
Hacker Spaces

User-Led Innovation
and Economic
Development

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Evolution works like the Nairobi market, not like the throwaway society of the wealthy West. You can evolve further only by using what you have in new and interesting ways. Organisms have no equivalent to currency for acquiring something truly new; they can reconstruct only from their own innards.

-Stephen Jay Gould

Evolution, Innovation and Economic Development:

A problem plagued evolutionary biologists in the mid-nineteenth century: if evolution is a series of incremental stages, then at some point a bird's wing would have only been 5% of its current size rendering it useless for flight. How then did this useless trait become an appendage absolutely necessary for flight? The solution posed by Darwin was that the bird's wing was first used to regulate body temperature; flight was the "latent potential" of the nascent wing(Gould, 1996). Much like evolution, innovation is reliant upon the latent potential housed within a society's economy. Teflon's first purpose was to provide a non-reactive surface in the manufacture of nuclear weapons, iconic Kleenex was first used as a sanitary cold cream remover before its widespread use as something to blow your nose into, and Thomas Edison's phonograph was marketed as a business correspondence device(Kawasaki, 1999). Each innovation was a dormant economic force until circumstance allowed the latent potential to become manifest.

The link between evolution and innovation is important as it provides economic development planners with an opportunity to learn from this natural process. The success of evolution is based on its ability to provide the planet with infinite diversity. No one species, arguably until Homo sapiens, had complete dominance over the eco-system; allowing life to burgeon in a fairly stable environment for billions of years. In contrast, the traditional methods of innovation focus solely on the rapid commercialization of latent potential. This divides the population into two groups: those who innovate and those who consume innovation. The division leads to homogeneity, a lack of diversity; thus, a dearth of latent potential. The evolutionary process teaches us that diversity and latent potential are intertwined. Our current method of innovation does not reflect the codependency.

User-Led Innovation:

Everyone has the innate ability to innovate. For example: When you're about to drive a nail into the wall and you realize you are without a hammer, you may decide to use the nearest heavy book to take the hammer's place. At the moment you first strike the nail with the book you have engaged in an elementary form of innovation. This type of innovation is what Eric Von Hippel calls "User-Led"(Von Hippel, 2005). You, the user, had demand for a product that was not readily available and took it upon yourself to modify an existing resource to meet your

specification. While the example is a singular act of one person, user-led innovation is a process that requires a community of innovators. User groups are composed of “firms or individual consumers that expect to benefit from *using* a product or a service” (von Hippel, 2007, p. 294). The open source software industry is a good example of the diverse groups that spawn around user-led innovations. In this industry, users can consist of individual programmers, programmers working for small open source software firms, or programmers in multi-national companies such as Google, Oracle and Microsoft. These programmers, regardless of firm size, all use their intimate knowledge of an available product’s shortcomings to create a new innovation.

Users in the open source software industry begin the innovation process “because they are not satisfied with the existing software or simply because the required software feature does not exist”(Bitzer & Schroder, p. 223). Software programmers alter the freely available open source code to meet their individual needs. Many times the alteration sparks interest among fellow programmers leading to the creation of a user innovation group. Apache, an open source web-server software, grew from a user community centered around a server run by the National Center for Supercomputer Applications (NCSA). NCSA allowed users to freely access the source code and asked for the group to make modifications to it. The project eventually lost the support of its developers and was scrapped by the NCSA. At this critical point, the users of the server software decided to carry on the project with the open source ethic. A recent Netcraft survey demonstrates the project’s impact. Netcraft surveyed 206, 741, 990 websites and found that 53.84 percent ran Apache(Netcraft, 2010). Microsoft's server software, according to the same survey, ran on only 24.08 percent of servers. The success of Apache is partly due to the user innovation network's ability to perpetuate the project once the lead developer lost interest. The success is also based on the three principles of user-led innovation.

Hippel suggests three main conditions which allow user-led innovation networks, such as Apache, to spawn into successful ventures: 1) Some users innovate, 2) Some users freely reveal, and 3)Users can self-manufacture their products cheaply(von Hippel, 2007).The first condition is met when at least one innovator within a network begins the innovation process. This sole innovator is usually called the “lead-user”(Von Hippel, 1988). All users needn't join the lead-user in designing the product or service, but all are welcome to attempt. Indirect innovators within network can still aid the development of the product or service by giving valuable user feedback on how the product or service functions over normal and extreme use. Secondly, the open exchange of information is a key to the success of the user-led innovation process. Users don't attempt to patent or secure copyrights to their ideas. Instead, they freely share their designs and the processes required to make the innovation to all members of the network. Indeed, this runs counter to the conventional economic development view of the importance of intellectual property as Nunn and Worgan state, “Innovations and the property rights to them directly affect the income and economic vigor of regions”(Nunn & Worgan, p. 237). Intellectual property rights, however, stymie the economic and innovative potential of user-led networks. The user group acts as a problem solving network requiring a free exchange of knowledge in order to create an optimized final product. Moreover, the free exchange of ideas gives user groups considerable advantages over conventional manufacturers largely

because of their direct access to users' needs and the low cost associated with sharing ideas over the internet(von Hippel, 2007). Finally, users are able to commercialize their products and create viable businesses only when mass manufacturers are unwilling to supply the market because they deem it unprofitable or are unaware of the product's demand. This gives the user innovator enough time to gain a strong foothold in the niche market. "The very special skills of the lead users and their connectivity with the community"(Hienerth, p. 287) are key competitive advantages the user manufacturers can enjoy even after mass manufacturers have entered the market. When mass manufacturers do enter the market place they can remain unaware of the innovative power of the user community for up to 5 years (Hienerth, 2006).

Implications for Economic Development Planners:

The difficulty in fostering user-led innovation networks within a local economy is that these networks operate over a medium which is ubiquitous; it is not tied to place. Someone's idea can become another area's innovation leading to a new industry in yet another area. This is both blessing and curse: Innovation can happen anywhere, and innovation can happen everywhere. Normally, it would be closer to a curse except that there is one type of user-led innovation network that is beginning to coalesce in physical form. This location-based, user-led innovation network is called a hacker space. A community, once dedicated to the collaborative power of the internet, is beginning to value face to face interaction. One member of a hacker space voices the realization, "In our society there's a real dearth of community. The internet is a way for people to key in to that need, but it's so inadequate"(Tweney, 2009).

Hacker Space Defined:

Hacker Spaces are "community-operated physical places, where people can meet and work on their projects"(Hackerspaces.Org, 2010). A hacker, in this case, is not someone who is attempting to access your bank accounts, steal corporate information, or engage in other forms of cyber mischief. Hackers are, as Nick Bilton describes, "a pretty wide variety of people, but definitely all geeks. Not Dungeons and Dragons type geeks, but more professional, working-type geeks"(Tweney, 2009). Think of them as technology oriented Do-It-Yourself enthusiasts. The projects they work are complex, but each involves the modification some existing product into a new use. For example, a member of HacDC took a Nintendo Wii controller (Nintendo Wii is a popular video game console that uses a motion sensor controller) and turned into a musical device(Musgrove, 2009). One such organization is located in Atlanta, Georgia.

Freeside:

The first meeting of Freeside, a hacker space in Atlanta, was rather brief. The February 2009 meeting note contains one sentence, "6 people, talked about basic community outreach and classes and stuff"(Freeside, 2010d). The brief meeting evolved into a "Georgia nonprofit corporation, organized to harbor a community of coders, makers, and information security researchers in order to promote collaboration and community outreach"(Freeside, 2010c). The nascent organization's meeting notes focus on two key issues: financing and location. Funding for the organization was raised largely from a \$300 membership start-up fee and monthly membership dues. As the organization continued to meet at Manuel's Tavern, a local Atlanta

pub, these do-it-yourself entrepreneurs began to gather a strong following. After enough money was raised, members voted on a list of locations across the metro area. The Freeside members chose a 5,500sq.ft industrial space a few minutes' walk west of MARTA's West-End station.

Freeside engages in two key activities: teaching classes and carrying out projects. Instructional classes provide one outlet for Freeside to accomplish its community outreach goals. A list of weekly courses offer an eclectic arrangement of skills and knowledge: a Saturday sewing lab, a Sunday night basic welding course, on Thursday night a Python programming class, and circuit bending on Wednesday night (Freeside, 2010a). Members of the public are encouraged to attend these courses which are generally free. The programs offer the community a chance to interact with technology in a new way, develop a basic understanding of how to manipulate technology and the ability to judge whether a certain subject is of personal interest. Moreover, the courses allow the individual to explore what types of innovations they can concoct; building their innovative capacity. For more advanced professionals, hacker spaces offer a helpful environment in which to hone one's skills.

Freeside's second function is to support individual and group projects. One of Freeside's active group projects is building a Replicating Rapid-Prototyper (RepRap) (Freeside 2009d). A RepRap machine is a 3D printer which, using plastic, prints 3D objects (Bowyer, et al., 2010). Essentially, the machine allows someone who has created a three dimensional model in a computer program to "print" that model. Another completed project is Freeside's mini-foundry. Creative Loafing describes the foundry as, "A combination of two metal buckets, some concrete, and the same propane gas tank used for standard home barbecue grills, the foundry is a simple tool offering limitless possibilities" (Williams, 2009). Both the Foundry and the RepRap machine will allow Freeside members to self-produce necessary parts to aid their individual projects thereby reaching organizational self-sufficiency. Individual projects fall into various assortments of categories and reflect the individual's interest in a given field. One member is working on a dog house that is cooled by a solar powered fan (Freeside, 2010b). The individual benefit of innovating in a collective environment is, "If you're hitting a roadblock on your latest project, the chances are good that somebody else in the group will be able to help" (Musgrove, 2009). Hacker spaces give individuals access to group resources and, most importantly group knowledge.

Conclusion:

The local economy is a Nairobi market. A local economy's capacity to innovate is dependent on its "innards", its intrinsic resources. Instead of relying on a bifurcated innovation structure, user-led innovation networks focus on diversifying the economy's innovation base. The diversification leads to an increase in the latent potential housed within a local area's economy; thus, there is greater potential that an economy's resources will yield an innovation. Hacker spaces create innovative diversity by introducing the individual to their innate innovative mind. These place-based innovation networks act as a bridge between the local economic development planner and user-led innovation. Planners can collaborate with their local area hacker space to create strategies that will broaden the community's capacity to

innovate. Strategies could involve linking high school students interested in technology with the organization or weekend workshops in which professionals design and build their own innovation. A list of hacker spaces and their locations can be found at the following link: http://hackerspaces.org/wiki/List_of_Hacker_Spaces. The direct economic impact of these organizations is uncertain. Members of hacker spaces are vehemently opposed to commercializing any innovation that occurs at the space. More importantly, commercialization undermines the spirit that drives the space's innovative engine. The indirect impacts of hacker spaces are more substantial. These place-based user innovation networks are founded upon a culture of innovation. They transform the passive consumptive habits of society into an active, critical interaction with consumer products. Hacker spaces foster a culture which is constantly discovering something new.

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