Tablets - Suitable Problem Solvers for Business Cases?

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Abstract—Tablets aren’t a new idea. They were already described in the early science fictions like Isaac Asimov’s novel Foundation from 1951 and are commercially available since 1989, e. g. the Grid GridPad 1910. Since Apple released the first iPad in 2010, tablets became favored and are in vogue today. Some experts already proclaim the end of the PC era. However, if tablets substitute PCs for private use, what are about the potential to suit the needs of organizations? In our contribution we consider this question and discuss, whether and in which way tablets are problem solvers. In summary, tablets are potential problem solvers but in which specific way depends on organization needs and business cases as well as the existing system landscape and social aspects.

Keywords—Tablet; iPad; Problem solver; Business cases; iOS; Android; Windows 8

I. INTRODUCTION

Due to numerous manufacturers sustainable decisions in IT investments aren’t easy. Imagine you are IT manager and the old PCs of an administration department e. g. human resources, financial or controlling have to be replaced. Now you face the situation to decide which type of device, e. g. personal computers (PC), notebooks or tablets, is the best for administration purposes and should be bought. Since Apple released the first iPad in 2010, tablets became favored and are in vogue today. In fact the number of sold tablets in general increases year in and year out [1] and estimations of IDC proclaim that sales of PCs (Desktop-PCs and portable PCs) will decrease while the number of tablets will permanently increase until 2018 [2]. For private use, tablets offer a wide range of functions, functionality and apps, e. g. email clients, maps, as well as navigation systems, web browsers, and many more. Facing to this high user-friendly usability of tablets and adapted from decreasing sales of personal computers (PC), some experts already proclaim the end of the PC era [3]. The described development makes it hard to make sustainable decisions. The worst case is to buy devices not fitting the required needs. Such a decision would have negative impacts on the three pillars of sustainability in terms of sunk costs, disappointed employee as well as waste of resources. In order to avoid such decisions our contribution aims to answer the question “Tablets - Suitable Problem Solvers for Business Cases?”.

However, if tablets substitute PCs for private use, what are about the potential to suit the needs of organizations? Is a tablet a problem solver for business cases? In our contribution we consider this question and discuss, whether and in which way tablets are problem solvers. We define the term “tablet” and identify which criteria are relevant for organizations to make purchase decisions. Furthermore, we explain how tablets and their Operating System (OS) fulfill these criteria. Last but not least, we summarize our contribution and present new covered gaps for future work.

II. TABLET

In order to discuss which type of device is the best for our business case, we have to clarify the differences between them. The term “personal computer” (PC) describes a large category of end-user devices, which are fulfilling the following criteria: they are digital computers with a largely automatic, and they are programmable by the user. The devices are accessible as a commercially manufactured product, a commercially available kit or in widely published kit plans. They are transportable by an average person, affordable by the average professional and simple enough to use that it requires no special training beyond an instruction manual. [4]

PCs can be divided in two subcategories. PCs with a more stationary purpose, like workstations, desktop computers, and home theater PCs and PCs with a more portable purpose, like laptops, notebooks, netbooks, and tablets. [5] What distinguish tablets from the other portable PCs?

Tablets in general aren’t a new idea. They were already described in the early science fictions like Isaac Asimov’s novel Foundation from 1951 and are commercially available since 1989, e. g. the Grid GridPad 1910 [6]. Over the time the understanding of a tablet has changed. Today, the terms “tablet”, “tablet computer” and “tablet personal computer” are mostly used synonymously and most people have an idea what a tablet is and what it is good for, without to be able to give an admitted definition. We searched for a definition on websites of the top five tablet vendors, based on the shipped units in the fourth calendar quarter of 2014 [7], and found out, that only Amazon and Lenovo provide (their own) one.

Both definitions have in common that a tablet is a portable, light and thin touch screen device with data connectivity, e. g. 3G, 4G or Wi-Fi, which is primary made for tasks like...
browsing the web, checking emails, watching movies, sharing photos and so on. Both vendors point out, that tablets with different OS are available and that each OS has its own proprietary app store, where users can download applications to extend the tablet’s functionality [8, 9].

In addition, Lenovo describes that most tablets have no physical keyboard or mouse but the possibility to add an external one [9]. Amazon differs between slate tablets, with no physical keyboard or mouse, convertibles, laptops which can be transformed into a tablet, and hybrid tablets, tablets designed to work with keyboard docks [10].

In order to differ tablets from other end-user devices, e. g. laptops, smartphones, as well as ebook readers, we follow Lenovo’s perception, which is compatible to Amazon’s understanding of slate and hybrid tablets. However, we have to mention, that the borders between the end-user device categories are blurred.

III. PROMISES AND REALITY

Since the market lunch of Apple’s iPad in January 27, 2010, an increasing number of people use these devices. Besides the consumer market more and more vendors offer tablets for business purposes. Apple promises “[…] there’s an iPad for every business. With iOS 7 and thousands of business apps, iPad transforms the way you work.” [11]. Samsung states to help “[…] mobile professionals quickly and easily access critical business and personal information anywhere, anytime.” [12] using the Galaxy Tab Pro line. Apart from this, Samsung promises user’s work getting “[…] better, faster and smarter” [13] as well as being a “[…] productive, mobile, reliable and secure device […]” [13]. In spite of these promises one can also read headlines like “Tablets Not Good Enough for ‘Real Work’” [14] or “Why tablets are hard to swallow for business” [15]. In conclusion there must be a gap between the promises the vendors made on one hand and the user expectations on the other hand. Due to the variety of vendors and available tablet models on the market for organizations, it isn’t easy to find the right one. The top five tablet vendors are Apple, Samsung, Amazon, Asus and Lenovo [7]. Table 1 shows the number of business tablets available at the vendor’s websites separated by OS.

IV. TABLETS - STATE OF THE ART

Organizations, which are interested in tablets for business purposes are facing an extensive range of products. Mostly, available OS and tablets depend on each other. The selection of an OS limits the number of available end-user devices and vice versa, e. g. iOS and Apple’s iPad.

As already mentioned in section two, the functionality provided by tablets depend on their OS. Against this background we analyze iOS, Android, and Windows regarding criteria which are relevant for organization needs. In addition we also consider other aspects which could influence the business strategy of organizations like finance, environment, and target audience.

Table 2 characterizes the mentioned tablet OS regarding their first release date and producer as well as its current version and market share.

In the following, we refer to the current version of the OS, otherwise we will mention it. The same apply for Windows 8.1 RT and Pro.

Next to the performance of built-in hardware components, the business suitability of tablets is influenced by their OS. Consequently we compare iOS, Android and Windows regarding to important business functionality. Due to missing information in literature about functionality mostly required by organizations, we clustered several business requirements into five categories. As shown in Table 3, these are: Apps, data exchange and access, security, strategic platform, integration and administration effort.

A. Apps

The category “apps” examine both the number of apps available in the specific store and solutions to install in-house apps. As well as for traditional software the make-or-buy decision applies for apps, too. If there is a large number of apps in a store the probability to find the right one for a specific task is much higher than in a store with a small number. Next to this, the ability for installing traditional application improves the situation to find suitable and existing solutions. Moreover a large number of commercial apps encourage competition among developer and increase the quality of apps. Microsoft’s app store counts more than 202,000 tablet apps [31] whereas in Apple’s app store are more than 725,000 apps available for Apple’s tablet iPad [32]. Despite these in Google’s play store are approximately 1,400,000 apps for android based devices [33]. With different effort all three OS allow to install in-house apps and those of third parties [34]; [35]; [36]. Beside the
opportunity to install apps, Windows Pro provides the option to install traditional application.

B. Data Access and Exchange

The category “data access and exchange” describes how users can access data on their tablets and how they can exchange this data with other people. For business purpose it is important to know this fact, because of the security and availability of business data, e.g. right of access, backup, central data management.

On iOS each app decides where the data will be stored, whether internal or external in the cloud. The access and exchange of internal stored data is possible with additional apps only. Android and Windows have built-in file browsers to access the data and allow exchanging the data in different ways, e.g. USB or network.

C. Security

Next category we examine is “security”. Due to the content and importance a large amount of business data are not intended for public consideration. Especially high sensitive data should be accessible for authorized persons only. Against this background privacy and security are important criteria organizations should know about to choose the right tablet. A detailed comparison of iOS 7, Android 4.3 and Windows 8.1 regarding eight security aspects are given in a whitepaper of Experton Group AG [37]. To summarize this whitepaper, iOS’ security strengths are encryption and apple updates, on average are access protection as well as the protection against malware. Weaknesses are missing functions and features, e.g. separation of private and business data but also allocation and separation of private and business apps. Further weaknesses are missing remote data removal functions and no multi-user-support. Android security advantages are a multi-user-support, separation of private and business apps. On average is the access protection. Androids security weaknesses are missing functions and features, e.g. remote data removal functions, encryption, updates for the OS, separation of private and business data but also the protection against malware. Unlike iOS and Android, Windows fulfill these criteria in a good way [37].

D. Strategic Platform

The category “strategic platform” represents which software vendors produce apps or application for the selected OS. Most organizations already have a software landscape based on different applications. Tablets have to be integrated in this landscape and their OS should be supported by the application vendors.

In order to give an impression for this category we search on the app stores of Microsoft, Apple and Google for apps of the top three vendors in “Software & Programming” of Forbes Global 2000 list 2013 [38]: Microsoft, Oracle and SAP. Microsoft supports Apple’s iOS and Google’s Android with apps like Office, OneDrive, Lync and SharePoint. For Windows, Microsoft offers additional apps, e.g. Maps, Power BI, and ships Office 2013 RT with Windows RT for free. Oracle provides apps for iOS and Android, e.g. Virtual Desktop, Tap, Business Intelligence, CRM on Demand, but not for Windows. SAP offers a lot of apps for Apple’s iOS and Google’s Android, e.g. SAP BusinessOne, SAP BusinessByDesign, and some of these apps for Windows. However, all current versions of Microsoft’s, Oracle’s and SAP’s desktop applications run on Windows Pro.

E. Integration and Administration Effort

The category “integration and administration effort” covers the needs of organizations to integrate tablets into their system landscape. In order to realize an integration of tablets with suitable cost, OS should have the required configuration options and OS vendors should provide administrative tools for this purpose. From user perspective, the OS should be user-friendly with just a few coherent configuration options for customizing. Regarding to this gap and the existing system landscape of organization, the effort to integrate and administrate tablets can be very expensive, e.g. separate device management [39].

All OS allow a basic integration into the system landscapes of organizations, e.g. to build intranet connections via VPN or to setup and synchronize to different email servers. In addition, Apple’s iOS offers some useful options for integration, e.g. VPN per app, enterprise single sign on or mobile device management [40]. Google’s Android provides a device administration API, which enables administration features at the system level [41]. Microsoft Windows RT doesn’t offer special tools for integration. In contrast, Microsoft Windows Pro can be fully integrated into a Microsoft system landscape, e.g. connect to an active domain controller [42].

F. Price and Environmental Aspects

Next to functional requirements the selection of a tablet model depends on the money. Each of the five top tablet vendor offer both low and high priced devices. Based on information, given at the US vendor’s websites, Table 4 shows the price for the cheapest but also for the most expensive tablet of the considered vendor. The price spread for tablets reaches from $99.00 for Amazon’s “Fire HD 6 Tablet” [43] up to $2,869.00 for the Leno’s “ThinkPad Helix” [44]. In case of replacing an old notebook or desktop computer a tablet as working tool could be a worthwhile option. But respecting the mentioned price spread, a wrong purchase decision costs up to $2,770.99 per device if the low priced model meets all desired business needs as well. On the one hand the acquisition of apps and desktop applications can lead to further costs, but on the other hand working with tablet can substitute devices e.g. laptops, desktops, thin clients as well as these devices can reduce printing cost.
### TABLE III. BUSINESS REQUIREMENTS AND THEIR FULFILLMENT BY TABLET OS

<table>
<thead>
<tr>
<th></th>
<th>Apple’s iOS smartphone and tablet OS</th>
<th>Google’s Android smartphone and tablet OS</th>
<th>Microsoft’s Windows RT tablet OS</th>
<th>Microsoft’s Windows Pro tablet and PC OS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Apps</strong></td>
<td>725,000</td>
<td>1,400,000</td>
<td>202,000</td>
<td>202,000</td>
</tr>
<tr>
<td><strong>Data Exchange and Access</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Exchange:</td>
<td>cloud</td>
<td>cloud</td>
<td>cloud</td>
<td>cloud</td>
</tr>
<tr>
<td></td>
<td>app</td>
<td>app</td>
<td>app</td>
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<td></td>
<td>USB</td>
<td>USB</td>
<td>USB</td>
<td>USB</td>
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<td></td>
<td>wireless connection</td>
<td>wireless connection</td>
<td>wireless connection</td>
<td>wireless connection</td>
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<tr>
<td></td>
<td>memory card</td>
<td>memory card</td>
<td>memory card</td>
<td>memory card</td>
</tr>
<tr>
<td>Data Access:</td>
<td>file browser</td>
<td>file browser</td>
<td>file browser</td>
<td>file browser</td>
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<tr>
<td><strong>Security</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive:</td>
<td>encryption</td>
<td>multi-user-support</td>
<td>multi-user-support</td>
<td>multi-user-support</td>
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<tr>
<td></td>
<td>updates</td>
<td>app separation and allocation</td>
<td>app separation and allocation</td>
<td>app separation and allocation</td>
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<tr>
<td>On average:</td>
<td>access protection</td>
<td>access protection</td>
<td>access protection</td>
<td>access protection</td>
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<tr>
<td></td>
<td>malware protection</td>
<td></td>
<td></td>
<td>malware protection</td>
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<tr>
<td><strong>Strategic Platform</strong></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Apps:</td>
<td>Microsoft</td>
<td>Microsoft</td>
<td>Microsoft [+] Office 2013 RT</td>
<td>Microsoft</td>
</tr>
<tr>
<td></td>
<td>Oracle</td>
<td>Oracle</td>
<td>SAP</td>
<td>SAP</td>
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<tr>
<td></td>
<td>SAP</td>
<td></td>
<td></td>
<td>Desktop applications:</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Microsoft</td>
</tr>
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<td></td>
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<td></td>
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<td>Oracle</td>
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<tr>
<td></td>
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<td></td>
<td>SAP</td>
</tr>
<tr>
<td>Integration and Administration Effort</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basic integration e. g.:</td>
<td>VPN</td>
<td>VPN</td>
<td>VPN</td>
<td>VPN</td>
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<tr>
<td></td>
<td>Email &amp; Calendar</td>
<td>Email &amp; Calendar</td>
<td>Email &amp; Calendar</td>
<td>Email &amp; Calendar</td>
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<td></td>
<td>Contacts</td>
<td>Contacts</td>
<td>Contacts</td>
<td>Contacts</td>
</tr>
<tr>
<td>Additional, e. g.:</td>
<td>device management</td>
<td>administration API</td>
<td></td>
<td>Active Directory</td>
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</table>
But money is not everything. Especially those organizations which feel responsible for environment should concern about aspects like energy consumption, material efficiency or harmful substances as well. But it isn’t as easy as it seems. There are two main problems, too many eco and energy labels as well as hardly comparable product eco declaration (PED) if these are provided by the vendors. In the third column Table 4 shows the way vendors provide product eco declaration.

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Price Spread of tablet models on vendors website [in US $]</th>
<th>PED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple</td>
<td>249.00 – 829.00(^{\text{a}}) on website</td>
<td></td>
</tr>
<tr>
<td>Samsung</td>
<td>119.99 – 749.99(^{\text{a}}) on request</td>
<td>PED</td>
</tr>
<tr>
<td>Amazon</td>
<td>99.00 – 579.00 not provided</td>
<td></td>
</tr>
<tr>
<td>Asus</td>
<td>no prices are given</td>
<td>on website</td>
</tr>
<tr>
<td>Lenovo</td>
<td>109.99 – 2869.99 no answer</td>
<td></td>
</tr>
</tbody>
</table>

\(^{\text{a}}\) For some tablets no prices can be found on the mentioned website.

Beside other criteria, the aspect of target audience is very important for the right purchase choice of tablets in organizations. It strongly depends on the needs and functions of employees, which should get tablets for their work. Regarding to the work tasks and the linked computer usage of the employees, tablets can be problem solvers. For example, MURPHY mentions nine business areas where tablets can be good in, e.g. warehouse, high-end sales and retail sales, operation and service staff [47].

V. DISCUSSION

In order to manage the complexity and scope of our contribution we made constraints consciously. At first, we defined the term “tablet”. This definition excludes similar end-user devices, e.g. convertibles, laptops and smartphones. However, it is to mention that the border between these devices is fuzzy. At second, we focused on top five tablet vendors only. This decision determines other aspects like considered OS as well as done researches. Concentrating on highly comparable results we decide to look at specific versions of OS. That means, we exclude Microsoft’s Windows Standard but also customized OS versions, e.g. Google’s Fire OS due to the lack of already admitted criteria for tablet selection, we present our own one. These were identified by available information of the chosen vendors in conjunction with mentioned business key points of OS emphasized by their developers. Beside this, further aspects, e.g. hardware requirements, sustainability, and marketing strategies, could be taken in consideration. At last, our findings result on investigations. Nevertheless, we point out that our concept isn’t proofed empirically, yet.

VI. CONCLUSION AND FURTHER WORK

Our contribution aimed to answer the question whether and in which way tablets are problem solvers for business cases. In summary, the first part of this question can be answered in a positive way. Owing to covered dependencies answering the second part of this question isn’t easy. Influencing factors are the specific business case, the existing system landscape as well as social aspects. All in all tablets can be powerful problem solvers, if organizations are able to find both the right tablet and a suitable setup.

The proof of concept regarding to real business cases is left to further work. Also the finding of additional business relevant criteria could improve the mentioned concept, in future.

REFERENCES


