

DECIDING WHEN TO USE TABLETS FOR BUSINESS APPLICATIONS¹

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Executive Summary

Like many disruptive technologies, tablet computers such as the Apple iPad are already changing the face of corporate computing and will likely have an even greater impact in the future. The purpose of this article is to provide a set of frameworks that can be used to identify when and where a tablet computer device, and tablet applications that leverage the unique features and interaction capabilities of this device, can add value to an organization and complement an existing information system infrastructure.

INTRODUCTION

Tablets can be seen as an alternative to two other types of portable devices: laptops and smartphones. These three devices all excel in different ways and their use should be consistent with their strengths. In addition, understanding when and where to use tablets requires two types of knowledge: 1) the technical capabilities of tablets and 2) the types of applications being developed for tablets. The latter depends on the former, and the use of tablets, irrespective of the applications they run, is inherently limited and enabled by the former. That is, an application is constrained by the form factor within which it resides; it is the platform that determines the human-machine interaction capabilities.

We therefore begin by first looking at the unique features of tablets, the different types of interactions that portable devices can be used for, and the contexts in which they take place. We then provide a framework that can be used to choose whether a tablet, versus a laptop or smartphone, best addresses three types of capabilities that we call Configure-ability, Consume-ability, and Context-ability. After providing some recent examples of iPad applications, we close with a few general recommendations for helping to ensure that the deployment of tablets will provide business benefits.

UNIQUE FEATURES OF TABLETS

Today's tablets have much in common with desktop and laptop computers (they can send e-mails, surf the Internet, and be used for typical office productivity applications) and smartphones (they can be used for games, are light and very portable, and have GPS capabilities). However, tablets also possess some features that are very different from either a PC or a smartphone. We describe these below, drawing on the unique capabilities of the Apple iPad.

- *Unique to the user:* Like smartphones, tablets are usually owned and used by one individual.
- *Almost ideal screen size:* The iPad's screen size (9.5 by 7.31 inches) is as close to ideal as is possible for a personal computing device. Although the iPad's screen size is smaller than most desktop PCs or laptops, the smaller screen

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size provides a significant weight advantage. On the other hand, the iPad's screen is significantly larger than those of most mobile devices (especially smartphones), while not being overly heavy.

- *Very portable*: Tablets (unlike even the smallest, lightest laptops) are very portable in every sense of the word. The iPad is only 1.6 lbs, easy to hold and carry, and fits easily into a bag or purse.
- *"Always on, instant on"*: Tablets are always on or can be turned on instantly with no boot-up time and turned off instantly with no waiting for shutdown. Although some newer Apple Macintosh laptops share this feature to some extent, most laptops do not have instant on and off facilities.
- *Very long battery life*: The iPad has a longer battery life (around 10 hours) than most commercially available laptops, which means that it can be used continuously throughout a full working day or throughout all but the longest intercontinental flights.
- *Ease of use, including touchpad*: Tablets are uniquely easier to use. They do not require a keyboard, mouse, or other pointing device. Because they operate entirely through touch, they can be used by the very old and very young alike, without even assuming literacy or keyboarding skills. Users can do a lot by merely pointing and touching with a finger, without having to enter data on a keyboard or click and double-click a mouse.
- *Accelerometer and gyroscope*: The iPad was the first computing device to be equipped with an accelerometer, which measures its rate of movement and senses the direction in which it is moving. Although smartphones have this feature, no laptops do. Among other uses, this means that the iPad can be used to control other devices in terms of movement and motion. Furthermore, one of the new and unique additions to the iPad 2 is a gyroscope, which measures or maintains orientation. The accelerometer and gyroscope improve motion sensing accuracy and allow the iPad to measure the direction in which the user is moving or rotating it in space (roll, pitch, and yaw), how much, and how fast.
- *GPS*: Because the iPad has GPS (Global Positioning System) capabilities, it can provide the user and applications on the device

with reliable and precise location and time information in all weather conditions, at all times, anywhere.

INFORMATION SYSTEM INTERACTIONS: THE 4-I'S FRAMEWORK

An information system is an integrated set of components for collecting, storing, processing, and communicating information. Essentially, there are four types of information interactions on any information systems device (of which the tablet is one): Inscriptive, Informative, Interactive, and Isolative, which we label as the "4-I's."

Inscriptive Interactions

One of the key challenges of mobile device and system manufacturers is to identify the optimal input method for their devices. Inputting, or entering information, is described by the Inscriptive function. Although tablets are typically used more for consuming information than for inputting information, input is an important feature—e.g., recording and saving a voice memo is an audio input, whereas typing and saving notes is a form of written input. In the context of the workplace, the Inscriptive function hinges on the ability of a worker to efficiently navigate between menus (and in doing so, input the right instructions). Until the implementation of the touch-sensitive screen for tablets, first seen in the iPad, Inscriptive efficiency wasn't really possible.

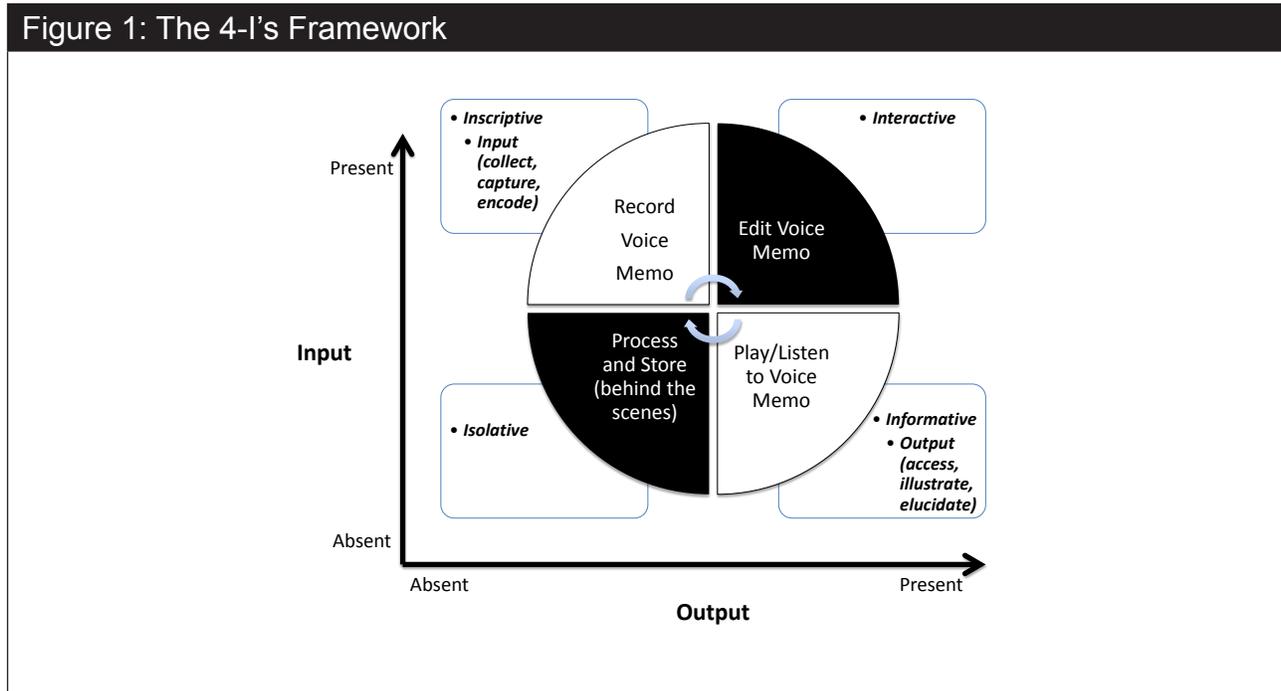
Informative Interactions

The Informative function of information systems is the output function, through which information is provided to the user—e.g., listening to a voice memo, reading notes or even watching a video. Small screens cause problems when data representation is involved. Collecting information (Inscriptive) or sending information (Informative) may occur in one-way form (as in an alert sent from one person to another) if the other party does not respond. Alternatively, both of these could occur in reciprocal communication if the two parties acknowledge each other.

Interactive Interactions

The Interactive function describes the interaction of the user with the information—such as editing saved work or using a graphics application to adjust an image.

Figure 1: The 4-I's Framework



Isolative Interactions

The Isolative function describes the storing of information for later use. Like a smartphone, tablets can store and send, but these are essentially passive functions from a user perspective. The four quadrants of the 4-I's framework are depicted in Figure 1.

CONTEXT FOR INTERACTIONS

Context characterizes a situation related to the interaction between users, applications, and the surrounding environment. It is typically related to location, identities of nearby people, objects, and changes to objects. For a mobile device, the specific context in which it is being used can change constantly.

Context can be important to the value of information in two ways:

1. When information is relevant to where a person is, or what they are doing, we refer to it as Contextive.
2. When information is relevant to where a person is, relevant to what they are doing, or contextually relevant in other ways, we refer to it as Contextual.

Contextive information is information *about* context; Contextual information is information *for* the context. The SH Guide iPhone app description below illustrates these concepts.

SH Guide is an English guide to the city of Shanghai in China. A great deal of the information embedded in the application is Contextive—that is, it tells the user a lot about the city. This information includes the history and geography of the city, available public services, places of interest, shopping, museums, hotels, and restaurants. However, any visitor to China who cannot speak the local language or read Chinese characters will know how difficult it is to use a cab, since most of the drivers do not speak or read English. Usually, the visitor has to rely on a hotel concierge to write the destination in Chinese characters on a piece of paper and present the paper with the address in Chinese characters to the cab driver.

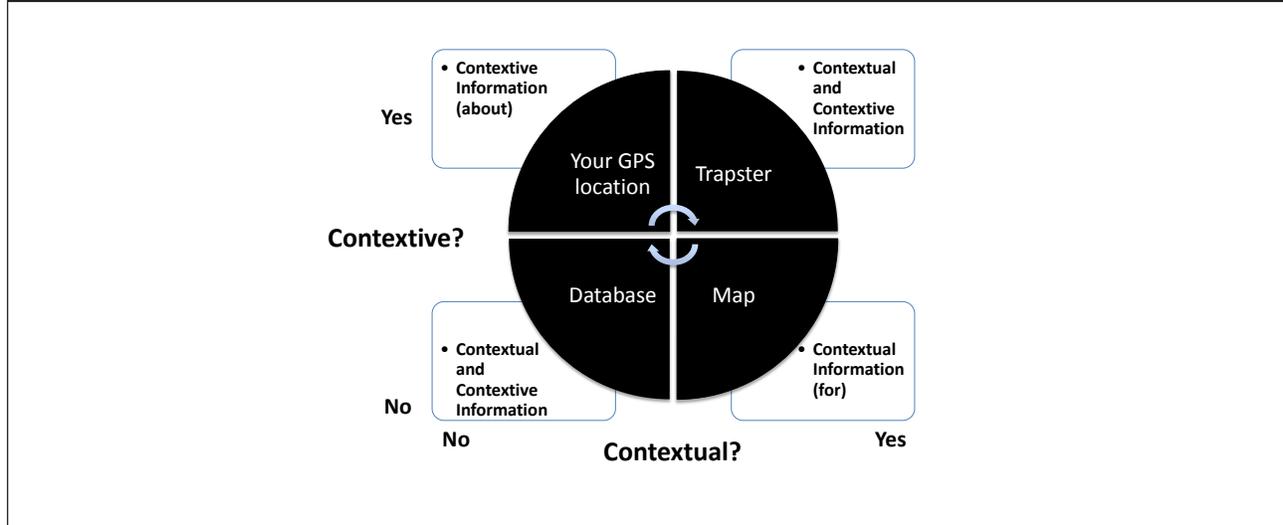
SH Guide addresses this problem by also providing Contextual information—information for the visitor specific to their exact circumstances in the city. The user enters the address in English to which he or she wants to take a cab and then touches a “Show address to taxi” button, which then displays the address in Chinese characters on the screen, so it can be shown to the cab driver. This is illustrated in Figure 2.

The Contextive and Contextual information concepts can be very useful for generating ideas for tablet applications. An information system can be neither Contextive nor Contextual. Or it can just be Contextive—that is, it can tell the user something about the context in which they find themselves. Or it can just be Contextual—it can provide information relevant to the individual for the situation in which they find themselves. Or, in the case of the SH

Figure 2: SH Guide iPhone App: Contextive and Contextual Information



Figure 3: Examples of Various Information Contexts using a Tablet



Guideapp, it can include both Contextual and Contextive properties.

These four variations are illustrated by examples of iPad apps.

- A map and all the associated data that resides in a database on an iPad is neither Contextive nor Contextual information.
- Using Google Maps and the iPad's GPS capability, the user can find out about their location (e.g., on the corner of Jones St. and 5th Ave., Smithville). The information is now Contextive.
- Using the map section of Google Maps and the iPad's GPS capabilities, the user can find the closest fast-food restaurant for them (e.g., a McDonald's at 504 5th Ave., just off Jones). The information is now Contextual.

- Finally, the user might be in a hurry but want to avoid speed traps. Using the Trapster app (which integrates maps, GPS, and user-input reports of police incidents and speed traps), the user can identify the traps currently in the area (Contextive information about the area) and can also alert the system to a trap he or she has just observed but that has not yet been reported. This Contextual information is uploaded to the system and becomes information that other users can now access Contextively.

Examples of these four information context scenarios for tablets are illustrated in Figure 3.

Table 1: The 3 C-Abilities for Portable Devices

C-Ability	Definition
Configure-ability	Ability to rapidly change the input and output of information (programmability of Inscriptive & Informative elements)
Consume-ability	Ease of media consumption and interaction (consumption of Inscriptive & Informative elements)
Context-ability	Awareness of context and ability to customize to personal preferences (Contextive and Contextual)

Table 2: Rating Portable Devices on the C-Abilities

Characteristic	Information	Laptop	Smartphone	Tablet
Configure-ability	Inscriptive & Informative	Low	High	High
Consume-ability	Inscriptive & Informative	High	Low	High
Context-ability	Contextive & Contextual	Low	High	High

THE 3 “C-ABILITIES” TO CHOOSE A PORTABLE DEVICE

There are three key dimensions to consider when choosing the most appropriate portable device: Configure-ability, Consume-ability, and Context-ability, which we label the 3 “C-Abilities” (see Table 1).

- Configure-ability refers to the ability to rapidly change the configuration of both input (Inscriptive) and display (Informative) of information.
- Consume-ability refers to the ease with which the user can consume or interact with information. Both Configure-ability and Consume-ability relate to the Inscriptive and Informative elements of the 4-Is framework.
- Context-ability, on the other hand, refers to the awareness of context, such as time and place, and therefore relates to the Contextive and Contextual elements discussed above.

Table 2 compares these C-Abilities for laptops, smartphones, and tablets. In terms of Configure-ability, both smartphones and tablets are superior to laptops. For example, switching from taking photographs to recording voice memos to taking notes is an easy process on either a smartphone or tablet; different applications will begin running almost immediately after tapping an icon. On a laptop, programs take longer to load and access.

Laptops and tablets share similar levels of Consume-ability: both devices have screen sizes that are conducive to consuming information. Their screens

are large enough to watch a video or view a slide presentation. Given the choice of watching a video on a laptop or tablet, versus a smartphone, most people would prefer the former because of the larger screens.

However, the Context-ability of smartphones and tablets is again greater than that of laptops. This partly stems from the basic function of smartphones and tablets, which are often used as GPS devices for navigating through traffic or following the whereabouts of friends and family with social networking applications such as Foursquare.

The best portable device choice therefore depends on the priority for the business application.

IDENTIFYING POSSIBLE TABLET APPLICATIONS

According to the social psychologist Bandura,² we learn very effectively by modeling the successful behavior of others—a process known as “vicarious learning.” Decision makers seeking to introduce tablets into their own organizations could therefore benefit by identifying successful tablet applications in other organizations and adapting them for their own use. We describe below some recent examples of iPad business apps³ that illustrate each of the 4-I’s as well as their contextual dimensions.

Isolative Information: Storing PDFs on iPads Rather than Lugging Around Heavy Manuals.⁴ Polish broadcast engineer Wojtek Pietrusiewicz uses

² Bandura, A. *Social Learning Theory*, Prentice-Hall, 1977.

³ For other excellent examples of recent iPad business applications, see <http://mashable.com/2011/02/24/ipad-productivity/>.

⁴ <http://www.macworld.com/article/152997/2010/07/ipadbiz.html>

an iPad instead of carrying a library of technical manuals with him as he services equipment in small spaces. “Whenever I do maintenance, software/hardware upgrades, or full installations, I require many manuals in PDF form. Since there is rarely space for a laptop in the central apparatus rooms, I decided to use my private iPad instead,” he said.

Inscriptive Information: Medical Intake Surveys in Doctors’ Offices. Although medical forms have been stored digitally in some healthcare organizations for some time, only recently has it become possible to complete forms digitally. The iPad Adobe Ideas app provides patients with a way to fill out medical history and contact information forms required by the clinic.⁵ Patients are able to sign the forms and hand the iPad back to the clinic. In this way, the information is returned in a structured format that can be electronically saved and stored by the clinic in an information system. The tablet can also provide the patient with information about the clinic, the physician, and services that are offered. Tablet devices can therefore increase the efficiency of collecting and updating information from patients. There may be an additional bonus for patients: if there’s a wait before their appointment, they can use the tablet to surf the Internet via a WiFi network in the clinic, read magazines, or play games installed on the tablet.

Informative Information: Restaurants and Hotels. The MenuPad⁶ app for restaurants provides a new way for patrons to review menus and wine lists. With this application, patrons can see photographs of dishes, compare recommended wine pairings, and read restaurant information. For the indecisive patron, the MenuPad app will suggest dishes based on the weather or a person’s mood.

Similarly, hotels have recently started to use tablets to inform their guests and potential clients about various services. At Hyatt Hotels & Resorts, the concierge can use an iPad to show guests their restaurant or entertainment options as well as directions on how to get there.⁷ The iPad can also be used to provide Contextive information about the hotel, such as descriptions of hotel amenities. In meetings with potential clients, Hyatt employees can show images of the banquet halls to wedding planners or images of rooms to potential guests. The Morgans Hotel Group⁸ uses iPads to deliver event lists to guests. Their guests can use the hotel’s iPads to browse entertainment options, arrange a car rental, or order room service.

5 http://www.drulp.com/2011_04_27_archive.html

6 <http://www.menupad.com>

7 <http://www.apple.com/ipad/business/profiles/hyatt-hotels/>

8 <http://www.hotelinteractive.com/article.aspx?articleid=19900>

Interactive Information: Automobile Dealer Showrooms. BMW is replacing traditional car specification brochure panels with iPads featuring the BMW digital configuration app.⁹ This application provides customers with an Interactive method to design their own car by mixing and matching car colors, wheel options, and interior options as they stand in front of models in showrooms or at auto-shows. Throughout the process, customers have the option of viewing the car from the outside or from the inside. When viewing the exterior, customers can rotate the vehicle to view it from different angles and can even change the background to see what the car will look like when parked in the driveway compared to when driving on a road with mountains in the distance. When in the hands of the salesperson, the application also lists vehicle information, such as the pricing associated with each feature, and allows salespeople to request additional information when necessary.

The application provides significant benefits for BMW because it reduces the need for floor space and provides a quick and easy way to demonstrate all possible combinations of features to customers. BMW is installing iPads in showrooms of dealerships around the United States. While the dealers of other auto manufacturers have also incorporated interactive applications on desktop computers in showrooms, the major advantages of the BMW iPad app are its portability, its ease of use, and the fact that it is “always on” (its Consume-ability).

RECOMMENDATIONS FOR USING TABLETS IN BUSINESS

The market for tablets and tablet applications is growing rapidly. New ecosystems will continue to evolve as these devices take their place in the corporate world. We provide five actions that IS organizations can take to ensure that the deployment of tablets provides business benefits.

1. Regularly scan relevant media for effective, creative use of tablets in a range of business settings, including some Web sites that we have found particularly useful: Engadget, CultofMac, Mashable, Wired, AppleInsider, TechCruch, and MacWorld.
2. Consider the Inscriptive (input) and Informative (output) functions of information systems, and the interaction between them,

9 <http://www.tuaw.com/2010/11/07/bmw-to-use-ipads-for-specification-panels-at-american-auto-shows/>

to envision how tablets might enable these activities to be performed more effectively.

3. Explore opportunities of moving applications that are purely Isolative into the Contextive and Contextual space to provide customers with superior service and improve the productivity of employees.
4. Compare the 3 C-Abilities of tablets versus other mobile devices, recognizing that even small changes in the technological capabilities of these devices may require changes in how organizations think about using these devices.
5. Envision the needs of your customers and employees using relevant strategic or business process models. For example, the application that permits boarding passes sent to smartphones for air travelers was developed by understanding that travelers might not have access to a printer to print a boarding pass prior to check in.
6. Envision employees accessing the organization's information systems via mobile devices.

CONCLUSION

Computer tablets like the iPad are probably the world's first truly "personal" computers and are already changing the face of corporate computing. The frameworks described in this article can be used by organizations to choose when and where to use this type of portable device and create tablet applications for interactions in contexts that fully leverage a tablet's unique properties. By being on a constant lookout for good examples of applications in a wide variety of settings and asking questions such as "How would that work in our business?" and "Could we do something similar in our organization?" organizations can identify how applications on tablet devices can shorten, short-circuit, and shape business processes and thus create business value.

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