

OS X | Windows | Linux

Marc Budofsky
Binghamton University, MGMT 516

Many factors affect a user's decision in choosing what kind of computer to buy. One of the largest deciding factors for many users is the Operating System the computer will be running.

In recent years, Apple OS X's ease of use and clean layout, combined with the visual appeal of the hardware and integration with Apple's other products, has led to an increase in OS X's market share and popularity, ultimately separating it from Windows and Linux as the best operating system available.

In 2005, OS X had a market share of only 3.05%. During this time, Apple had both the iBook and PowerBook on the market, running PowerPC processors and OS X 10.4 "Tiger". The following year, Apple transitioned from PowerPC to Intel CPUs, and introduced the Macbook and Macbook Pro. Since the Apple-Intel Transition, Apple has released three updated versions of OS X, each offering additional features, functionality and speed-ups. Both the transition to Intel CPUs and the regular updates to OS X have helped to increase notebook sales, with OS X market share reaching 8.13% this year, and Apple recording record global market shares this past September. While this seems like a small increase, one must remember that the market share is based on all computers currently in use; Windows systems that have been in use since 2005 will still be reflected in the 2011 market share, skewing the data slightly.

In the process of determining which Operating System is best, an analysis of certain components of the OS and developer must be conducted. These components range from visual appeal and features that the user will interact with to key components that dictate how the OS will behave.

One of the most important components of the OS that the user will interact with is the pure aesthetics of the system; strictly how the screen looks and displays content to allow the user to quickly and easily perform their desired task.

OS X's main interaction for users is a dock system; applications can be placed in the dock to allow quick execution, with all open applications residing in the dock as well. Additionally, the ability to make use of multiple desktops allows users to increase their productivity under OS X.

Windows uses a task bar as the main point of user interaction. In Windows 7, users can 'pin' applications to this task bar, similar to the ability of placing applications in the OS X dock, while all running applications are showed here as well. Windows 7 also makes use of a glass effect, allowing the user to view windows that are hidden due to other windows lying on top of them.

Ubuntu 11.04 allows users to customize the user interface. By default, it makes use of a task bar that is similar to that of Windows; the difference lies in that only running programs are displayed in the task bar. However, users have the ability to add a dock and multiple desktops by changing settings and through Compiz, a 3D effects application that is installed with the system.

Users typically look at the features that the OS will offer them after finding the look that most appeals to them. While there are many features that are common to all three operating systems, there are several that help to set them apart.

OS X incorporates many features that aim to further user productivity and ensure system stability. Some of the most notable features include Time Machine, an automated backup system that helps recover the system if a catastrophic error occurs, Versions and Autosave, a new set of features in Lion that allows a user to view revisions of their files and take portions from previous copies as they see necessary, Resume, which automatically reloads any applications and files that were previously opened if the system must be restarted, iCloud, a new service that allows a user to synchronize up to 5 GB of data across multiple computers, and Full Screen Applications, allowing the user to utilize the entire viewing area to help minimize distractions.

Windows too has features that are meant to increase productivity; Taskbar Preview allows the user to hover over a minimized window to view the contents, Libraries help organize folders and files that share similar content and allow the user one-click access, and Snap Windows automatically sizes and places windows based on where the user drags the window.

Ubuntu's features are slightly different than that of the other two operating systems. Due to the open source nature of Ubuntu, its main features focus around its ability to allow the user to tweak and customize the system to their liking. By default, Ubuntu utilizes the GNOME desktop manager, but can be changed to either KDE or Xfce. Additionally, Ubuntu is the only of the three to offer a version customized strictly for the netbook architecture, taking into account the small screen size and limited resources of the system.

Once a user has determined the features that are important to them, they will usually begin to install their applications on the computer.

OS X offers the simplest installation method out of the three; applications are typically installed via "drag and drop", with no restarts required to finish the process. OS X also utilizes an App Store that allows users to purchase programs without having to leave their computer. For users that require programs that are designed for Windows, an emulation layer can be installed to allow these programs to run within OS X.

The installation process in Windows varies drastically from that of OS X. All programs are installed through dialogs, often requiring several clicks to proceed through the menus, and many times requiring a system restart to complete the installation. This

becomes tedious for a user that wishes to install a large number of programs at once, as they will be waiting for the system to shut down and restart for extended periods of time.

In Ubuntu, there are two ways by which a user can install applications – building them via source code in terminal or through the Synaptic Package Manager. The Synaptic Package Manager operates in a fashion similar to the Mac App Store, while building applications from source requires a user to enter specific commands in the terminal and ensure that the necessary dependencies are installed on their system. Much like OS X, Ubuntu also allows Windows programs to be run by installing an emulation layer.

In addition to the components of the operating system that the user interacts with, there are many background tasks and functions that the user may never see, but play an important part in the overall system. The security and stability of the operating system is an important factor that must be considered during operation.

Due to its relatively small market share compared to Windows, OS X faces minimal virus threats. The few incidents that have been reported typically stem from users trying to obtain software through illegal means, and, for the most part, only affect a small portion of users. OS X does face several security issues due to the nature of how the system is set up, specifically related to User and Hardware-level security. By default, OS X creates profiles with administrative privileges; if a hacker compromises an administrative profile, the entire system is at their disposal. This can be remedied by changing the accounts to “user”-level, with a single administrative account being present and only used when needed. Security issues with regards to hardware become apparent when the system is booted off of an OS X install disc; if the system has no firmware password, a hacker can make changes to administrative passwords or partitions and disks.

Windows has notoriously been a target for viruses due to its market share. For a hacker, there is much more recognition in writing a program for Windows, as it has the potential of reaching more users. Due to this, Windows is a very virus prone operating system. While changes in applications and systems permissions have helped to reduce the number of viruses, Windows is still the leader in the number of infections. Another security issue was inadvertently introduced with Windows Vista. Microsoft implemented “User Account Control” as a way to limit programs from gaining administrative, or “superuser”, privileges without first being authorized by the user. While this seemed like a logical way to reduce administrative processes, the UAC was too intrusive and slowed down various tasks, including software installation. Because of this, many users disabled the UAC entirely, allowing any process to gain administrative privileges.

Linux has an even smaller market share than OS X, and, due to this, very few viruses are written to infect Linux systems. As such, Ubuntu has had minimal virus threats in its history. Additionally, due to the secure nature in which Ubuntu was created, it is often used to clean Windows systems that have been infected by a virus.

Most users are content knowing that their system works, not how it works. However, the underlying code of the operating system is important in determining how

various tasks and processes will be handled. Three kernel architectures are currently used in operating systems: monolithic kernels, microkernels, and hybrid kernels. The different designs specify how the software and hardware will interact, and which parts of the operating system will be responsible for which tasks.

OS X utilizes a hybrid kernel based on the mach microkernel from Unix/BSD. A hybrid kernel allows the OS to split tasks between kernel space and user space, reducing the time it takes to perform certain operations. It is closed source with open source components due to the underlying Unix core. By implementing the Unix core, OS X benefits from many of the core functionality present in Unix and Linux systems.

Windows 7 also uses a hybrid kernel based on the NT kernel, which was developed by Microsoft for the Windows NT operating system. As such, the NT kernel is proprietary and only utilized by Microsoft in their operating systems.

Ubuntu makes use of a monolithic kernel. Unlike OS X and Windows 7, the monolithic kernel utilized by Ubuntu maintains all operating system functions in kernel space. The Linux Kernel is completely open source, and is used in the majority of Linux distributions.

One of the fastest growing uses of the computer is for software development; programming has contributed a large part to the fast-paced evolution of computing.

OS X can support most languages natively due to the inclusion of Terminal from the underlying Unix core. Terminal allows users to interact with the system via sets of specific commands, ultimately providing the necessary tools to compile and execute custom code.

Windows 7 has no out of the box support for any programming languages. One must install an additional software package to use Windows as a development environment. Two of the most common programs are Cygwin, a terminal clone, and Visual Studio, an integrated development environment.

Ubuntu, like OS X, has Terminal, and thus supports the majority of modern languages without any additional software.

Another factor that is important in determining which operating system is best is to look at the integration of the company producing the software. A more integrated company can help ensure better compatibility and a better user experience.

Apple is a completely integrated company. Looking beyond OS X, they design the hardware and software for all of their products. By having a hands-on approach through every step of the product development cycle, Apple is able to ensure the highest level of system compatibility throughout all of their product offerings. This applies to Apple's desktop/notebook computers and OS X, as well as their iPhone/iPad and iOS.

Windows 7 is developed by Microsoft, and implemented by third party companies who develop the hardware. This approach will work as long as the hardware companies follow the strict requirements put in place by Microsoft. If they deviate, it could result in a poor user experience as the system will not be compatible. One benefit from this approach is that a user has the opportunity to design and build their own system.

Ubuntu is maintained by the Ubuntu Foundation, and licensed under the GNU General Public License. Although uncommon, it can sometimes be found installed by third party hardware manufacturers. Typically it is installed as an alternative OS to what comes on the system, or is added as a secondary OS to supplement the original OS.

The final factor that must be analyzed is the support that the developer offers for the OS.

Due to Apple's integration approach, OS X has the best support. When a problem arises, the user simply has to make an appointment at their local Apple store and bring their computer in to the Genius Bar. Regardless of where the product was purchased, Apple will provide support as long as there is a valid warranty on the device. If a user desires additional support, they can purchase AppleCare, which provides full coverage, minus user error, for three years. There is also an active online community that operates via forums that can provide support for smaller issues.

Support for a Windows system can be more difficult to obtain. Due to the nature in which Windows computers can be purchased, a user may not know where to go to receive the appropriate help. Often times, one is able to call the manufacturer, but sometimes it is necessary to return to the seller. The worst case scenario occurs when the manufacturer and seller contradict each other, and inform the user that they need to obtain support from the other party. As with OS X, there is also an online community that operates in a similar fashion to offer help.

Ubuntu releases are generally supported for a six month cycle after release, due to the six month release cycle on updates. Basic support can be found on Ubuntu's website, while the majority of information is located in various user forums and wikis.

Ultimately, there are many factors that need to be assessed to determine which operating system is truly best. While Windows and Ubuntu are strong performers, they fall short in several key areas and end up leaving the user wanting more from the system. OS X combines the key factors into a finely crafted package that provides the necessary tools for the most basic user up to the hardcore enthusiast. As computing continues to evolve, OS X will continue to eat away at the market share of Windows and further itself as the dominant OS.