

BOB CRINGELY ON CAMERA\ Americans love technology. We love stuff. The industrial revolution of the 19th century was about building more stuff cheaper. The technology revolution of the 20th century was about building stuff that was cheaper and more powerful. And boy was it. I'm Bob Cringely and in addition to this very fine bicycle, I have most of the gadgets of the modern cyclist – I have a satellite navigator, a trip computer, heart monitor, digital watch, music player and mobile phone. Together they weigh about one pound in all but that one pound contains more processing power than NASA needed in 1969 to go to the moon.

BOB VO-001\ Of course this advance of information technology has revolutionized much more than just cycling. Technology is transforming markets, industries and our personal lives.

BOB ON CAMERA\ That's what our show is about – how Information Technology has changed – and will change - our lives in the 21st Century. It is a story of subtle but constant transformation that may amaze us with its impact.

Take my one pound of cycling gadgets, for example. They cost me about one thousand dollars. Had they been available when Neil Armstrong walked on the moon, they would have filled entire rooms and cost inflation adjusted 11 point 5 billion dollars.

BOB VO- 002\ Dramatic increases in computing power, combined with lower prices, mean the sky's the limit for anyone with a new idea. So strap yourself in, and join me for a journey through the Transformation Age.

BOB VO-003 \ Information Technology didn't even exist as an industry when the parents of the boomer generation were born. Yet today in the United States alone it is a \$1.2 TRILLION business. Even more important - Information Technology is what controls all the other businesses. We're addicted to IT as a society. We can no longer make money without it.

CARLY FIORINA \ There will be no sphere of life. I don't care if its education or Healthcare or how you do your grocery shopping at home; this trend from physical to digital, mobile, virtual, personal is not only inexorable it is pervasive.

DAN BRICKLIN \ The technological world that we have is very fertile. What I mean by fertile is it's a place where things can grow, it has all of the nutrients to create new things and new ways of doing things, but those that produce this fertile ground don't know what others are going to plant there and how those plants are going to react to the environment. We're going to see that happening.

RICHARD ADLER \ To me the really underlying power of this whole revolution is converting something from an analog form, which is sort of messy and hard to deal with, to a digital form, and once something is digital there are all kinds of benefits that come from that -- it can be stored, they can be processed; they can be replicated infinitely in copies that are perfect, and it can be analyzed in all kinds of ways.

FILM CLIP ANNOUNCER VO \ "A triumph of mathematical and mechanical skill is this great new automatic calculator at Harvard University. (audio under)

BOB ON CAM \ Information technology – or IT – used to mean computers, big ones like this DEC PDP-1 that's the first computer I ever worked on in the 1960s. People of my age have seen the entire history of IT to date. Today, IT means not the computer but the data it contains – the information that drives business and more and more drives our lives. A trend that is only getting faster and faster.

BOB VO-004 \ Long before computers began to hum to life, most Industrial Age did more building than paperwork. They didn't need offices or office workers, but simply served the physical needs of people in a physical fashion.

BOB ON CAMERA \ Once office functions became necessary the clerks were kept in the back room away of the REAL workers -- to keep from interfering with production.

BOB ON CAMERA \ Offices like this had rows of people handling tasks from answering phones to counting money to taking dictation. Their tools were the latest technologies at the time. Then, one by one, newer technologies not only were invented to help these people, they began to replace them.

VOICE ON PHONE\Get me Cringely, right away!

SECRETARY #1\ I'm sorry, but Mr. Cringely is not in the office right now...

CRINGELY'S VOICEMAIL\ So please leave a message and I'll get back to you as soon as possible.

ACCOUNTANT\ "We'll have those numbers for you in a moment Bob!

SECRETARY #2\ Your letter is almost done sir.

BOB ON CAMERA\ The office as we know it was changed forever in a matter of decades and IT made a lot of that possible. Let's consider for a moment the function of an office. It contains people who oversee or design products and services, market them and handle finances. Information technology continues to reduce the role of people in some of these functions while simultaneously reducing the importance of location.

BOB VO-005\ But some workers don't have offices and never did. These hyper-mobile workers would seem abandoned by technology but that's not so. When you have no office, your mobile telephone BECOMES your office....

ANINA\ Modeling is a really lonely industry. I travel around, I show up in a hotel, I live somewhere, I don't know anybody, and I think that a lot of my technology came out of the desire to communicate wider than my physical presence could be.

Bob VO-006\ Meet Anina. She may look like a Bond girl, but this model and entrepreneur has a high-tech arsenal James Bond would envy. And she knows how to use it.

ANINA\ I grew up with technology. I grew up with two brothers who are computer engineers. So it was just a question of well I don't have enough money to buy a computer, what tool can I afford?

BOB VO-007\ The item that fit the bill was a cell phone. Not just any cell phone, mind you, but the best multimedia handheld device she could get her hands on. It became Anina's lifeline to the world, a mobile office in her hand.

ANINA \ I think I was one of the first ever to have such a device, at least I never met any other model that was using it.

NAT SOT\ (Italian) computer....

ANINA \ And suddenly with the contact management software, I was able to build up a wide contact database that I could manage. That meant that when I was sitting on a location in the middle of nowhere, I could get an email saying Anina, we need Polaroids of your hair for a job tomorrow in Spain. So I would just hand my phone to the photographer and say, would you please, you know, mug shots? I think that a lot of my success came because of my connectivity.

Bob VO- 008\ The career lifespan of a model, however, is almost as short as the technology tools Anina employs. Using her unique skill set, she founded her own company and web site called 360 Fashion. With blogs, photos and online interviews recorded by phone, her team is a new generation of 21st century journalists.

ANINA \ They're interested in the new communication tools so they can get their name and their brand and their message out there.

SOT ANINA\ Hi. This is Anina and I'm here with Al Silvestri.

ANINA\ I'm personally really working to pioneer technology designed by women for women. So the things that I can see coming up in the future are devices that know where you are and know where the things are that you wanna find. And the only way you can really know that is either every single store has a database, or, you have 360 Fashion reporters who pick out the best items.

BOB VO-009\ But it isn't just fashion models who function without offices. Here in Seattle is a very successful national consulting firm with hundreds of workers but not a single office to show for it....

NAT SOT\ Ready, set hut!

TIM JENKINS\ Most of the time consulting is associated with long hours and lot of travel. So we decided why not create a firm where the people do consulting work that they like, but keep them in town and not have them work as many hours.

BOB VO-010\ The company is called Point B and to find a CEO without an office meant tracking down Tim Jenkins at his son's football practice. See? No office, no time clock.

TIM JENKINS \ So our idea was, let's just get rid of the office space. It's just, basically, overhead and it doesn't add any value to the client. In 1995, when we started, that was just beginning to get possible.

BOB VO-011\ Tim Jenkins founded Point B as an IT consultancy then realized IT had taken over almost every kind of business. The next step was to turn Point B into an IT software application in its own right -- a company that lived inside its computers.

BOB SOT\ Chris, this is your office?

CHRIS OLSEN\ This is my office, yes. We're headquartered in Seattle, but we have seven markets currently and we all work primarily at our clients' sites. So we don't have a central building where we all come everyday to work. So frequently we're working out of our cars or we're meeting in different locations other than a central office.

BOB SOT\ How do you handle business cards? Does it have like a post office box and a cell phone number on it?

CHRIS OLSEN\ You know, we do have -- we use a service for our office where we actually have a central office here in Seattle. And we have a mailing address there, and they answer our phones for us and collect and forward our mail. And we also can use day offices there as well as conference room space.

TIM JENKINS \ I think when people first start with us, they're used to going to an office everyday, and sometimes it's very difficult. You know, they'll come to meet us, and one of our -- we have our virtual offices and office suites and things like that, but often times they are doing a lot of their work in their laptop in a Starbucks or they're doing it at home.

CHRIS OLSEN\ We use primarily web based applications that are accessible from anywhere. So we have a server room that has very high availability. And then we have accessibility over the internet from whatever location we're at. But those applications whether they are time and expense tracking or e-mail or even voice and fax services are pretty important investments for us.

TIM JENKINS \ Now, IT is just part of what we do, it's in the flow of our daily lives and our business lives. 18:33:48 Before the football practice started, I was working in my car. I had a laptop, I had a Blackberry, and was able to operate pretty effectively for about 45 minutes and get a lot of work done.

BOB on CAM \ OK, so maybe millions of you are still living the cubicle life of Dilbert. Look on the bright side - you could be in meeting right now. Worse still, you could be traveling to a meeting in another city – and having to come back the same day. Where is the future we were promised? Wasn't it supposed to be better than this by now?

ANNOUNCER VO\ "Technicians make last minute adjustments for the world's first demonstration of the telephone of tomorrow at the Western Electronics Convention in San Francisco. It's the often forecast videophone! How does it work? Just lift the receiver and you see you own image...."

BOB VO-012\ For over 75 years videoconferencing has been a dream of a cheaper and virtual way to talk "in person." I saw a videophone demo myself at the 1964 New York World's Fair and thought – cool! I want that in my home.

BOB ON VIDEOPHONE \ There were several serious attempt to make it a reality in both the 1970s and the 1990s like with this AT&T model - but at \$1500. each, they failed to take off.

BOB ON CAM \ Finally in the new millennium high speed internet lines and program like Skype seem to be bringing the dream closer.

MARY ALYCE ON SKYPE\ Bob, as soon as you get home you need to take out the trash.

BOB ON CAM\ But whatever happened to Star Trek?

MARK GORZYNSKI \ Well, hello.

BOB\ Hey, Mark.

MARK GORZYNSKI \ Hi.

BOB\ How are you? You are in Corvallis, Oregon, right?

MARK GORZYNSKI \ Sunny Corvallis, Oregon, that's right. And you are over there Palo Alto I see.

BOB\ Today I'm in Palo Alto, California. and we are like 600 miles or 700 miles apart

MARK\ Yes.

BOB\and it seems as though we're together.

BOB\ I feel like I'm there. I feel like actually we are in the same room. That's the idea, right?

MARK GORZYNSKI \ Yeah, that is the idea.

BOB\ So, Mark, you're the architect of the Halo system. Can you tell us about this?

MARK GORZYNSKI \ Yeah, the Chief Scientist, yes, and one of the original --

BOB\ Chief Scientist, even better. You actually control personally the Dilithium crystals?

MARK GORZYNSKI \ Yes, captain we have the Dilithium crystals, I have a secret bag and below we mine them on our planet.

BOB \ And what is Halo?

MARK GORZYNSKI \ Well, Halo is a system to help people improve their collaboration, it combines a worldwide network with a great set of room designs and a management service. What this is doing for companies is helping them bring groups of people together beyond faces, beyond their data, beyond their e-mails, really to help build this kind of business conversations to help companies be more productive.

BOB VO-013 \ Today HP has built over 100 locations around the world where people can have virtual face to face meeting with interactive components. The price? Just \$400,000 per room.

BOB \ Am I likely to see this in my home?

MARK GORZYNSKI \ I think that if you answered -- if you asked yourself, are you likely to want it in your home then I think it'll be there. I think that you're likely to see things integrated to your home in a very useful way, and I would say that that day is really coming fairly soon. And so one way to think of technology is not that is that it's advancing beyond people it's catching up to people. So what I expect to more of is technology integrating itself and developing ways of working together that offer people interfaces that they are used to using, instead of people having to catch up to the technology.

BOB\ What is the meaning of life?

GOOGLER\ 120 million results returned. Take a look and decide for yourself.

BOB \ What is the gestation period for emperor penguins?

GOOGLER\ 63 days.

BOB \ How tall is the Eiffel Tower?

GOOGLER\ It's about 990 feet, or 108 stories high.

BOB \ How did PEZ dispensers get their name?

SPEAKER\ The name PEZ is from the German Pfefferminz, a.k.a peppermint.

BOB \ Who was Charles Lindbergh's sister?

GOOGLER\ His half-sister's name was Eva.

BOB\ Where is the Hogwarts School of Witchcraft and Wizardry?

GOOGLER\ Scotland, United Kingdom.

BOB ON CAM\ Before personal computers and the Internet, finding information often involved hours of library research or phone calls. And though books and phones are not yet extinct like this Tyrannosaurus rex, it took the advent of Internet search engines give us the answers to billions of questions literally at our fingertips. The place most of us go for such answers is spelled G-O-O-G-L-E.

DAVE GIROUARD \ Most people know Google first and foremost as a search engine. And then if you are, kind of, into the business side, you know, the -- about this fairly massive advertising network that funds it all, well, we're really the third leg of that which is sets of technologies that we deliver to businesses.

BOB VO-014 \ This 800 pound gorilla of Silicon Valley has seen the future of IT, and they don't think it will be sold in little cardboard boxes. Not only do they want to provide the answers to your questions, they have begun providing software applications that only exist online, and are accessible from anywhere.

RAJEN SHETH \ So Google Apps are essentially a bundle of products to help organizations collaborate more effectively. So what we've tried to do is design more effective tools that are usable by end-users and can be used anywhere by any web browser. You want to collaborate on a document with six other people. Typically what you'll do is you'll attach to an e-mail and send it out. They'll all make their changes and send it back to you and everybody else. So pretty soon you end up with 36 copies of the document. You end up with six different versions and nobody knows which is the latest. We, with Google Docs, provide you a much better way to do that in a single consolidated place on the web.

DAVE GIROUARD \ 100 years ago, most big companies had a Vice President of Electricity. Okay? And it is a silly concept now, but in reality if you wanted to be sure the plant would be running, and this and that, you had a VP and they got yelled at if there -- if there was a loss of power. And a lot of the things that have been built and managed by enormous numbers of people really should be utilities. And they are becoming utilities. Computing is becoming less computer-centric everyday.

BOB \ How do I get a job at Google?

GOOGLER \ Go to Google.com slash jobs.

BOB \ And they'll just give one?

GOOGLER \ Maybe.

BOB VO-015 \ You could say that one of the best things about today's technology is that it's ...democratic. Here in America, anyone can make it and anyone can use it. A Mom and Pop convenience store can have basically the same systems Wal-Mart spends billions on. So when a business comes to a crossroads, the question is

which technology will lead to success. A man named Bill Scott seems to have a road map.

Bill Scott\ The small retail industry is in a lot of trouble. I feel a real need to try to save not only convenience store industry, but the small retail industry as a whole.

BOB ON CAM \ It's tough being an Internet pioneer in New Hebron, Mississippi, a place where the computers come from Wal-Mart, where high tech is almost unknown and yet Bill Scott is one of the best sorts of internet pioneers. He has proven, world-beating technology; a wide-open \$400 billion market; ecstatic customers -- everything but success. If this guy lived in Silicon Valley, he'd be a zillionaire. Bill Scott runs StoreReport.com, an application service provider for gas-station and convenience-stores. Bill Scott wants to put your Slurpee machine on the Internet.

Cringely VO-016\ The 80 year old convenience store business has come a long way since 7-11 was born. While sales are booming, increased competition, rising oil prices and antiquated inventory tracking have many stores making as little as 2 percent profit - pretty dismal for working 24/7.

Bill Scott \ Most of the convenience stores out there have hundreds, if not, some thousands, of days worth of some items in the stores and you can't put 1000 days worth of an item in a store and expect it to turn, its still there 2 years later.

BOB\ Or even to taste good!

Bill Scott\ That's right, that's right!

Cringely VO-017\ A store with enough bubble gum for the entire state of Mississippi is just the kind of problem Bill wants to solve. Convenience stores have never exactly been on the leading edge of information technology.

Bob\ We got the cheese, we got the beef. It's Beef 'N Cheese!

Cringely VO-018\ And chains with multiple locations struggle keeping track of the figures. Typically it takes days for an owner to find out what's going on at a

particular store. Bill Scott's IT solution enables store owners to track every item as it's sold and know exactly when it's...

BOB ON CAM\ Time to restock!

Cringely VO-019\ Stores were left at the mercy of suppliers who sold them things they didn't need. Now with one PC, some minimal training and an internet connection to StoreReport servers, all of this information is available in real time – to the big boss and the store managers.

BOB NAT SOT\ I have all the basic food groups covered here.

Bill Scott\ In this environment the owner of a convenient store chain has complete control of all his stores from his office, he doesn't even have to get out of his chair. He can change prices, and that something that normally takes six months to a year . With our system I can be walking through the airport terminal in Kansas City, Missouri and change the price of a package of cigarettes in Hattiesburg, Mississippi with a handheld data-terminal and that gives you a lot of power.

Cringely VO-020\ With computers ubiquitous in today's society, Bill Scott's answer to the convenience store challenge may seem obvious. But the battle is more than just getting people interested in saving money.

Bill Scott \ The fear of change to new technologies has always been there. People get complacent they like to do things the same old way. But once they make that change, like everything else they sit back and say "how did we ever get by doing things the old way?"

BOB VO-021\ In the information age not a day goes by without some new technological wonder being introduced. Some arrive to great fanfare but fail to live up to the hype. The true impact of each new idea that hits the marketplace is sometimes not felt for years, even decades. But the more an idea develops, the better it can get, and the more people will employ it.

BOB ON CAMERA\ In high tech there's a conference for everything, from microelectronics to enterprise computing. If you're in the RFID business, this is the place to be.

BOB VO-022\ Welcome to RFID Journal Live. Here both creators and buyers of Radio Frequency Identification products come together not only to make deals, but to teach and learn the possibilities. At this event, if you can imagine it, they can track it.

BOB VO-023\ It turns out you can track RFID all the way back to World War II, when British fighters accidentally shot down their own bombers returning from Germany. Their solution was to develop a transponder that sent and received identifying radio signals, creating a friend or foe identification concept still in use today. But RFID has many other uses, too.

Chuck Williams \ RFID technology came to the forefront when Wal-Mart said, "I want you to put these little RFID tags on cases of pallets that you ship to me." But since then, it has taken off in other areas like asset management, even people management, inventory tracking.....

Bob\ So everything gets a little chip installed?

CHUCK WILLIAMS\ Everything gets a little chip.

BOB\ Show it to me.

CHUCK WILLIAMS\ Here's a sample of a little chip. It's an asset tag.

BOB\ Ok, I can sort of see it through there.

CHUCK WILLIAMS\ This is a passive tag.

BOB\ So I have to pass it by a reader which sends energy that activates it.

CHUCK WILLIAMS\ Right. Think of it as your cell phone, like a cell phone tower. Well the reader sends out a signal saying "Is anyone there, is anyone there?" The tag responds and says "Here I am"

BOB\ I've been counted.

BOB VO-024\ Why not just stick with bar codes? Because RFID technologies have so much more potential – just look at card keys and EZ-Pass. But it's a constant search for new applications, so the vendors' wheels are always turning.

BOB\ What are we doing in this Mini in the middle of a trade show?

SALEEM MIXAN\ Well, we've put together a program with them that actually uses active RFID tags to identify the drivers in the vehicles and an ad agency has put up billboards across the US that allows them actually to get very specific targeted messages - marketing messages.

Bob \ But what I want is to go by and have it say, "Bob isn't it time for you to change your windshield wipers?"

Saleem Mixan\ So, welcome to the next phase of the project. These guys could be advising their customers when their next service is due. And these little tags are what does it for them.

Donna \ This is our animation this firefighter is navigating down that floor. He's positioning through.

BOB\ So the green things are the tags.

Donna\ The green things are reading the passive tags, yes. This information is being relayed to the fire captains screen right here. You know the position of the last tag that he passed by.

BOB \ This is a ray gun?

Mike Fisher\ No, this is an RFID wireless handheld reader. I have antennae. I have an RFID module. It has its own battery. And then it communicates through the IR port. So now I can scan barcodes and I can transfer that information wirelessly.

BOB\ We're looking at RFID tags on clothing. What's the deal here?

Mark \ When a retail item is put in the wrong spot it's just like not having it there at all, in fact that's even worse, from a retailer standpoint, you've paid for that inventory but its not there for the customer to buy. This system because your taking inventory every 30 seconds, it would know that someone put that product in the wrong spot. The Holy Grail is really having real time inventory.

PHIL LAZZO \ It basically is more visibility in terms of the assets and the items that are crossing their enterprise and also a reduction in labor you don't have to spend a lot of time scanning and counting things with RFID. Its hands free data capturing.

BOB\ So it saves money?

PHIL LAZZO\ It saves a lot of money.

BOB ON CAMERA At the heart of these technologies we've discussed lies virtuality, virtual office, virtual inventory systems, virtual marketing. The logical extension of this trend is virtual people living virtual lives and more important to merchants shopping and buying things in virtual worlds.

GINSU YOON \ I like to think about this story that I have from way back in 1992, when somebody introduced the Internet to me for the first time. And the friend of mine who showed it to me said this is going to be everything, this is going to connect everybody, you're going to be on this thing all the time, and I couldn't conceive of it. Well, that's the nature of the future -- none of us can really fully imagine ourselves in it.

BOB VO-025 \ Among the largest of these worlds is Second Life – a place where people and companies build their presence inside a computer network – where virtual real estate costs real money.

GINSU YOON \ Land is a great metaphor, because everybody understands it. However, the entire dynamic of the system is not similar to real estate. Right, I mean what they're saying about real estate is true; they're not making any more of it. The Second Life virtual world's in general its server capacity. We'll keep making more as long as people keep making servers for us to put up.

SIBLEY VERBECK \ I've been excited for many years about the idea of technology that has grown through video games being used for things that are not games. And saw virtual worlds as a new communications medium.

SIBLEY VERBECK \ We've seen with video on the web, you know, it's the same thing you could get on television in a lot of ways. But now what we see in a way, virtual worlds are actually interactive television. And talking about interactive television for 20 years, the most we've really gotten are voting on American Idol.

BOB VO-026 \ Unlike American Idol, Second Life doesn't take us all to some TV studio but to a place that doesn't even exist...

SIBLEY VERBECK \ Here what we can do is you're in an environment. You're living it, you're moving around, you're helping make it. Virtual worlds are the first communication medium that allows people to feel like they're in a place together and to interact with that place, cooperatively, competitively, or just meeting each other. It's in its very early stages. Most of the great applications for it haven't been built yet, and it's hard to use, hard to learn. It's like 1994 on the web.

SIBLEY VERBECK \ This has a potential to be very, very important for retail. In fact, I certainly predict that five years from today, we'll see more retail sales to consumers through virtual worlds than on the web.

BOB ON CAMERA \ So is the virtual you ready to try on a pair of virtual pants? We may never have to find a parking place at the mall again.

GINSU YOON \ Right now there are almost a billion people interacting in a computer environment through the Internet, mostly through websites, through e-mail, it's a very flat, 2-dimensional experience. And so this is so much at the

beginning of this company, this industry's history that it's really just the start and we have to imagine another decade or so before we really see where this thing can go.

BOB ON CAMERA \ Sometimes the ingredients for success boil down to simply three things - the right person, the right technology, the right time. Andrew Carnegie, Henry Ford, Bill Gates. They might not have invented the technologies they employed, but each knew how to capitalize on it. And the rewards for success can be quite impressive.

Young George Eastman was an industry builder like those others. His technology was one he first bought in 1877 – the still photo camera. Eastman liked what he saw and set out to make it even better. After some experimentation, he created rollable film, an alternative to delicate plate glass negatives.

By 1888 Eastman needed a cool name for a new camera he'd created, that would eventually become the name of his business. The "Eastman Dry Plate and Film Company" didn't have a great ring to it. So the name he just made up ...was "Kodak".

BOB VO-027 \ With the slogan "You press the button, we do the rest", the first camera Kodak sold could shoot 100 exposures, but at 25 dollars apiece - plus film developing costs – it was only for the very wealthy. What really made Kodak a huge success was the "Brownie."

BOB ON CAM \ At only a dollar in 1900 it made photography affordable for everyone, and for the next 75 years physical film was the only way people had for capturing their visual memories.

BOB VO-028 \ What occurred in the late 20th century was a transformation that would completely change the way we take photographs. Engineer Steve Sasson was given an assignment by his bosses to make a radically new kind of camera. Who did he work for? Not Nikon or Canon - not even Sony.

STEVE SASSON \ I joined an apparatus division research laboratory inside of Eastman Kodak Company in 1973, and in 1974, probably late '74, my supervisor

Gareth Lloyd came to me and asked if I would do some experiments with a new type of device called a charge-couple device, and it was sort of a solid state form imager. And they were very crude and they were just becoming available. And so decided to take a digital approach.

BOB VO-029\ What young Steve Sasson invented was the very first digital camera. Capturing images with 10,000 pixels – that's .01 megapixels - his new invention was years ahead of its time. Photographs could now be represented by 1s and 0s - digital information.

BOB\ So this is your invention Steve?

STEVE SASSON \ Yeah Bob we keep it in this case because we transport it around to show different people. The camera itself is kinda big.

BOB\ Kinda big?

STEVE SASSON \ Yeah (laughs). It weighs eight and half pounds. Clearly you wouldn't confuse it for a camera like today.

BOB\ Oh I would of course.

STEVE SASSON \ But it has the basic attributes of a digital camera.

STEVE SASSON \ We did many demonstrations throughout 1976. First I entitled it filmless photography which perhaps was a bad choice of title back then, but it got people interested. And what I'd do is I'd come in and I'd take a picture of somebody right away and then I'd tell a little about what was happening. What this thing was. And there were really lots of questions which, to be honest with you, I had no answer for. I mean, you know, why challenge, why would anyone want to watch their, look at their pictures on a television set? How are you going to store these things? What's an electronic album going to look like? And the big one was, when is it going to be a consumer reality? That one I got asked every time. I came up with between 15 and 20 years, which was a long time for somebody sitting in a conference room looking at this prototype.

BOB SOT\ Say Cheese!

BOB VO-030\ As it turned out, his prediction was not too far off, and what happened at Kodak is a now a hard lesson in technology that will be studied for years.

Today, in Kodak's hometown of Rochester, New York, George Eastman's company is a much different place. The full consumer switch to digital photography took less than a decade, and the once very profitable film business shrank. More than 100,000 Kodak employees worldwide have lost their jobs. Staying ahead of a technological curve is hard enough – but catching up after falling behind is far more difficult. You could say George Eastman's company missed the ultimate Kodak moment.

Carly Fiorina\ Kodak sat on a mountain of cash and profitability in their traditional photography business and I believe their thinking was digital photography will eat into my traditional most profitable business. What I think Kodak miscalculated about was they weren't in charge of whether that would happen. Consumers were in charge. Individuals were in charge. And so now they're attempting a transformation in a very weakened state and they may have missed their season of change.

BOB ON CAM\ The switch to everything digital has a profound impact on institutions that struggle to adapt, and none have been hit harder than the newspaper industry. Newspapers have been written, printed and sold for over 400 years, but now that business model is in danger. The internet has changed the way people consume news, and this new method of posting stories and advertisements are crippling newspapers around the country. Publications depend on the relationships between writers, advertisers and readers. Is anything that isn't solely one of those three components - like paper in this case – is just excess.

BOB VO-031\ A company that many claim has had a profound effect on the so-called "old media" - and with a value estimated at over 1 billion dollars - is in an unassuming house in San Francisco.

Jim Buckmaster is the CEO of Craigslist.

JIM BUCKMASTER \ Craig started Craigslist as e-mail list in '95 sending out event listings to friends and coworkers.

JIM NAT SOT\ This is the kingdom that is Craigslist in all its glory.

JIM BUCKMASTER\ When I came in the site was running on a single PC, it was getting something like, I think either 10 million page views per month. Now, of course we're on 200 or so servers, each one of which is probably 10,000 the power of that the one of us on back in '99-2000.

BOB VO-032\ Now with 8 billion page views a month, Craigslist operates in over 450 cities worldwide. From personal ads to jobs to the junk you just want to get rid of – the online classifieds site founded by Craig Newmark provides the means to advertise anything. Usually a company experiencing explosive growth means massive hiring and a parking lot of Ferraris. With only 24 employees however, Craigslist continues with their plan to keep it simple.

JIM BUCKMASTER \ I think the goal has really stayed the same from what it was originally, which is just to provide a helpful service to as many people as possible largely for free

BOB \ So, what, you're a communist?

JIM BUCKMASTER\ Oh, the business-press actually uses -- has used a lot of those kind of adjectives to describe me and describe us. They've used "Communist," "Socialist," "Anarchist," and a lot of other ones. But it -- you know, they just don't have good adjectives to describe a business that doesn't seek to maximize financial performance. We can certainly be making probably \$10 million or more per month by putting text ads and other kinds of ads on the site because there is so much traffic. But we don't consider it, because our users haven't asked us to put ads on the site.

BOB VO-033\ With print newspapers in decline, many experts blame Craigslist for stealing one of every paper's most profitable sections – classified ads – though the folks at Craigslist disagree.

JIM BUCKMASTER\ Probably, 90 percent or more of classified ads on Craigslist never would've seen the light of day in print.

JIM BUCKMASTER\ I mean, When you're talking about small value transactions for which paying any amount for a classified ad is going to be prohibitive whether you're talking about selling a used cell phone, or whether you're talking about an odd job, you don't want to pay hundreds of dollars for a classified ad for that.

Russell Wilcox\ The business premise behind a newspaper is I'm going to give you information of the day and alongside I can sell you ads. The reason the internet has just wiped out the market capitalization of newspapers their business premise is much more powerful, I'm not going to just give you the news of the day, but I'm going to give you all human information and alongside that I'm selling you ads.

BOB VO-034\ In Cambridge, MA a 100-person company thinks the answer to the ink based media problem is to make newspapers all electronic to compete.

Russell Wilcox \ The mission of e-ink is to provide the most convenient way to read digital information. And we chose that goal because convenience is something we think there's an infinite demand for, and digital information is something we think there will be an infinite supply of.

BOB VO-035\ Electronic paper was invented 30 years ago at Xerox's fabled Palo Alto Research Center. The technology itself is already on the market in the form of the Sony Reader and the Amazon Kindle, which both use E-Ink to display books. However, the goal within the labs of E-Ink is to make the paper thin electronic newspaper a reality.

Russell Wilcox\ If you look at the United States alone, the newspaper industry is a 50 billion dollar industry, but of the 50 billion that they get, mostly selling advertising, they then turn around and then spend 20 billion manufacturing the

newspaper that comes to your doorstep. And from my perspective that's a business problem you can drive a truck through.

RUSSELL ON CAM\ This is different sheets of electronic ink.....

Russell Wilcox\ Electronic paper is this idea of making a computer display that looks and feels like a piece of paper, that you can read like a piece of paper, and then fold up and put it in your pocket and to do that we have a technology which we call electronic ink, or E-Ink for short. And we have 5 different newspapers who are investors in the company who have been waiting for this to happen.

BOB SOT\ All the E-Ink in the world comes from this room?

RUSSELL SOT\ That's true.

Russell Wilcox \ One of the nice things about electronic ink as a technology is that everything we do that's new is in that layer of microcapsules everything else around is standard display technology, so every time your laptop display gets cheaper, our display gets cheaper. So the newspaper of the future is going to be either the news of the day if you're a news organization or it's going to be some packaging of all human information and you'll end up with a new type of media, Print Broadcast. So I really do think that this is a technology that reaches out to everybody the same way that paper is universal lots of people will benefit from this.

BOB ON CAMERA\ The new rules of this revolution affect everyone. First Napster and then the remarkable success of Apple with its iProducts – for better or for worse – have completely transformed the music industry forever. There is no turning back the digital clock - and this industry has been forced to rethink how it makes money from music. In fact the only thing affected more by Information Technology than music – is money.

BOB ON IPHONE\ And no industry has been changed more by IT than Finance.

BOB ON IPHONE SCREEN\ As money has become virtual, an entry in an electronic journal, its ability to travel at the speed of light has turned securities trading into a

huge business with very little human intervention. That's because people are just too slow for a business where time literally is money.

BOB VO-036\ Not many would accuse Mark Gorton and his company of going too slowly. If anything, they've been leading the fray, and controversy has followed. Founder of the Lime Group in New York City, Mark and his team of software engineers are now trading as many as 7 billion shares a month on the stock market.

MARK GORTON \ The trading that we do now was impossible to do 10 or 15 years ago just because the markets weren't that electronic and because of technology, markets have gotten a lot more efficient.

BOB VO-037\ Their secret involves algorithms – complex mathematical instructions that calculate when to buy and when to sell – running on some of the fastest computers on Wall Street. Or is it NEAR Wall Street?

MARK GORTON \ We do a lot of automated trading we currently trade about 100, 150 million shares every day in the US. So we have computers that are processing data and spitting out buy and sell signals and trading like crazy and we have people working here to program those computers. So if you have a lot of really smart people out there competing to try and buy and sell things and the competition is so intense that it creates these very, very efficient markets.

BOB VO-038\ Gorton has been described as a serial entrepreneur, constantly seeing business opportunities for building new Lime companies. And while his speedy stock trading has earned him money and respect, his foray into file trading has earned him both respect other names – among them, “digital pirate.” Limewire is one of the most popular file sharing programs on the internet, allowing people to exchange any digital products they get their hands on – all for free.

MARK GORTON \ In some sense its great you know its all about sharing and people giving away what they have to these digital commons. But there is also this problem that people give away what's not there's to give away and that's where you run into these issues with copyright infringement and that's been particularly difficult for the music industry.

BOB\ And the record companies are trying to make that your fault?

MARK GORTON\ Oh yeah, they're suing me. I mean yeah, for a lot of money.

MARK GORTON\ Technology is a tool, and just like shovels are a good tool for digging holes you can also hit people over the head. And technology is very value neutral there's nothing inherent about file transfer or technology that is neither good or bad its how people use that. So you have to find a way to mitigate the harms without getting rid of what's good about the technology too.

BOB ON CAMERA\ Americans spend nearly two trillions dollars a year on healthcare – that's 15 percent of the gross domestic product. And hundreds of billions of those dollars are spent on hospital stays – it's a huge business that's growing rapidly with our aging population – and the amount of paperwork is almost impossible to fathom. But what if paperwork were no longer part of the process?

If you were to suddenly become ill and have to be rushed to the hospital, one of the best places in the world to be sent to would be right where, at the Mayo Clinic in Rochester, Minnesota.

BOB VO-039 \ The clinic's century long history of medical contributions has been well documented, but it was their invention of crossed-referenced dossier-type files for patients that first put them on the map. Files were kept on every individual patient and meticulously stored – a system still widely used around the world today.

BOB ON CAMERA\ After decades of that kind of record keeping, this is what you get – shelf after shelf of manila folders – millions of patient files.

BOB VO-040 \ One file is like the ark in an Indiana Jones movie.

BOB ON CAMERA\ Not exactly quick and easy to access, nor very high tech, so in 1993 the Clinic decided to do something about it.

Dr. David Mohr \ Many of the things we had prided ourselves on with the paper record were starting to become, you know, stressed and strained. So, it became evident to our leadership here that we would have to move to an electronic system.

BOB VO-041 \ Dr. David Mohr is an internal medicine specialist with a background in engineering who was given the task of leading the Mayo Clinic into the electronic 21st century.

Bob \ What would have happened had you just stayed with paper?

Dr. David Mohr \ Well, one humorous downside was this building was going to need significant structural re-enforcement. The records were getting so heavy, the volume of records were huge.

Bob & Mohr SOT \ I'd ask you first about what are the issues that bring you here to see us.

Dr. David Mohr \ So to start out, we put together the building blocks of what would be eventual integrated systems. So we had a clinical notes system that would capture the documentation from the physician visits.

Bob NAT SOT \ There was some lab work done and even a preliminary diagnosis had something about possession by demons.

Dr. Mohr \ Aha.

Dr. David Mohr \ An ordering system for the physician to place their orders, a scheduling system where the things that were ordered could be scheduled, a patient provided information system where patients could fill out information about themselves and that information could be transferred electronically to the physician and stored in the data base for future reference.

MOHR SOT \ So I'm going to renew your Xanax and lice killing medicine and this stool softener, that'll probably pick up your spirits.

Dr. David Mohr \ So, those, as well as an electronic results inquiry system were the major building blocks. Of course, that is the system that takes the millions of laboratory results that are collected on patients, inpatient and outpatient setting, and puts that together for a convenient display.

Bob VO-042\ Those millions of manila folders are slowly becoming the ones and zeroes of digital data stored in rows of modern computers.

Dr. David Mohr\ Now, you can't go more than 30 feet in the hospital without having another PC available to view information, and providers can sit down and work on their patient care. Everybody at the point of care for every decision should have the full expertise of the whole clinic available for that decision.

BOB ON CAMERA\ Only 10% of medical institutions have accomplished what the Mayo has done, but the promise of analyzing millions of patient records at the same time in order to cure a single person is the ultimate dream. In an emergency, imagine your record is available from anywhere, and it saves your life. Then IT will have truly transformed medicine.

BOB VO-043\ We've digitized our friends, the way we shop and the way we track our shopping. Our pictures are on flash drives and our health records on hard drives. My music is compressed and your stocks are online. We have passwords for our 17 user names to stay in touch with thousands of our digitized friends. If only we could organize our digital lives.

JIM GEMMELL\ Our experience is we almost never regret recording something. But we almost always are saying, oh, I wish I had recorded that and I wish I had more. Why would anyone want to record absolutely everything single thing in your life? What kind of software would you need to support that?

JIM GEMMELL\ You won't record absolutely every single thing in your life, but you will record so much compared to what we recorded in the past, it will seem like practically everything.

BOB VO-044\ If you think you've never been on candid camera, then you haven't met Jim Gemmel. Jim works with Microsoft Research, and takes pictures by the thousands.

BOB\ Jim, it's great to see you.

JIM GEMMELL\ Hi, Bob.

BOB\ Hey, what is this thing you're wearing?

JIM GEMMELL\ This is a sense cam. This was developed by Lindsay Williams in our Cambridge lab, and it's a camera enhanced with some sensors so it can take pictures automatically at a good time.

BOB\ And what is that glazed over eyeball thing?

JIM GEMMELL \ Well, you've got a passive infrared detector here, it's for picking up warm bodies they usually use in burglar alarms. But here it's detecting you're nearby and it says "Hey, that's an interesting picture to take. It's got accelerometers so that when I jiggle it, it knows not to take a blurry picture right now. It's gonna wait for it to settle down and it knows "OK, I can take a picture"

BOB\ Does it know where you are?

JIM GEMMELL\ It doesn't know where we are, we want to add GPS to it someday, but right now what I'm carrying a little GPS with me so that I can keep track of where I'm at so we can stamp that on the photos so we know where they've been taken.

BOB\ And how is this better than my senseless cam?

JIM GEMMELL \ Well, this way you don't have to stop living to go behind the scene or wait for that shot, you just do what you are doing and it automatically captures what is going on for you.

BOB\ And this is your office?

JIM GEMMELL\ Well, I wish this is my office. We're a couple minutes away from campus. Let's go.

BOB VO-045\ The project, begun by Jim's fellow researcher Gordon Bell, is known as MyLifebits, and the goal is enabling the complete digitization of a person's life.

BOB AND JIM SOT\ And I brought you in here to show you this 18-panel display...

JIM GEMMELL \ So it started actually, I think around 1999 when Gordon Bell wanted to go paperless, and so he starts scanning like crazy, and around the same time we started looking ahead and said gee, do you think by about 2007, we'll have terabyte hard drives. And at the time in our lab, we were talking about how hard it would be to actually fill the terabyte. That it's a vast amount of storage.

JIM GEMMELL \And we ran some numbers on the kind of things, we would store at the time and we figured that it would take over 65 years to fill a terabyte. Even if we optimistically added in a bunch of stuff we weren't even doing at the time. So that's where I got involved. They said "Hey, we need some software to deal with this."

BOB VO-046\ Looking for inspiration, the Microsoft team reviewed a research article written in 1945 by President Roosevelt's science advisor. Vannevar Bush saw a future where everyone would own a device called a Memex, where a person would be able to store all their books, records, and communications – a supplement to human memory.

JIM GEMMELL\ He wrote our manifesto as it turned out. We looked back and said "wow", we ought to try and build build Memex. So if you think of an airplane now has this black box recorder, I think more and more devices -- in fact, pretty much every device is going to have a black box recorder.

JIM GEMMELL\ We have come into an era where you are going to have sensors all over the place. Whether its things in your car, or a dishwasher, or things on your

body, we're going to have sensors that are recording your blood pressure and your heart rate and so on. We are going to enter an era of quantitative health where you are not just going to the doctor and saying, gee, when did I start feeling this way? Well, I think maybe it was Wednesday.

JIM GEMMELL \ No, you are going to go in, and you are going to have the log of your temperature, and he is going to see when your temperature started to rise. Now, we are going to enter this era where nearly everybody is walking around with some kind of sensor, and we have just a wonderful data-rich environment for the medical researchers to go and discover things and it's going to really have a huge impact on health. It's very exciting.

JIM GEMMELL \ So when we began, we actually had people writing us, and we had a guy write and say "I have been keeping a diary since my teens, and it's amazing when my friends reminisce, and they get things wrong, I look back at my page and I get so much out of it." And it's made me very conscious that I want to make sure I record things because of the immense value in it. Digital immortality is one of the dreams here, is that someday, as part of your legacy, someone can interact with virtual you.

BOB VO-047 \ Transformations are everywhere, but they aren't always obvious. There are both opportunities and threats in this Technology Revolution.

GINSU YOON \ My question is, is this it? You know, we've advanced over the last, you know, 15 years of the internet, you know, 50 years of telecommunications evolution and what we're going to do is just click around websites, follow hypertext around, you know, that's, that is the apex of all this development. It can't be.

DAN BRICKLIN \ You can see where things are probably going. You know that massive storage is making a big difference. Portability, mobility is making a big difference. Wireless is making a big difference and it's changing the way we interact with individuals, it's changing with what we can draw upon when we do things.

CARLY FIORINA \ Charles Darwin maybe said it best. It is not the strongest of the species that survives, nor the most intelligent, but those most adaptive to change. It's all about adaptability. How fast can a business adapt.

RICHARD ADLER \ When I was a kid I grew up reading a lot of science fiction, and I really loved the idea of a world of instant communication, global communication and travel by, you know, to the planets. And then a few years ago, I realized that we're actually living in the future. The future has arrived. And the world that we're living in is already that world of the future and you know, what the next future is like, I think is actually not so clear now to us.

BOB ON CAM \ Information Technology has changed our lives forever in ways the first computer engineers could never have imagined. And the rate of change is only increasing. The challenge is for us to figure out how the technology is going to transform everything around us so that perhaps we can join in the revolution. The worst case is that as computers gain more processing power and get smarter than humans - I will end up spending eternity working for the grandson of my electric garage door opener.

I'm Bob Cringely.