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Why, Where, and How Is Touch Right for Your Business?
A Guide for IT and Line-of-Business Managers

With its rapid consumer acceptance in smartphones, in tablets, and on the desktop (especially in Windows 8), touch-based user interfaces (or "touch" for short) are set to become an integral part of how we compute in the future. It's not that touch has made activities possible that were never possible before, but it has enhanced the user experience by making many of these activities practical (voting, drawing, entering a customer's order), cool (consuming news, generating social media), and most importantly, efficient (browsing the Web, taking notes, delivering presentations, checking/composing/replying to e-mail). Fed by the consumerization of IT, touch has begun to move from consumer apps on personal devices to highly productive, collaborative business applications on PCs.

IT and line-of-business (LOB) managers see touch coming inward through the front door on users' personal devices instead of downward from executive management. However, some are not convinced that touch will be part of their normal business workflow. They're not sure why, where, and how touch is right for their business, in the same way that their predecessors in the 1980s were not sure why, where, and how the PC could increase productivity enough to outweigh the headache of adapting it to business, or adapting business to it.

This paper will explore the why, where, and how of touch in business, including ways in which users, organizations, and the IT industry are using touch for greater productivity. IT and LOB managers will find trends, lessons, background information, and data points with which they can equip themselves in upcoming discussions about integrating touch computing and devices to their own workflows.

Key Points

- Because of its potential to boost worker productivity, touch is fundamental to the future of enterprise computing. Employees are coming to expect employers to support it and employers are coming to expect touch-proficiency from employees.

- With more business applications and more smart businesses accommodating the superior user experience and greater productivity of touch computing in their IT landscape, deploying or purchasing non-touch-enabled devices is a short-sighted strategy.

- Ultrabook™ devices and Windows 8* apps are gaining prominence as the optimal hardware-software combination for business productivity with touch screen, keyboard, and touchpad input modes.

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The Whys

Sheer numbers make touch-enabled devices a force to reckon with: IDC has estimated worldwide tablet sales of 172.4 million units in 2013, rising to 282.7 million units in 2016.[1] Similarly, a Gartner study estimated that worldwide sales of smart devices (smartphones and tablets) will pass the billion mark in 2013.[2] In fact, the demand for touch has surprised even device manufacturers, some of whom have noted supply shortages, a strong indicator of the tremendous market opportunity.

Inside businesses, the ripple effects of personal, touch-based computing are not far behind. The same Gartner study forecast that:

- Purchases of tablets by businesses would reach 13 million units in 2012 and will more than triple by 2016, to reach 53 million units.[2]

Prominent consumer preferences make their way into the workplace eventually—think personal computers, blogging, and social media—and touch computing is well on its way to becoming part of the business landscape.

1. Why Touch Is Such a Hit

Tens of millions of users have demonstrated the suitability of small-form-factor touch devices like smartphones and tablets to casual tasks such as using e-mail, browsing the Web, and watching video. For several reasons, touch is now ripe for the leap to larger computing platforms like PCs and to focused tasks like analyzing and designing.

First is the natural sequence of seeing an object, then reaching out to interact with it. To supplement visual perception, humans instinctively want to manipulate things by touching them directly.

Touch is immediate, and it avoids the abstraction that a device—mouse, touchpad, or joystick—places between the eye and the object to be manipulated.

Furthermore, input devices require training of motor skills. Users try to figure out sensitivity and reconcile the manipulation of the device on the horizontal plane to the object they see on the vertical plane. When using touch for tasks like note-taking, drawing, and signatures, there are no motor skills to develop and no mechanical interface to learn.[3]

Few businesses face the need to develop the motor skills of their users, but all businesses want to maximize worker productivity. Giving users the opportunity to interact with a work device in the same, instinctive way they are accustomed to interacting with a non-work device is a big step on the road to greater productivity.

The natural way of using touch with hardware is also a big step toward multi-modal interface. Touch is a hit because it is one of a growing number of innovative modes—keyboard, mouse, and touch combined with gesture, voice, and machine vision—in which users interact with computing devices. In a multi-modal interface, the device makes its own decisions about mode of control and can even combine modes like machine vision and voice recognition for optimal user experience.

Users are already rewarding that kind of innovation in human-computer interface (HCI). Software and hardware companies that made the most progress in HCI and multi-mode interface have also built the largest followings and made the most money. Consumers are voting for touch as they have for mouse, trackpad, voice, and gesture: with their dollars.

Moreover, the software and hardware needed to make touch computing work properly are in place and no longer experimental. While research on touch computing spanned the second half of the twentieth century, it yielded little commercial fruit except in point-of-sale systems. High cost and low accuracy separated touch devices from consumers until the 2007 advent of smartphones built around thinner, transparent components for sensing touch more accurately and without the use of wires.[4] User-accessible operating systems like iOS*, Android*, and Windows 8 support touch computing, and the processing power needed for touch is available in ever smaller, less expensive chipsets.

2. Why Touch Will Not Completely Displace Other Input Modes

Just as the mouse has not displaced the keyboard, touch will never completely displace the mouse or other input modes.

Consider some ergonomic factors that weigh against using touch computing exclusively:

- **Angle:** Touch has become a popular mode of input in devices like phones and tablets, which users can hold horizontally in one hand or lay flat on a table. Other than casual interactions with ATMs and kiosks, users are not accustomed to touching vertical displays.
- **Distance:** Touch is easier when the screen is close to the body. Extending the arm to touch a device is more work.
- **Precision:** Touch works best for casual activities like tapping icons and scrolling pages. Focused computing activities are still relatively difficult with touch.[5]

Most importantly, the long periods of use associated with using a computer exacerbate all of those factors. Working at a PC all day can be exhausting even with a keyboard and mouse; how much more so when repeatedly flicking, swiping, and rubber-banding on a vertical display at arm's length? Shoulder fatigue will guide users to the most naturally appropriate mix of input modes. Table 1 outlines the relative advantages and disadvantages of common input modes.

Mode	Advantages	Disadvantages
Keyboard	Longest-standing, most widely accepted mode Ideal for text entry	Lack of pointing feature Layer of abstraction between user and screen Conducive to repetitive stress injury (RSI)
Mouse	Direction-oriented mode for navigating screen Ideal for fine, precise movements in focused computing tasks (designing, modeling, extensive editing) Standard complement to keyboard	Imperfect compromise between horizontal work surface and screen Layer of abstraction between user and screen Conducive to RSI
Touch, multi-touch	Close cognitive match between visual and tactile No need for intervening device Ideal for casual computing (browsing, reading, signing documents, taking notes)	Not suited to prolonged use in focused tasks
Game controller, remote control	Optimal for quick, repetitive movements	Inconvenient support for text entry and voice Layer of abstraction between user and screen Conducive to RSI
Voice	Brisk user uptake on mobile devices Appeal of hands-free operation and adaptive technology	Susceptible to ambiguity, misinterpretation Computationally intensive Potentially laborious training process Distracting to nearby co-workers
Gesture	Appeal of hands-free operation Novelty	Association with science fiction and gaming No support for text entry and voice
Stylus	Handwriting recognition for detailed drawing and note-taking Contextual ("right-click") supplement to touch functionality Intuitive match to the act of pen-and-paper writing	Additional piece of easily misplaced hardware
Machine vision	Complement to other modes; for example, reading lips to increase accuracy of voice input Potential to enable computing for physically disabled users	Computationally intensive Privacy issue of device watching and learning about user Still experimental

Table 1. Input modes

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Like all input modes, touch will augment but not universally displace the others, particularly not in computing tasks such as:

- Creating and maintaining large spreadsheet models
- Working (typing, copying, cutting, and pasting) in long documents
- Editing video

For the same reason, it is unlikely that touch devices in general, such as smartphones, tablets, phablets, and table PCs, will completely displace non-touch devices. Tablet users will favor touch, augmenting it when necessary with keyboard/mouse; desktop computer users will favor keyboard/mouse, augmenting them occasionally with touch; and laptop computer users will strike the potentially most productive balance of all, among keyboard, mouse, and touch. (See "How users are making touch work.")

3. Why Touch Has a Role in Business

Like any tool, touch has a role in business to the extent that it increases productivity, boosts revenue, and helps people work more effectively.

Organically, touch demands a role in business because of the consumerization of IT, as employees have bought touch devices for personal use, and then taken those devices to work. Having become accustomed to mobile access to e-mail, calendar, and the Web on devices that are larger than a smartphone and smaller than a laptop computer, users naturally take the devices to the office seeking to extend their personal productivity gains to the workplace. In fact, Gartner predicts by 2017, half of employers will require employees to supply their own devices for work purposes[6]—and those employers will likely move from embracing touch-competence among workers to expecting it.

The current generation of IT and LOB managers is still working out the role of touch in business, much as the previous generation addressed the PC revolution in the 1980s. Meanwhile, as employees continue to accomplish more tasks from more places, one point becomes clear to businesses: buying non-touch-enabled computing devices is short-sighted. Smart companies will start moving to touch in their next wave of PC-refresh and device purchases.

For example, consider a touch-enabled laptop in a sales-presentation scenario. The laptop offers a better complement of tools than a tablet for creating and updating the presentation, yet the device lends itself more naturally to advancing from slide to slide and topic to topic, and to promoting conversation between presenter and prospect, than a laptop computer requiring the keyboard and mouse. The sweet spot of touch computing in business is this 2-devices-in-1 characteristic, and it is where touch can play its most prominent role.

The Wheres

Manufacturers are doing more than retrofitting traditional hardware with touch screens; they are putting new devices, form factors, and ergonomic models on the market. Form and function help determine where these devices fit best in the business (see Figure 1).

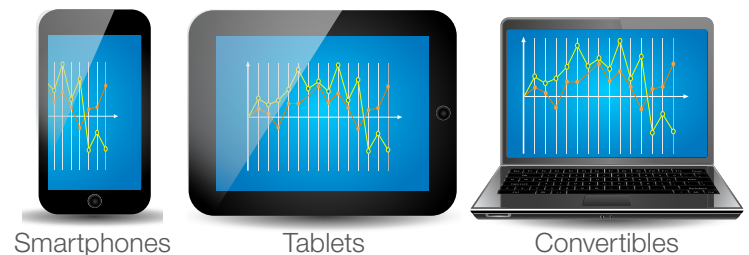Smartphones   Tablets   Convertibles

Figure 1. Touch devices

1. Where Touch Works Best in Business

Touch works best where people will gladly use it and be most productive with it. Successful use cases and scenarios vary widely, with a few successful hardware combinations.

Use Cases

Touch is evolving as a means to boost both productivity and the bottom line across a broad spectrum of business areas and industries:

- C-suite: Dashboards and business intelligence for managing performance across the organization, from employee output to the situation on the shop floor
- Customer relationship management (CRM): Monitoring tools for customer-facing campaigns, contact center activity, and customer feedback in social media
- Workforce management: Human resource administration, employee training, instruction, and signatures on electronic documents
- Sales and marketing: Presentations, face-to-face customer interaction, trade shows, and digital brochures
- Meetings: Note-taking and drawing
- Big data: Post-computation analysis of large amounts of data; for example, web and mobile usage
- IT troubleshooting: On-the-go network monitoring and mobile knowledge base
- Preliminary design and sketching: Stylus-based apps for early UI sketches, storyboards, diagrams, and rough visuals
- Military and defense: Analysis of video feeds and real-time command/control for officers in the field
- Commercial aviation: Digital flight bags as replacements for paper versions of flight maps, manuals, and continuous updates
- Health care: Mobile supplement to hospital workstations and better workflow for constantly moving clinicians
- Retail: In-store employee tools for training videos, display illustrations, and sales materials; UPC scanner and signature pad to complete transactions anywhere on the sales floor
- Mobile point of sale: Simpler, less expensive, and more flexible alternative to cash registers and traditional retail point-of-sale devices

These typify use cases in business that go far beyond the data snacking and casual browsing associated with non-work-related touch computing.

Hardware

As noted earlier, touch is ideal for browsing, analyzing, and responding to content, rather than for creating it. What kind of device can reconcile the casual functions of touch and the focused needs of business computing?

Intel's touch-enabled Ultrabooks are evolving as the happy medium between the laptop and the tablet. Ultrabook devices combine the computing power of the laptop with the touch screen, profile, battery life, and boot time of the tablet. The display of an Ultrabook also lends itself to sharing and presentations the way a tablet does.

Ultrabook devices are a strong move toward the necessary form and functionality that business users will embrace. (See "How users are making touch work.")

2. Where Touch Alone Won't Work for the Foreseeable Future

In fact, the multi-modal nature of the Ultrabook device addresses the other side of the "where" question: where won't touch alone meet the needs of business users?

Touch alone will not suffice for many traditional productivity applications, such as creating and maintaining spreadsheets, writing and editing long documents, laying out promotional materials, writing code, designing a website, editing video, and computer-aided design.

Workers who perform basic business functions like entering data and filling out forms might benefit from touch to navigate among fields, but hardware keyboards are better suited to long stretches of text input. Long-standing advantages include the feel of individual keys and physical landmarks for touch typing and productivity-enhancing keyboard shortcuts and key combinations.[3]

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With enough time and training, and with the continued evolution of modes like voice and machine vision, touch will play a greater role in productivity applications and basic business functions, but alone it will not suffice to master them. Meanwhile, the Ultrabook's combination of keyboard, touchpad, and touch screen will allow users to begin integrating and relying on touch for as many tasks as practical.

The Hows

Once businesses have addressed the "whys" and the "wheres," they turn to the "hows" of fitting and integrating touch into business.

1. How Touch Makes a Difference in Business

Fine, psychological nuances come to bear on the ability of touch to increase productivity.

Touch and touch devices reduce physical obstacles to collaboration and help people share information in a more natural way. Whiteboards and pads of paper are open and made for touch, but they lack the digital support—consistency, networking, and storage—of electronic devices. In a meeting or a customer interaction with touch devices, participants can engage in shared content by unobtrusively touching images on a screen, rather than interrupting the collaborative process to use the mouse or enter keystrokes.

More concretely, an open laptop screen introduces a physical barrier between collaborators or between salesperson and prospect. Touch devices can reduce that barrier to a physical profile no greater than that of pencil and paper. They can also provide a common focal point instead of an impediment to sharing.

The use of touch in three typical activities illustrates the potential to make a difference when companies exploit the advantages of touch while avoiding its disadvantages:

- **Sales force automation:** This activity encompasses sharing and presenting promotional materials, sales collateral, product videos, and slide decks with prospects at the point of decision. Touch brings a compelling immediacy to researching, placing, and even paying for an order in a way that engages both salesperson and customer. In a survey by Dimensional Research, nearly half of responding businesses reported demand in their organizations for sales-force automation on tablets.[7]

- **Business intelligence:** Although touch computing and touch devices do not lend themselves to compute-intensive database operations, they are ideal for displaying the dashboards and reports that come from the data. Touch applications can combine overviews, simple what-if analysis, scorecards, and performance measurement so that decision makers can take action based on current data, no matter where they are.

- **Status meetings:** Will touch usher in the end of the dull meeting? That might be too much to ask, but the prospect of sharing on a touch device goes a long way toward more fruitful collaboration. When attendees can write, draw, highlight, modify, move, and zoom objects with their finger on a powerful, low-profile device, instead of writing on a whiteboard or pointing at a projector screen, they are bound to be more engaged.

2. How Users Are Making Touch Work

The ongoing consumerization of IT bodes well for touch in business: many users are already applying their off-work computing behaviors, technologies, and devices in the workplace.

Usability testing conducted on Ultrabooks underscores the ease with which users take to touch in business. Testing results demonstrate:

- Propensity to use the touchscreen (77 percent of users) when it was an option, rather than the mouse (12 percent), keyboard (8 percent), or touchpad (3 percent)
- Mixed use of input modes—touch screen, mouse, and keyboard—depending on the task
- Preference for an Ultrabook over a combination of tablet and wireless keyboard
- Favorable ergonomics, with users staying comfortable by shifting naturally among input modes
- Perception among users that touch computing makes work more like play
- Preference for a device that users can open and close like a laptop, yet include a touch screen like a tablet
- Preference to retain the hardware keyboard built into the Ultrabook

The testing focused on a suite of common, workplace tasks to which touch is well suited: changing settings in Windows 8, creating a Microsoft Office PowerPoint* slide, writing an e-mail message, browsing and searching, online purchasing, video calling, and cropping an image. The testing population was 81 users from the United States, Brazil, Italy, and China. Subjects' experiences with touch computing ran the gamut from none to daily use.[8]

3. How the IT Industry Is Making Touch Work

Users have created the demand; now it's up to hardware manufacturers and software developers to optimize their products for touch. Intel and Microsoft have invested heavily in industry-leading initiatives for putting touch computing to work in businesses.

Intel

Intel launched the Ultrabook in 2011 as a business-caliber computer that also embodies the most desirable qualities of the tablet: touch screen, extended battery life, small profile, and fast start-up. Intel Capital, Intel's global investment organization, created a $300 million Ultrabook Fund to stimulate the outside development of technologies that will help deliver better user experiences, longer battery life, and slim components.[9] In 2012, Intel and its partners built touch and voice activation into selected Ultrabook devices in traditional clamshell and new convertible designs. By February 2013, Ultrabook device designs with touch numbered 40, most of which were already in the market.[10]

According to a Gartner study,[11] Ultrabook devices and other "ultramobiles" are rapidly gaining market share. Not only are they drawing demand from traditional desktop and laptop PCs, but they are also likely to ship at even higher rates of growth than tablets and smartphones (see Table 2).

Device Type	2012	2013	2014	2013–14 Change**
PC (Desk-Based and Notebook)	341,273	305,178	289,239	-5.2%
Ultramobile	9,787	20,301	39,824	96.2%
Tablet	120,203	201,825	276,178	36.8%
Mobile Phone	1,746,177	1,821,193	1,901,188	4.4%
Total	2,217,440	2,348,497	2,506,429	6.7%

**These percentages were calculated by Intel using the Gartner data.

Table 2. Worldwide Device Shipments by Segment (Thousands of Units)

The road to business adoption of touch devices leads through software development, so the Intel Developer Zone (http://software.intel.com/en-us/windows) contains a section dedicated to developing applications that take full advantage of touch and sensor hardware on the Ultrabook device. Intel publishes a steady stream of documents, code samples, demos, tools, and videos to help developers write software optimized for touch, particularly in apps for Windows 8.

Microsoft

With the advent of Windows 8, touch computing has leapt from the tablet to the PC. Windows Store applications appear as tiles and run full-screen, without the frames and minimize/maximize/close buttons that characterize the traditional desktop UI. On touch-enabled PCs, Windows 8 encourages users to launch, interact with, and switch among applications by means of touch gestures.

Because touch represents a fundamental shift in the UI, enabling an application for it often means revisiting design to provide the user with the best input mode for a given task. (In many cases, the updated design will need to accommodate touch, keyboard, mouse, and other input modes, as revealed in the usability testing on Ultrabook devices.) For touch, this involves designing visual targets, designing touch targets, and preventing interference and spacing errors. Microsoft has revisited the design of several products to implement important security and productivity enhancements for touch. For instance:

- **Picture passwords** allow users to sign in to Windows 8 devices more securely with a sequence of touch gestures on their chosen image.
- **Microsoft Office 2013*** includes improvements in targeting, selecting, typing, and commanding, such as Touch Mode, which increases the size and spacing of onscreen controls in the ribbon, and radial menus for touch access to contextually useful commands.
- **Microsoft OneNote MX*** is the touch-optimized version of the Office 2013 application for taking notes. With either finger or stylus, users can draw pictures, create to-do lists, convert from handwriting to text, and annotate files.

To guide developers (including enterprise developers) in writing business applications that conform to how touch screens work and how people interact with them, Microsoft's Dev Center contains an entire section on developing Windows Store apps (http://msdn.microsoft.com/en-us/windows/apps/), with product guides, documentation, user experience guidelines, and an API reference. Of particular note are detailed online guides for:

- Designing an enterprise LOB Windows Store app: http://msdn.microsoft.com/library/windows/apps/jj659079
- Touch interaction design for Windows Store apps: http://msdn.microsoft.com/en-US/library/windows/apps/hh465415
- Designing and testing multi-touch hardware solutions for Windows 8: http://msdn.microsoft.com/library/windows/hardware/hh872968.aspx

The initiatives by these and other IT industry stalwarts demonstrate that touch computing is a direction, not a distraction.

4. How Businesses Are Making Touch Work

Businesses themselves have seen the wisdom in embracing touch and taking advantage of the mobility that touch devices afford their employees. As an interim measure, some companies configure their employees' touch devices with virtual desktop interface (VDI) software. This allows workers to see and control their PC (or a virtual PC) from anywhere using touch, although usability and productivity are not the same as with a proper, touch-enabled app designed for the device.

Large companies are scrutinizing their own internal applications and making them available through enterprise app stores. Rather than trimming the apps down to fit mobile devices, IT is often optimizing the apps for touch. An internal app store built around touch-enabled Windows 8 apps offers the productivity and security that the business wants with the devices and touch that users want.

Conclusion

Touch is a direction—not a fad—that smart companies are rapidly adopting. Employees are taking into the work environment their expectations for accomplishing more of their job with touch. When they can work in ways and on devices that appeal to them, they work more productively—a benefit for both the business and the employee. In time, employers will come to expect touch-competence from their employees.

Because some typical, focused business tasks require more than touch input and more features than smartphones and tablets, the Ultrabook device is emerging as the optimal device for blending touch, keyboard, and trackpad. Usability testing shows that business users can switch easily and comfortably among the input modes, naturally gravitating to the one best suited to the task at hand.

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