intel ®

information
technology

e-Business
GROUP

Wireless LANs

Linking Productivity Gains to Return on Investment

Enterprises and their IT groups instinctively
recognize the benefits of wireless LANs (WLANs).
Some have dollar figures attached, but many do not.
Measuring the return on investment of a WLAN can
present a challenge when it is time for IT to make its
business case. Through its extensive WLAN
program, however, Intel IT has learned the challenge
is not insurmountable. By quantifying "soft" benefits
and adding them to "hard" benefits, WLANs are
clearly an important way in which IT can add value
to the overall company.

October 2002

Table of Contents

Introduction

Intel IT and Intel Finance have succeeded in the difficult task of linking return on investment (ROI) to productivity gains from wireless LANs (WLANs). Together, they built an ROI model that became the backbone of Intel IT's business case for deploying WLANs. Though demonstrating this business benefit was a challenge, they learned that they could demonstrate how WLANs deliver business value to the entire company. These "soft" benefits were not easy to measure, but they did add tremendous value.

Intel IT and Intel Finance focused on productivity data derived from various WLAN pilots. Their analysis showed that an average of 11 extra minutes of productivity per week will pay for a WLAN, and most WLAN users will gain much more productivity. Over time, a deployment of:

> "We are Intel's IT group. We don't sell chips, systems or anything else. Our job is to assess, obtain, deploy, and operate the best information technology available to help Intel run effectively. Because Intel as a business has been an early adopter of technology solutions, we have extensive experience from supply chain automation to peer-to-peer computing. Our goal now is to share with you what we've learned—IT to IT."
>
> *— Doug Busch, Intel Vice President*
> *and CIO, Information Technology*

- 32 users with a total cost of ownership of $20,000 over three years would deliver a benefit of $300,000 over a three-year period.

- 150 users with a total cost of ownership of $60,000 over three years would deliver a benefit of $1,000,000 over a three-year period.

- 800 users with a total cost of ownership of $400,000 over three years would deliver a benefit of $5,000,000 over a three-year period.

Of course, not all companies are the same, and their deployments may not exactly resemble Intel's. So how does a company turn a go/no-go decision on WLANs into a how, where, and when decision based on a clearly identified business value? This paper describes how Intel IT quantified these productivity benefits and built a business case for deploying WLANs.

Background

Intel IT is a single, centralized, worldwide information technology division for Intel's 83,000 employees and contractors in 45 countries. Formed in 1993, Intel IT's job is to add value to the overall business through deployment and management of technology solutions. One of its most important missions is to use mobile technology to benefit Intel's overall business. From 1998 to today, Intel IT turned Intel from a company where 20 percent of employees used notebooks, to a highly mobile business where more than 65 percent of workers worldwide use mobile PCs.

That effort was just the beginning. Having proven that widespread use of mobile PCs could increase worker productivity and deliver a positive ROI, Intel IT launched an aggressive push into wireless networking. Currently, Intel IT oversees over 80 WLAN deployments around the world. Recently, Intel IT formalized its efforts to share best-known methods with other IT organizations.

While most IT organizations understand the benefits of WLANs, translating those benefits into quantified ROI can prove difficult. Some benefits, such as lower networking costs, are self-evident. Other "soft" benefits, such as increased productivity, higher employee satisfaction, and faster decision making, are not as easily measured in dollars and cents.

Still, it is possible to see real ROI from soft benefits, such as increased productivity. Although difficult, IT groups must quantify these benefits and demonstrate their ROI to stakeholders. As Intel IT has learned, the keys are a well-executed pilot program and rigorous analysis by financial specialists.

> From 1998 to today, Intel IT turned Intel from a company where 20 percent of employees used notebooks, to a highly mobile business where more than 65 percent of workers worldwide use mobile PCs.

Intel IT identified soft benefits such as:

Increased flexibility for WLAN users to work how, when, and where they wanted to work. This flexibility includes mobility within the office, at home, or at a public hotspot.

Faster decision-making by WLAN users because of anytime, anywhere access to information.

Higher employee satisfaction owing to increased flexibility and access to the latest technology.

Greater accuracy of information through the ability to instantly input and transmit data from wherever they happen to be.

Increased productivity of WLAN users thanks to the ability to work anytime, anywhere.

In today's IT climate, however, soft benefits such as these mean little without a dollar figure attached to them.

"Intel, particularly Intel Finance, is a very data-driven organization," says Intel Finance's IT controller. "We are skeptical of intangible benefits, and challenged when asked to quantify them. In the case of WLAN, we felt the need to base our valuations on real data from pilots. Otherwise, we could not defend the business case to ourselves or our business associates."

With the help of Intel Finance, Intel IT developed an ROI model based on the standard discounted cash flow methodology. Put simply—although the actual calculations require factors such as tax consequences, time value of money, and so forth—the formula is:

Productivity benefits - Start-up costs - Sustaining costs = ROI

Executing this model can demonstrate tremendous ROI, and it does not take into account hard benefits associated with lower network costs or the value of additional soft benefits, such as faster decision-making. Those benefits are the "icing on the cake." In short, once an IT department demonstrates ROI based solely on productivity benefits, it can expect the final ROI to be even greater.

When reading this paper, remember that no one solution exists for quantifying the cost and benefit of wireless networking. Every opportunity to deploy WLAN technology is different, and no two companies are exactly alike. For instance, although Intel IT believes strongly that virtual private networking (VPN) is currently the best way of securing a WLAN, that solution may not be as important to other companies. The security of the WLAN should be evaluated by IT departments to determine the necessary components for the infrastructure. Look at your own environment and keep in mind how factors within your enterprise might impact a WLAN pilot.

For more information on deploying and securing WLAN implementations, go to:
http://www.intel.com/eBusiness/wireless.

Preparing for a WLAN Pilot

Get the green light

Going from the perceived value of a WLAN to actual ROI requires effort, and an untapped desire for a WLAN is helpful. At Intel, employees in certain business units were experimenting with wireless networking on their own. Intel IT used these early-adopters as evidence of pent-up demand and to bolster the business case for deploying wireless solutions.

In addition, as Intel IT identified early adopters and began to understand their business needs, it recruited champions on the business side of the company who could help make the case for a WLAN. Such champions are important not only because they can sway the key stakeholders responsible for approving a WLAN deployment, but also because they can help spur adoption in their business units.

With WLAN champions on board, present a WLAN pilot plan to the key stakeholders. The group differs from company to company, but it could include the CIO, CEO, and/or other managers. The reason for the pilot is not just to test the technology but also to collect useful data, identify users most likely to benefit from the WLAN, build a skill set to deploy and sustain the WLAN environment, and—most importantly—show how WLANs can deliver ROI to an organization.

Executing a WLAN Pilot

Lay the groundwork

Ultimately, a WLAN pilot should pay for itself. Target high-value users who directly contribute value to the business. They can be salespeople, operations, design engineers, and so forth. Also target existing mobile PC users rather than first-timers. Note, however, that a pilot should include more than just high-value users. If an IT department does not study the impact of WLANs on managers, support staff, and other worker segments, it will not get a complete picture of WLAN benefits.

If a pilot is to achieve the desired result—demonstrating the ROI of WLANs—make every effort to launch the pilot on the right footing. Taking deliberate steps before actually executing any pilot is important.

Determine data points—Know what to measure before measuring it. For Intel IT, timesavings were an important measure of the productivity gains enabled by WLANs. General timesavings, however, are difficult to measure and become less meaningful when applied to a diverse workforce where job functions vary. Intel IT wanted to learn exactly how users might save time with a WLAN—sending/receiving e-mail, accessing data, transferring files, attending online meetings, and connecting to the network.

Establish a baseline—After deciding what to measure, survey the pilot participants before giving them WLAN access. Discover how they do their jobs, outline their daily routines, and identify the challenges they face using current technologies. Without that information, it is difficult to measure whether WLANs have improved the workplace and delivered an appropriate ROI.

Segment the users—Classify pilot participants according to their job functions. Based on their job functions, some users will derive more benefit from a WLAN than others, and the ROI of users' productivity gains will be determined, in part, by the value of their time (for example, salaries). When Intel IT segmented its pilot user base, it chose five categories:

- Engineering/product management
- Manufacturing
- Sales
- Marketing
- Support

Intel IT discovered that engineers, product managers, and marketing staff realized the most ROI from using WLANs. Segmenting users will also help an IT department plan for deployment after the pilot phase, because it can start rolling out WLANs to the workers who will benefit the most.

Set expectations—Ensure that all pilot participants know what to expect throughout the program. Should they keep a log? Should they complete surveys? Should they undergo training? What are the service level agreements? How will they get support when something goes wrong? It is crucial to set expectations without unnecessarily skewing the results. If participants are not prepared for what they must

> "Defining the total costs and benefits of ownership of mobile wireless devices is an important first step in understanding the value and adopting the technology to create a return on investment model."
>
> Source: Gartner, "True Costs and Benefits of Mobile Wireless Devices." P. Redman, May 2002.

do, the pilot experience could cloud their perception of WLAN technology. On the other hand, supporting them through the process more than would happen in a production environment may give feedback that is too positive and not reflective of an actual deployment.

Learn from users

Throughout the pilot, collect data from users to measure the impact of the WLAN. Intel IT called on human factors engineers (HFEs) who specialize in measuring the impact of technology on users. These HFEs emphasize that although an IT department can learn a lot about its pilot program from surveys, it must not rely on surveys alone. Surveys help establish a new baseline for productivity, which is very important, but they do not always tell the whole story. In addition to surveys (printed or online), consider other methods of collecting data:

Activity logs—Users record their experiences, including the time they save using the WLAN, as their day progresses. Activity logs help capture data as it happens, while surveys require users to remember experiences in the past. If using activity logs, prepare the users for the effort it requires.

Usability testing—With new technologies such as WLANs, Intel IT typically observes usage in a lab setting as well as in the real WLAN-enabled environment. Intel IT required this research to test the assumption that WLANs could save users time in connecting to the network. That assumption, however, proved not always true and so could not be factored into the ROI equation.

Formal interviews—In preparing its HFE study, which helped measure the productivity benefits of its WLAN pilots, Intel IT surveyed more than 160 users. It also supplemented those surveys with more than a dozen formal interviews. These interviews, as well as informal interviews and observations of users actually using the WLAN technology, added to Intel IT's knowledge and served as a useful reality check when looking at the productivity data.

> ...people who already had mobile computers actually used them more when they became wireless-enabled, which unlocked productivity from previous IT investments.

Applying the Results of a WLAN Pilot

Overall findings

In observing WLAN users, Intel IT saw many things that helped demonstrate the positive impact of WLAN technology. Perhaps most importantly, people who already had mobile computers actually used them more when they became wireless-enabled, which unlocked productivity from previous IT investments. In addition, most participants used their wireless connections continuously and emphasized the fact that they liked being always on-call and responsive to customer and co-worker needs. Overall:

- 68 percent of respondents indicated they used the WLAN continuously or most of the time during working hours.

- If given a choice between a wireless and wired connection, 62 percent of respondents preferred to use a wireless connection whenever possible.

- The average WLAN user saved a significant amount of time in meetings, where the wireless connection made the user more productive.

Although many positive results arose from Intel IT's WLAN pilots, the timesavings proved important for deriving quantitative metrics. Put simply, WLANs saved users significant amounts of time.

Measuring productivity

In measuring timesavings, Intel IT asked pilot participants in each of five user segments to estimate how much time the WLAN saved them each day overall and while performing certain tasks. When it had a user-perceived timesavings figure for each segment, Intel IT made two important adjustments to establish conservative estimates for its ROI model.

First, Intel IT chose a conservative approach and cut the user-perceived time estimates by 50 percent. Second, Intel IT cut the time estimates in half again to recognize that not all timesavings necessarily contribute directly to higher productivity and increased ROI. In other words, not all timesavings drop to the company's bottom line. The ROI is huge, however, if even a fraction of those timesavings translates into real productivity gains.

Timesavings equal productivity

Intel IT asked WLAN users how much time they saved by using the WLAN and then took just 25 percent of those numbers to use in its ROI equations. For instance, if an engineer claimed that using WLAN enabled 1.5 hours additional productivity each day, Intel IT assumed slightly more than 20 minutes in actual productivity gains.

After determining daily timesavings for productivity gains, Intel IT calculated the value of each user's productivity gains. It multiplied each user segment's average hourly burden rate —salary plus benefits—by the number of workdays per year: 235.

Table 1 below shows how Intel IT adjusted the user-perceived timesavings to establish conservative estimates.

The value of increased productivity

By taking the adjusted daily timesavings and multiplying it by each user segment's burden rate, Intel IT could attach a dollar figure to the productivity gains attributable to WLAN usage.

Table 2 shows how Intel IT calculated the value of annual productivity gains attributable to using a WLAN. Although the timesavings accurately reflect Intel IT's experience, the burden rates are for example purposes only.

	User-perceived daily timesavings (in hours)	Adjusted for human judgment (50%)	Adjusted to reflect actual productivity gains (50%)	Fully adjusted daily timesavings for productivity gains (in hours)
Engineering/product management	1.49	0.75	0.37	0.37
Manufacturing	1.33	0.67	0.33	0.33
Sales	0.67	0.34	0.17	0.17
Marketing	1.80	0.90	0.45	0.45
Support	1.47	0.74	0.37	0.37

Table 1. Fully adjusted user-perceived timesavings

	Adjusted daily timesavings for productivity gains (in hours)	Hourly Burden Rate[1]	productivity benefit per year/ per user
Engineering/product management	0.37	$60	$5,253
Manufacturing	0.33	$40	$3,126
Sales	0.17	$55	$2,165
Marketing	0.45	$55	$5,816
Support	0.37	$45	$3,886

[1] Burden rates are for example purposes only and will vary from company to company.

Table 2. Value of annual WLAN productivity gains

The cost of WLANs

After measuring the value of productivity gains, subtract start-up and sustaining costs to arrive at the ROI. While executing a WLAN pilot, an IT department will get a firm grasp on those costs. The pilot will show that the total cost goes up when adding more users to a WLAN, but the cost per user drops significantly, depending on the size of the deployment. It will also show that certain costs may no longer exist by the time a WLAN pilot deploys. For example, most notebook PCs today require a wireless network interface card (NIC) for LAN access. In the future, notebook PCs will have integrated NICs.

Table 3 shows the infrastructure start-up costs for three potential WLAN deployments—large (800 users), medium (150 users), and small (32 users). These costs include the initial hardware, software, and labor expenses to build the WLAN, but they do not include sustaining costs for supporting a WLAN over time (although those costs must be accounted for when calculating ROI).

These start-up costs assume several things, including deployment of 24 wireless access points per 100,000 square feet of office space and 12-15 simultaneous users per access point. The large building in our example has four

Costs for deploying WLANs[1]

	Unit Cost	Large Building (800 users)		Medium Building (150 users)		Small Building (32 users)	
		Units	Extended Costs	Units	Extended Costs	Units	Extended Costs
Capital Items							
VPN Box	$5-10,000	1	$10,000	1	$7,000	1	$5,000
DHCP Server	$3,000	1	$3,000	1	$3,000	1[2]	$1000
Sniffer	$5,000	1	$5,000	0	$0	0	$0
Switch	$2-3,000	8	$24,000	1	$3,000	1	$2,000
Power over Ethernet (PoE)	$1,500	8	$12,000	1	$1,500		
Spares/Backups			$3,000		$500		$500
	Subtotal		$57,000		$15,000		$8,500
Initial Expense Items							
Access Points (APs)	$449	96	$43,000	12	$5,400	2	$900
Cabling/installing APs[3]	$1,000	96	$96,000	12	$12,000	2	$2,000
Client NICs	$90	800	$72,000	150	$13,500	32	$2,880
Installing/configuring NICs	$175	800	$140,000	150	$26,250	32	$5,600
	Subtotal		$351,000		$57,000		$11,300
Cost Per User			$510		$480		$620
Total Deployment Cost			$408,000		$72,000		$19,800

[1]Example costs only. Does not include sustaining costs. Costs and needs will vary depending on the company. All numbers are rounded.
[2]Cost for a gateway.
[3]Includes project management.

Table 3. Start-up costs for WLANS

floors of 100,000 square feet each, for a total of 400,000 square feet. The medium-size building is 50,000 square feet with one or two floors. The small building is roughly 8,500 square feet with one floor.

> Over a period of three years, companies can see sizable returns on their WLAN investments.

In addition, these costs reflect the way in which Intel IT decided to build its WLAN. Access points and NICs support the 802.11b wireless networking standard. In the future, Intel IT plans to deploy dual-mode 802.11/a/b access points as a transition to a higher speed 802.11a network. Moreover, Intel IT has determined that VPNs offer the best security for a wireless network at this stage in the technology's development. Future versions of the 802.11 standard promise enhanced security without requiring VPNs.

As Intel Finance emphasized throughout Intel IT's pilot program, consider all indirect costs when building an ROI model, no matter what the environment looks like. Including these indirect costs helps build credibility. For instance, when coming up with the cost for installing and configuring wireless NICs, Intel Finance accounted for the cost of any one-on-one handholding that Intel IT might have to provide.

After determining start-up costs, factor in the sustaining costs. These costs typically consist of the burden rates associated with support personnel and will vary from company to company. If WLAN support is just part of a staff's responsibilities, the company should estimate what percentage of the staff's they will devote to the WLAN to get the most accurate picture of sustaining costs. Intel estimated the time required to support a given installation and then multiplied it by the burden rate of the support personnel.

WLANs Deliver ROI

Based on Intel IT's findings, Intel Finance took the productivity gains per year per user and factored them into a much larger equation. The calculations accounted for the already established start-up costs, sustaining costs for WLAN support and service, time value of money, tax consequences, depreciation, percentages of users within each user segment, and more.

Over a period of three years, companies can see sizable returns on their WLAN investments. Intel IT demonstrated a net present value (NPV) ROI of over $4.6 million in its large-building scenario. In the medium-building scenario, the NPV ROI over three years was just under $1 million. In the small-building scenario, the three-year NPV ROI was slightly more than $250,000 (see Table 4 below).

	Number of users	Net three-year cost[1]	Net three-year productivity benefit[2]	Net ROI
Large building	800	$400,000	$5,000,000	$4,600,000
Medium building	150	$60,000	$1,000,000	$940,000
Small building	32	$20,000	$300,000	$280,000

[1]Includes start-up cost and three-year sustaining costs. Costs have been adjusted to reflect net present value—accounting for time value of money—and tax impact.

[2]Benefits adjusted to reflect net present value—accounting for time value of money—and tax impact.
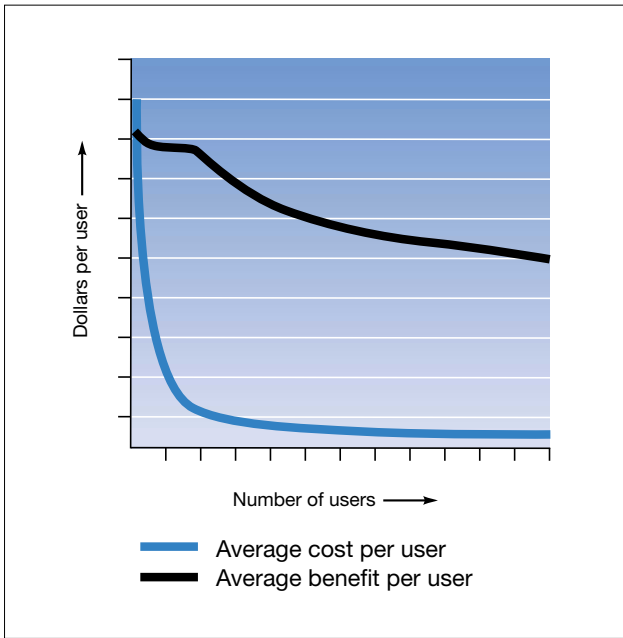
Table 4. WLAN ROI over three years

Figure 1. The cost per user of a WLAN drops automatically soon after the network is deployed.

More WLAN users means better ROI

As a company adds more WLAN users, ROI increases. The average cost per user drops dramatically when deploying a WLAN. Although the average benefit per user also drops when adding new users—because the WLAN deploys first to the users who will benefit the most—it drops at a much slower rate and eventually levels off. Figure 1 shows this relationship. It does not take many users to pay for the infrastructure. The break-even point comes very early in a wireless deployment.

Conclusion

A WLAN deployment business case depends heavily on turning productivity gains into ROI. The most logical way to demonstrate ROI is through quantitative productivity benefits, but soft benefits can bolster the business case, even if they do not have attached dollar figures.

According to users in Intel IT's WLAN pilots, several other productivity factors were very important, including the ability to make more frequent contact with customers and co-workers, the ability to make faster decisions, improved quality of life, and the flexibility to work wherever and whenever the user wants. These WLAN benefits contribute to a more productive workforce. After accounting for gains through timesavings, they are the "icing on the cake."

WLANs continue to evolve and improve. As technology improves and wireless hot spots roll out worldwide, companies will reap additional benefits. For example, hotels, airports, train stations, and coffee shops are adding wireless capabilities. These developments only serve to enhance the productivity benefit of an enterprise WLAN.

IT groups now have what they need to change the way businesses evaluate WLAN deployments. It's no longer a decision of whether to deploy, but rather how, when, and where to deploy. Intel IT, with the help of Intel Finance, found that WLANs deliver positive ROI in all scenarios and across all user segments. A well-executed pilot can deliver similar results to any IT department.

According to Intel IT's product line manager for wireless and mobile computing, "When you build a business case and deploy WLANs, you enable your mobile workforce to be more productive."

For more information
To learn more about Intel Corporation, visit our site on the World Wide Web at www.intel.com.