



Broadband

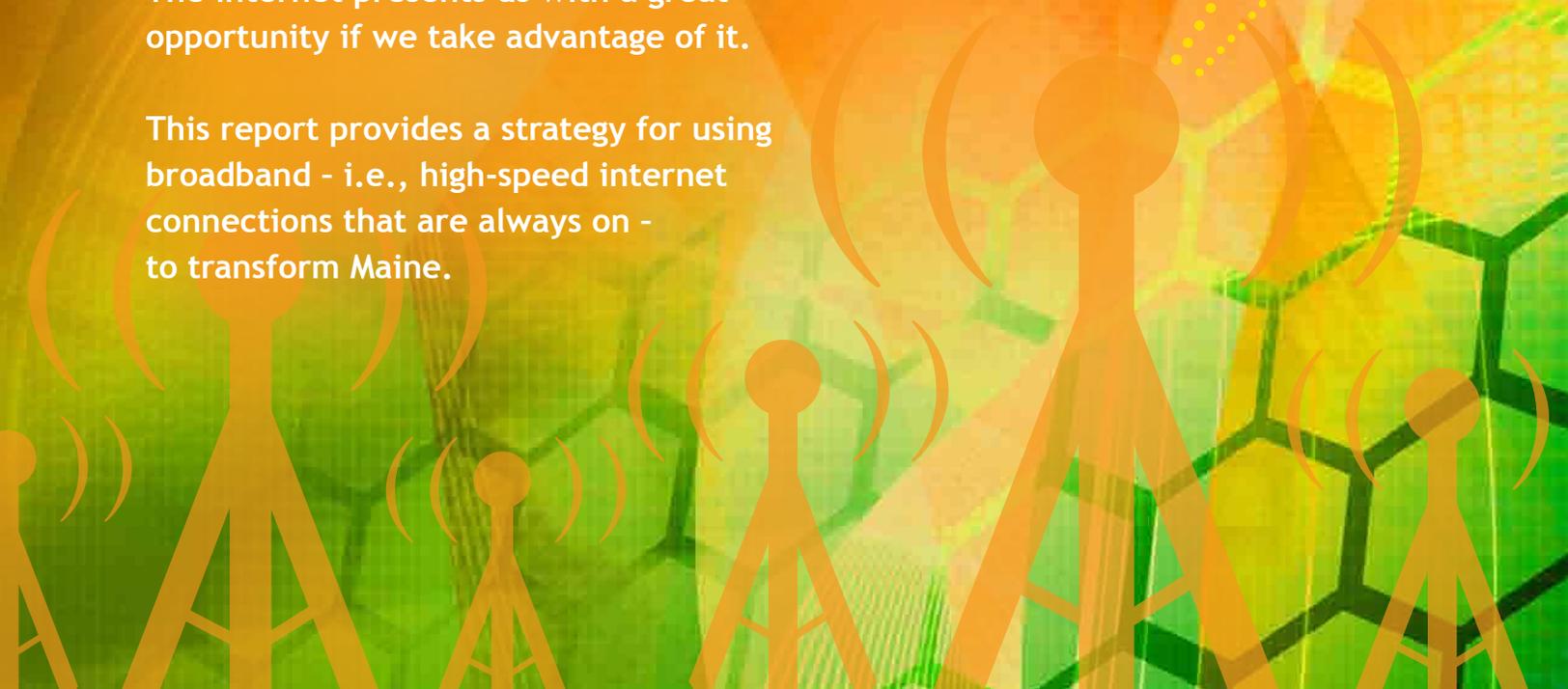
The Road to Maine's Future

The internet is fun. It's a way to keep up with your friends, follow sports teams, play games and shop.

But it is also something very serious – a technology that offers the promise of more jobs, better health care, more effective schools, and less expensive government services for Maine. It is a vital connection to the world economy. It brings us into intimate contact with people around the nation and the world.

The internet presents us with a great opportunity if we take advantage of it.

This report provides a strategy for using broadband - i.e., high-speed internet connections that are always on - to transform Maine.





Report of the Governor's Broadband Capacity Building Task Force

Warren Cook, Chair
December, 2013

Maine faces a distinct set of challenges. Our population is aging, our incomes are low, and our government costs are increasing at all levels. This report looks at the positive impact that increased use of broadband internet can have on Maine's economy, education system, government and healthcare.

The purpose of this report is twofold:

1. To provoke thinking about how the Broadband-based communications revolution can help Maine people better meet their physical, economic, social and governmental needs; and
2. To suggest ways state government can support and guide this communications revolution in Maine.

This report is the product of the Governor's Broadband Capacity Building Task Force. Established to manage the creation of a Broadband Capacity Building Plan, the Task Force is funded by the State Broadband Infrastructure Grant Program of the National Telecommunications and Information Administration (NTIA). It is staffed by the ConnectME Authority, a Maine government component unit established by the State of Maine Legislature in 2006 to facilitate universal availability of broadband service and increase the adoption and use of that service among Maine individuals, businesses and public organizations.

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Warren Cook, Chair, Co-founder of Maine Network Partners
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Letter from the Chair

Dear Reader,

If you're like many of us, you take the internet for granted. It's a way to keep up with your friends, send emails, follow sports teams, shop, and play games.

The internet is all of these things. But it's also something more serious. It is a vital connection to the world economy. It is every bit as important for Maine as roads and piers and airports. It provides our state with the opportunity to overcome longstanding problems of isolation and distance from markets, challenges that have plagued our economy for centuries.

But there's more than opportunity here. There is also danger. Other states and other nations are racing ahead to develop broadband¹ communication. If we fall behind in installing and using broadband technology, we will remain isolated and distant from markets relative to our competitors for another century.

The strategy laid out in this report is designed to take advantage of the opportunity – and avoid the danger. It is the product of a committee of nine leaders in the private and public sectors in Maine. The proposed strategy will create jobs, reduce government costs, and attract and retain young people. The effort would be led by state government, but involve the participation and investment of all institutions and individuals in the state.

Although it is a win-win strategy, we are under no illusions that its implementation will be easy. It requires people and institutions to change, to learn new skills, to invest in new technologies, to take risks. Change is hard. But change is achievable with leadership. That is what we hope our report stimulates.



Warren Cook
Chair, Governor's Broadband Capacity Building Task Force

¹ "Broadband" refers to a fast connection to the internet that is always on. It can be on a computer, a smart phone, or a tablet.

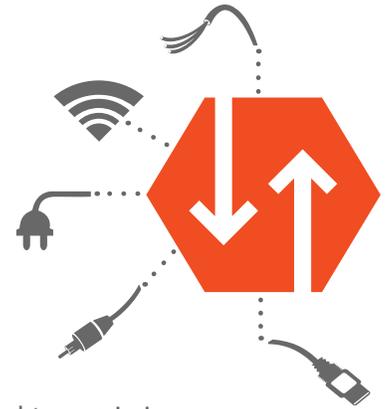
Executive Summary

What Is Broadband?

In the simplest definition, broadband is a fast connection to the internet that is always on. In the most complicated definition, broadband means all forms of high-speed digital communications among people, organizations and machines. It means billions of devices running billions of apps transmitting enormous volumes of voice, text, image, numeric and video content through wires, cables, cell towers and satellites to computer servers located all over the globe.

Use of this vast digital network is exploding, pushing ever more data through ever more connections to ever more devices. Industry experts agree that wired broadband will not be able to meet this growing demand, and wireless devices and transmission technologies will play a larger and larger role in meeting users' apparently insatiable desire to communicate – and to draw useful information from all these communications.

Broadband communication comes to people through wires, satellites, cell towers – and often a combination of the above – on its long journey from source to your computer or tablet or cell phone.



Broadband Trends

What does the future of internet use look like? No one knows, or can possibly predict. Between 2000 and 2012, internet use worldwide increased by more than 550%.² With constantly emerging new ways to use data, that rate is likely to accelerate. The only clear prediction is that tomorrow will be different. Several recent trends, however, reveal general patterns of use that should guide state policy toward broadband development.

- **Ubiquity:** Ubiquity means that the network is available everywhere and always on.
- **Crowdsourcing & Broad Collaboration:** Crowdsourcing is the process of distributing tasks to a geographically dispersed group of people.
- **Big Data:** The term “big data” encompasses several trends, but at its heart refers to the capacity to access and analyze massive amounts of information from different sources.
- **Mass Customization & Individual Choice:** With ubiquity and big data comes the ability to understand, market to, or serve anyone anywhere with tremendous accuracy.
- **Application Hosting & Cloud Computing:** Thanks to greater adoption of broadband, the economics and infrastructure of hosting software in a central location and letting users access it remotely (instead of selling it to them on shrink-wrapped discs) has become common.
- **Remote Sensing, Monitoring & Tracking:** Devices that are linked to distance diagnostic or data-processing centers – like EZPass transponders, cameras, thermometers, or blood testing kits – have created opportunities to reduce the bottlenecks and expense of collecting remote information.

² World Internet Usage and Population June 30, 2012, <http://www.internetworldstats.com/stats.htm>

Broadband In Maine

Why It Matters

In Maine, increased broadband use and availability can save money and increase choice by offering:

More Jobs for Maine.

- 21% of economic growth in developed economies from 2004 to 2009 is attributed to the internet³
- 97% of American consumers look online for purchases⁴
- Start-up businesses can save \$16,500 annually by making use of internet-based services⁵
- Companies that make extensive use of broadband internet grow more quickly than companies that don't⁶

Better and More Affordable Health Care.

- More individual control of care
- Faster access to experts
- Lower insurance costs due to more efficiency

Individualized, Interactive, Affordable Education.

- Student access to the best teachers
- Quality diagnostic information available to teachers
- Individualized learning programs

Responsive, Affordable Government.

- No waiting in line for licenses and permits
- Interactive feedback to elected officials about current proposals
- Lower cost to taxpayers for back office functions like assessing, billing, etc.
- Reduced paperwork and administrative costs



Where We Are

Maine's broadband problem is not that we don't have enough "high-tech" businesses. Nor is it that we don't have "fiber to every home and every business." Our problem is that we don't even come close to fully utilizing the broadband capacity we already do have. In the face of the dramatic opportunities for business growth available through more and better utilization of the internet, 59% of Maine's 141,000 small and intermediate size businesses do not have a website, and 55% see no need for using the internet.⁷

When asked why they don't make greater use of broadband, 54% of Maine households and 55% of Maine businesses responded that they didn't see any value in such use. Another 18% of households and 18% of businesses said that the cost of higher levels of service was too great.⁸

3 McKinsey Global Institute, Internet matters: Is this The Net's sweeping impact on growth, jobs, and prosperity, May 2011 by Matthieu Pélissier du Rausas, James Manyika, Eric Hazan, Jacques Bughin, Michael Chui, Rémi Said, http://www.mckinsey.com/insights/high_tech_telecoms_internet/internet_matters

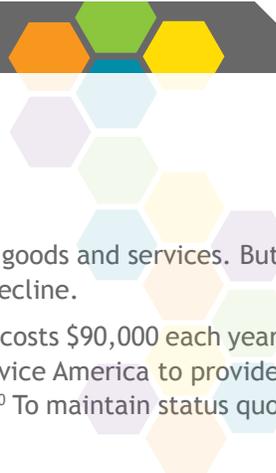
4 BIA/Kelsey's (www.bia.com and www.kelseygroup.com) User View Wave VII, 2010

5 Wednesday, April 18, 2012, Broadband Saves Entrepreneurs More Than \$16,000, <http://www.internetinnovation.org/press-room/broadband-news-press-releases/broadband-saves-entrepreneurs-more-than-16000/>

6 McKinsey Global Institute, Internet matters: Is this The Net's sweeping impact on growth, jobs, and prosperity, May 2011 by Matthieu Pélissier du Rausas, James Manyika, Eric Hazan, Jacques Bughin, Michael Chui, Rémi Said, http://www.mckinsey.com/insights/high_tech_telecoms_internet/internet_matters

7 James W. Sewall Company for the ConnectME Authority, Developing Broadband in Maine: Baseline Update 2013, Volume 1, Retrieved from <http://www.maine.gov/connectme> (publication pending)

8 Ibid.



The Danger of Falling Behind

If Maine lags behind in the adoption of broadband internet, our economy will lose out.

- **Maine will lose jobs to the competition:** 97% of American consumers look online for goods and services. But 59% of Maine businesses don't even have a website. This is a formula for economic decline.
- **Maine's families will sink under the burden of health and government expenses:** It costs \$90,000 each year to pay for nursing home care.⁹ It costs \$5,000 a year for Damariscotta-based Full Service America to provide equivalent long-term care in the home, using simple telecommunication technology.¹⁰ To maintain status quo in Maine will cost \$200 million more each year in MaineCare expenses alone.¹¹
- **Maine students will fall behind:** The U.S. Department of Education has found that "students who took all or part of their course online performed better, on average, than those taking the same course through traditional face-to-face instruction."¹²
- **The choice is simple:** Embrace the communications revolution that surrounds us, or lose out. The world is passing us by. Every minute we delay, the cost of catching up accelerates. We must act now.

What's the Smart Way To Proceed?

Many observers believe that enormous public benefit will flow from more extensive investments in internet connections; their philosophy is, "Build it, and they will come." A Maine-based commentator puts it starkly: "It's long past time for us to connect *every* home and business in Maine to the existing fiber networks. If that ever happens, we will see an economic boom..."¹³ Fiber to every door, in the commentator's view, will be our economic salvation.

A second way of looking at the public policy question is to focus on the demand side. While supply-siders believe that building a publicly subsidized network is the first step to increasing broadband use, demand-siders believe that informed, engaged users of broadband who see the benefits of increased service will help pay for network extensions.

Demand-siders focus on enabling entrepreneurs to develop business models based on the internet, and letting them lead providers to the demand those efforts create. Demand-siders say, "Put whatever public resources may be available into encouragement for entrepreneurs, not into subsidies for providers." While nobody on either side disputes the public benefit of widespread internet connections, demand-siders focus less on the initial physical placement and type of infrastructure.

The demand side implications for the task force are two-fold:

- **Increase Use:** Maine's broadband problem is not that we don't have fiber to every home and business, but that we don't even come close to fully utilizing the broadband capacity we already do have; and
- **Build Demand:** Therefore, the central goal of Maine's public policy toward broadband should be to encourage entrepreneurs who will build demand.

9 Univita 2010 Cost of Care Survey, <http://www.univitahealth.com/media/2010-Cost-of-Care-Survey-Final.pdf>

10 Damariscotta doctor working to care for elderly in their homes," Dec 17, 2010 <http://www.wch6.com/news/local/story.aspx?storyid=141108>

11 Planning Decisions Inc. estimate (see chart on page 17)

12 U.S. Department of Education. (2010). Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies. <http://www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf> as cited in Research on the Effectiveness of Online Learning. (2011).

13 Sullivan, D. (2012, August 6). Politicians: Connect Maine to the internet. *Bangor Daily News*.



Technology First vs. Solutions-Based Approach

We need to make broadband available to everyone in Maine. But we shouldn't pick winners when it comes to different types of technology. The popular technology today may be outdated tomorrow – think of the desperate attempts to find programmers for aging, obsolete computer systems. Maine policymakers should create an environment that allows all players equal footing in broadband expansion, and allow the private market to choose the winners.

What Are the Benefits of Moving Ahead?

If the recommendations presented in this report are carried out over the coming decade, the impact in year 10 will be:

- Creation of over 11,000 additional jobs in Maine
- Paying nearly \$500 million of new income in Maine
- Generating over \$70 million of new state & local tax revenues in Maine

Recommendation 1: Help Maine Businesses Move to the Internet

The State of Maine should provide a three-year tax credit for all Maine small and medium businesses for internet-related staff training and marketing expenditures.

97% of American consumers look online for goods and services. But 59% of Maine businesses don't even have a website. This needs to change.

The result would be a cumulative increase in sales of nearly \$270 million, supporting nearly 1,500 new jobs. The key to meeting this goal is business education. Maine's business owners and operators must more fully embrace the digital world. The best way to do this is to make the leap less fearful and expensive.

Recommendation 2: Help Maine's Elderly Stay at Home

Use in-home technologies to reduce the proportion of elderly on MaineCare receiving long-term care in institutions from 65% to 40% by 2015, and to 20% by 2020. This will allow seniors to stay home longer – which is what they want – and at the same time save Maine taxpayers over \$100 million in 2015, and over \$250 million annually in 2020.

The average cost of a nursing home bed is about \$90,000 each year and few seniors prefer living in an institution. Telemedicine has been adopted by many providers here in Maine and around the country to improve care and save money. Dr. Chip Teel of Damariscotta developed an approach that takes telemedicine a step further, using simple broadband communication technologies to help elderly stay in their homes for about \$5,000 a year by allowing them (and their children) to use simple off-the-shelf technology like cameras and Skype for 24-hour communication. But it's not all technology. Home visits, volunteering, transportation help, and neighbor check-ins are also essential to creating a high quality of life for participants in the program.¹⁴

¹⁴ Teel, A. S. (2011). *Alone and invisible no more: How grassroots community action and 21st century technologies can empower elders to stay in their homes and lead healthier, happier lives*. White River Junction, Vt: Chelsea Green Pub.



However, Maine’s Department of Health and Human Services has policies that are more restrictive than other states regarding reimbursement for expenses for such new approaches under MaineCare, so even though these techniques have been pioneered in Maine, other states are now moving ahead faster in implementation.¹⁵ Maine needs to apply for federal waivers that would allow the reimbursement of new in-home technologies in order to reduce the proportion of elderly on MaineCare receiving long-term care in institutions.

Recommendation 3: **Educate Health Data Analysts**

Develop a talent pool of health informatics specialists to expand Maine’s competitive advantage in health information systems by:

- **Building a broad-based data analytics competency in Maine’s K-12 schools** by creating statewide education policies and incentives that reward innovation in teaching curricula and demonstrate student competency in the command of data analytic methods.
- **Further investing in more specialized knowledge in health informatics at the university level** by undertaking an assessment of university assets in healthcare and data analytics to discern and prioritize gaps, focusing particularly on which segments of health data analytics are central to this new growth strategy.

Information technology has permeated every aspect of our economy and lives, generating a volume and diversity of data that can be made readily available and useful through the internet. Those who know how to access and use these data are opening doors to a wealth of unprecedented, and often disruptive, opportunities. Virtually every enterprise and job is vulnerable. Yet Maine and the nation as a whole are not prepared. McKinsey Global Institute projects that the U.S. will face a shortage of 140,000 to 190,000 data analytic specialists¹⁶ within only a few years. And this shortage speaks only to the specialists. The ability to gather, manipulate and interpret data is fast becoming a line item of nearly every job description, specialist or not.

As a nationally recognized leader in using health information technology,¹⁷ Maine can and should be a national leader in developing this high-value talent thanks to its unique assets in health data systems and health policy education. Developing this talent locally will have a compounding benefit to Maine’s private and public institutions, driving growth and high-value job opportunities.

Recommendation 4: **Make the UMaine System a Model for Blended Learning**

UMaine should get 25% of its courses online by 2015, revise its financial incentives to reward online learning, and create consolidated degree programs when possible.

Research has shown that the most effective learning environment is one that combines the best of online learning with face-to-face classroom teaching.¹⁸ The University of Maine system has faculty, facilities and students all around the state, including up to 150,000 adults who started – but have yet to complete – their

15 Ten states now authorize telemedicine coverage under Medicaid, but not Maine - see American Telemedicine Association 2013 *State Telemedicine Legislation Tracking*. Retrieved from <http://www.americantelemed.org/docs/default-source/policy/state-telemedicine-legislation-matrix.pdf?sfvrsn=48>

16 Manyika, James, et. al. “Big data: The next frontier for innovation, competition, and productivity”, McKinsey Global Institute, May 2011.

17 *Maine one of three states nationally recognized for use of health information technology* | HealthInfoNet. Retrieved from <http://www.hinfor.net.org/news-events/news/maine-one-three-states-nationally-recognized-for-use-health-information-technology>

18 *Research on the Effectiveness of Online Learning*. (2011). The Future of State Universities. <http://www.academicpartnerships.com/research/ap-white-paper-compilation-research-online-learning>



college studies.¹⁹ It has high speed broadband connecting all of the campuses. UMaine is the ideal laboratory for developing the new model of college education, one that will serve adult learners equally as well as young high school graduates.

Recommendation 5: **Provide Every Elementary and High School Student an Internet Connected Device**

Expand Maine’s laptop program to all students K-12, and pay for this expansion with savings that result from switching to 100% digital textbooks.

In 2002, Maine became the first state in the nation to provide a laptop to every 7th and 8th grade student. Research by David Silvernail has shown that laptop use in middle schools has contributed significantly to improvements in student test scores in writing and math.²⁰ Teachers reported that it helped them to respond better to individual students. A recent review of what is working in schools around the country found that schools employing a 1:1 student-computer ratio outperform other schools.²¹

Paper textbooks are heavy, expensive, and become out of date quickly – many students use textbooks that are 7-10 years old and often contain outdated materials. Digital textbooks are more flexible, more effective, and less expensive. Digital instructional materials are interactive and personalized, allowing students to explore content more deeply. Recent U.S. Department of Education studies have found that technology-based instruction can reduce the time students take to reach a learning objective anywhere from 30 to 80 percent. The annual cost savings from switching to digital instructional materials are estimated at \$600 per student. With 184,685 K-12 students in Maine, that would amount to more than \$110 million in annual savings.

The Maine Department of Education has estimated that the state spends approximately \$285 per student, per year, for the existing middle school program, including a device, technical support, professional development, and warranties. At \$285 per student, per year, expanding the program to include all K-6 and 9-12 students would cost an additional \$44 million per year. A portion of the local savings from the switch to digital textbooks (\$110 million annually) could pay for the increased expense.

Recommendation 6: **Save Tax Dollars by Shifting Administrative Functions Online**

Adopt a formal target of reducing the growth rate of state and local government administrative spending per person by 25% over the coming decade. Achieving this goal would produce a relative savings in 2020 of over \$47 million and a cumulative saving over the decade of over \$260 million.

The early Maine experience with online government administration has been positive. Reserving state park campsites online has saved campers hours of waiting in line and the Maine Bureau of Parks hundreds of thousands of dollars. Filing state income tax returns online has gotten refunds into the pockets of taxpayers faster and has saved Maine Revenue Service hundreds of thousands of dollars each year.

19 *A Stronger Nation Through Higher Education: Maine.* (2012, March). Retrieved from http://www.luminafoundation.org/publications/state_data/2012/Maine-2012.pdf

20 Silvernail, D. L., & MLTI Research and Evaluation Team at the Maine Education Policy Research Institute, University of Southern Maine Muskie School of Public Service. (2011, August). *A Middle School One-to-One Laptop Program: The Maine Experience.* Retrieved from http://www.usm.maine.edu/sites/default/files/cepare/MLTIBrief20119_14.pdf, pg 23-25.

21 Greaves, T.; Hayes, J.; Wilson, L.; Gielniak, M.; & Peterson, R., *The Technology Factor: Nine Keys to Student Achievement and Cost-Effectiveness*, MDR 2010



If current trends continue, the per-person cost of administering state and local government in Maine would increase to \$527 by 2020. At this rate, even with Maine’s slowing population growth, state and local administrative costs will exceed \$700 million in 2020. If Maine can slow the current 37% per decade increase in the per-person costs of administering its state and local government programs, the savings would amount to tens of millions of dollars each year and, over the course of a decade, accumulate to hundreds of millions of dollars.

Recommendation 7: **Make the Maine Turnpike a Model for Smart Roads**

The Maine Turnpike Authority and the State of Maine should become a model for Smart Road transportation by:

- Installing fiber optic cable along the length of the Maine Turnpike
- Establishing a Center for Digital Transportation Services to identify and develop cost-saving, service-enhancing projects from Smart Road transportation data
- Developing and adopting a state Dig-Once policy to expand broadband infrastructure cost-effectively

Smart Roads are highways that use wireless technology to monitor traffic conditions, communicate those conditions directly to vehicles (“traffic accident 5 miles ahead”), and to send information about those conditions to emergency responders, road maintenance crews and the traveling public.

A second opportunity for broadband and the Maine Turnpike is utilizing the massive amounts of data already collected by the EZPass program. In 2012, Maine Turnpike traffic count was 60,596,022, and 65% of vehicles used EZPass electronic tags attached to vehicles to calculate distance traveled and charge tolls. The tag relays the vehicle’s entry and exit locations. In aggregate, this data could be used by the trucking industry to determine the best possible times to schedule travel. It could also be used by the tourism industry to analyze origins and travel patterns of visitors, and to forecast numbers of tourist arrivals.

A third opportunity lies in the cost of installing broadband infrastructure. According to the Federal Communications Commission (FCC), most of the cost of installing fiber optic cable for broadband usage is not for the cable itself – it is for the digging and placement of the cable into the ground or under the road. Estimates suggest that in rural areas, there is a cost savings of roughly 15.5% per mile when conduit and fiber are installed during rather than independent of a road project. Savings are greater in densely populated areas where complexity and cost of construction are highest.

A Dig-Once policy would make the installation of broadband conduit a regular practice in road construction projects. This would decrease the costs of deploying fiber and eliminate the need for multiple excavations.

Recommendation 8: **Redeploy Existing Funds to Support Broadband Growth**

Companies receiving Maine State Universal Service Fund assistance should support broadband expansion as well as landline telephone service.

The State of Maine should look comprehensively at all of its telecommunications funds to see whether they offer the proper incentives for broadband expansion and upgrading, and whether there are opportunities to increase the effectiveness of these efforts through fund consolidation.



Maine has a Universal Service Fund for telephone service, just as the federal government has. The federal government, through the Federal Communications Commission (FCC), has chosen to redirect its Universal Service Fund from the subsidy of telephone landline extension to broadband support, e.g. Connect America Fund. The FCC is now laying the groundwork for this change, and by next year there could potentially be tens of millions of dollars coming into Maine for broadband expansion, telehealth support, and lifeline support for broadband for low-income families.

By contrast, Maine’s Universal Service Fund has not undergone the same rethinking. In 2013, the fund distributed \$8 million for landline rural service. This amount could increase dramatically in future years. By contrast, the ConnectME Fund for broadband service is about \$1 million a year. The Maine Legislature should require that “provider of last resort” services subsidized under this program support broadband as well as telephone service.

We also recommend that the ConnectME Fund be allowed to support broadband expansion projects with a major economic impact – even if the project does not involve extending service to an unserved area.

1 Challenges

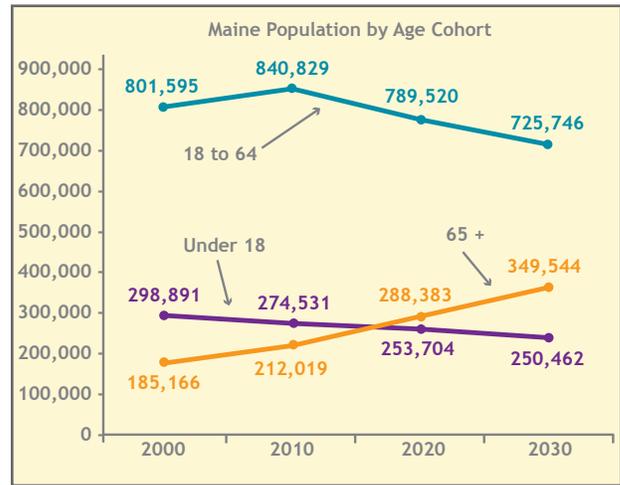
Maine is the oldest state in the nation, and growing older. In 2000, Maine had 60 people over the age of 64 for every 100 people under age 18. If current projections hold true, by 2030 that ratio will more than double to 140 “elderly” for every 100 of our young people. By 2020, our elderly will outnumber our youth. This change will have profound fiscal consequences as we struggle to find ways to care for the elderly while watching the costs of education rise in underutilized facilities we have spent billions to build over the past generation.

Maine’s looming population problem brings with it an even more threatening economic problem. Between 2010 and 2030, our working age population will fall by 14%, from 841,000 to 726,000. At the same time, at our current rate of job creation, we won’t regain our pre-recession (2006) level of employment until 2017.

We generally lag behind the nation in job growth and household income level. We pay more per capita than the national average for most of our essential public services such as health care, elementary and secondary education, and transportation. The reasons for this are that the state is rural and its population spread out, and that many of our public facilities are old and were built for a different era.

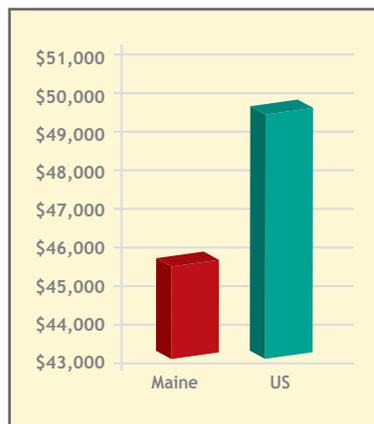
Together, these demographic and economic forces threaten to push our state into a fiscal death spiral. As the working age population can’t find jobs and moves away (and the only people coming to Maine are the retired who don’t need a job), the cost of maintaining aging and underutilized infrastructure rises with the cost of paying healthcare costs of our growing elderly population. This fiscal pressure leads to rising taxes, further inhibiting job creation. Over the past decade, the cost of operating Maine’s state and local governments has increased by 53%. Without significant changes to the methods and costs of meeting our public needs, that increase threatens to accelerate over the coming decade.

Maine Population by Age, 2000-2030



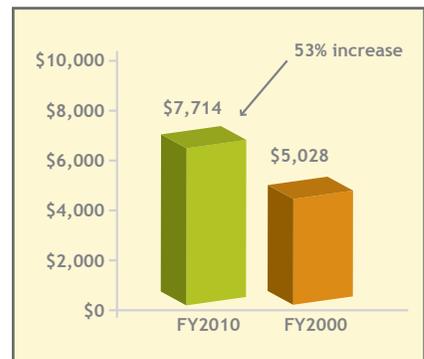
Source: Maine Office of Policy and Management | Maine Demographic Projections

Household Income in Maine and U.S., 2010



Source: U.S. Census

Maine State & Local Government Spending Per Person, 2000-2010



Source: U.S. Census of Government

2 Broadband

How Can Broadband Help Maine Address Its Pressing Problems?

What Is Broadband?

In the simplest definition, broadband is a fast connection to the internet that is always on. In the most complicated definition, broadband means all forms of digital communications among people, organizations and machines. It means billions of devices running billions of apps transmitting enormous volumes of voice, text, image, numeric and video content through wires, cables, cell towers and satellites to computer servers located all over the globe.

Use of this vast digital network is exploding, pushing ever more data through ever more connections to ever more devices. Industry experts agree that wired broadband will not be able to meet this growing demand, and wireless devices and transmission technologies will play a larger and larger role in meeting users' apparently insatiable desire to communicate – and to draw useful information from all these communications.

Broadband communication comes to people through wires, satellites, cell towers – and often in combination – on its long journey from source to your computer or tablet or cell phone.



How Is Broadband Used?

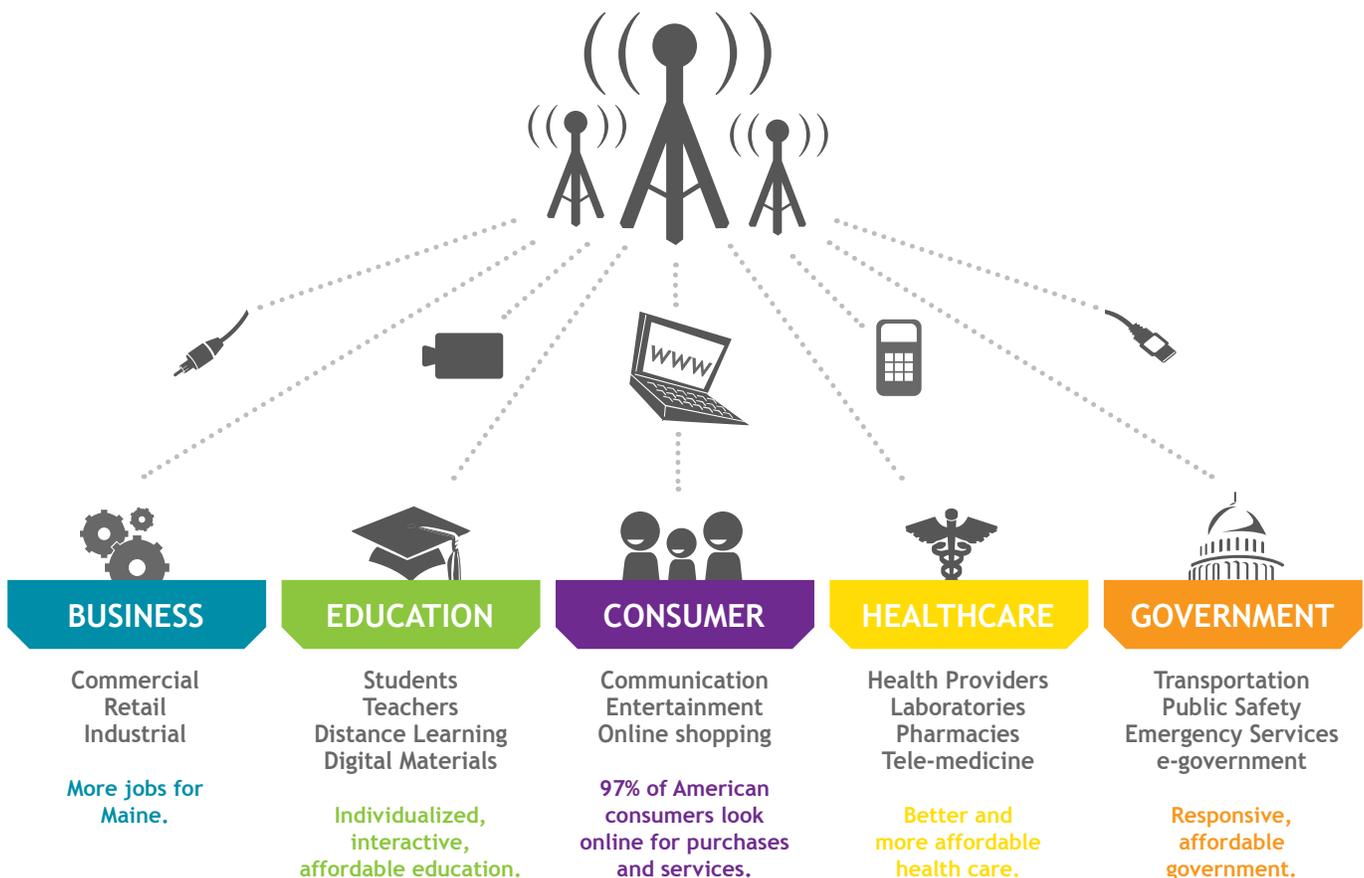
Personal Use

Most people don't think of electricity in terms of turbines, poles and wires. They think of it in terms of light bulbs, TV's, dishwashers, stoves, vacuum cleaners and the plug in the wall where they charge the batteries on all their mobile devices – and maybe their car. They think in terms of use, rather than delivery.

Yet many people, when they think about broadband, think in terms of poles, wires and cell towers. They think of *delivery* rather than *use*. Because broadband is in the relatively early stages of its development (at least compared to electricity), focus on the delivery technology is natural – that's where the excitement, mystery and action is. But transformative economic change comes not from the invention of a new technology, but from the penetration of that technology through all facets of life, spawning previously unimagined new industries and jobs.

So it is with broadband. Digital communication is delivered through airwaves, wires, poles, and towers, but real economic transformations (and youthful billionaires) are emerging from how it is changing the ways we communicate – with each other, with friends, family and groups of people and, increasingly, with the machines connected to this vast digital network.

This revolution has already changed our lives profoundly. We write home to our parents differently. We get our money from the bank differently. We get our news differently. We shop differently. We file our taxes differently. And the businesses on the other end of these interactions know about and interact with us differently.





Broadband Trends

What does the future of internet use look like? No one knows, or can possibly predict. Between 2000 and 2012, internet use worldwide increased by more than 550%.¹⁴ With constantly emerging new ways to use data, that rate is likely to accelerate. The only clear prediction is that tomorrow will be different. Several recent trends, however, reveal general patterns of use that should guide state policy toward broadband development.

Until recently, internet “progress” had been largely defined by large institutions in terms of network speed and capacity: How far and wide does it extend? How fast is it? How reliable? Which companies, providers and users will create new ways to use the network, and what will they be? In the last several years, however, as the overall network has become faster and included far more players than the traditional telecommunications companies, progress has come to be defined in other ways.

Ubiquity

In its early days, digital communication mirrored its ham radio predecessor – it was a service used when called upon, hence the term “dial up” for early versions of internet service. As networks improved, the internet paradigm shifted from “dial-up” to “always-on.” This shift brought a wide range of service and application possibilities, including voice-over-internet (making remote and global communications affordable), “push” services that afforded real-time distributed workflow, and automated services for users – think of being informed immediately when mail, a task, or a friend’s location is automatically brought to our attention. “Ubiquity” means that the network is available everywhere and always on. In the ubiquitous world, we don’t go get the news, we are “fed” the news constantly.

Crowdsourcing & Broad Collaboration

Crowdsourcing is the process of distributing tasks to a geographically dispersed group of people. Voting in a constitutional democracy is a fundamental form of crowdsourcing. Ubiquitous digital communication, however, vastly expands the possibilities of crowdsourcing. Instead of racking their brains alone, mathematicians make a problem available to the network and wait for the solutions to flow in. Instead of hitting up family and friends (or a bank) for a loan, potential borrowers make their need and credit history available to the network and wait for the loan offers to come in. For several years, the City of Saco, Maine, has hired a survey research firm to poll citizens regarding city services, and used the results to inform budget decisions. With crowdsourcing, this process could be expanded and focused in a wide variety of ways.

Big Data

The term “big data” encompasses several trends, but at its heart refers to the capacity to access and analyze massive amounts of information from different sources. From this data and analysis come new knowledge—knowledge attainable only with massive amounts of information and computer processing power. Accessing and processing these large volumes of data requires the power of many interconnected computing servers, which can range from dedicated servers in the high desert of Oregon (where Facebook keeps 127 acres of servers)¹⁵ to a laptop owner renting out processing time when her computer is idle. Big data presents both a potential threat to privacy and an enormous capacity to revolutionize shopping, job searching, paying taxes, filing licenses, diagnosing diseases and attending school. Its challenge to public policy is enormous.

¹⁴ World Internet Usage and Population June 30, 2012, <http://www.internetworldstats.com/stats.htm>

¹⁵ Rogoway, M. (2011, November 19). Data centers in Oregon: High tech meets high desert. *The Oregonian*. Retrieved from http://www.oregonlive.com/business/index.ssf/2011/11/data_clouds_settle_in_oregon_w.html



Mass Customization & Individual Choice

With ubiquity and big data come the ability to understand, market to, or serve anyone anywhere with tremendous accuracy. “You like that book (or movie, or skirt or vacation)? Here are four more like it we’re sure you’ll love just as much!”

Earlier stages of internet adoption permitted businesses to reach targeted markets that were otherwise too dispersed to serve cost-effectively. Today, thanks to big data and automated production processes, that “target market” has been refined, narrowed and analyzed until it becomes a market of one. This marketing, however, could apply to more than books, clothing and personal care products. It could also be used for a teacher’s student-specific lesson personalization, or a doctor’s therapeutic recommendations based on individualized characteristics. The opportunities are enormous, but only if we answer the challenge.

Application Hosting & Cloud Computing

Thanks to greater adoption of broadband, the economics and infrastructure of hosting software in a central location and letting users access it remotely (instead of selling it to them on shrink-wrapped discs) has become common, lowering the cost of software and extending its use. For example, Microsoft now lets you subscribe to (basically, rent) its suite of office software for ten dollars per month, instead of paying a much larger amount to purchase a box of software discs.¹⁶ This trend allows consumers to focus on what they do best, and leave supporting operations of software maintenance to the supplier.

Cloud computing allows people to log into internet-based services that host computer programs they need, instead of physically purchasing software, storage, and other services for their computer. Personal computers rely on external systems - often physically very far away - to “do the heavy lifting.”¹⁷ Cloud computing expands access to powerful computing to an even greater population than client/server computing. The results are reduced costs, ease of entry by new businesses without exorbitant start-up costs, and entirely new business models.

Client/server computing is what happens when you use your personal or work computer (the “client”) to request something from a much larger, geographically dispersed networked server, like Google or Yahoo. Client/server computing is cheaper and more accessible than its predecessor method, mainframe computing, which required that all data be located in the same place and accessed via terminals hooked up to the system.

As the speed and volume of information have increased, so has the portfolio of applications that are available to users both on computers and, increasingly, on mobile devices.

Remote Sensing, Monitoring & Tracking

The geographic ubiquity of internet access, combined with the expansion of remote sensing and data-reading technologies, has made machine-to-machine communication common in our everyday lives. Devices that are linked to distance diagnostic or data-processing centers – like EZPass transponders, cameras, thermometers, or blood testing kits – have created opportunities to reduce the bottlenecks and expense of collecting remote information. Digital tax returns, online permits, and distance learning modules are among the many ways machine-to-machine communication is changing how business, healthcare, education and governmental services are offered.

¹⁶ Buy Microsoft Office 2013 suites and Office 365 subscriptions - Office.com. Retrieved October 4, 2013, from <http://office.microsoft.com/en-us/buy/>

¹⁷ How Cloud Computing Works. Retrieved October 4, 2013, from <http://www.howstuffworks.com/cloud-computing/cloud-computing.htm>

What Can Broadband Mean for Maine?

In Maine, increased broadband use and availability can save money and increase choice by offering:

More Jobs for Maine.

- 21% of economic growth in developed economies from 2004 to 2009 is attributed to the internet¹⁸
- 97% of American consumers look online for purchases¹⁹
- Start-up businesses can save \$16,500 annually by making use of internet-based services²⁰
- Companies that make extensive use of broadband internet grow more quickly than companies that don't²¹

Better and More Affordable Health Care.

- More individual control of care
- Faster access to experts
- Lower insurance costs due to more efficiency

Individualized, Interactive, Affordable Education.

- Student access to the best teachers
- Quality diagnostic information available to teachers
- Individualized learning programs

Responsive, Affordable Government.

- No waiting in line for licenses and permits
- Interactive feedback to elected officials about current proposals
- Lower cost to taxpayers for back office functions like assessing, billing, etc.
- Reduced paperwork and administrative costs



18 McKinsey Global Institute, Internet matters: Is this The Net's sweeping impact on growth, jobs, and prosperity, May 2011 by Matthieu Pélissier du Rausas, James Manyika, Eric Hazan, Jacques Bughin, Michael Chui, Rémi Said, http://www.mckinsey.com/insights/high_tech_telecoms_internet/internet_matters

19 BIA/Kelsey's (www.bia.com and www.kelseygroup.com) User View Wave VII, 2010

20 Wednesday, April 18, 2012, Broadband Saves Entrepreneurs More Than \$16,000, <http://www.internetinnovation.org/press-room/broadband-news-press-releases/broadband-saves-entrepreneurs-more-than-16000/>

21 McKinsey Global Institute, Internet matters: Is this The Net's sweeping impact on growth, jobs, and prosperity, May 2011 by Matthieu Pélissier du Rausas, James Manyika, Eric Hazan, Jacques Bughin, Michael Chui, Rémi Said, http://www.mckinsey.com/insights/high_tech_telecoms_internet/internet_matters

3

Roadmap

Where We Are

Maine's broadband problem is not that we don't have enough "high-tech" businesses. Nor is it that we don't have "fiber to every home and every business." Our problem is that we don't even come close to fully utilizing the broadband capacity we already do have. In the face of the dramatic opportunities for business growth available through more and better utilization of the internet, 59% of Maine's 141,000 small and intermediate size businesses do not have a website, and 55% see no need for using the internet.²²

When asked why they don't make greater use of broadband, 54% of Maine households and 55% of Maine businesses responded that they didn't see any value in such use. Another 18% of households and 18% of businesses said that the cost of higher levels of service was too great.²³

The Danger of Falling Behind

If Maine lags behind in the adoption of broadband internet, our economy will lose out.



- **Maine will lose jobs to the competition:** 97% of American consumers look online for goods and services. But more than half of Maine businesses don't even have a website. This is a formula for economic decline.
- **Maine's families will sink under the burden of health and government expenses:** It costs \$90,000 each year to pay for nursing home care. It costs \$5,000 a year for Damariscotta-based Full Service America to provide equivalent long-term care in the home, using simple telecommunication technology. To maintain status quo in Maine will cost \$200 million more each year in MaineCare expenses alone.
- **Maine students will fall behind:** The U.S. Department of Education has found that "students who took all or part of their course online performed better, on average, than those taking the same course through traditional face-to-face instruction."²⁴

The choice is simple – embrace the communications revolution that surrounds us, or lose out. The world is passing us by. Every minute we delay, the cost of catching up accelerates. We must act now.

22 James W. Sewall Company for the ConnectME Authority, Developing Broadband in Maine: Baseline Update 2013, Volume 1, Retrieved from <http://www.maine.gov/connectme> (publication pending)

23 Ibid.

24 U.S. Department of Education. (2010). Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies. <http://www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf> as cited in Research on the Effectiveness of Online Learning. (2011). The Future of State Universities. [http://www.academicpartnerships.com/docs/default-document-library/white-paper-final-9-22-2011-\(1\).pdf?sfvrsn=0](http://www.academicpartnerships.com/docs/default-document-library/white-paper-final-9-22-2011-(1).pdf?sfvrsn=0)

Where We're Going

Forty thousand Maine households (7%) don't have broadband access. The ConnectME Authority estimates it will cost \$60 million to build the infrastructure to reach them. How can we stimulate the private sector to pick up more of this tab, instead of relying entirely on taxpayer subsidies?

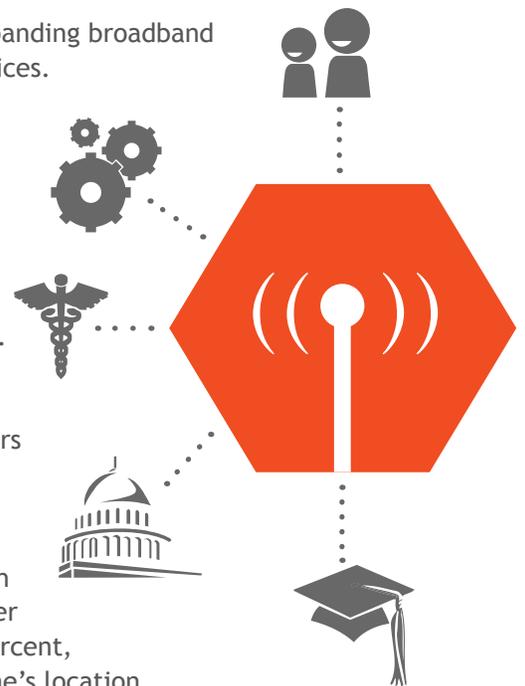
The *take rate* is the proportion of households who subscribe to broadband internet when it is available. The take rate in Maine is around 75%. That means that if a service provider extends a fiber line down a road, that provider can expect three out of four households to buy the service. If Maine had a 98% take rate like South Korea, the financial return to private providers for investing in infrastructure expansion would be a third higher than it is now. They would make more investments on their own. Less government financial help would be needed. The strategy presented in this report is based on the principle that the best way to expand Maine's broadband access is to expand Maine's broadband use.

The fundamental goal of Maine's broadband policy toward economic development should therefore be to encourage greater use, thus driving both small business sales and demand for greater broadband capacity. In particular, Maine should encourage low-intensity internet users (a category where Maine's share far exceeds the national average) to move to moderate levels of use (where Maine falls far below the national average).

A second but equally important benefit arising from this strategy is that expanding broadband use in Maine will grow the economy, and lower the cost of government services.

The Benefits of Increased Broadband

- **Maine becomes a more affordable place to live:** Lower health care inflation, lower education inflation, lower government inflation.
- **The quality of life improves for Maine people:** More individualized health care, more individualized learning, more responsive government.
- **Maine people enjoy more autonomy and choice:** Individuals actively participate in health care monitoring, treatment, and decisions. Learners actively create and implement their own learning agendas. Citizens participate in government decisions at every step, not just at elections.
- **Maine people have a shot at new businesses and jobs:** Business growth accelerates through more and faster connections to the world. Computer and information technology occupations are projected to grow by 22 percent, adding 758,800 new jobs to the U.S. economy from 2010 to 2020.²⁵ Maine's location changes from disadvantage to an advantage as wired businesses place an increasing emphasis on quality of life.
- **Maine gets younger:** We create a culture and economy where young people can work and enjoy life. Quality of life (natural beauty, safety, small-town atmosphere, good schools, good jobs) draws young people from around the globe. Communities that are "wired" for high-speed internet are more attractive to young people to live and work in. Communities lacking broadband internet are simply out of the running.



²⁵ Thibodeau, P. (2012, March 29). IT jobs will grow 22% through 2020, says U.S. - Computerworld. Retrieved from http://www.computerworld.com/s/article/9225673/IT_jobs_will_grow_22_through_2020_says_U.S.?pageNumber=1



Landscape

In the not so distant past, telecommunications was easy. You picked up a phone, dialed a number and spoke to someone over a copper wire. The phone company provided the service. If the call was local, the state regulated the price, and if the call was long distance, a federal agency regulated the price.

Today, telecommunications is much more complicated. It includes voice, data, email, TV, movies and videos. Some services are provided by what used to be the “phone company,” some by what used to be the “cable TV” company and an increasingly large portion by internet service providers, many of which are part of the phone company.

Pricing, too, has become more complicated. The simple “local versus long-distance” distinction has been replaced with complicated bundles of services that increasingly put customers in the middle of fights between service and content providers that lead to blackouts of favorite TV shows. Some providers are still regulated at the federal level, and some at the state level, even though they compete directly in the same market for the same service. AT&T and Verizon are federally regulated, while FairPoint and smaller local “land-line” companies are subject to state regulation. And some companies that haven’t been subject to telecommunication regulations at all – like Google, Amazon, Apple and Netflix – are moving closer to telecommunications in the services they provide.

The choices for consumers and businesses across the globe and in Maine are exploding. The central question for any particular consumer is, “What level of service – meaning speed and reliability – is available to me, and at what price?” In Maine, the answer to that question depends on where you live. As is true of any utility, the per-person cost of extending the telecommunications network rises as population density falls. Telecommunications providers are forever asking the question, “Can I sign up enough users in that area to justify my cost of extending the network?”

Unlike electricity and simple voice communications, however, the telecommunications network is not an “all or nothing” operation. With electricity, you either have it or you don’t. With broadband, you may have a connection, but it may not have the speed or reliability to do all the things you want.

The FCC defines broadband in terms of tiers of the speed (bytes per second) with which a device at a particular connection can transmit data.

FCC’s Seven Tier Broadband Classification

FCC Speed Tier	Upload/Download Speeds	Broadband (Y/N)
1st Generation Data	200 kbps to < 768 kbps	No
Tier 1	768 kbps to < 1.5 Mbps	Yes
Tier 2	1.5 Mbps to < 3 Mbps	Yes
Tier 3	3 Mbps to < 6 Mbps	Yes
Tier 4	6 Mbps to < 10 Mbps	Yes
Tier 5	10 Mbps to < 25 Mbps	Yes
Tier 6	25 Mbps to 100 Mbps	Yes
Tier 7	> 100 Mbps	Yes

Source: James W. Sewall Company for the ConnectME Authority, 2013



Download and Upload Speeds for Types of Applications

Application	Download Speeds	Upload Speeds
Basic Email Voice Over IP (VOIP) Browsing YouTube Video	768 kbps - 1.5 Mbps	256 kbps - 896 kbps
Remote Surveillance Telecommuting Streaming Music Standard Definition Video	1.5 Mbps - 3 Mbps	356 Kbps - 1 Mbps
Internet Protocol Television (IPTV) File Sharing (small/medium files)	3 Mbps - 6 Mbps	356 kbps - 1 Mbps
Video On Demand Remote Diagnosis (basic) Online Gaming	6 Mbps - 10 Mbps	768 kbps - 2 Mbps
IPTV High Definition (HD) Telemedicine Remote Education	10 Mbps - 25 Mbps	2 Mbps - 5 Mbps
HD Video Surveillance Smart/Intelligent Building Control Educational Services	25 Mbps - 50 Mbps	5 Mbps - 10 Mbps
Video Conferencing Multiple Educational Services Research Applications Remote Supercomputing	50 Mbps - 100 Mbps	10 Mbps - 25 Mbps
Real-time Data Collection Real-time Medical Image Consultation	> 100 Mbps	≥ 100 Mbps

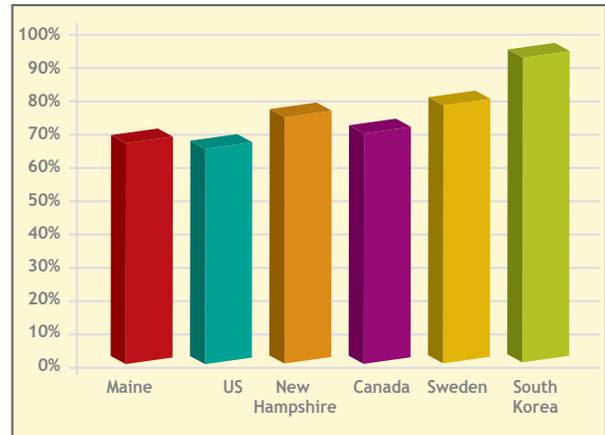
Source: James W. Sewall Company for the ConnectME Authority, 2013

The ConnectME authority has engaged in a major effort to map the scope of both broadband service and capacity in Maine.²⁶

Maine has a very high level of Tier 1 service access; when provider service lines are measured, slightly more than 93% of all street locations in Maine have access to broadband. When Maine households and businesses are surveyed, a similar percentage have access to the internet – but not as many reach the minimum connection speeds for Tier 1 levels of service.²⁷ Tier 1 levels of service are associated with common internet functions such as web-based email, sending and receiving small files, and limited web browsing.²⁸

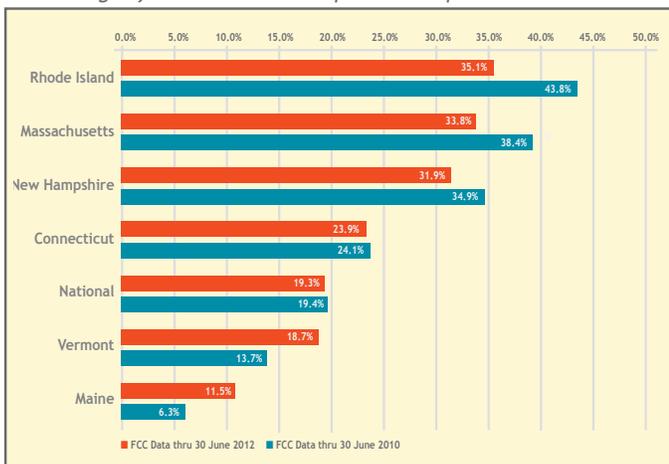
In Maine, the percentage of all internet users with at least Tier 1 connections is slightly below the national average, but the share with connections at Tier 5 levels or more is far below the national average. Maine is roughly in the middle of the pack when it comes to broadband usage in the home. About 7 in 10 Mainers have broadband in the home.

Maine Household Broadband Use, 2013



Sources: *The Whole Picture: Where America's Broadband Networks Really Stand*, February 12, 2013; and *Exploring the Digital Nation: America's Emerging Online Experience*, Prepared by National Telecommunications and Information Administration and Economics and Statistics Administration, June 2013

Percentage of Connections with Speeds 10Mbps or Greater



Source: James W. Sewall Company for the ConnectME Authority, 2013

Maine ranks 19th among the 50 states in broadband use, and is a bit above the national average.²⁹ But Maine's economic competition is not just other states – it is the world. The U.S. ranks 15th among countries in the world. The international star is South Korea, with nearly 100% usage. About 93% of Mainers have access to some form of broadband, but only 75% have it their home – and when they do, their connection speed may be severely limited. Maine ranks 49th in internet speeds in the nation, with an average download capacity that just barely qualifies as Tier 1 broadband access.³⁰

26 *About Mapping: Find Broadband Options: ConnectME*. Retrieved from <http://www.maine.gov/connectme>

27 James W. Sewall Company for the ConnectME Authority, *Developing Broadband in Maine: Baseline Update 2013, Volume 1*, Retrieved from <http://www.maine.gov/connectme> (publication pending)

28 *The Whole Picture: Where America's Broadband Networks Really Stand*, February 12, 2013, by Richard Bennett, Luke A. Stewart and Robert D. Atkinson, <http://www.itif.org/publications/whole-picture-where-america-s-broadband-networks-really-stand>; and *Exploring the Digital Nation: America's Emerging Online Experience*, Prepared by National Telecommunications and Information Administration and Economics and Statistics Administration, June 2013, <http://www.ntia.doc.gov/report/2013/exploring-digital-nation-america-s-emerging-online-experience>

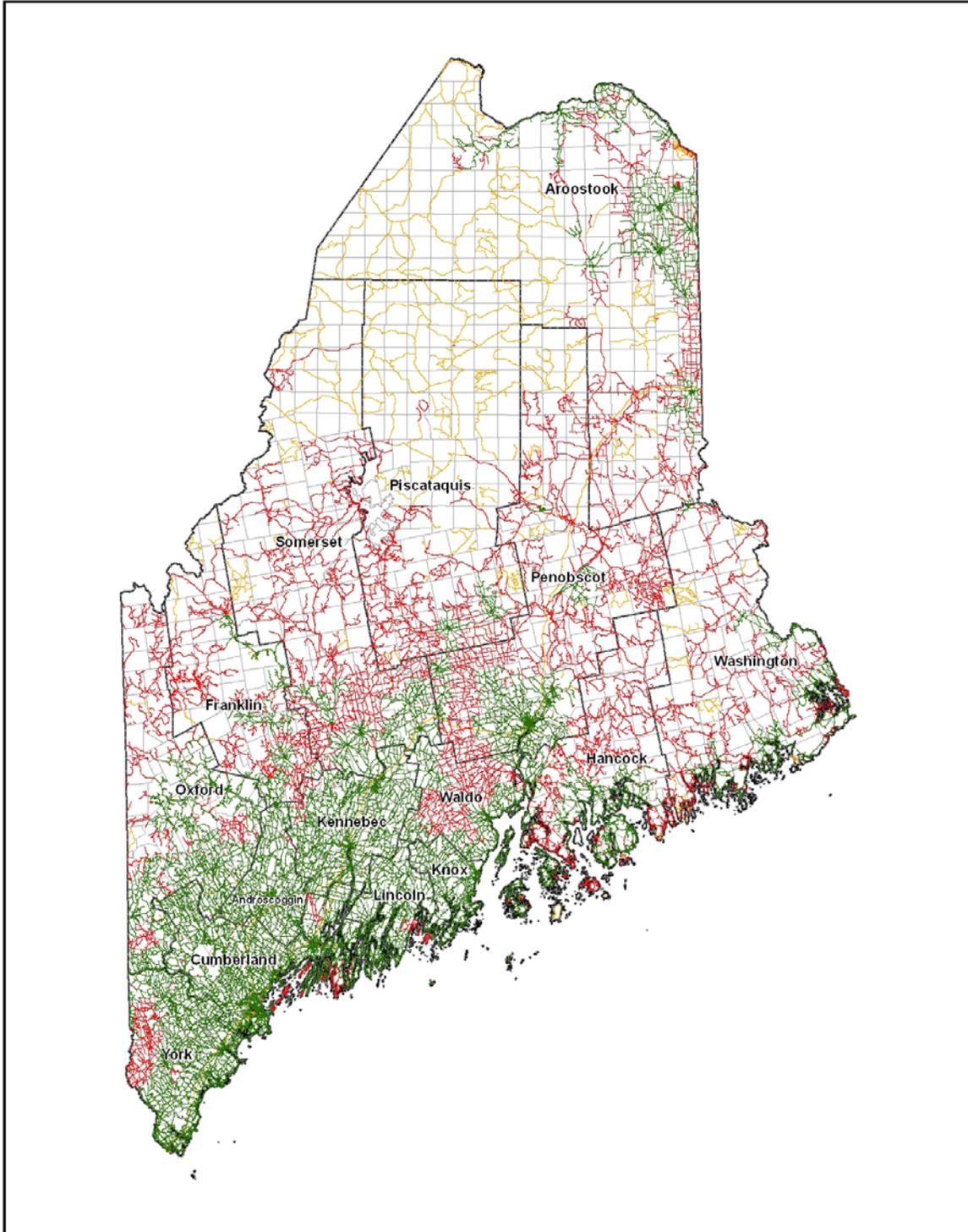
29 James W. Sewall Company for the ConnectME Authority, *Developing Broadband in Maine: Baseline Update 2013, Volume 1*, Retrieved from <http://www.maine.gov/connectme> (publication pending)

30 *Ibid.*



MAINE BROADBAND SERVICE COVERAGE

WIRED AND FIXED WIRELESS TECHNOLOGIES: FCC SPEED GREATER THAN OR EQUAL TO TIER 3
(Maximum advertised download and upload speeds: Greater than or equal to 3 Mbps)



- BROADBAND SERVICE MEETING OR EXCEEDING TIER 3 CRITERIA
- NO BROADBAND SERVICE MEETING OR EXCEEDING TIER 3 CRITERIA
- LOCATIONS WITH NO REPORTED PROVIDERS OR BUSINESSES
- TOWN
- COUNTY



Source: James W. Sewall Company for the ConnectME Authority, 2013. *Developing Broadband in Maine: Needs Assessment Volume I*. Retrieved from <http://www.maine.gov/connectme>



What's Driving Us?

The task facing the Governor's Broadband Capacity Building Task Force is to recommend state policies relative to deployment and use of high-speed internet connections. These policies can be addressed from two perspectives – supply and demand. While it is critical to examine policy approaches and implications from both sides, the Governor's Broadband Capacity Building Task Force has concluded that the demand side will best help Maine to solve problems in education, healthcare, government expenditures and business expansion.

Supply Side

The central question facing internet service providers (ISPs) when they look at capital investment spending is, "How many users do I need to sign up to justify the cost of extending service to their area?" Various providers have told the ConnectME Authority that, telecom companies are looking on average for twenty-five homes per mile before they will expand their networks. While Maine's ISPs may argue about specific numbers in specific areas, all agree with the central problem – they need to have some minimum assurance of demand before supplying the connection.

Looking at the supply side, the question for public policy becomes one of the benefits of public subsidies to ISPs to help them to extend their networks farther than would usually be profitable. If the answer to the question, "Is there a public benefit..." is "yes", then a series of questions follows:

- **What is the value of the public benefit?** How much subsidy can taxpayers or communications ratepayers justify with some reasonable expectation of payback? This formulation simply extends the investment mindset of a private ISP to public taxpayers or communications ratepayers.
- **Where is that public benefit greatest?** In what geographic area? In what use? Households, businesses, government or community anchor institutions such as schools, hospitals, community centers? Or machine-to-machine connections such as health monitors, manufacturing controls, traffic lights, or drone aircraft?
- **How can the subsidy most effectively be collected and allocated?** Through general taxes or communications ratepayers? Through negotiating subsidized rates or allocating competitive grants?
- **Quantity vs. quality?** Is extending a minimum level of connection to everyone more important than increasing the quality (speed, reliability, redundancy) of service to a potential high-use population? Where will the state get the greatest bang for its subsidy buck?

Many observers believe that enormous public benefit will flow from more extensive investments in internet connections; their philosophy is, "Build it, and they will come." Fiber to every door will be our economic salvation.

Demand Side

A second way of looking at the public policy question is to focus on the demand side. While supply-siders believe that building a publicly subsidized network is the first step to increasing broadband use, demand-siders believe that informed, engaged users of broadband who see the benefits of increased service will help pay for network extensions.

Demand-siders focus on enabling entrepreneurs to develop business models based on the internet, and letting them lead providers to the demand those efforts create. Demand-siders say, "Put whatever public resources may be available into encouragement for entrepreneurs, not into subsidies for providers." While nobody on either side disputes the public benefit of widespread internet connections, demand-siders focus less on the initial physical placement and type of infrastructure.



This philosophy is embodied in a statement by Jim Clifton, Chairman of Gallup, the international public opinion company. “Entrepreneurship,” Clifton says, “... doesn’t just provide supply, it *builds* demand. It was not,” he continued, “the invention of the internet, but the commercialization of the internet that advanced America and the world.”³¹

Based on his decades of research on what he calls “behavioral economics and customer science,” Clifton goes on to distinguish entrepreneurship from innovation and explain why it is the key to future prosperity for any city, region or nation. The implication of Clifton’s position for the Task Force is twofold:

- **Increase Use:** Maine’s broadband problem is not that we don’t have fiber to every home and business, but that we don’t even come close to fully utilizing the broadband capacity we already do have; and
- **Build Demand:** Therefore, the central goal of Maine’s public policy toward broadband should be to encourage entrepreneurs who will build demand.

Tools

Technology First vs. Solutions-Based Approach

We need to make broadband available to everyone in Maine. But we shouldn’t pick winners when it comes to different types of technology. The popular technology today may be outdated tomorrow – think of the desperate attempts to find programmers for aging, obsolete computer systems. Maine policymakers should create an environment that allows all players equal footing in broadband expansion, and allow the private market to choose the winners.

It can be daunting, given rapid technological changes and an ever-changing array of market participants, to make sense of where to place priorities when creating an internet strategy, whether you’re a business, a community, or a state. While many arguments have merit, there are differing viewpoints on the role of broadband in development and change.

Technology First: Supply-siders may argue that because of the rapid pace of change, it is too difficult to predict tomorrow’s uses (or users) of broadband; the best broadband strategy is to devote resources to extending the highest capacity fiber-optic cabling to businesses and households throughout the state. This approach, although understandable, is high cost, and the return on investment must be left to faith. It also dismisses technological developments by ignoring other methods of accessing the internet, such as wireless technologies, that may eventually have equal or greater importance for gathering or accessing data from a broad geographical spread. Given Maine’s geography, this is an important factor to consider.

Solution-Based: An alternative viewpoint on the role of broadband is to look first at business or civic challenges to be overcome, and then at the role of broadband in creating cost-efficient solutions. The financial analyst may argue that focusing on the problem – rather than the technology – leads to optimal investment and application of appropriate technology. From this viewpoint, the analyst may start with a specific problem, such as growing Maine’s small and medium size enterprises (SMEs). A similar approach could be applied to assess broadband needs in education, healthcare, and remaining opportunity areas. Understanding the problem will clarify both the opportunity for leveraging the internet and the investment that may be needed.

Entrepreneurs will find ways to build new businesses, and the customers they create will lead ISPs to extend internet connections to previously unserved areas.

31 Clifton, J. (2011). *The coming jobs war: What every leader must know about the future of job creation*. New York, NY: Gallup Press. p89.

4 Summary of Findings

The Task Force examined how broadband could affect four major policy targets: economic development, health care, education and the delivery of state and local government services, an area that has become known as eGovernment. The following sections of this report summarize Task Force findings in each topic area.

Economic Development

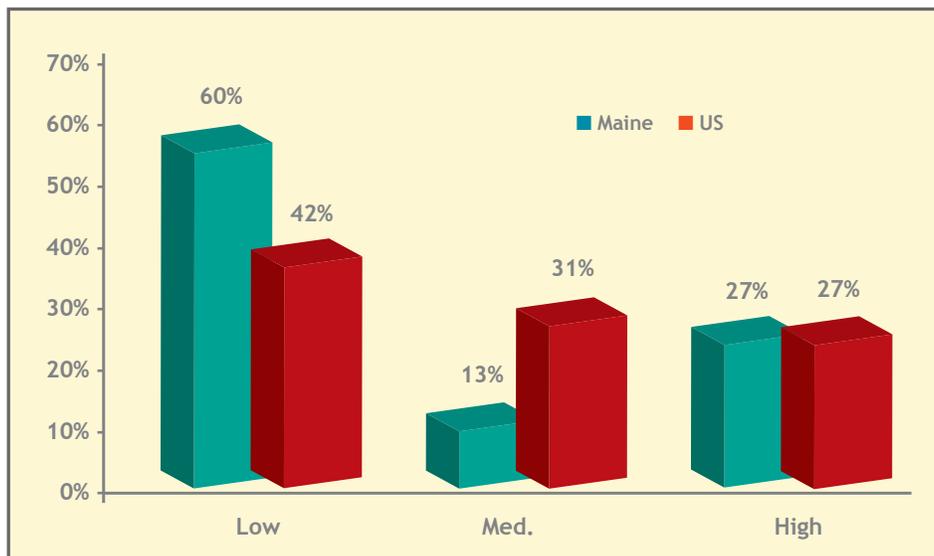
Problem

Maine businesses could grow dramatically if they made better use of the ever-increasing opportunities offered through the internet: 97% of American consumers look online for goods and services³² – yet 59% of Maine’s 141,000 small businesses do not have a website and 55% see no need for using the internet, and too few young Mainers have the skills to fill internet-based job opportunities.

What Can Maine Do?

Nationally, small and medium size business enterprises with high web use grew more than twice as fast as those with low web use.³³ Internet use is not just for high-tech businesses; 75% of internet-generated economic growth is in traditional industries – it comes from making people more productive in the jobs they’re already doing;³⁴ 21% of economic growth in developed economies from 2004 to 2009 occurred because of the internet.

Distribution of Small and Medium Enterprises by Level of Internet Use



Developing Broadband in Maine: Needs Assessment, Volume I, Prepared by James W. Sewall Company for the ConnectME Authority, 2013

32 Google. (2013). *Maine get your business online*. Retrieved from <http://www.gybo.com/maine/>

33 Manyika, James, et. al. "Big data: The next frontier for innovation, competition, and productivity", McKinsey Global Institute, May 2011.

34 Ibid.

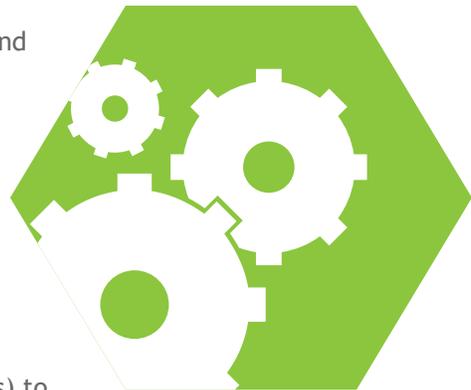


There are enormous opportunities for business creation and growth.

- **Big Data:** Remote data storage and easily scalable computing are rapidly driving down the costs of doing business and managing information,³⁵ opening up “unimaginable new markets.”³⁶
- **Smart Manufacturing:** 3-D printing allows direct digital manufacturing in an environment that relies on a knowledge culture, not cheap labor.³⁷
- **Nanotechnology:** Quite literally “the study and application of extremely small things,”³⁸ nanotechnology is providing breakthroughs in medicine, genetic research, electronics and quantum computing, and suggesting “an impending turning point in high tech as important as silicon and integrated circuitry were half a century ago.”³⁹
- **Empowered Consumers:** Home diagnostic and monitoring devices can enable greater drug regimen adherence, early identification of disease, better maintenance of chronic diseases and virtual doctor visits.

What Maine Can Do

- **Build from the demand side,** looking at what problems broadband can solve; focus on building demand, and networks will follow.
- **Build on Maine’s quality of life** for young people seeking a higher quality of life and for second career “retirees” looking to start or support new enterprises.
- **Establish a broadband extension agent for Maine businesses** such as a “geek squad” for new ideas, training for crowdsourced financing, and online entrepreneurship training.
- **Apply recruiting deals** such as Tax Increment Financing (TIFs), tax incentives and Community Development Block Grants (CDBGs) to broadband entrepreneurs in Maine.
- **Connect with large companies** trying to boost internet usage in Maine, such as Google, Amazon, L.L. Bean, and local cable and wireless operators.
- **Connect labor force development efforts in Maine** such as courses, internships, and certifications with network expansion subsidies.



35 Malone, M. (2012, July 5). The sources of the next American boom. *Wall Street Journal*. Accessed at <http://online.wsj.com/article/SB10001424052702304141204577508403022406864.html>

36 Mills, M. P. (2012, January 30). The coming tech-led boom: Three breakthroughs are poised to transform this century as much as telephony and electricity did the last. *Wall Street Journal*

37 Mills.

38 National Nanotechnology Initiative, *What is nanotechnology?* Retrieved from website: <http://www.nano.gov/nanotech-101/what/definition>

39 Malone.

Health Care

Problem

Compared to the national average, Maine has an older and more rural population. With age comes higher-than-average incidence of health problems and related costs. Health outcomes are worse in rural areas than in urban areas, where there are shortages of dentists, nurses, and direct care workers, as is the case in Maine.⁴⁰



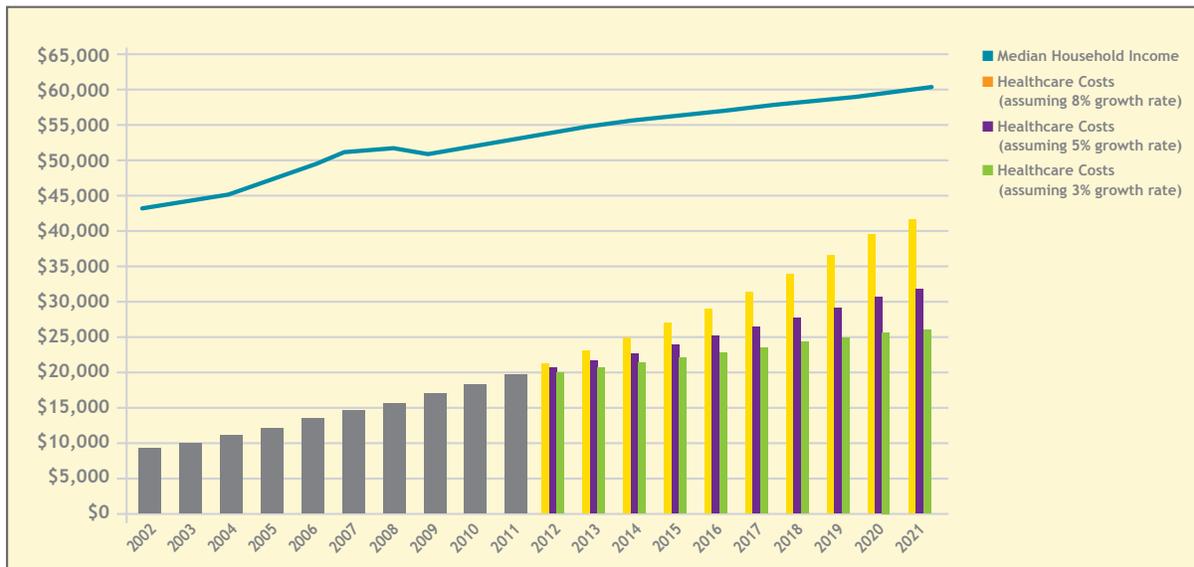
Health Outcomes

- Maine had the 7th highest proportion of adults with disabilities in the U.S. in 2008.
- Maine had the 5th highest cancer rate in the U.S. in 2008.
- Maine had a higher than national average proportion of adults reporting poor mental health in 2010.

Costs

- Maine had a higher proportion of the population on Medicare – 20% in Maine compared to 15% nationally in 2010.
- Maine was the 5th most expensive state in the nation in per-person health care costs in 2009; Maine spent \$8,521 per person for health care in 2009, compared to \$6,815 nationally.
- Maine’s average annual percent growth in health care expenditures from 1991-2009 was 7.4%, compared to 6.5% for the nation.

Household Income and Healthcare Costs, 2012-2021



Source: Martin’s Point Healthcare

Collectively, these facts put Maine on an unsustainable path of ever-increasing costs. Maine has taken initial steps to use broadband-enabled solutions to address its health problems; in response to the Affordable Care Act, and in partnership with Health InfoNet,⁴¹ Maine has a plan to create a secure, integrated electronic health information system by the year 2015. But the success of this plan is threatened by several factors.

40 Lenardson, J. D. (2007). *Issue brief: Maine’s rural health challenges*. (University of Southern Maine Muskie School of Public Service) Retrieved from <http://muskie.usm.maine.edu/Publications/PLA/ruralhealth.pdf>

41 Maine Department of Health and Human Services, Office for Health Information Technology. (2013). Retrieved from website: <http://www.maine.gov/hit/>



- **Diminished Funding:** There aren't enough revenues to achieve Maine's 2015 electronic communications goals; the federal broadband grant funding phases down dramatically in 2014.
- **Insufficient Bandwidth:** 25% of hospitals without telemedicine and 13% of other providers reported a lack of bandwidth as an obstacle to adoption.⁴²
- **Lack of Knowledge:** Among providers without telemedicine, the major reason for non-adoption was, "have not identified a need for telemedicine services."⁴³
- **Medicaid Reimbursement:** Medicaid will not pay for off-site monitoring, technology and related expenses. This is the primary reason 25% of the hospitals and 20% of providers do not adopt telemedicine practices. This is also the primary obstacle to the spreading of the Full Circle America home care model (see below).

What Can Maine Do?

Maine is fortunate in that it possesses key assets in many of these areas and an educational foundation that may be leveraged to achieve national leadership in health data analytics:

- **HealthInfoNet:** HealthInfoNet is a Maine-based, independent, nonprofit organization using health information technology to improve and transform health care quality and safety. HealthInfoNet offers a unique collaboration run by Maine people serving on behalf of doctors, hospitals, public health, patients and groups representing various consumer interests.
- **Muskie School of Public Service:** The Muskie School is host to The Cutler Institute for Health and Social Policy, dedicated to developing innovative, evidence-informed, and practical approaches to pressing health and social challenges faced by individuals, families, and communities. The school offers a critical foundation for expanded training in health informatics, serving as a reputed talent resource for private and public institutions alike.
- **Maine's Health Care Claims Database:**⁴⁴ Maine is one of thirteen states to currently operate an All Payer Claims Database (APCD) and collect data on health care utilization and costs that can be used to inform consumers, researchers, policymakers and health industry stakeholders.

Maine can take pro-active steps to address healthcare issues through the following broadband options:

- **Telemedicine:** 71% of hospitals, but only about 10% of local providers, used telemedicine in Maine in 2010. The major uses of telemedicine are for specialty advice, behavioral health, patient monitoring.⁴⁵
- **Allowing Elderly to Stay at Home:** Full Circle America is an innovative in-home care model that has been developed in Damariscotta, Maine. It uses a combination of neighbors and family; volunteers; in-home cameras and sensors; and computer-based communications to allow frail elderly to stay in their homes rather than go into institutional care. The model is being considered in other areas of Maine and New England.⁴⁶
- **Partnering with Providers:** Axiom Technologies has created an innovative pilot in which 66 nursing students in unserved areas in Maine get training from Central Maine Community College in Auburn.

42 Bratesman et al (2011). Telemedicine Use among Hospitals and Ambulatory Practitioners. University of Southern Maine Muskie School of Public Policy.

43 Ibid.

44 State Health Access Data Assistance Center (2011, May). *State Data Spotlight: Maine's Health Care Claims Database*. Retrieved from http://www.shadac.org/files/shadac/publications/StateDataSpotlight_ME_May2011.pdf

45 Telemedicine use in Maine 2010. Retrieved from http://www.mainetelehealth.org/images/stories/Conf_2011/Telemedicine_Use_in_Maine_2010.pdf

46 *Full Circle America - Virtual Assisted Living*. (2013). Retrieved from <http://www.fullcircleamerica.com/index.html>

Education

Problem

Maine faces severe challenges in maintaining a level of educational quality needed to enable our children to compete for jobs in the age of the information revolution.



- **Public school enrollment (PreK-12) in Maine is declining:** According to the Maine Department of Education, public school enrollment has been declining since the 1970s. Enrollment is projected to bottom out in the next few years and begin to rise again, “but at a much slower pace than that of the recent decline.”⁴⁷
- **Public school costs continue to rise, yet student achievement is flat overall:** Despite a three-fold increase in education spending over the last four decades, student performance has not significantly changed. In fact, Maine high school graduation rates, as well as student achievement, have remained relatively flat. We are at a time when keen global competition underscores the need for exceptional performance in our primary and secondary schools, yet state and federal governments face unprecedented budget deficits and limited resources for the foreseeable future.⁴⁸ Maine ranked 15th in the nation for per pupil spending for the 2009-2010 school year (\$7,202 compared to U.S. average of \$6,478), according to the most recent report from the U.S. Census.⁴⁹
- **Fewer Mainers have higher education degrees:** Current U.S. Census Bureau estimates indicate that 39% of Mainers ages 25-64 have an associate, bachelor’s, or advanced degree, compared with 46% of working-age adults in New England.⁵⁰

What Can Maine Do?

Faced with these challenges, Maine has taken significant steps toward embracing the communications revolution, especially with the Maine Laptop Initiative.

Maine Laptop Initiative (MLTI): In 2002, Maine became the first state in the nation to provide a laptop to every middle school student. The program also provided schools and teachers with wireless internet infrastructure, technical assistance, and professional development for integrating laptop technology into their curriculum and instruction. Student scores improved in math, writing and science. Teachers reported that use of laptops helped them to respond better to individual students. However, adoption and integration of the laptops into curriculum is uneven among teachers, and curriculum areas.⁵¹ A recent study evaluating the efficiency of Maine schools (performance relative to spending) found that technology is used in more efficient schools to supplement rather than replace teacher-student interaction.⁵² This program could also be expanded – in 2012, the Auburn School Department provided iPads to kindergartners. Early test results of pre-reading skills show that kindergartners who received iPads performed better than those who did not.⁵³

47 *Maine DOE - Maine Education Snapshot*. Retrieved from <http://www.maine.gov/doe/inside/snapshot.html>

48 Maine Education Policy Research Institute, 2012 report to the Legislature, *A Study of Maine’s More Efficient Schools*, <http://www.maine.gov/education/data/eps/studyofMaineEfficientPublicSchools2012.pdf>

49 *Public Education Finances: 2010*, <http://www.census.gov/govs/school/>

50 The Maine Compact for Higher Education, “Indicators of Higher Education Attainment in Maine,” http://www.collegeforme.com/pdf/HigherEdIndicators_aug09.pdf

51 “A Middle School One-to-One Laptop Program: The Maine Experience,” http://usm.maine.edu/sites/default/files/Center%20for%20Education%20Policy,%20Applied%20Research,%20and%20Evaluation/MLTIBrief20119_14.pdf

52 Maine Education Policy Research Institute, 2012 report to the Legislature, *A Study of Maine’s More Efficient Schools*, <http://www.maine.gov/education/data/eps/studyofMaineEfficientPublicSchools2012.pdf>

53 Washuk, B. (2012, February 16). Report says giving iPads to Auburn kindergartners increases test scores. *Bangor Daily News*. Retrieved from <http://bangordailynews.com/2012/02/16/education/report-says-giving-ipads-to-auburn-kindergartners-increases-test-scores>



More opportunities are available for bringing the communications revolution into Maine classrooms, including:

- **Cloud Computing:** In 2013, Falmouth started using cloud-based computer servers to store information, software and content. Students can use their own computers, and everyone has access to the same technology. The goal is a 1:1 student to laptop ratio, without having to purchase computers for all students. Eventually, the school may be able to stop purchasing textbooks.⁵⁴
- **Online Class Offerings:** A growing number of elite universities offer their most popular courses online for free.⁵⁵ Investment in online K-12 education start-ups is on the rise, supported by the rise of cloud computing and increased bandwidth.⁵⁶ Pilot curriculums across the country are experimenting with computerized individual instruction.
- **Interactive Media in the Classroom:** Games are being used in the classroom to teach both academic subjects and digital citizenship. Experts observe that games are especially well suited to engage students at the edge of their ability and can keep up as their skills improve. There is a great deal of bad educational content, so caution is important in exploring uses of new media.⁵⁷

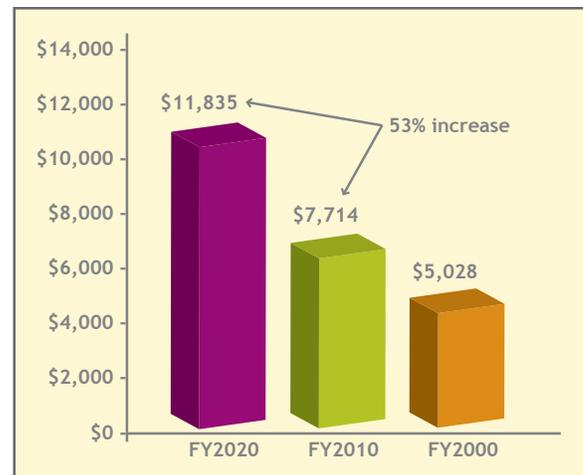
e-Government

Problem

The hard demographic and economic realities of an aging population and slow job growth are pushing Maine against a fiscal rock. We've made promises to provide health care and retirement benefits, but the rising cost of operating public infrastructure in rural and urban areas that are rapidly losing population means that maintaining current levels of public services results in a greater and greater tax burden. Growing budget deficits have become routine in Augusta. Maine supports a large and widely dispersed governing structure, including 489 municipalities, 16 counties and the 6th largest state legislature for the 40th largest state.

In 2000, Maine spent over \$5,000 per person to operate state and local government. In 2010, that figure had risen by 53% to nearly \$8,000 per person. Projecting that increase ahead another decade means a per person cost of nearly \$12,000.⁵⁸ Without an unforeseen explosion of new jobs, this fiscal burden is simply beyond Maine's means. We must find ways both to accelerate job growth and operate state and local governments more efficiently. Just as private business has radically reduced costs through the dispersal of digital technology – backwards through production and distribution supply chains, and forwards through customer relations management systems – so state and local governments can use digital technology to transform the ways they provide services to their citizens.

Maine State & Local Government Spending Per Person, 2000-2020



Source: Brookings Institute, US Census, PDI Analysis

54 "Falmouth High School moves into the cloud," The Forecaster, August 14, 2012

55 "Berkeley to Join the Free Online Learning Partnership EdX," The New York Times, July 24, 2012

56 "Investment in K-12 education innovation is soaring, but it's not all rosy," GigaOm.com, August 8, 2012

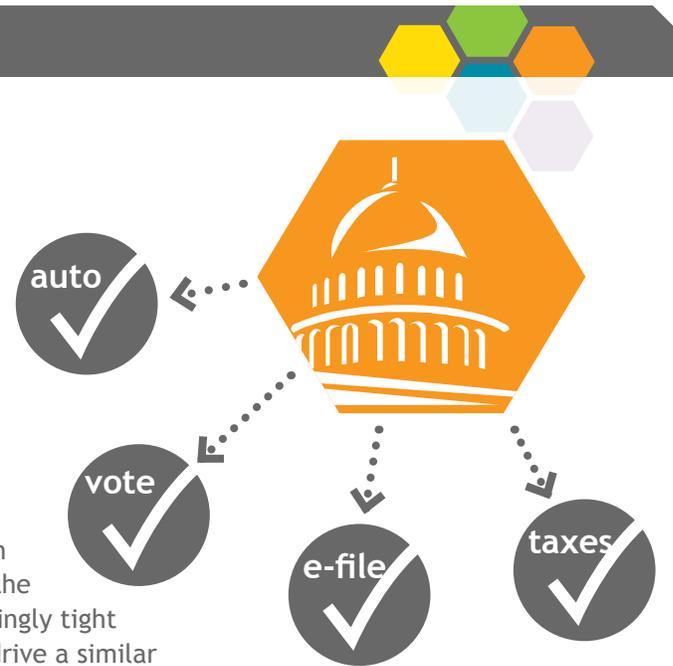
57 "Getting Schooled by a Third Grader," Future Tense panel presentation, August 9, 2012

58 Trostel, P. A. (2010). *Maine State and Local Government Payroll and Expenditure in 2007*. Retrieved from School of Economics & Margaret Chase Smith Policy Center, University of Maine website: <http://www.umaine.edu/soe/files/2009/06/staffpaper.pdf>

What Can Maine Do?

The examples are virtually endless – increasing civic participation through virtual town meetings and instantaneous citizen feedback, saving time and lowering costs through electronic filings for taxes and permits, decreasing traffic congestion and speeding infrastructure repairs through EZPass transponders and other “Smart Road” digital monitoring systems, saving time and travel through telecommuting and teleconferencing.

And just as the costs of operating in an increasingly competitive global economy have driven the adoption of digital technology through the business sector, so the pressures of maintaining service quality in an increasingly tight fiscal environment could, with effective incentives, drive a similar adoption in the state and local government sector. We face an increasingly tight and more divisive fiscal environment if we do not change the way we deliver state and local government services.



- **Online Services:** Many basic transactional services can be conducted online, including state income tax payments, automobile registration renewals, hunting and fishing license applications and state park campsite reservations.
- **Open Information:** Many municipalities offer basic information portals with critical directory information, event schedules, and some with online property databases. MaineOpenGov.org, a program of the Maine Heritage Policy Center, makes government expenditure data transparently available online.
- **Targeting Policies:** Richer and interactive data allows for more specific and targeted tests of policy approaches before they are adopted for a broader constituency, avoiding pitfalls of overly ambitious (and expensive) legislation.
- **Citizen Input:** Broadband facilitates the transition from providing information to citizens to deriving input from citizens. Strategies for crowdsourcing policy ideas and decision making that recall New England town hall democracy are made possible through an “always on, available everywhere” information communication infrastructure.⁵⁹
- **Smart Government:** The “always on and on everywhere” internet serves the information and data collection needs for new types of eGovernment applications. These range from identifying road potholes to tracking tagged moose.⁶⁰
- **Shared Services:** Broadband increases the opportunities for shared services. Given the expenses of doing business, rural towns and Maine’s state government need to examine where services can be combined and jointly provisioned. A place to start is the obvious pain points, such as reducing the costs of public assistance administration.
- **Big Data:** Better data analysis could reduce costs of programs like public assistance by automating delivery of payments. Tracking recipient behavior through smart apps could better monitor conditions for receiving aid, promote educational and work opportunities, and decrease dependence.

59 *Citizen Request Tracker* - Simplified. Retrieved from <http://blog.civicplus.com/blog/bid/245598/Citizen-Request-Tracker-Simplified>; Ushahidi. Retrieved from <http://ushahidi.com/>

60 *FixMyStreet*. Retrieved from <http://www.fixmystreet.com/>; *Citizen's Connect* | City of Boston. Retrieved from <http://www.cityofboston.gov/doit/apps/citizensconnect.asp>



Economic Benefits of Increased Demand

If the recommendations presented below are carried out over the coming decade, the impact in year 10 will be:

- Creation of over 11,000 additional jobs in Maine
- Paying nearly \$500 million of new income in Maine
- Generating over \$70 million of new state and local tax revenues in Maine

If Maine meets the targets set in the report recommendations below, the economic benefit over the coming decade will be enormous. The savings in health care and government administrative costs will put millions of dollars back into the pockets of Maine households and businesses, freeing up growth now restrained by the fiscal pressures that have hamstrung the Maine economy and polarized our civic culture.

In addition, the sales gains made by Maine businesses moving to proven internet-enabled marketing and management strategies will increase sales and employment across all sectors of the Maine economy. The creation of a world-class health care data analytics program in Maine will create scores of new jobs as highly skilled professionals fill existing job openings and bring new employment opportunities to the state.

The direct economic impact of implementing Task Force recommendations comes from the increased sales for businesses better connected to the internet, and the savings to taxpayers from more efficient health care, education and government administration. The resulting increase in business and consumer spending will flow to a wide range of Maine businesses – trades people, food suppliers, oil dealers, insurance agents, bankers and marketing professionals. These indirect impacts add to the direct impact of the recommendations to create a larger total impact.

Presuming steady progress toward the targets set in this report and using the IMPLAN impact model of the Maine economy,⁶¹ the Task Force estimates that the total economic impact of following its recommendations will result in increased sales for Maine business of \$945 million, creation of over 11,000 jobs earning a total income of nearly \$500 million. All of this economic activity will generate over \$70 million in additional local and state tax revenues. The table below summarizes this analysis.

Total Economic Impact on the Maine Economy of Implementing the Recommendations of the Governor’s Broadband Capacity Building Task Force (time: 10 years)

Impact	Sales	Jobs	Income
Direct Impact	\$387,000,000	6,200	\$290,000,000
Indirect Impact	\$558,000,000	5,200	\$195,000,000
Total Impact	\$945,000,000	11,400	\$485,000,000
State & Local Taxes			\$71,780,000

Source: IMPLAN model analysis conducted by Planning Decisions, Inc. Impact in ten years measured in current dollars

61 IMPLAN (IMpact Analysis for PLANing) is a computer based input-output modeling program originally developed by the U.S. Department of Agriculture Forest Service for resource management planning. It contains a mathematical representation of the purchasing patterns that take place between sectors of an economy. Built into the IMPLAN data files are all of the industry sales, employment and income data for 506 sectors of the Maine economy. IMPLAN uses these data along with national purchasing patterns (national input-output matrices) to create state models. Data presented here are rounded to avoid the appearance of unwarranted precision.



6 Recommendations Principles

The Task Force heard and considered scores of recommendations for improving the scope and utilization of Maine’s broadband network. The recommendations presented here were developed using the following principles as a guide:

1. Look for the highest rate of return on investment for the state’s economy.
2. Consider investments where providing increased *quality* of service will generate more broadband use – don’t just look at number of persons served.
3. Don’t pick “winners” when it comes to technology – anticipate the expansion of broadband to include wireless services, fiber, or other delivery options.
4. Maximize private investment and minimize cost for public sector.
5. Meet tests of speed, access, and quality.
6. Implement recommendations in tandem with workforce development investments in order to create digitally inclusive, digitally literate communities.
7. Implement recommendations to transform sectors, to change the nature of education, with team building, courses across borders.
8. Bring Maine fully into the communications revolution that is all around us.

Recommendation 1: Help Maine Businesses Move to the Internet

The State of Maine should provide a three-year tax credit for all Maine small and medium businesses for internet-related staff training and marketing expenditures.

97% of American consumers look online for goods and services. But 59% of Maine businesses don’t even have a website. This needs to change.

The immediate payoff from such increased use would be immediate and substantial. The annual sales of Maine’s sole proprietorships and small (fewer than 20 employees) businesses amount to approximately \$21.7 billion. If these enterprises achieved the national average in terms of level of web use, the result would be increased annual sales of nearly \$50 million per year.

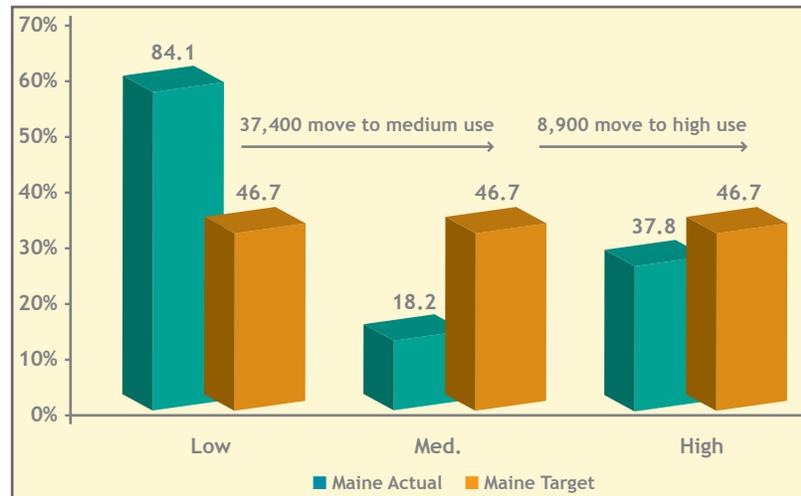
The Governor’s Broadband Capacity Building Task Force believes that Maine should aim higher than the national average. We believe our target should be one-third of Maine’s small and medium enterprises (SMEs) at each level of internet use within three years. We believe that Maine should, over the next three years, move:

- 37,400 SMEs from low to intermediate levels of internet use; and
- 8,900 SMEs from intermediate to high levels of internet use

The result of this change would be a cumulative increase in sales of nearly \$270 million, supporting nearly 1,500 new jobs. The key to meeting this goal is business education. Maine’s business owners and operators must more fully embrace the digital world. The best way to do this is to make the leap less fearful and expensive.

Maine faces a severe gap in skills needed to utilize the promise of increased use of broadband technology. For this reason, The Governor’s Broadband Capacity Building Task Force supports the goals embodied in LD 1489, The Maine Skills Gap Program, passed by the Maine Legislature in 2013 and now awaiting budgetary approval.

Number of Small & Medium Enterprises by Level of Internet Us



Source: McKinsey Institute, U.S. Census, PDI Analysis

Recommendation 2: Help Maine’s Elderly Stay at Home

Use in-home technologies to reduce the proportion of elderly on MaineCare receiving long-term care in institutions from 65% to 40% by 2015, and to 20% by 2020. This will allow seniors to stay home longer – which is what they want – and at the same time save Maine taxpayers over \$100 million in 2015, and over \$250 million annually in 2020.

The average cost of a nursing home bed is about \$90,000 each year. And few seniors prefer living in an institution. Telemedicine has been adopted by many providers here in Maine and around the country to improve care and save money. Dr. Chip Teel of Damariscotta developed an approach that takes telemedicine a step further, using simple broadband communication technologies to help elderly stay in their homes for about \$5,000 a year by allowing them (and their children) to use simple off-the-shelf technology like cameras and Skype for 24-hour communication. But it’s not all technology. Home visits, volunteering, transportation help, and neighbor check-ins are also essential to creating a high quality of life to participants in the program.⁶²

However, Maine’s Department of Health and Human Services has policies that are more restrictive than other states regarding reimbursement for expenses for such new approaches under MaineCare, so even though these

⁶² Teel, A. S. (2011). Alone and invisible no more: How grassroots community action and 21st century technologies can empower elders to stay in their homes and lead healthier, happier lives. White River Junction, Vt: Chelsea Green Pub.



techniques have been pioneered in Maine, other states are now moving ahead faster in implementation.⁶³ Maine needs to apply for federal waivers that would allow the reimbursement of new in-home technologies in order to reduce the proportion of elderly on MaineCare receiving long-term care in institutions.

Realistically, the alternative to moving to telemedicine and in-home care is not the provision of more institutional care to the elderly. It will be the provision of *no* care at all to many. State taxpayers will be unable to support the cost of the current status quo. The use of telehealth technology will enable MaineCare to support more people every year without increasing taxpayer expense. Many providers in Maine and elsewhere are using telehealth to improve care and reduce costs. Maine should move aggressively in this area.

Long-Term Care Clients and Expenses, MaineCare Program Historic and Projected, 2010-2020

		2000	2010	2015	2020
Current Trend ¹	Institutional Clients	7,422	8,038	9,110	10,326
	In-home Clients	4,519	4,274	4,844	5,490
	Total Clients	11,941	12,312	13,954	15,816
	Institutional Cost (mill\$)	\$ 218	\$ 308	\$ 399	\$ 489
	In-home Cost (mill\$)	\$ 49	\$ 47	\$ 53	\$ 60
	Total Cost (mill\$)	\$ 267	\$ 354	\$ 452	\$ 550
Recommended	Institutional Clients	7,422	8,038	5,582	3,163
	In-home Clients	4,519	4,274	8,373	12,653
	Total Clients	11,941	12,312	13,954	15,816
	Institutional Cost (mill\$)	\$ 218	\$ 308	\$ 244	\$ 150
	In-home Cost (mill\$)	\$ 49	\$ 47	\$ 92	\$ 139
	Total Cost (mill\$)	\$ 267	\$ 354	\$ 336	\$ 289
Difference	(Millions of \$)	-	-	\$ 116	\$ 261

Source: University of Southern Maine Muskie School of Public Service, 2012

⁶³ Ten states now authorize telemedicine coverage under Medicaid, but not Maine -- see American Telemedicine Association 2013 *State Telemedicine Legislation Tracking*. Retrieved from <http://www.americantelemed.org/docs/default-source/policy/state-telemedicine-legislation-matrix.pdf?sfvrsn=48>



Recommendation 3: Educate Health Data Analysts

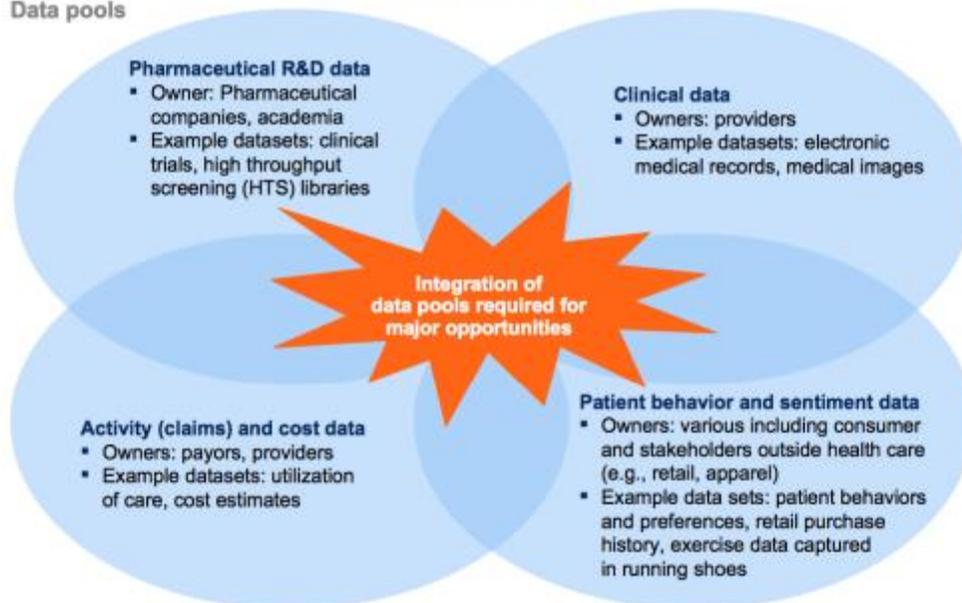
Develop a talent pool of health informatics specialists to expand Maine’s competitive advantage in health information systems by:

- Building a broad-based data analytics competency in Maine’s K-12 schools by creating statewide education policies and incentives that reward innovation in teaching curricula and demonstrate student competency in the command of data analytic methods.
- Further investing in more specialized knowledge in health informatics at the university level by undertaking an assessment of university assets in healthcare and data analytics to discern and prioritize gaps, focusing particularly on which segments of health data analytics are central to this new growth strategy.

Information technology has permeated every aspect of our economy and lives, generating a volume and diversity of data that can be made readily available and useful through the internet. Those who know how to access and use these data are opening doors to a wealth of unprecedented, and often disruptive, opportunities. Virtually every enterprise and job is vulnerable. Yet Maine and the nation as a whole are not prepared. McKinsey Global Institute projects that the U.S. will face a shortage of 140,000 to 190,000 data analytic specialists⁶⁴ within only a few years. And this shortage speaks only to the specialists. The ability to gather, manipulate and interpret data is fast becoming a line item of nearly every job description, specialist or not.

Four distinct big data pools exist in the US health care domain today with little overlap in ownership and low integration

Data pools



SOURCE: McKinsey Global Institute analysis

A group of Maine corporate and education leaders has begun to address this skills shortage through Project Login, a cooperative effort among businesses seeking to double Maine’s computer and technology degree graduates in four years. Maine needs a parallel effort distinct from Project Login to prepare Maine’s youth to apply this

64 Manyika, James, et. al. “Big data: The next frontier for innovation, competition, and productivity”, McKinsey Global Institute, May 2011.



technology to data analytics. This effort must be broad in scope, engaging the arts as well as the sciences. It also must start at an early age to hone analytical thinking and the disposition to view the world through a lens of data.

Building on this foundation, Maine stands to gain further by nurturing deeper competency in the specialty of health care analytics at the university level. The nation as a whole will reap \$300 billion of added *annual* value in the health care sector alone through big data analytics. As a nationally recognized leader in using health information technology,⁶⁵ Maine can and should be a national leader in developing this high-value talent thanks to its unique assets in health data systems and health policy education. Developing this talent locally will have a compounding benefit to Maine’s private and public institutions, driving growth and high-value job opportunities. The key to realizing these opportunities is to develop capabilities that can examine and correlate findings across multiple sources of data.

Recommendation 4: Make the UMaine System a Model for Blended Learning

UMaine should get 25% of its courses online by 2015, revise its financial incentives to reward online learning, and create consolidated degree programs when possible.

Research has shown that the most effective learning environment is one that combines the best of online learning with face-to-face classroom teaching.⁶⁶ The University of Maine system has faculty, facilities and students all around the state, including up to 150,000 adults who started – but have yet to complete – their college studies.⁶⁷ It has high speed broadband connecting all of the campuses. UMaine is the ideal laboratory for developing the new model of college education, one that will serve adult learners equally as well as young high school graduates.

This recommendation will reduce costs for the University and for students, provide greater access to higher education courses for older students, and position the University to be competitive in the coming century. It will make programs at geographically dispersed campuses in the UMaine System available statewide.

It won’t happen in the current incentive system. Currently the campuses compete against each other for students and course revenues. The financial incentives within the system discourage joint ventures, joint majors, 3-2 accelerated programs that include three undergraduate years and two graduate years, and delivery of courses from one campus to another.

University of Maine Online Education Growth, 2010-2015



Source: University of Maine System Spring 2013 Enrollment Reports, University of Maine System Summary of Spring 2011 Enrollments

65 *Maine one of three states nationally recognized for use of health information technology* | HealthInfoNet. Retrieved from <http://www.hinfonet.org/news-events/news/maine-one-three-states-nationally-recognized-for-use-health-information-technology>

66 Research on the Effectiveness of Online Learning. (2011). The Future of State Universities. [http://www.academicpartnerships.com/docs/default-document-library/white-paper-final-9-22-2011-\(1\).pdf?sfvrsn=0](http://www.academicpartnerships.com/docs/default-document-library/white-paper-final-9-22-2011-(1).pdf?sfvrsn=0)

67 *A Stronger Nation Through Higher Education: Maine*. (2012, March). Retrieved from http://www.luminafoundation.org/publications/state_data/2012/Maine-2012.pdf



But it cannot continue if the University is to thrive in the coming decade. The combination of online competition from free online courses from consortia of prestigious universities, shrinking high school graduate age cohorts, and declining state budgets will slowly squeeze the University System unless it adapts aggressively to the challenge. Already, enrollments in the System have dropped by 5% in the last five years. Budget cuts are forcing campuses to drop courses, programs, and professors – often from the newest and most creative sections. These cuts, in turn, make it harder for the System to attract future students.

The cycle needs to be broken. We recommend that the UMaine System:

- Set a goal of bringing 25% of UMaine System courses online by the spring of 2015. Online learning has been growing in the University System, from 10% of all credit hours in the spring of 2010 to 15% in the spring of 2013.⁶⁸ While there is nothing magic about this particular measure – in fact, online learning should be integrated into all courses taught at the University – this measure at least provides a simple general indicator of how swiftly the University is moving in this area.
- Revise its financial incentives to reward faculty who design and teach effective online courses; reward departments that collaborate with departments at other campuses to integrate and enrich their curricula and offerings; and reward faculty and departments that provide certificates of competency and specialized programs to adults in the workforce.
- Create consolidated degree programs in foreign languages, in business, in public policy, and in health care, that can be offered at multiple sites. Discussions are already underway among UMaine campuses to combine foreign language offerings, and between Orono and Portland to offer joint professional management degrees. These can be a model for a much more ambitious effort to create joint programs in the future.

This direction will increase the University's appeal to a major growth market of the next decade – adult learners. Maine needs to help 95,000 people in the existing workforce to get a higher education degree in the next ten years⁶⁹, according to the Lumina Foundation. These are people who have families and jobs, and can't live in a distant dormitory to further their education. A new set of courses that combine online learning, local classroom discussion, and intensive campus visits will serve this group. In the meantime, traditional students who seek a dorm living experience will continue to have such an opportunity – with the added benefit of a much richer set of available courses.

Recommendation 5: **Provide Every Elementary and High School Student an Internet Connected Device**

Expand Maine's laptop program to all students K-12, and pay for this expansion with savings that result from switching to 100% digital textbooks.

In 2002, Maine became the first state in the nation to provide a laptop to every 7th and 8th grade student. Research by David Silvernail has shown that laptop use in middle schools has contributed significantly to improvements in student test scores in writing and math.⁷⁰ Teachers reported that it helped them to respond

68 University of Maine System Spring 2013 Enrollment Reports, University of Maine System Summary of Spring 2011 Enrollment

69 *A Stronger National Through Higher Education: Maine*. (2012, March). Retrieved from http://www.luminafoundation.org/publications/state_data/2012/Maine-2012.pdf

70 Silvernail, D. L., & MLTI Research and Evaluation Team at the Maine Education Policy Research Institute, University of Southern Maine Muskie School of Public Service. (2011, August). *A Middle School One-to-One Laptop Program: The Maine Experience*. Retrieved from http://www.usm.maine.edu/sites/default/files/cepare/MLTIBrief20119_14.pdf, pg 23-25.



better to individual students. A recent review of what is working in schools around the country found that schools employing a 1:1 student-computer ratio outperform other schools.⁷¹

Paper textbooks are heavy, expensive, and become out of date quickly – many students use textbooks that are 7-10 years old and often contain outdated materials. Digital textbooks are more flexible, more effective, and less expensive. Digital instructional materials are interactive and personalized, allowing students to explore content more deeply. Recent U.S. Department of Education studies have found that technology-based instruction can reduce the time students take to reach a learning objective anywhere from 30 to 80 percent. The annual cost savings from switching to digital instructional materials are estimated at \$600 per student. With 184,685 K-12 students in Maine, that would amount to more than \$110 million in annual savings.

The federal government has adopted a goal of an e-textbook in every student’s hand by 2017. Other states have mandated the adoption of digital materials in all public schools, provided free digital texts to encourage adoption, or supported the development of open source textbooks. We recommend that Maine adopt a goal of switching completely to digital textbooks by 2024. Districts usually replace just a portion of their textbooks each year, so the transition could be complete by the end of the next 10-year cycle. The state has already begun developing the technical assistance and teacher support necessary for such an effort, including a clearinghouse of online learning resources. Expanding the Maine Learning Technology Initiative (MLTI) to all Maine students K-12, with a goal of a 1:1 student technology ratio, would help incentivize school districts to make the switch to digital.

Supporting and expanding MLTI builds on an existing strength and creates the infrastructure necessary for all Maine students to benefit equally from the digitization of textbooks. Currently, the program includes only 7th and 8th graders. Districts can take advantage of the state’s bulk purchasing leverage to purchase laptops for high school students, but that additional expense is locally funded and only about half of high schools participate. The Maine Department of Education has estimated that the state spends approximately \$285 per student, per year, for the existing middle school program, including a device, technical support, professional development, and warranties. At \$285 per student, expanding the program to include all K-6 and 9-12 students would cost an additional \$44 million per year. A portion of the local savings from the switch to digital textbooks (\$110 million annually) could pay for the increased expense. It will take careful thought because of the complexities of school funding, but this recommendation makes the funding available.

MLTI Existing and Expanded Program Costs

	Grades	# Students	Total cost at \$285 per student
Existing Program	7-8	28,886	\$8,232,510
Proposed Expansion	K-6, 9-12	155,799	\$44,402,715
Total	K-12 students	184,685	\$52,635,225

Source: Maine Department of Education, PDI Analysis

⁷¹ Greaves, T.; Hayes, J.; Wilson, L.; Gielniak, M.; & Peterson, R., *The Technology Factor: Nine Keys to Student Achievement and Cost-Effectiveness*, MDR 2010

Recommendation 6: Save Tax Dollars by Shifting Administrative Functions Online

Adopt a formal target of reducing the growth rate of state and local government administrative spending per person by 25% over the coming decade. Achieving this goal would produce a relative savings in 2020 of over \$47 million and a cumulative saving over the decade of over \$260 million.

The early Maine experience with online government administration has been positive. Reserving state park campsites online has saved campers hours of waiting in line and the Maine Bureau of Parks hundreds of thousands of dollars. Filing state income tax returns online has gotten refunds into the pockets of taxpayers faster and has saved Maine Revenue Service hundreds of thousands of dollars each year.

Just as the costs of operating in an increasingly competitive global economy have driven the adoption of digital technology in the business sector, the pressures of maintaining service quality in an increasingly tight fiscal environment could drive a similar adoption in state and local government. To fail to make these changes will condemn Maine to a continuous cycle of fiscal battles and budget cuts.

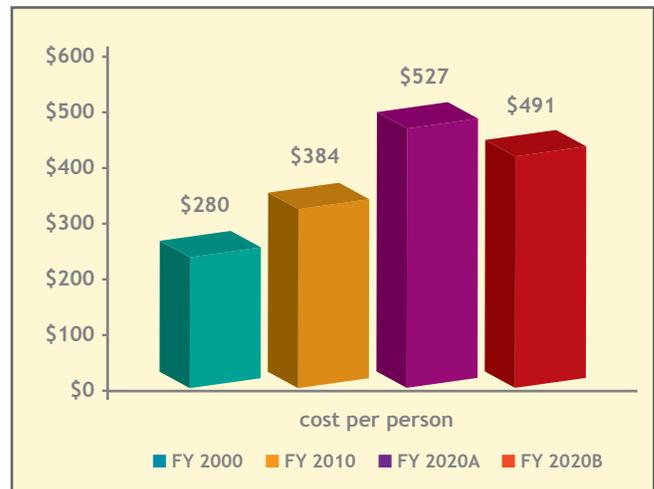
If current trends continue, the per-person cost of administering state and local government in Maine would increase to \$527 by 2020. At this rate, even with Maine's slowing population growth, state and local administrative costs will exceed \$700 million in 2020. If Maine can slow the current 37% per decade increase in the per-person costs of administering its state and local government programs, the savings would amount to tens of millions of dollars each year and, over the course of a decade, accumulate to hundreds of millions of dollars.

Since 1999, the agency most responsible for providing and enhancing access to public information and eGovernment services in Maine has been InforME, a public-private partnership managed by a 15-member board of directors representing state and local government agencies and private business. Over the years, InforME has built websites, installed online payment systems, created systems for filing forms, reserving park camping sites, obtaining permits and hundreds of other services that have saved citizens time and money and reduced government administrative costs. Funding for InforME is currently limited to transaction and subscription fees associated with the services it provides.

Rather than attempt to identify specific ways Maine state and local governments should adopt eGovernment services – such possibilities are limited only by the imagination of the state's citizens and public servants – the Task Force instead recommends that the activities of InforME be greatly expanded.

1. Expand the charge of InforME from simply the provision of requested services to the achievement of explicit annual cost reductions and service improvement targets;
2. Link InforME more formally with the newly created Office of Policy and Management whose charge is “to identify and implement best practices within state agencies in an effort to improve the efficiency and effectiveness of state services;”

Cost to Administer State & Local Government in Maine, Current Trend & Policy Target



Source: Brookings Institute, US Census, PDI Analysis



3. Allow state and local agencies to be reimbursed 50% of development costs paid to InforME for documented line-item budget savings achieved in the four-year period following implementation of eGovernment solutions; and
4. Include InforME projects among those eligible for start-up financing from a Maine Technology Bond.

Possible InforME initiatives include expansion of electronic filing to all forms of tax payments, and the elimination of multiple paper forms now required for the processing of motor vehicle sales.

Potential Savings from Hitting Policy Target

Variable	FY 2000	FY 2010	FY 2020
Population	1,266,808	1,329,590	1,331,607
State & Local Administrative Expense (\$ million), current trend	\$355	\$511	\$702
State & Local Administrative Expense (\$ million), recommended target	\$355	\$511	\$655
Savings (\$ million)			\$47

Source: Source: Brookings Institute, US Census, PDI Analysis

Recommendation 7:

Make the Maine Turnpike a Model for Smart Roads

The Maine Turnpike Authority and the State of Maine should become a model for Smart Road transportation by:

- Installing fiber optic cable along the length of the Maine Turnpike
- Establishing a Center for Digital Transportation Services to identify and develop cost-saving, service-enhancing projects from Smart Road transportation data
- Developing and adopting a state Dig-Once policy to expand broadband infrastructure cost-effectively

Smart Roads are highways that use wireless technology to monitor traffic conditions, communicate those conditions directly to vehicles (“traffic accident 5 miles ahead”) and to send information about those conditions to emergency responders, road maintenance crews and the traveling public.

There is an initiative underway for co-locating optic fiber and a direct current electricity transmission lines along the interstate and Maine Turnpike Authority right-of-way, with potential for locating other infrastructure, such as gas lines, along this new energy infrastructure corridor. A task force created by the Maine legislature in 2013 is guiding this process. The task of the panel is to oversee the use of this corridor and to solicit, evaluate, and approve a proposal to develop the corridor, which would bring hydroelectricity from Canada and wind electricity from Northern Maine through the state and into the New England grid. The panel has approved a letter of intent from Bangor Hydro Electric (Emera) and National Grid to develop the transmission system. There is a fiber company that has expressed interest in locating fiber at the same time, and in the same space.

A second opportunity for broadband and the Maine Turnpike is utilizing the massive amounts of data already



collected by the EZPass program. In 2012, Maine Turnpike traffic count was 60,596,022, and 65% of vehicles used EZPass electronic tags attached to vehicles to calculate distance traveled and charge tolls. The tag relays the vehicle's entry and exit locations. In aggregate, this data could be used by the trucking industry to determine the best possible times to schedule travel. It could also be used by the tourism industry to analyze origins and travel patterns of visitors, and to forecast numbers of tourist arrivals.

A third opportunity lies in the cost of installing broadband infrastructure. According to the Federal Communications Commission (FCC), most of the cost of installing fiber optic cable for broadband usage is not for the cable itself – it is for the digging and placement of the cable into the ground or under the road. Estimates suggest that in rural areas, there is a cost savings of roughly 15.5% per mile when conduit and fiber are installed during rather than independent of a road project. Savings are greater in densely populated areas where complexity and cost of construction are highest.

A Dig-Once policy would make the installation of broadband conduit a regular practice in road construction projects. This would decrease the costs of deploying fiber and eliminate the need for multiple excavations.

During the 2013 legislative session, with the support of the Governor and the Governor's Broadband Capacity Building Task Force, the Maine Legislature passed LD 876, SP 301, *a resolve To Establish a Working Group To Study Issues Relating to Broadband Infrastructure Deployment*. We hope that a proposed Dig-Once policy will be part of the group's final recommendation when it reports back in the winter of 2014.

Recommendation 8: **Redeploy Existing Funds to Support Broadband Growth**

Companies receiving Maine State Universal Service Fund assistance should support broadband expansion as well as landline telephone service.

Maine has a Universal Service Fund for telephone service, just as the federal government has. The federal government (through the FCC) has chosen to redirect its Universal Service Fund from the subsidy of telephone landline extension to broadband support. The FCC is now laying the groundwork for this change, and by next year there could potentially be tens of millions of dollars coming into Maine for broadband expansion, telehealth support, and lifeline support for broadband for low-income families.

By contrast, Maine's Universal Service Fund has not undergone the same rethinking. In 2013, the fund distributed \$8 million for landline rural service. This amount could increase dramatically in future years. By contrast, the ConnectME Fund for broadband service is about \$1 million a year. The Maine Legislature should require that "provider of last resort" services subsidized under this program support broadband as well as telephone service.

The State of Maine should look comprehensively at all of its telecommunications funds to see whether they offer the proper incentives for broadband expansion and upgrading, and whether there are opportunities to increase the effectiveness of these efforts through fund consolidation.

We also recommend that the ConnectME Fund be allowed to support broadband expansion projects with a major economic impact even if the project does not involve extending service to an unserved area.

Finally, it is imperative that competitive forces be unencumbered by legacy rules or previously subsidized infrastructure (such as right-of-ways or backbone networks). Otherwise, entrenched providers will understandably



pursue profit maximization motives, extracting as much value as they can from legacy infrastructure before making the investments needed for users to competitively engage in our global economy.

State Telecommunications Fee and Taxes On Your Telephone Bill

Maine Telecommunication and Education Access Fund (MTEAF) - 7% of state telecommunications charges (supports internet connectivity for schools and libraries)

E911 Charge - \$.45

ConnectME (Connect Maine) - .25% of instate charges (supports broadband and projects in rural areas)

Maine Universal Service Fund - 1.51% of instate charges (supports high cost phone companies)

Maine Service Provider Tax - 5% of instate charges (new names for sales tax on telcom services)

Source: Office of the Public Advocate

As a rural state, it also necessary to level the playing field and incentivize providers to service dispersed populations. Through this combination of incentives, the state can champion continually improving service at competitive rates. To achieve these objectives, Maine's utility regulatory authority and representatives at the national level should promote:

- Opening the definition of provider of last resort service beyond simple voice telecommunications;
- Opening the definition of service provider to include others beyond telecommunications firms who can deliver subsidized information communications services to unserved locations;
- Champion a technology-agnostic approach to regulation that reorients service objectives to continually improve minimum standards based on international market-leading benchmarks, considering both quality and breadth of services offered. Policies now favor physical wire solutions, regardless of their appropriateness. Meanwhile, 80% of the world population will access the internet via wireless solutions and the market is responding to satisfy the growing demands of the majority.⁷²

⁷² By example, Samsung of South Korea has already successfully demonstrated 1Gbps speed, striving to reach 10Gbps, and to make commercially available within the next seven years.



Implementation Schedule

Action	Who	When
<p>Recommendation #1: Pass a bill providing a three-year tax credit for all Maine small and medium businesses for internet-related staff training and marketing expenditures.</p>	Governor and Legislature	2014
<p>Recommendation #2: Apply for federal waivers that would allow the reimbursement of new in-home technologies in order to reduce the proportion of elderly on MaineCare receiving long-term care in institutions.</p>	ME Department of Human Services	2014
<p>Recommendation #3: Incorporate data analytics competencies in Common Core standards for elementary and high school, and develop curriculum materials. Expand University health analytics programs.</p>	ME Department of Education and University of Maine System	2014-2016
<p>Recommendation #4: Make the University of Maine a national model for integrating classroom and online learning.</p>	University of Maine System	2014-2015
<p>Recommendation #5: Switch to digital textbooks and use the savings to pay to expand Maine's laptop program.</p>	ME Department of Education	2014-2016
<p>Recommendation #6: Set target for state and local government administrative savings. Expand the role of InforME.</p>	Governor, Legislature, InforME Board	2014
<p>Recommendation #7: Create plan for making the Maine Turnpike Authority a model for Smart Road transportation. Develop and adopt a state Dig-Once policy to expand Broadband infrastructure.</p>	Governor, ME Department of Transportation, ME Turnpike Authority	2014
<p>Recommendation #8: Require companies receiving Maine State Universal Service Fund assistance to support broadband service. Expand ConnectME Fund eligible activities.</p>	Governor, Legislature, ConnectME Board, PUC	2014

Broadband Resources in Maine

Get Online and Trained at Your Local Library

All Maine public libraries provide free public access to broadband internet connections. The Maine State Library website offers free online tutorials on basic computer skills, social media, email, Microsoft Office, job searches, and other internet uses.

<http://www.maine.gov/msl/digital/resources.shtml>

Get the Skills

Adult Ed Classes

Centers throughout Maine offer internet and computer skills classes, from beginning to advanced levels. Use their web page to find a course near you at <http://www.maineadulted.org/>

Get the Website

Google's "Get Your Business Online" project offers free website design, business listing on Google, a customized web address and free website hosting for a year - see <http://www.gybo.com/maine/>

Get on Social Media

Facebook can help build a page for your business and Twitter offers "Twitter 101" for businesses:

<https://www.facebook.com/business>

<https://business.twitter.com/twitter-basics>

Get Help

For information about broadband availability at your address, and state policies concerning broadband expansion, see the ConnectME website at <http://www.maine.gov/connectme/index.shtml>

Maine Broadband Task Force Members

Warren Cook, Chair, Co-founder of Maine Network Partners

Devore Culver, Executive Director and CEO, HealthInfoNet

Lisa Smith, Senior Planner, Governor's Energy Office

Allyson Handley, President, University of Maine at Augusta

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Peter Mills, Executive Director, Maine Turnpike Authority

Bob Montgomery-Rice, Executive Vice President, Bangor Savings Bank

Ryan Pelletier, Director of Economic and Workforce Development, Northern Maine Development Commission

