



## CONNECT WITH AXIOM

### CONNECTING COMMUNITIES USING TV WHITE SPACES IN RURAL MAINE



*Communities served by Axiom. Photo credit: Axiom*

### EXECUTIVE SUMMARY

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Axiom is a small ISP in rural Maine, United States, which serves around 1,200 customers. Axiom is a hybrid of for-profit and non-profit entities. The for-profit arm builds connectivity infrastructure and sells Internet services in rural, remote, and sparsely populated regions of Maine. The non-profit arm, Axiom Education and Training Center, provides mandatory but free digital literacy and inclusion training programs. Axiom leverages grants and subsidies, offers connectivity at affordable prices through innovative technologies, and ensures that users have the skills and knowledge to effectively use their connections to form sustainable networks in difficult geographic, social, and economic conditions.

*Keywords: TV white spaces, digital literacy, rural connectivity*

## CONTEXT

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Broadband access at acceptable speeds in the United States experiences a substantial urban/rural divide. The Federal Communication Commission defines acceptable speed as a minimum of 25 megabits per second (Mbps) download speeds and 3 Mbps upload speeds. Despite efforts by the government and private interests to close this divide, 35 percent of people in rural areas have no Internet access, which is nearly 22 million Americans. Fiber-optic cable installation costs about US\$ 30,000 a mile, which is financially unfeasible for sparsely populated regions. Those areas are instead served by existing copper lines, which are too weak to deliver high-speed data.

Among these unconnected areas is rural Maine, where 20,000 households lack Internet service completely, and a considerable amount remain underserved. The majority of Maine counties have download speeds between 7.3-10.9 Mbps, 40-60 percent below the national average of 18.2 Mbps. Some of the reasons for Maine's weak broadband infrastructure are a high percentage of rural areas in the state, lack of tax incentives for network improvement, an aging population, and an inadequate understanding of the benefits of high-speed Internet access. Also, unlike many other U.S. states, Maine does not offer tax breaks or subsidies for network improvement in market failure areas.

<b>United States</b>			
<b>Population (UN, 2015)</b>	325,127,634	<b>Fixed broadband subscriptions (%) (ITU, 2016)</b>	32.36
<b>Population density (people per sq.km) (UN, 2015)</b>	33.77	<b>Mobile cellular subscriptions (%) (ITU, 2016)</b>	127.16
<b>Median household income (Gallup, 2006-2012)</b>	US\$ 43,585	<b>Individuals using the Internet (%) (ITU, 2016)</b>	76.2
<b>Education (Mean years of schooling) (UNDP, 2013)</b>	Male: 12.9 Female: 13.0	<b>Individuals using the Internet by Gender (%) (ITU, 2016)</b>	Male: 74.2 Female: 74.9

## PROJECT DESCRIPTION

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Axiom's most recent initiative is a pilot project that serves 40 customers in Indian Township, a remote stretch of tribal land in Washington County, Maine. This area was unserved by Internet service providers (ISPs) as it is sparsely populated by low-income residents and heavily forested.

With a grant of US\$ 72,000 from Microsoft's Affordable Access Initiative, Axiom deployed TV white space (TVWS) technology in order to bring connectivity to the area. TVWS is a new and relatively inexpensive technology that does not require line-of-sight. Microsoft's grant subsidized costs that profitability prospects would have made untenable.

Axiom charges users US\$ 9.99/month for their first year of connectivity. They also mandate digital literacy training through their non-profit education partner, Adaptrum. By pairing low-cost Internet access with user-specific training programs, Axiom ensures that customers are able to use their connections effectively and to their advantage. After the first year, the price

of connectivity will rise to US\$ 39.99, at which time Axiom projects that customers will have a more robust understanding of the value of their access to the Internet.

<b>Project details</b>			
<b>Technology</b>	TV white spaces deployment	<b>Training</b>	Required digital literacy training for subscribers
<b>Year program started</b>	2016	<b>Cost to users</b>	US\$ 9.99 per month for the first year, US\$ 39.99 after the first year
<b>Geography</b>	Washington Country, Maine Heavily forested area	<b>Total cost of program</b>	US\$ 72,000
<b>User profile</b>	40 people for pilot	<b>Associated organizations</b>	Adaptrum, Axiom Education Center, Microsoft

## PROGRESS AND RESULTS

Axiom’s nonprofit arm was started in 2014. Since then, they have trained more than 5,000 adult learners in Washington Country, Maine, to better utilize the Internet. Generally, in rural America, incomes are lower, education is less prevalent, jobs are scarce or homogenous in industry, and social isolation is common. Internet connections are key to helping people in these areas participate in a culture and an economy reliant on digital technologies.

Axiom reports success in “closing the homework gap.” When school assignments require online work, children without Internet access at home are at a disadvantage. A student who might have needed to travel 30 minutes to the town’s library to do their homework – or not be able to do it at all – now has access at home due to the Axiom deployment.

In these remote areas, telemedicine helps save people time and money. A patient with a pacemaker used to have to drive up to an hour to the nearest clinic to have their device monitored. With connectivity, they can now talk to a doctor from their home and have the data from their heart monitored remotely via the Internet.

## CHALLENGES

**Challenging terrain** – The areas Axiom serves are heavily forested, remote, and sparsely populated areas of Maine. In addition, the weather is a factor that needs careful consideration. Maine has extremely cold winters with large volumes of snowfall, which poses obstacles to installation and equipment maintenance.

**High equipment prices** – Even when the price of Internet service is made affordable, people in the areas Axiom serves often have trouble being able to afford Internet-capable devices. In order to meet this need, Axiom sells low-cost, refurbished computers to people who otherwise would not have been able to purchase a device.

## AXIOM'S SUGGESTIONS FOR FUTURE PROJECTS

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**Subsidies can help provide initial connectivity in rural areas** – Subsidies, such as the grant Axiom received from Microsoft, are useful in order to expand Internet infrastructure into remote areas such as those in Maine. Without the prospect of exceeding operational costs, ISPs have little incentive to provide these much-needed services in these areas.

**Affordable access with digital literacy training helps** – Axiom's experience suggests that digital literacy training is complementary to affordable, low-cost connectivity. By discounting services and devices, Axiom is able to introduce people to the Internet so that they are able to organically cultivate their own interest and place in the information society.

**Local partnerships are useful** – Axiom works with local institutions such as local libraries, and works to ensure that the library's opening hours are suitable for a local working population to access services and discover how they can benefit from the Internet. When the specific social needs of a particular population are first descriptively identified – job opportunities, education quality, and diversity – then a connectivity provider can better target the requirements of the area as well as ensure future subscriptions.

## SOURCES

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Oulette, M. (2017, July 14) Personal Interview.

Project website: <http://www.connectwithaxiom.com/>

Project video: <https://www.youtube.com/watch?v=sMdmIHaDccA>