Building a Next Generation, Creative Urban Workforce for the Information Economy: Temple University’s Urban Apps & Maps Studios

Youngjin Yoo, Michele Masucci, and Alan Wiig
Temple University
The IBIT Report

Bruce Fadem
Editor-in-chief
Retired VP and CIO, Wyeth

David Schuff
Editor
Associate Professor
Fox School of Business, Temple University

Laurel Miller
Managing Editor
Director, Fox School of Business, Temple University

Munir Mandviwalla
Publisher
Executive Director, Fox School of Business, Temple University

BOARD OF EDITORS

Andrea Anania
Retired VP and CIO, CIGNA

Ed Beaumont
Management Consultant

Michael Bradshaw
Vice President, Lockheed Martin

Jonathan A. Brassington
Founding Partner and CEO
LiquidHub Inc.

Richard Cohen
Management Director, Deloitte

Larry Dignan
Editor-in-Chief, ZDnet
SmartPlanet Editorial Director, TechRepublic

Craig Conway
President
Conway Technology Consulting, Inc.

Niraj Patel
Managing Director, Witmer, LLC

Kent Seinfeld
Retired CIO, Commerce Bank

Joseph Spagnoletti
Senior VP & CIO, Campbell Soup Co.

© 2014 Institute for Business and Information Technology, Fox School of Business, Temple University, Philadelphia, PA 19122, USA. All rights reserved. ISSN 1938-1271.

The IBIT Report is a publication for the members of the Fox School’s Institute for Business and Information Technology. IBIT reports are written for industry and based on rigorous academic research and vendor neutral analysis. For additional reports, please visit our website at http://ibit.temple.edu.

No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, scanning or otherwise, except as permitted under Sections 107 or 108 of the 1976 United States Copyright Act, without the prior written permission of the Publisher. Requests to the Publisher for permission should be addressed to Institute for Business and Information Technology, Fox School of Business, Temple University, 1810 N. 13th Street, Philadelphia, PA 19122, USA, 215.204.5642, or ibit@temple.edu.

Disclaimer: The conclusions and statements of this report are solely the work of the authors. They do not represent the opinion of Temple University or the members of the Fox School’s Institute for Business and Informational Technology (IBIT).

Review process: IBIT reports are sourced, reviewed, and produced as follows. The managing editor oversees this process. The editor and editor-in-chief consult on topics and identify new sources of reports. The editor typically works with authors who are interested in writing reports and provides feedback on initial drafts. Completed reports are first screened by the editor-in-chief. After approval the report is sent out for review to two members of the editorial board. The editor-in-chief assesses the completed reviews and provides further guidance to authors. Final reports are then professionally produced and made available to IBIT members.
Foreword

The transition of many US cities from an economy focused on manufacturing to one focused on digital and information technology has contributed to the decline of many inner-city neighborhoods. The impact of this change has not been evenly distributed across the labor market and the disparity has affected urban, minority communities disproportionately. Philadelphia is an example of this imbalance. In response to this problem, Temple University launched an interdisciplinary, university-wide initiative in 2012 called Urban Apps & Maps Studios Program. The program’s goal is to cultivate design-based and civic minded start-ups that will foster sustainable economic renewal in the North Philadelphia neighborhoods surrounding Temple University. This IBIT report details the drivers of the economic decline and impact on Philadelphia, the origination and development of the program, examples of the program’s success, and the program’s potential and applicability to other urban communities. It is hoped that the experiences and results from Temple University’s program will provide a model for others to adopt and adapt to address their own persistent urban problems.

Bruce Fadem
Editor-in-chief
July 14, 2014
Executive Summary

Initially funded by the United States’ Economic Development Agency to foster long-term, entrepreneurial economic growth in inner city neighborhoods, the Urban Apps & Maps Studios (the Studios hereafter) at Temple University work to foster generative new uses of information technologies in marginalized urban neighborhoods. While digital technologies like smartphones and social media hold significant potential for community development in these communities, applications (typically called ‘apps’) that utilize these mobile computing devices and the mobile Internet are rarely designed specifically for—let alone by—inner city, largely minority populations. The Studios take this concern as its imperative to foster local design, development, and commercialization of locally-relevant apps and related sources of productive information such as maps and crowd-sourced databases. We see the potential here to enable transformative change and new forms of civic exchange via community-designed, neighborhood relevant information technologies. The Studios work with local youth to train work-ready skills and improve digital literacy by engaging with app design, coding, and targeted entrepreneurial approaches to marketing and successfully selling apps or other information technology-driven products. These new neighborhood assets have the potential to bring about novel forms of economic activity in inner city Philadelphia, both through new markets for apps and, more importantly, through connecting fractured, often impoverished neighborhoods to local social media networks around issues such as food access and urban farming, or personal health.

This report is organized into seven sections, first detailing the impetus and motivations that brought the Studios together, then going through the background and the processes of the work, and finally listing examples of successful projects.

Section 1 argues that the transformation of the United States’ economy from the “atom” to the “bit,” from producing industrial goods to knowledge and information, has had tremendous impact on business activities, from automating routine tasks, to offshoring many jobs, to improving the speed and efficiency of communication. Unfortunately, these improvements for businesses have not been evenly distributed into the labor market, a disparity that has affected urban, minority communities disproportionately.

Section 2 outlines the complex origins of inner city urban problems by examining Philadelphia’s decline from the 1950s to the 1990s. While apps and maps will not solve these concerns on their own, the Studios offer a novel approach to merge economic revitalization and community development in marginalized neighborhoods by opening up opportunities for creating local solutions to meet the residents’ needs.
Section 3 considers the potential of the app-based economy to meet these needs in a novel, information technology driven fashion. Since a majority of Philadelphians--and city dwellers in general--carry a mobile phone or an Internet-enabled smartphone, this pervasive connectivity offers a means of providing services in ways never before offered. In turn, these services can foster new, local economic growth as well as create pathways toward generative urban change.

Section 4 makes the case for equitable community development and economic revitalization through engaging with local residents directly. The background and motivations of the university-community partnership, youth-engagement project that the Studios utilizes to achieve its goals is discussed.

Section 5 offers three examples of successful urban, civic start up projects: the Smart Urban Garden/Growshare project; the Urban Health Warriors project; and the Fantasy Ed project.

Section 6 concludes the report by returning to the original motivations for the Studios and considers the implications of the Studios’ work in the future.

The Appendix transitions to discuss the “nuts and bolts” of the Studios’ process and considers the implications of setting in motion a platform for urban, civic-minded start-up businesses.
1. Introduction: From the Atom to the Bit

The United States’ economy is at a crossroads: it is going through an undeniable, pervasive transformation as the core foundation of value creation is moving away from the “atom” based industrial economy to the “bit” based digital economy. Even though companies have started showing profits again after the recession that started with the global financial crisis of 2007, the overall unemployment rate is persistently high. It is particularly high among urban, minority communities such as those surrounding Temple University in Philadelphia. The disparity between the recovery of corporate profits and the recovery of jobs in the labor market indicates that an irreversible, structural change is taking place in the US economy. The increasingly sophisticated and effective use of information and communication technology is an important factor that contributes to this structural change.

Over the last half century, information and communication technology has been a major force reshaping firms in all sectors (Brynjolfsson and Saunders 2009). These technologies have allowed firms to improve their productivities through automating and “informating” routine physical works or repetitive back-office tasks (Zuboff 1988). By replacing human labor with automated machines, firms could enjoy radical cost saving through the economy of scale. Also, the use of networked information and communication technology, along with the modularization of products, allowed firms to offshore many of the jobs to other countries, “flattening the world” (Friedman 2002; Malone et al. 1987; Castells 2000; Castells 2001). By using information and communication technology, firms could radically reduce communication and coordination cost, managing workforces locally and worldwide at once (Schultze and Orlikowski 2010). This allowed firms to tap into inexpensive foreign labor markets by offshoring the jobs to other countries. While such transformation brought unprecedented opportunities for firms to increase their productivity, it at the same time brought a fundamental transformation in the US labor market and consequently to the cities that were at the core of the industrial economy (Malone 2004; Rifkin 1995).

The challenge is that the widespread impact of information and communication technology and its transformation of work and organization are not evenly distributed. While firms are enjoying record productivity gains, it often comes at the expense of a shrinking labor market, especially for the unskilled workforce. For example, although corporate productivity has rapidly increased through the use of technology over the last half century, the median income of full-time employees in the US is virtually stagnant during the same period (Brynjolfsson and McAfee 2012). As firms continue to seek to enhance their productivity through the advanced technology, the jobs that used to serve as the foundation of American middle class are rapidly disappearing. Such economic disparity
is undesirable and unsustainable in the long run. Furthermore, the “drought of jobs” is much more severely felt among urban minority communities where education and other basic social support infrastructures have fallen significantly behind other more affluent and often more suburban neighborhoods (Wilson 1997, Zukin 1996). We further discuss this point in Section 2 below.

In response to the widespread, ongoing economic crisis in Philadelphia’s minority communities, in 2012 Temple University launched an interdisciplinary, university-wide initiative called Urban Apps & Maps Studios Program (the Studios hereafter) through the initial support of the US federal government’s Economic Development Administration. The Studios’ strategic goal is to create a platform for community-engaged economic development through cultivating design-based and civic-minded start-ups. These start-ups would, in turn, foster sustainable economic renewal of the North Philadelphia neighborhoods surrounding Temple University, as well as in the greater Philadelphia region. Since the initial launch, the Studios have been awarded additional funding from the John S. and James L. Knight Foundation and have quickly emerged as a key component of the region’s urban and civic digital innovation community.

The Studios are structured around a trans-disciplinary approach, involving a core team of Temple University faculty drawn from the following departments: Management-Information Systems; Geography-Urban Studies; Electrical Engineering; Computer-Information Science; English; and Graphic and Interactive Design. Each faculty member runs their studio autonomously while contributing to the overarching goal of neighborhood-level economic growth. The Studios take the innovative economic potential of targeted applications for smartphones and train community members to develop, market, and sell applications relevant to their neighborhood itself—this is the spatial, maps and mapping component—as a means of building new engines of job growth in areas left behind by the economic shift to digitally-focused, information-heavy industries. This report is not intended to act as an operating manual per se, but instead to highlight our particular situation in North Philadelphia. A key element of the Studios’ work is, through grounded, place-based investigations, to identify the locally-specific, contextual issues we seek to improve through community-engaged efforts. Anyone seeking to apply the lessons presented here would be best served by first reaching out to their community and determining what in particular is needed.

Based on our on-going, successful experience with the Studios, we describe a new strategy of fostering entrepreneurial, civic-minded start-ups. We achieve this goal through the active and deliberate merging of digital technology and design methodologies with community-engaged action research methodologies. Figure 1 outlines the Studios’ process. After discussing the origins of the early twenty-first
century urban problems and then considering the overarching rationale for the Studios, we describe how action research informs our work in community outreach, which in turn directs how the overall project proceeds. Finally, we describe the four core, constitutive components of this urban, civic start-up platform and outline how such a platform can support a sustainable model of digital inclusion, citizen entrepreneurship, and neighborhood-driven, ground-up urban renewal.

**Harnessing the City as a Platform for Entrepreneurial-led Community Development**

<table>
<thead>
<tr>
<th>Stage One</th>
<th>Stage Two</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Design Challenge</strong> to identify solutions to an urban issue</td>
<td><strong>From proposal to concept</strong></td>
</tr>
<tr>
<td>• Multiple proposals put forward</td>
<td>• Studios’ professors, student workers research how to build an app around the concept</td>
</tr>
<tr>
<td>• Community input</td>
<td>• Community members provide input</td>
</tr>
<tr>
<td>• Apps &amp; Maps Studios input</td>
<td>• An app’s design, layout, and data sources, are decided upon. App is ready for coding</td>
</tr>
<tr>
<td>• Winning proposal chosen by community and Studio members</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stage Three</th>
<th>Stage Four</th>
</tr>
</thead>
<tbody>
<tr>
<td>From <strong>concept to prototype</strong></td>
<td><strong>App is brought to market</strong></td>
</tr>
<tr>
<td>• App is coded into a workable prototype</td>
<td>• Data is collected by Studios to improve app and to provide metrics for analysis</td>
</tr>
<tr>
<td>• A market is identified</td>
<td></td>
</tr>
</tbody>
</table>

*Figure 1. Harnessing the City as a Platform for Entrepreneurial-led Community Development. A diagram of the Studio’s process of App creation.*
2. The Urban Problem

The Studios are located on Temple University’s main campus in North Philadelphia, about two miles north of the city’s downtown; the projects the Studios engage with are targeted to improve issues in the inner-city neighborhoods surrounding the university by involving residents of those communities directly. While we maintain this close connection to our area, the issues that affect inner-city Philadelphia and specifically North Philadelphia—the concerns that the Studios aim to turn around—are not unique to the city. This section takes North Philadelphia’s recent history as an exemplar of the challenging urban situation facing many cities in the Northeast and across the US, as the industrial economy shifted to an information and knowledge-driven economy, but did not find a place for the former’s workers into the latter’s jobs.

The neighborhoods surrounding Temple University are a telling example of a marginalized area with significant urban poverty. A walk into the formerly-industrial landscape of vacant and run-down row homes, abandoned manufacturing factories and smaller workshops, and weed choked empty lots that can be found surrounding the campus can attest to this: the industrial economy that made the area the “Workshop of the World” in the nineteenth and early twentieth centuries (Gyourko et al 2005, 20) has very little of this economic activity still in action. Efforts to encourage new businesses over the last few decades to re-invigorate the area have had lackluster results at best; as Philadelphia’s new economic activities create a healthy, vibrant downtown, these formerly-strong, working-class neighborhoods have been left behind or passed over (Graham and Marvin 2001; Davidson, 2012).

From Industrial Economies to Information Economies

To better understand the factors leading to Philadelphia’s—and especially North Philadelphia’s—decline, it is necessary to consider what effect the transition to a digital, information economy had on cities and their neighborhoods. In the 1950s, the industrial, manufacturing-focused economy in the US—which was largely urban—began to decline. This process continued to a near-complete collapse by the 1980s. At the same time, the information economy and its workforce was located outside of the inner city, initially in suburban areas surrounding the city core and later in ex-urban edge cities, and eventually other countries through offshoring. The information economy work that occurred in cities was largely contained in the central business districts and did not filter out into the formerly industrial neighborhoods.

This population shift from city to suburb was enabled by developments in telecommunications and automobiles and then exacerbated by social issues. The building of freeways in the 1950s to the 1970s connected outlying areas to the central business districts of cities; the evo-
olution of telephones, fax machines, then personal computers and the Internet allowed for remote management and control of back offices and factories. While certain face-to-face business activities still occurred downtown, with telecommunication systems, less value-added segments of a corporation could be shunted to suburban office parks, and manufacturing could, to an extent, locate wherever the business atmosphere was amenable to that industry, even if that location was in another country (Castells 2000; Graham and Marvin 1996; Graham and Marvin 2000; Garreau 1991).

Socially, this same post-World War II period was an era of significant unrest, racial tension, and cultural ferment. The Civil Rights Movement of the 1960s created significant improvement in the lives of African Americans, but the decrease in manufacturing jobs in inner city areas was compounded by the “white flight” to the suburbs. These complex problems further destabilized local property tax revenue, which was also reduced due to the decline of industrial businesses. The growing marginalization of inner city neighborhoods, now predominantly composed of African Americans, was hit with numerous and significant setbacks including drug abuse and crime, but at the core of all of these negative, destabilizing impacts was the lack of regular employment (Wilson 1997). Without jobs, a neighborhood cannot attain a healthy community with diverse local businesses and the attendant social and economic exchange.


According to The Wall Street Journal, in 2012 the size of the global market for smartphone programs, typically called the app market (short for application) was $25 billion (Lessin and Ante 2013). Another recent study estimates that mobile industry was responsible for roughly 466,000 jobs in the US in 2012 (Mandel 2012). More than sixty percent of the Internet access is from some type of mobile device in the US, rather than on traditional desktop computers (Duggan and Smith, 2013). What is striking here is the rapid pace by which these numbers have grown: use of the mobile Internet has doubled since 2009, and the so called “app economy” did not even exist before the introduction of the Apple iPhone’s “App Store” in 2008 (Deloitte Open Mobile, 2012).

We believe that what is happening with the app market for smartphones will continue to expand as these apps – lightweight software application programs to run on specialized operating systems optimized for mobile computing devices – continue to merge with new types of smart computing devices. These new smart devices are previously non-digital products that are equipped with a lightweight operating system and “always-on” connectivity to the Internet (Yoo 2010). Apps that are currently being used with smartphones, therefore, will be the key component of this emerging app-based digital economy that increasingly combines the digital and physical worlds together. As more
and more products are connected to the Internet, we expect that the scope and the scale of the app-based digital economy will continue to grow, presenting new opportunities to provide targeted, individualized services and entertainment to people in a wide variety of specific locations, down to the level of a neighborhood or to a dispersed community with specific interests. This point will be expanded on later in the report.

Another important aspect of the contemporary digital technology is its **generativity**. Generativity refers to a “technology’s overall capacity to produce unprompted changes driven by large, varied, and uncoordinated audiences” (Zittrain 2006, 1980). For example, Google Maps can be used as a standalone product and it can be used in a variety of different ways, such as bundled with a host of heterogeneous devices like desktop computers, mobile phones, TV, cars, navigation systems, and digital cameras. Many of the innovations with Google Maps did not come from Google itself, but from third-party developers who do not have any formal relationship with Google. Such a generative nature of digital technology allows individual developers to pursue their own creative insights by affixing existing technology resources mostly available on the Internet to smart devices in new and unique ways (Yoo et al. 2012).

In turn, these generative relationships enabled through smart devices and apps can reflect back into the urban landscape itself, fostering a “generative urbanism” of which personal digital technologies such as smartphones and their apps form a foundational element of the urban experience (Lindsay and Inaba 2012). The multi-modal functionality of a smartphone can transition into the urban landscape through new computing devices located within the urban fabric itself. As it becomes feasible to deploy inexpensive sensor networks throughout a neighborhood—including using the sensors existing in smartphones already—apps can be created to do new things through those sensors. For example, they can be created to foster new relationships within a place through digital connections, which in turn can present further opportunities for economic innovation. The pervasive connectivity to the Internet can influence communication within and between neighborhoods and residents. One example is the social media platform around urban agriculture and community gardens that the Studios produced in 2012 and will be discussed in the final section of this report.

The emergence of digital technology as the major engine of economic activities, its generativity, and its ability to equalize entry into the market, thus, together create a unique opportunity to address the economic disparity that has arisen from the use of information and communication technology in companies. While the traditional middle class jobs are rapidly disappearing in America due to automation and offshoring, the emergence of an app-based digital economy offers an opportunity to build a new type of middle class in the urban minor-
ity communities most affected by the economic downturn, one whose apps could address their own community needs in ways the current digital app economy does not.

4. Addressing Urban, Economic Growth through Community Development

The impetus for the Studios was inspired by the university’s geographic location and the need to find creative, targeted, and realistic solutions to the lack of economic opportunities in North Philadelphia. To achieve these goals, the Studios foster community-based civic engagement through digital inclusion that, by directly involving members of the community in defining problems and finding solutions, creates new opportunities for generative, entrepreneurial economic growth. Implementing this framework-for-discovery is a means of locating the new digital literacies discussed above into the neighborhoods, through the input and assistance of the people who have the potential to benefit the most from the apps themselves, both as creators and users. We define community both through our engagement in the neighborhoods surrounding Temple University—community as proximity to others in a specific location—and through shared experience in the greater city. For instance, youth in Philadelphia form a community even if they live in different neighborhoods throughout the city. The shared experience of residing in or near Philadelphia provides a community-context that we apply at Temple University and across the city.

As the polar opposite to our framework, a top-down approach to app development—imposing the expert knowledge of the Studios university faculty, team members into the community with existing ideas for apps—would marginalize the experiences of the community itself by assuming the expert will inherently improve the situation. We see a difference between providing access to education, technologies, and job-experience toolkits, and taking for granted that the community needs what the scholar/researcher can provide. Expert knowledge such as that manifests in a university faculty member can quickly locate the agency to affect change away from the community itself. In order to avoid these issues, the Studios start from the bottom up, actively engaging the community to develop literacy around the issues under consideration, then tackle the subjects that emerge from there (Cameron and Gibson 2005; Gilbert and Masucci 2011, 2; Pain 2003; Pain 2004).

Although the digital divide is closing through more readily available broadband Internet access, prevalent home computer ownership, and widespread use of mobile phones and smartphones, this access has not automatically translated to increased digital inclusion in inner city neighborhoods (Gilbert and Masucci 2011, 4-5; Mossberger et. al. 2013; Servon 2002, 25). Cyberspace, online forums, and social media can provide opportunities for rebuilding community in marginalized places (in addition to well-off places), but there is no guarantee that a technological fix such as providing an app like
an online community-resource clearinghouse would improve on-the-ground issues (Adams 1997; Adams 2009; Aurigi 2005; Kitchin 1998). Residents still have to have the inclination and the ability to use the app or website: it has to have a use-value for their particular needs. Community-centric projects such as those the Studios work towards can provide the next step in addressing marginalized neighborhoods by developing a sense of agency around their technology needs, but only if the projects are designed with community input from the start.

_Economic Revitalization and Community Development_

The Studios are not the first effort at neighborhood-focused community development and local economic revitalization. These two efforts often intertwined but have separate histories. Fitzgerald and Leigh define “local economic development [as] preserving and raising the community’s standard of living through a process of human and physical infrastructure development based on the principles of equity and sustainability” (Fitzgerald and Leigh 2002, 7). Broadly, federal, state, and local economic development strategies in cities such as Philadelphia have targeted: 1) bringing industry back to inner city neighborhoods by incentivizing various business aspects, such as offering tax waivers, 2) starting in the 1980s, “selling” the city in an entrepreneurial effort to promote the location as a promising location for new information economy businesses, but typically not in inner-city areas (Harvey 1989), and 3) re-training residents for new types of work. These strategies are all examples of cities promoting economic growth rather than fostering economic development (Fitzgerald and Leigh 2002, 27).

Community development work—which largely considers community as the physically-bounded places where people live, and then the same or different places where those people work—is concerned with the needs for social equality in order to facilitate lasting, strong neighborhoods that contain active citizens fully engaging with the city but also ensuring that the everyday needs of the residents are met (DeFilippis and Saegert 2008, 5). The ability to secure and keep well-paying jobs is inherently central to community development; without work the community disintegrates. Where economic revitalization often comes from top-down efforts by city planning officials and bureaucrats from outside the neighborhood, community development work seeks to empower local residents to ensure long-lasting neighborhood health and growth.

By focusing on creating bottom-up entrepreneurial economic activities through engaging with creative uses of information technologies, the Studios seek to integrate locally-driven economic revitalization into the neighborhoods directly by considering working towards solutions to the urban marginality that has impeded community development efforts as an opportunity for residents to build businesses around
providing targeted solutions to the issues they face daily.

**Community Engagement around App Development**

To achieve these goals in an equitable fashion, and to foster economic innovation in ways appropriate to and spatially integrated in the North Philadelphia neighborhoods in which the Studios work, we engage with community members in an ethically-minded fashion to define what is to be done: to build apps that community members would want to use by training the community in app development.

Consequently, the Studios have worked with local high school students on projects based around the ongoing, fifteen-plus years of university-community partnership, outreach, education, and work-experience training that the Studios’ Co-Director Dr. Michele Masucci has engaged in. Through the Information Technology and Society Research Group (ITSRG) at Temple University that Dr. Masucci heads, a summer and school-year work ready program for local youth has taken place for the last decade. These youth form the core of the Studios’ community both for idea creation and fostering entrepreneurial growth through the design, development, and eventual marketization of apps.

The program we work through in this context is titled Building Information Technology Skills (BITS). It utilizes geographic fieldwork techniques of critical observation, investigation, and thick description, paired with learning information technology skills including general reading and writing comprehension through online and in-location exploration of places in Philadelphia. In many ways this provides the mapping and spatial thinking that lies at the base of creating community or neighborhood-relevant apps.

These activities are a way to bridge the digital divide, teach work-ready skills, and introduce geographic concepts such as space, place, location, and landscape to these digital natives (Prensky 2001), high school-age students who have likely not been exposed to such concepts in the classroom even though they are typically quite comfortable with information technologies such as social media. This combined geographic and digital literacy provides a building block for the youths to become engaged students as well as engaged citizens of Philadelphia within a group that is largely marginalized in terms of employment—being both young and primarily of minority backgrounds—and education as well as civic participation, being for the most part students of a chronically underfunded public school system.

The Studios have overlaid their new digital literacies, design, and coding experience on top of the spatial thinking of BITS, taking groups of 100-150 local youth each summer, then a targeted 10-15 during the school year, to engage in app and map creation, marketing, and selling (see the Appendix for more information about the new digital literacies). The Studios
form the overall, innovation-driven, entrepreneurial approach to building new digital literacies, and BITS is the programming element engaging high school students to achieve the program’s goals. Our community-focused, bottom up approach has been documented as a powerful framework for conducting service learning work in general, with youth, and with marginalized communities (Askins 2008; Cahill 2007; Fine 2009; Kindon and Elwood 2009). Tying university-community partnerships to community-relevant app creation and to seasonal or longer-term employment for local youth provides the Studios with a productive and extremely creative and engaged test-bed through which to bring ideas to fruition and apps out to the neighborhood. The Studios provide tools to the youths to create apps for their communities, syncing with similar uses of this framework (Cahill 2007, Fine 2009).

5. Examples of Urban Civic Start-Up Projects from Apps & Maps

In this section, we will provide three examples of civic start-up projects that came through three different routes, thus requiring different layers of our platform cores to be activated.

**Smart Urban Farming / GrowShare**

Smart Urban Farming and GrowShare projects grew out of the 2012 Design Challenge competition. The first prize winner of the design challenge proposed an idea to transform vacant lots in Philadelphia into a series of urban farms that will sell organic vegetables and fruits to local community members and restaurants. In order to support such efforts, we had to build a set of technology platforms. After the design competition, the Studios commissioned two separate activities. First, we assembled a group of students from the winning team and faculty members to pursue further technology development. In order to assist the process, we organized a design workshop with a set of heterogeneous stakeholders who are related to or interested in urban farming, including current urban farmers, local restaurant owners, and not-for-profits who advocate land re-use and a healthy diet among the urban minority community. The workshop led to three clear app ideas that have commercial potential. One idea was to identify available vacant lots and find necessary resources (money, seeds, labor, water, etc.) to transform them into viable urban farms. The second idea was to create a local sensor network to collect data from the existing urban farms to assist urban farmers with successfully growing vegetables and fruits. The third idea was to create an app for a hyper-local urban vegetable and fruit market. The team decided to pursue the second idea first. During the summer program when about 150 local high school students work with our faculty members and students for six weeks, the team decided to design and build a prototype. At the end, the team constructed a local sensor network that collects three different types of environmental information: moisture level in the soil, temperature, and sun exposure. The data is then uploaded to
the private cloud. The urban farmer can monitor the current condition of the farm through a mobile phone app or a dashboard on the web.

At the same time, the Studios presented the idea of transforming vacant lots into urban farms at a local hackathon organized by Code for America and Open Access Philadelphia (a local movement for open data standards in the city of Philadelphia). The hackathon led to the discovery of certain government data sets that can be used to identify the ownership of vacant lots. The team, led by Temple University professors Justin Shi (Computer and Information Sciences department) and Youngjin Yoo (Management Information Systems department), then took the idea to an independent study project with three undergraduate students to build a web site using various available web services, particularly Google Places APIs. The project developed an auction-based resource exchange model to mobilize various resources that are necessary to transform a vacant lot. The idea received second place in the Google Places API development challenge. The team is currently building a generic set of web APIs that are designed to facilitate various resources (physical, financial, intellectual, and digital) for social cause, including urban farming.

The cases of GrowShare (Figure 2) and Smart Urban Farming (Figure 3) show examples of ideas flowing from an open idea competition, supported by the resources of the Studios, which then produce a number of different commercialization options. In the case of GrowShare, we are seeking research-based funding for technology commercialization. In the case of Smart Urban Farming, we are looking into philanthropic investment options, possibly partnering with local not-for-profit organizations.

Figure 2. Screenshot of GrowShare.Net
Urban Health Warriors

Urban Health Warriors is a program that came out of the collaboration between community leaders, Temple Medical School and Hospital, and the Studios. Temple Medical School reached out to a group of local community leaders who represent the public health interests of the community to find a better way to engage with local community members. One particular concern that the hospital was facing was the skyrocketing healthcare costs for patients with chronic conditions such as high blood pressure, Type II diabetes, and heart disease. Although the medical community has extensive knowledge about how to manage these chronic diseases, they are not able to communicate this information to the local patient population. One group of local community leaders proposed a novel program where local youth will act as intermediaries between the patients and the hospital. This idea was exciting as this would allow the local high school students to have an opportunity to interact with medical professionals (which will inspire them to pursue careers in those areas), and the team...
believed that the youth would be received by
the patients with less suspicion and skepticism.
One of the concerns, however, was maintaining
the engagement level of the students. The Stu-
dio, led by James Moustafellos of the Manage-
ment Information Systems department, took on
this challenge to conceive a technology-based
solution to implement the Urban Health War-
riors program.

Professor Moustafellos took a two-stage ap-
proach. In the first stage, he adopted the project
as a part of his class. Students in the class in-
teracted with various stakeholders involved in
the project to learn about various aspects of the
problem. They developed the idea of gamifica-
tion as a way of addressing high school stu-
dent engagement. In Spring 2013, the Studios
commissioned a project team to develop a
gamification app to support Urban Health War-
riors (Figure 4). The team included a faculty
member, a graduate student studying gamifica-
tion, two Temple undergraduate students who
worked on the project as a part of their course-
work, and two local high school students. To-
gether they developed a detailed design of the
app and information architecture. The project is
now waiting for additional funding to finalize
the app development and field-testing.

The Urban Health Warriors program is an
example of a civic start-up idea that was
initiated by local community members. The
university enters into joint collaborative re-
search and development agreements with the
community members who formed their own

Figure 4. Paper-based wireframe of Urban Health Warrior
not-for-profit organization to represent their interests. The joint team is seeking additional funding to conduct the next phase of development and commercialization. We are looking at both research-based funding models through traditional funding agencies like NIH or Robert Wood Johnson Foundation, and private corporate partners such as insurance companies. The intellectual property right is co-owned by the university and the community members.

**Fantasy Ed**

Fantasy Ed (Education) is an example of a civic start-up that came out of a regular class project. The Studios collaborated with Management Information Systems (MIS) and Computer Information Sciences (CIS) departments at Temple University to possibly source new project ideas from the class projects. Professor Justin Shi of CIS department and Youngjin Yoo of the MIS department co-taught mobile application development and digital-urban entrepreneurial start-up courses. Students from these courses had to collaborate to design and develop an app that addressed significant urban challenges. One project that developed from the class was Fantasy Ed. An MIS undergraduate student and two CIS students initiated the project. The purpose of the project is to use gamification strategies to improve urban high school students’ engagement with their educational experience. The Philadelphia public school district, like many urban school systems in the US, suffers from chronically high dropout rates, with only sixty-six percent of public school students successfully graduating from high school (The Notebook, 2013). The team combined the idea of Fantasy Football with school activities, where all students are treated as professional players, with teachers assuming the role of team owner/coach. Based on students’ activities that include both curricular and non-curricular activities, the game tracks students’ “performance.” The coaches put together their teams based on past performance statistics. Each team competed with another team on a weekly basis to earn points.

After the semester, the Studios and the lead student of the group agreed to form a project to further design and develop the project led by Youngjin Yoo. The team included a graduate student who acted as a project manager, a business major who acted as a business lead and was involved from the start of the project, a computer science major who acted as a coder, and two high school students who acted as domain experts and community members. The high school students conducted extensive field research to learn what motivates high school students and to learn about possible legal, administrative, cultural, and academic challenges that might emerge as they try to implement the project. The team developed a fully working prototype that demonstrates the concept. Currently, the team plans to improve the design of the app and to conduct a field pilot at a local high school with a full administrative support from the school. Once the pilot stage is over, the team plans to seek seed investment to sell the product to other school systems.
Fantasy Ed (Figure 5) is an example of a project where a course project at a local university can evolve into a collaborative project with significant involvements from local youth and other stakeholders including local schools. As we continue to develop the Fantasy Ed project, we are likely to enroll other stakeholders including local investors who are interested in the public education market as well as government agencies and school districts.

---

6. Conclusions

Temple University’s Urban Apps & Maps Studios represent a new model for community-focused, civic-minded start-ups that takes advantage of the unique characteristics of new, digital technologies to address persistent urban problems. We believe that the intellectual foundation of fostering new digital literacies through design thinking, computational thinking, and spatial thinking will become a critical element for future workforce development and entrepreneurial growth, which is crucial in rebuilding vibrant, healthy, and urban middle class neighborhoods. We hope that our work can be replicated in other US cities and other countries. The generative capacities of smartphones and other mobile computing devices...
offers the potential for bottom-up, transformative urban change, but only if the marginalized communities are involved in identifying, designing, and selling the resulting applications themselves.

This final point is likely the most crucial to the Studios’ success and relevance. The Studios work with existing university-community partnerships as well as Philadelphia-based civic organizations, both within city government and outside, to identify and work with local residents. Without this community the Studios could not function. By fostering working relationships with both city youth and local neighborhoods, it is possible to collaborate on projects that not only provide a solution to an urban problem, but also create a pathway to that solution that is applicable to city residents who might use the apps that are produced.

In addition to prototyping functional apps, talking about these urban concerns and possibilities of new digital literacies in creating a grammar-of sorts to consider the potential of generative digital technologies to address urban problems in new, novel, and relatively quick fashions spins the perception of Philadelphia as a city with poor, depressed neighborhoods full of longstanding social and economic problems into places with the potential to create innovative, unique changes. Changing perceptions does not offer solutions, however, which is why the Studios will continue to actively design, develop, and market their apps.

As for the replicability of the Studios, nothing done at Temple University could not occur elsewhere: this has been part of the organizational strategy from the start. Each city would offer unique challenges and opportunities, but the means of addressing these issues through creativity and design thinking, computational thinking and programming, and spatial thinking and active fieldwork in the city, is straightforward. The imperative lies first with identifying and, most importantly, connecting with the neighborhoods and communities affected and interested in change. Without the interest and support of local residents, civic-minded apps and other forms of outreach cannot find success.
Appendix: Four Cores of an Urban, Civic Start-up Platform

Urban Apps & Maps Studios Program as a platform for urban civic start-up consists of four core constitutive components: technology, community, organization, and knowledge. These four cores provide the socio-technical foundation of generativity that is essential in creating a sustainable urban civic start-up ecosystem. Below, we will first explain what each of the four cores are and how the Studios deal with these four cores. This Appendix provides detailed information about the process of designing and implementing civic apps for community development.

Technology Core

The first core element of the platform for urban civic start-up is technology. The technology core of urban civic start-up platform is based on three distinctive layers of technological infrastructure. The first layer is generic web services architecture. Web services provide a standard means of interoperating between software applications, running on heterogeneous systems and frameworks. Utilizing standards like HTML5, XML, and UDDI, web services architecture enables various web APIs (Application Programming Interfaces) to be easily integrated to create new applications.

The second layer is open data standards. In the US, many government agencies are releasing various forms of data that they have in their database. The Obama administration appointed Vivek Kundra as the first Chief Information Officer (CIO) of the United States in March 2009. Kundra launched the data.gov platform on May 21, 2009. It serves as a single repository of various types of government data. As of July 2013, the site is hosting over 183,708 databases and 295 government APIs from 172 government agencies of all levels. Various local governments are advancing similar efforts. In Philadelphia, the government agencies and local volunteers created www.opendataphilly.org to curate available open data. As of July 2013, the site is hosting 216 different individual databases or APIs. Mayor Michael Nutter appointed Mark Headd as the city’s first Chief Data Officer (CDO), a position created as a part of his open data policy on April 26, 2012. The primary goal of the open data initiative is to democratize the government data and make them available for citizen developers to build new apps and services utilizing data that have been collected by the government.

The third layer is the private cloud service that provides a place where new data and web services can be developed, tested, and stored. In order to create new app-based civic start-ups, citizen entrepreneurs need to collect new forms of data and store them so that they can interact with apps. Furthermore, such private data can be combined with public data made available through open data layers or other existing web-based services and data through web service architectures (such as Google Maps or Twitter). Ideally such a private cloud service would also
allow the entrepreneurs to distribute the apps to local market before they introduce their products to larger markets.

The Studios has established our private cloud through the collaboration with the university’s central IT service. The private cloud offers a “playing ground” for the start-up projects we conceive. We also selected a set of standard technologies for mobile app development. Specifically, we draw on the PhoneGap web app development framework. Unlike native app development frameworks, the PhoneGap framework allows a cross-platform app development environment. Furthermore, since the PhoneGap framework relies on the basic web programming tools including HTML5, CSS, MySQL, Java Script and PHP, the training for mobile development can be done in a cost-effective manner.

**Community Core**

In order to build a vibrant and generative urban civic entrepreneurship platform, diverse and heterogeneous actors must actively participate in the process. These actors should represent a wide spectrum of stakeholders who can play different strategic roles. The first stakeholder is various local and national government agencies. As shown in the case of open data initiatives, government can play the role of catalyst by offering data sets that are not available elsewhere. In the case of Philadelphia, the provision of initial data sets from the city government was an important event that brought previously unconnected stakeholders together to seek potential areas to collaborate. Government also brings financial resources through its budgetary process. Whether they are budgets for internal operation or the services provided for the external constituents, government agencies could be an attractive market, particularly when they are pulled together. However, the most important role government can play is through its policy and standards. For example, government can set the standard for data access and disclosure. Government can also provide critical legislative support by providing tax incentives and business regulations for civic start-ups. All of this suggests that the government must take the role of enabling platforms for urban civic start-ups in order to provide services to its citizens instead of providing those services directly.

Another important group of stakeholders is **local community members**. Local community members play two important roles. On one hand, community members play the role of traditional “consumers.” On the other hand, they play the role of “experts” of local urban challenges. As they experience urban challenges and problems first hand, they must be resourceful in meeting these challenges and overcoming them. Just as users can play important roles in open innovations (von Hippel 2005), these community members can act as the experts in urban challenges, imagining possible solutions that might work for their own problems. One important practical and intellectual challenge of creating an urban civic entrepreneurship
platform is finding a way to harness the creative potential of the local community members without alienating them in the process of commercialization of the technology. This can be achieved by ensuring the fair and equitable treatment of their ideas. Often the urban minority community members are not familiar with the complex legal, organizational, and technological issues that are involved in the creation of new start-up companies. As such, they are vulnerable to possible exploitation and thus remain highly suspicious about the process. Therefore, addressing these emotional concerns is a key issue in designing the platform.

**Not-for-profit organizations** are another important stakeholder group for the urban civic start-up platform. Most not-for-profit organizations are cause-driven. They deeply care about certain issues and often have extensive expertise with particular urban issues. At the same time, they often lack technical expertise and are not well equipped to create a sustainable business model. Some of the not-for-profit organizations, however, began exploring hybrid organizations that pursue a so-called triple bottom line that includes economic, environmental, and social values. Some of the not-for-profit organizations, particularly those that have philanthropic foundations, could also act as philanthropic investors for urban civic start-ups.

On the opposite side of the not-for-profit organizations are the **traditional for-profit organizations**. These are established companies that are conducting traditional business practices and pursuing profit and shareholder value maximization. Traditionally, many of these companies consider urban civic issues as non-essential activities that are a part of their corporate social responsibilities and philanthropic activities. Certainly urban civic entrepreneurship platforms can benefit from such traditional corporate social responsibility activities by getting necessary financial capital. However, an increasing number of firms are recognizing that the urban market is a new breeding ground for next generation breakthrough innovations. In particular, like emerging markets such as India, China and Africa create unique innovation contexts known as “the bottom of the pyramid” (Prahalad 2009), companies begin to discover the extreme conditions found in some of the urban minority communities can provide a fertile ground for breakthrough ideas. These established companies could play a significant role in building an urban civic start-up platform due to the significant financial, human, and technical resources they can mobilize. As the use of apps goes beyond the boundary of smartphones and is increasingly combined with previously non-digital products and services, traditional manufacturing firms are likely to find new growth opportunities by leveraging the emerging digital ecosystem. Also, some of the traditional companies provide infrastructure services for cities including public transportation, various aspects of building and facility management, and public safety. As digital technology is increasingly embedded into the urban infrastructure, traditional companies that
used to provide these infrastructure services can play an important role in creating an urban civic start-up platform.

Together with the traditional corporations, another important potential stakeholder is local start-ups. Many technology-based start-ups are looking to create disequilibrium in the market by exploiting new innovation opportunities and leveraging emerging technology. Furthermore, most technology-based start-up companies are looking to design products that appeal to young consumers. Therefore, they can gain unique insights into the emerging domestic market by working closely with urban community members, particularly those who are young. These start-up companies can also solve particular technological problems of integrating digital technology with the urban infrastructure by creating technical solutions to patch the heterogeneous technologies together. Some of them can also work with various government agencies to introduce public sector solutions that can penetrate the global market. More importantly, these start-up companies can provide an important source of entrepreneurial energy and momentum in local communities. Even though they may not work to create solutions for urban civic issues, their presence attracts new talents that often inspire urban youth to learn necessary technology skills.

Finally, local education institutions and students can play a vital role in building an urban civic start-up platform for a local community. Universities and high schools have natural contact points with local youth and young adults. Furthermore, their intellectual capital that comes from education and research activities provides a natural foundation for creating an urban civic start-up platform. Universities can offer opportunities for community members to explore their ideas and see if those ideas are technically and commercially viable. Universities, working with other stakeholders such as philanthropic foundations, government funding agencies, or traditional venture capitals that are particularly interested in social enterprises, can offer an incubator space where local community members or not-for-profit organizations can explore possible urban civic solutions. This incubator space can offer physical space for technology development and networking opportunities, intellectual properties that the university owns, virtual infrastructures that are essential for technology-based start-ups, and human capital through students who are interested in start-up experiences.

The Studios have been able to mobilize these different stakeholders and serve as an open innovation forum where the stakeholders can come together to explore possible co-creation of solutions for the problems they share. One of the most important aspects of building such coalitions which often include both public and private partners, as well as non-traditional members including vulnerable urban minority community members and youth, is to establish a strong trusting relationship with these stakeholders.
**Organization Core**

The third core of an urban civic start-up platform is organizational. The organizational core deals with how to organize different resources in order to support the creation of new urban civic start-ups. Broadly it deals with three key areas: **procedural, legal, and knowledge**.

**Describing the Procedural Layer**

In order to effectively and repeatedly operate a platform for urban civic start-up, it is critical to establish a clearly articulated process layer by which urban problems are identified, solutions are developed, and the new start-up is launched. In order to support this process, the Studios have designed and implemented a three-step process: **design, develop and incubate**. In the design phase, we run various forms of design workshops in order to gain contextualized understanding of the problem. We also explore the key community stakeholders and their relationships in a neighborhood-centric, civic-minded context. Once we identify key stakeholders, we conduct a thorough study utilizing the social action research framework discussed above to understand the unmet needs of these different stakeholders. We pay particular attention to identifying hidden or marginalized stakeholders whose voices are often missing or neglected in the traditional design process.

The design workshop can be either open or closed. In an open condition, the design workshop is managed as a competition which we call a *Design Challenge*. Such an open design workshop is open to anyone in the community, including Temple University students and local Philadelphia high school and area college students. We invite a broad spectrum of community leaders and other stakeholders to help participants better understand the ground-level experiences of the key stakeholders. In a closed mode, a design workshop is often focused on a particular area that has been selected for either clients, particular community members, or our own projects.

Once we identify potential ideas based through design, we then engage in the *development* process. The development process can also be closed or open. In an open mode, we organize a daylong or weekend-long hackathon event to harness the broad spectrum of collective creativity and development skills in the community. Hackathon participants literally write and put together the computer code needed to make an app function at least at a basic level. However, although the hackathon event can provide an initial push for app development, it often lacks structure and sustained level of focus to build an app completely. Therefore, in order to supplement the hackathon competition, we also mobilize a project team to continue the app development in-house. Such in-house development also offers an educational opportunity for our students and the community members and youth who participate in the program.

We have also developed a strategic partnership with TopCoder (http://www.topcoder.com/),
which provides a global platform for design and development through contests. In-house development and TopCoder can be effectively combined to complement each other’s strengths. The outcome of the process is a working software prototype and a landing page of a website to introduce the idea of the app.

The final stage is the incubation stage. In this stage, a small set of ideas and prototypes from the design and development stages will be picked for actual commercialization through a start-up. During this stage, the participants—typically members of the in-house team that completed the app—would develop a viable, sustainable business model and identify key resources they need in order to launch their start-up business.

In summary, design, development and incubation form the procedural layer of the organizational core of the Studios. Each project has slightly different configurations, but fundamentally all projects should go through some form of these three stages.

**Describing the Legal Layer**

The legal layer of the organizational core of an urban civic start-up platform deals with how to handle various aspects of intellectual property rights that are involved in the research and development of the technology and the commercialization of the app. A traditional legal framework for a start-up company, particularly in the context of emerging out of a research university, is based on the assumption that only highly educated faculty members or graduate students are capable of generating new intellectual property. Furthermore, such intellectual property must be protected through copyright or patents. In such a traditional arrangement, the university often plays a dominant role in establishing the boundaries of the intellectual property rights.

In order to harness the collective creativity of North Philadelphia, particularly its minority communities and youth members, the Studios take a different approach. Our legal framework is divided into three stages. First, we offer the open design workshop or competition where all ideas created remain in the pool of an open idea library. These ideas are made available to anyone (including the Studios) to further develop on his or her own. Second, the Studios faculty members periodically review the ideas to decide which ideas will be further developed through our own resources. Any ideas that are further developed through the resources of the Studios—faculty, student workers, and the private cloud—are considered either fully or partially owned by the university. It is partially owned by the university if an external stakeholder came up with an original problem and asked the Studios to further define the problem. In order to protect the intellectual property right of community members, the Studios treat community members who come up with the original inspirations as inventors. Traditionally, people who merely contributed the ideas are not protected, as a traditional legal frame-
work protects the intellectual property rights only once a copyright or patent is issued. As our goal is to provide an opportunity for local community members to become urban civic entrepreneurs, we extended the boundary of inventors even in the case where the traditional legal system would not have protected them. By being recognized as an inventor, community members receive any license revenue from the technology commercialization. Third, once the technology is operational and can be demonstrated with a proof-of-concept prototype, the Studios form another group (which can be an expansion or continuing of the group from the second phase) in order to pursue the commercialization and incubation.

Here we have two possible outcomes. The first possible outcome is a traditional technology commercialization by licensing the technology to an outside company or companies. The university will acquire the license revenue, which will then be shared with the inventors as recognized through the intellectual property rights disclosure form. The second possible outcome is a start-up model where the community members and students, together with other stakeholders, form a civic start-up. In this case, the inventors can become the entrepreneurs. Following the traditional model, the entrepreneurs would sign an exclusive technology license agreement with the university. Since they are also inventors, they will get financial rewards twice, once as entrepreneurs and again as inventors.

Finally, the financial layer forms the last layer of the organizational core of the urban civic start-up platform. Like any other start-ups, civic urban start-ups also need financial capital. However, traditional venture capital may not always work for the civic start-ups. Due to the unique nature of digital technology, in many cases, it does not require a huge up-front investment in order to start a new company. Furthermore, unlike traditional start-ups that seek IPOs and big exits, civic start-ups might seek a continuous revenue stream to sustain their service. Such a model of modest revenue without a clear exit strategy, albeit desirable for civic start-ups, may not be an ideal investment target for traditional venture capitals who seek quick return on their investments. As a result, we are seeking several different models to finance the start-ups.

Describing the Knowledge Core: Three Fundamental Skills to Foster New Digital Literacies

The final core of a successful urban civic start-up is the knowledge core. In order to successfully participate in the emerging app-based digital economy, we believe that the future workforce needs to be trained with a new set of core digital literacy skills. We identify three core skills as the fundamental components of digital literacy: design thinking, computation thinking, and spatial thinking.
Design Thinking

Design thinking refers to a powerful problem solving approach to complex and often intractable social challenges. By emphasizing contextual understanding of the problem, the design thinking emphasizes the importance of gaining deep contextual understanding of the problem from multiple stakeholders’ perspectives and their unmet needs. It emphasizes the grounded observation based on both qualitative and quantitative data. It also utilizes visualization and rapid prototyping as a way of conceiving new ideas. This is a technique that has become the basis of many successful start-ups in Silicon Valley and elsewhere. Design thinking is considered to be one of the most critical skills in creating new products and services and building innovations for both public and private sectors. Fox School of Business is one of the world leading institutions for design thinking. Under the leadership of Temple University’s Fox School of Business Professor Youngjin Yoo—who is the primary investigator of the Studios project—learning about and implementing design thinking is a requirement for all MBA students. The Center for Design+Innovation also offers various corporate training programs for companies and not-for-profit organizations. Professor Yoo offers workshops in Design Thinking through AACSB (a global accreditation organization for business schools) to faculty members of other universities around the world. Design thinking begins with in-depth field research with emphatic observations. It requires individuals to ask the following core questions:

- What inspires you the most (both good and bad)?
- Who are the stakeholders and what are their relationships?
- What are the unmet needs and why are they important?
- What are you going to do to change the situation?
- What are the resources you need to create and sustain your solutions?

By answering these questions systematically, students learn how to identify urban problems that could have normally been ignored. Design thinking is an essential base of the digital literacy the Studios seeks to foster.

Computational Thinking

Computational thinking refers to a pattern of complex problem solving through abstraction, decomposition, and iterations that allows algorithmic approaches to a problem. Computational thinking is the foundation of software programming, but it is not just limited to the technical aspect of programming itself. Computational thinking should be treated as one of the fundamental skills for the 21st century, even for those who do not want to become programmers. Computational thinking allows one to break down complex problems into a set of smaller problems that can be further broken into small pieces until each of them can be managed individually. It allows one to see how
these individual components are interrelated and interact. It also allows one to see how certain activities can be routinized so that certain tasks can be automatically performed without human intervention. The technical components of computational thinking are essential for the emerging app-based digital economy which includes basic web and mobile programming (HTML, CSS, Java Script, PHP, and MySQL), sensor programming (Arduino or Raspberry Pi), and the use of web APIs.

**Spatial Thinking**

Spatial thinking refers to the cognitive processes and associated visualization and abstraction that permit geographical analysis of phenomenon that occurs across space. It includes the ability to perceive relationships within and across variables that have spatial dimensions. It also includes the ability to identify, classify, and analyze objects, processes, and occurrences in space. It enables one to conduct inquiry through the lens of space. As digital technology penetrates deeply into our everyday life experiences, the way these technologies transform our work and life in space must be understood. Many of the popular apps for smartphones use all types of information about locations of the users and surrounding areas. Spatial thinking includes both technical and non-technical components. Non-technical components deal with cognitive, social, and cultural understanding of urban geography and space. The technical components deal with how to use digital technology (such as Google Maps) to create location-based apps and build and analyze spatial databases.
Works Cited


About the Authors

Michele Masucci
masucci@temple.edu
Interim Senior Vice Provost for Research, Temple University

Michele Masucci, (Ph.D., Clark University) is a Professor of Geography and Urban Studies and the Interim Vice Provost for Research at Temple University (TU) since 2012. In her role as the Interim Vice Provost for Research, she oversees the research enterprise operations for the University, including research strategic, government, and development initiatives; technology transfer; business development; research integrity and compliance; grant administration; and research technical support. Throughout Dr. Masucci’s tenure in academia, her work has examined how barriers to accessing information resources using geographic information technologies are interrelated with community development and environmental quality problems, including accessing health, education, and social services. She has worked to develop university-community partnerships with organizations that address human rights issues, community and environmental planning organizations in the Southeastern U.S. and in Brazil involved in water quality monitoring and assessment, and with informal educational settings on integrating information technology curricula through educational programs aimed at advancing knowledge of how to develop information resources.

Over the past twenty years, Dr. Masucci has held a variety of research leadership positions and built research enterprises that include, Director of the Information Technology and Society Research Group at Temple University, the Chair of the Department of Geography and Urban Studies in the College of Liberal Arts, Founder and Director of the BITS Program, and Co-Director of Urban Apps and Maps Studio, Step Up and UCenParcerias.

Dr. Masucci is Temple’s representative to the Federal Demonstration Partnership, where she leads the Pipelines Initiative, aimed at expanding access to STEM careers for women and underrepresented minorities. She is also Temple’s representative to the Government University Industry Research Round Table (GUIRR) of the National Academies.
Youngjin Yoo
yxy23@temple.edu
Professor, Management Information Systems in the Fox School of Business, Temple University

Dr. Youngjin Yoo is a professor in Management Information Systems, and the Irwin L. Gross Senior Research Fellow at Temple University. In addition, he is the director of Center for Design+Innovation, which works with Apps & Maps to consider the role of pro-active design thinking for solving entrenched urban issues. His ongoing research examines digital innovation, design, experiential computing, and the role of innovation and information technology on business entrepreneurship; within Apps & Maps, Dr. Yoo’s scholarship looks at the role of information technology driven entrepreneurship on community development in Philadelphia. He has received over $3.5 million in research grants and has worked with leading companies including Samsung Electronics, American Greetings, Bendix, Moen, Intel, Andersen Consulting, IDEO, Gehry and Partners, Lotus, NASA, Parker Hannifin, and Poly One, among others. Dr. Yoo is also an adjunct professor at Warwick Business School, UK and is a visiting faculty member at the Indian Business School.

Alan Wiig
alanwiig@temple.edu
Researcher, Urban Apps & Maps Studios; PhD Candidate, Geography and Urban Studies, Temple University

Alan Wiig is a PhD candidate in the Geography and Urban Studies Department at Temple University in Philadelphia. His work examines smart city policy initiatives and the impacts of information and communication technology—including the Internet and mobile telephony—on the urban landscape. He writes about these issues at www.everydaystructures.com.
Fox School of Business and Management
Established in 1918, the Fox School of Business is the largest, most comprehensive business school in the Greater Philadelphia region, and among the largest in the world with over 6,500 students, 180 full-time faculty and more than 59,000 alumni.

The Fox Bachelor of Business Administration (BBA) in MIS is ranked in the top 15 and the MBA in Information Technology Management in the top 25 by U.S. News & World Report. The Association for Information Systems (AIS) ranked Fox School’s MIS faculty number 1 worldwide for research 2009- 2012. The MIS student organization was recently named ‘chapter of the year’ by AIS.

Institute for Business and Information Technology
The Institute for Business and Information Technology (IBIT) provides cutting-edge knowledge and valuable connections to sustain excellence in IT. IBIT integrates industry perspectives with academic research expertise to create forums that generate best practices. IBIT membership offers firms the opportunity to leverage our knowledge, human capital, relationships, and established network.

CONFERENCES AND COMPETITIONS
IBIT conferences are exclusive interactive forums of practitioners and academics addressing current topics such as analytics, digital business innovation, and cyber-security. The Temple Analytics challenge provides practical experience to students in making sense of big data.

THE IBIT REPORT
Rigorous vendor neutral research that provides actionable knowledge to industry. Recent topics include big data, online labor markets, crowd funding, open innovation, video gaming, and social media.

PROJECTS
IBIT faculty and students work with member firms on joint research projects. Recent examples include a job index for information systems workers, and a grant program on big data.

IT AWARDS
The IT Innovator, Leader, and Distinguished Alumni awards are presented to industry leaders at the annual IT Awards Reception.

INDUSTRY INTERNSHIPS
Project-based internship model provides firms and students with a structured light weight opportunity to work on projects.

EXECUTIVE-IN-RESIDENCE
The program facilitates interaction between students, faculty, and industry leaders.

CORPORATE TRAINING
IBIT offers customized on-site training to corporations on specific topics including analytics, cyber-security, and social media.

ADVISORY BOARD
The Fox IT advisory board includes senior executives from Lockheed Martin, Merck, LiquidHub, Walmart, Deloitte, ZDNet, Pfizer, Campbell Soup, Electronic Ink, and others.
The IBIT Report

The Fox School’s Institute for Business and Information Technology (IBIT) regularly publishes The IBIT Report for its members. IBIT reports are based on rigorous vendor neutral academic research and are written to provide actionable knowledge to industry. Each report focuses on an important cutting edge topic that is of interest to our members.

For additional information, contact:
Institute for Business and Information Technology
Fox School of Business
Temple University
210 Speakman Hall (006-00)
1810 N. 13th Street
Philadelphia, PA 19122

ibit@temple.edu
ibit.temple.edu
215.204.5642