palm Computing in October 2003, there are approximately 30 million Palm-powered handhelds and SmartPhones sold. Manufacturers include ACEECA, AlphaSmart, FOSSIL, GARMIN, SONY, Symbol, Tapwave, and its original palmOne, which is formed by the remaining Palm Computing after purchasing Handspring, Inc in 2003. There are also over 20,000 Palm OS software titles and approximately 275,000 developers, licensees, and strategic partners.ⁱⁱⁱ These allies have established a strong kingdom in the handheld world.

2.0 Brief Comparison of Palm OS PDA and Windows Mobile Pocket PC

Palm has won many awards including PC Computing's "Usability Achievement of the Year" in 1997, Business Week's "Design of the Decade" in 1999^{iv}, and the Gold level of 2003 Industrial Design Excellence Awards (IDEA). Palm OS platforms are known to have following compensation:

- Easy to use.

ⁱⁱⁱ PalmSource: www.palmsource.com

^{iv} About palmOne, Awards and Articles: www.palmone.com/us/company/articles/

- Small and easy to carry.
- Long battery life.
- Fast, compact and efficient in programming and size of applications.
- The widest range of hardware (including accessories) and software.^v
- Tons of commercial and FREE software (over 15,000^{vi}).
- Great market share plus better enterprise standards and solutions

Other advantages such as “the de facto standard” and “great compatibility” are also claimed by the PalmSource^{vii}; in addition, “higher standard for ease of use” is heavily emphasized.^{viii}

On the other hand, the war between Palm-powered handheld and Windows Mobile Pocket PC has been fought since Microsoft dreamed to unify the PDA market under Bill’s territory. Pocket PC is the PDA which runs Windows Mobile OS developed by Microsoft. Although it has similar design to handle PIM and additional functionalities, Pocket PC is notorious because of the following reasons:

- Harder to use due to the complex GUI.
- Bigger and heavier.
- Shorter battery life.
- NOT as many 3-party applications available due to software compatibility and hardware architecture.
- More expensive.

Both Palm and Microsoft have their claims of why customers should choose their OS, whereas Microsoft has its different aim on Windows Mobile’s feature advantages^{ix} such as:

^v PalmSource, Why Palm OS: http://www.palmsource.com/includes/why_palmos.pdf

^{vi} The palmOne Advantage: www.palmone.com/us/products/compare/palmadvantage.html

^{vii} PalmSource, Top 10 Reasons:

http://www.palmsource.com/includes/top_ten_reasons_to_choose_palm_powered.pdf

^{viii} PalmSource, Why Palm OS, PowerPoint Presentation:

http://www.palmsource.com/palmos/Advantage/index_files/frame.htm

^{ix} Windows Mobile, Why PPC: <http://www.microsoft.com/technet/itsolutions/mobile/evaluate/mobilwhy.msp>

- Better security options.
- Better entry options.
- Better hardware characteristics in CPU, RAM, and Multi-expansion slot.
- Better Peripherals availability.
- Have Microsoft software.
- Better Internet connection technology.

Despite Microsoft's assertion sounds very promising in many of their white papers^x, many reviews and critics have different opinions:

1. There is no clear winner in hardware capability for everything gets improved and promoted overtime^{xi} and form design is more important because of usability issues.
2. The result of competition will be determined by software usability, performance, and availability.^{xii}

In my opinion, ease of use shall be a handheld computer's priority. A steeper learning curve always discourages beginners to master a new IT product. Secondly, if a PDA's new function, either in hardware or in software, cannot fit the needs of users, it will become less useful or even unnecessary.

3.0 Palm's Development (from Usability Standpoint)

3.1 Location of the Power Switch and Button Layout

The overall form design of Palm's handheld devices has not been changed dramatically since its very first model, Pilot 1000, which was released to the public in 1996. The basic button layout includes a power switch, 4 PIM access buttons, and 1 or 2 separated up-down

^x Windows Mobile White Papers:

<http://www.microsoft.com/windowsmobile/resources/whitepapers/default.aspx>

^{xi} Jim Thompson MD, Palm OS / Pocket PC Handheld Comparison (2002):

<http://www.jimthompson.net/handhelds/Comparison.htm>

^{xii}Rick Broida, PDA Prizefight, CNET (2004): http://reviews.cnet.com/4520-3127_7-5120845-1.html?tag=nav

buttons.

The power switch of the early model is located beside the "Date" button. This layout design was not changed until 1999 they shifted Palm V's power switch to the top-right of the device. This change is in fact a better arrangement because it can avoid the user accidentally turn off the device when using the "Date" button. Moreover, the top-right location is easy for the index finger to operate if the device is held by left hand. Strangely, in the recent Zire series, the power switch came back to the problematic position.



Figure 5: Palm IIIx,

Figure 6: Palm V

Figure 7: Zire

Figure 8: Tungsten T3

In the latest Tungsten T3, the layout of the PIM buttons is a rebellion to its ancestors. Instead of lining up horizontally, these four buttons are arranged into a circle. At the first glance, this layout seems to occupy much space of the device; however, they become more accessible for the user's thumb for one-hand operation than the traditional arrangement. This layout was made possible because the "slider" cover hides the graffiti area and saves some space. It is a clever tradeoff.

3.2 The 5-Way Navigator

Palm first introduced its 5-way navigator at Tungsten T, the first model of the Tungsten series. Before this innovation, prior Palm devices only have 1 or 2 separated up-and-down buttons for scrolling aside the 4 PIM access buttons. Like its name, it is built for one-hand operating without using the stylus. This saves the extra labor of pulling out and putting back the stylus every time, which is not for writing but navigating and selecting purpose.



Figure 9: 5-way navigator

The 5-way navigator features a 4-direction circular panel and a centre selection bottom. The four directions (up, down, right, and left) are well defined and the navigating functions can be shifted swiftly. It provides superior navigation functionality than the Jog Dial of Sony's Clie and PPC's

4-direction navigation panel.

The Jog Dial of Sony's Clie's a scrolling wheel with selection function, which typically operates as a regular mouse's scrolling wheel does. Despite suggesting a faster means of scrolling; the Jog Dial has not fully replaced the up-down bottom which still can be seen on Clie devices. On the other hand, although PPC's 4-direction navigation bottom looks much similar to Palm's 5-way navigator, the navigation mechanism is different. The up-down direction of the disc-like bottom is for page scrolling and the right-left direction is for navigating application icons. Users still need to use stylus for selection; thus, one-hand operation is not possible.



Figure 11: Jog Dial



Figure 12: PPC's 4-Direction bottom

Palm's 5-way navigator in fact provides a better one-hand operation by combining the navigation mechanisms from Clie's Jog Dial and PPC's 4-direction bottom. It also incorporate functions to search items within application, which makes information retrieving more convenient and gaming more attractive with an alternative version found in Zire 71.



Figure 13: Palm Zire71's joystick-like 5-way navigator

3.3 Compact "Slider" Design and Dynamic Input Area

This is a very unique form design of Palm's Tungsten T series because there is no similar model from other PDA manufacturers. However, this figure has both pros and cons since the first Tungsten T.

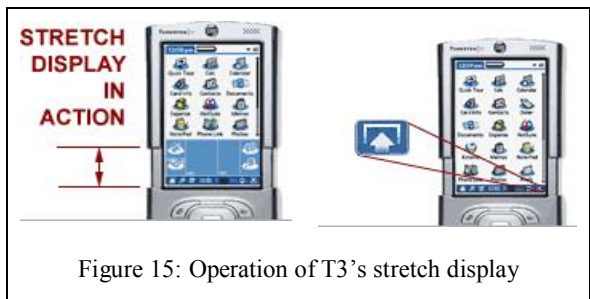
The basic concept is that since the Graffiti area is not always being used and most of the time users are searching for information, why not get rid of it for a while? Hiding the Graffiti area makes the device more compact for carrying. Nevertheless, it also causes the lack of access to the eight soft buttons including “home”, “menu”, “free”, “find”, “time”, “back light”, “character input”, and “number input” next to it at the same time. This drawback was first recovered by 5-way navigator's functions in which the most frequently used “home” and “menu” can be accessed without opening the slider. Secondly, Palm OS was improved simultaneously to allow users to write Graffiti on the screen outside of the input area. Hence, the slider can remain closed for one more reason.

Yet, what about the other six buttons? They are less but not least used in function. Responding to this, Palm gives the answer in its latest model, Tungsten T3. A virtual tool bar, called “the status bar”, replaces the physical buttons with the shortcuts having the same even more functions. Still, does it mean that users do not have to open the slider anymore? The answer is yes, and no.

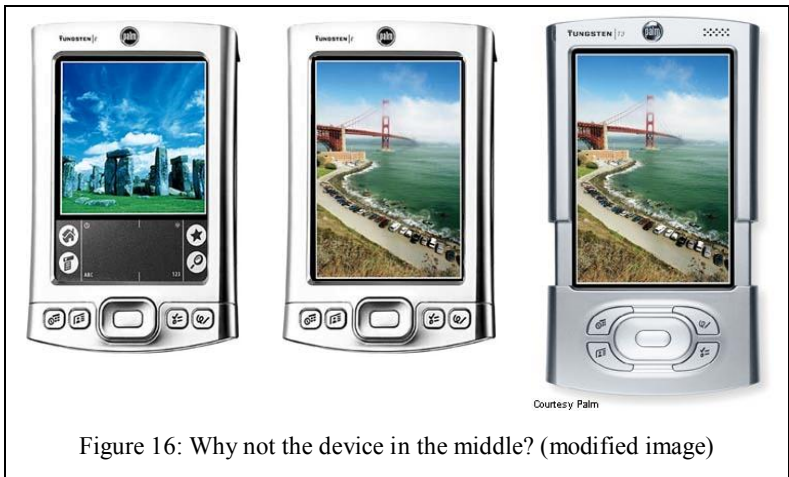


Figure 14. The status bar of Palm Tungsten T3

This is where this slider design becomes unexpectedly impressive. Since the traditional Graffiti area can remain hidden in most tasks, opening the slider does not have to reveal it anymore. Thus, the screen is expanded to stretch the display, and the Graffiti area becomes software-emulated and is to be called if needed. The approach of this evolution is actually a coordination of hardware and software. The slider is meant to reduce the size of device, while at the same time, it also provides opportunities to preserve old goodies and incorporate new features.



In spite of the seemingly achievement to perfection, we still can argue, "Why bother to have the slider?" After Graffiti area became software-emulated and the status bar can support the prior bottom array, opening the slider to expand the screen seems to be a redundant task. As a result, introducing virtual Graffiti area to the regular model without the slider can still have an expanded screen and stretched display. In this sense, reducing the size with the slider becomes ironically inefficient because any current model with opened slider is after all larger than the regular one.



3.4 From Graffiti to Graffiti 2

A PDA's feature characteristic is its handwriting recognition for data input. Palm's Graffiti had served well for its easy-to-learn uni-stroke character recognition. Unfortunately, Palm has to abandon the long-standing pioneer because of the copyright lawsuit with Xerox since 1997.^{xiii}

Graffiti 2 was introduced at the model of the first Tungsten T. There were a few resistances from the user community, and some attempted to switched back to what they have favored.^{xiv} However, the change is in fact subtle, except a few modifications in operation and some characters need more than one stroke to write. These alterations are considerable because the strokes are more similar to the natural handwriting. In fact, according to my personal experience, Graffiti 2 is more intuitive for a beginner who does not know it to input data for the fist time.

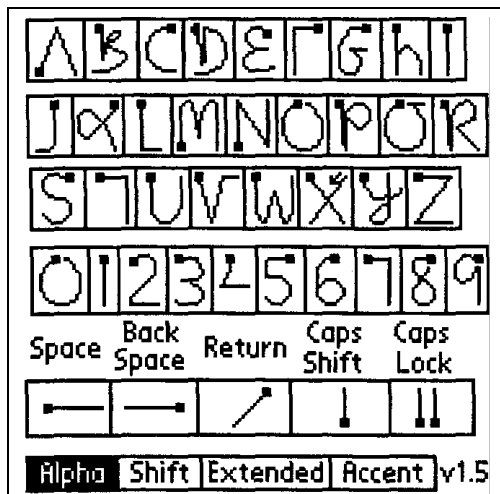


Figure 17: Graffiti



Figure 18: Graffiti 2

Still, there are a few problems in the new system. For instance, “K” or “k” is sometimes confused to “L”,^{xv} and I personally encountered the obstacle with letter “T”. The untamed letter “T” will sometimes cause difficulty when the letter “L” is the last

^{xiii} Graffiti's Dead, Long Live Graffiti 2 (2003): http://www.brighthand.com/article/Graffiti_Dead

^{xiv} Howto: Replace Graffiti 2 with Original Graffiti (2003):

http://www.palminfocenter.com/view_story.asp?ID=5830

^{xv} Ed Hardy, Inside Graffiti 2 (2003): http://www.brighthand.com/article/Inside_Graffiti_2

character of a word in the middle of a sentence. The “space” stroke will combine the “L” and makes it into a letter “T”. This happens when I write too fast, and this problematic operation is the opposite situation when writing “K” too slow it becomes “L”. Although it is not a major flaw, a bit annoying this is especially when time is precious.

The data input of a PDA is critical because it determines the successfulness of replacing the traditional paper-and-pencil notebook. It also determines the scale of ease of use. That is why most of the PDAs including PPC provide more than one input mechanism and on-screen graphic notes.^{xvi}

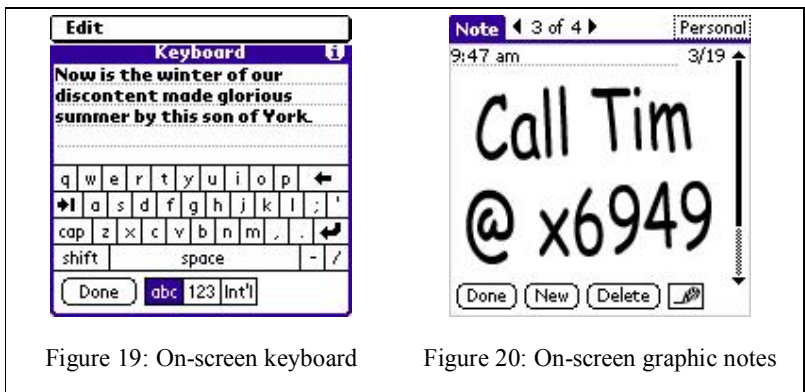


Figure 19: On-screen keyboard

Figure 20: On-screen graphic notes

4.0 Conclusion and Personal Opinions

I have been a Palm user for a year. I had a Palm m515 and I personally thought it was the ultimate model of the first generation PDA. Palm Zire 71 is the current device in service. I joined the Palm user community right at the transition period of Palm Computing when they seized the production line of its m500 series and started the new Tungsten (enterprise) and Zire (general) series. The shift of the transition is not dramatic but quite exciting from a user’s point of view because after years of solid marketing in business world, Palm finally spares some focus on general users. Unlike Sony’s overly flashy Personal Entertainment Organizer (PEO), which uses its own launcher developed from Palm OS, Palm maintains its constant solidness in functionality and usability.

^{xvi} Ways to Enter Data into a palmOne Handheld: <http://www.palmone.com/us/products/input/>

Sony is well known to release new models and software ideas in a very short period of time. However, it is also the endurance of Sony's devices being criticized the most because "let's wait and see" strategy can always be applied before customers will be willing to donate their money to Sony's gold pit. I never dislike Sony's models; in fact, I am always surprised by their new concepts of handheld entertainment. Yet somehow whenever I tried the latest Clie out in the retailer store, those new appliances are rather eye candies to me. I guess I have adapted to Palm's beauty of simplicity.

Still, I have to admit that Palm's devices are not perfect. It is obvious that Palm is still experimenting the Tungsten series and building new standards after the end of its legendary V and m series. Better hardware and design such as faster CPU, enlarged RAM, higher resolution screen, the slider, 5-way navigator, and wire-less network connection are installed. Enhanced OS and software are as well introduced. These all happened in a very short period of time. The handheld computers indeed will become more powerful and complex in the future. The question to Palm is: would they still remain in the leading position?

PIM applications are still the core of a PDA. Palm succeeded because the basic concept and interface of PIM software they introduced in 1996 became an industrial standard. In addition, Palm's overall form design and operation are distinguished by simplicity. Of course, the affordable price always opens the market (e.g. the \$99 Zire phenomena). Simplicity, clarity, and economically affordable were, are, and will always be the criteria to justify the quality of an innovation.