Finding Place: Discovering What Everyone Already Knows

Lillian L. Hancock and A. Mitchell Wood

ARCH 597 Spring 2012

DMG, University of Washington
Abstract

Traditional and currently evolving methods employed by designers to access the personal experience and knowledge of community members to facilitate public participation in project planning are often difficult and ineffective. In light of the growing use of technology to augment traditional processes of facilitating participation through primary sources, emerging methods utilizing secondary sources for gathering local knowledge, such as social media, are reviewed. Based on the promising evolution of knowledge interpretation through aggregated data streams created by social media, we propose new methods of accessing local knowledge through the use of web-based applications that will allow users to filter multiple unrelated data streams for personal interpretation and relevance to their specific projects, supplementing traditional methods of gathering local community knowledge.
Introduction

In the arena of planning and architecture, designers are often faced with the task of gathering information pertinent to the process of forming design solutions. While significant information can be gathered directly from the client who has commissioned the project through direct questioning, designers often want to include the input of people who have personally used the space and the surrounding areas under consideration (Brabham, 2009; Carp, 2004; Corburn, 2003). The use of first-hand experience, or “local knowledge” (Geertz, 1983), potentially allows a designer to access the information embedded in the members of the community who create the events that occur in these locations every day (Carp, 2004; Corburn, 2003). However, participation derived through traditional methods is often fraught with challenges, including underrepresentation, counterproductive actions and discussions, intimidation, and exclusion (Brabham, 2009).

The following paper reviews many of the traditional and currently evolving methods employed by designers to facilitate public participation in project planning in order to access the personal experience and knowledge of community members. In light of the growing use of technology to augment traditional processes of facilitating participation through primary sources, further review of emerging methods utilizing secondary sources including social media is also presented. Based on the promising evolution of knowledge interpretation through aggregated data streams created by social media, a framework is presented for new methods of accessing local knowledge through the use of web-based applications that will allow users to filter multiple unrelated data streams for personal interpretation and relevance to the design and planning projects at hand. Finally, technological challenges to immediate implementation of such a tool are discussed.
Background

The importance of “local knowledge” when observing the process of people living their lives is typically identified with anthropology and the study of local knowledge in order to understand culture, society, individuals, and representations of a specific community. Local knowledge is more related to the “immediate deliverances of experience, not deliberated reflections upon it” (Geertz, 1983, p.75). In this context, local knowledge is not based on professional study, but instead is “information pertaining to local contexts or settings, including knowledge of specific characteristics, circumstances, events, and relationships, as well as important understandings of their meaning” (Corburn, 2003, p.421). Local knowledge, then, is not only the observation of life at a particular location or environment, but also an interpretation of the significance of the events observed in relation to the inhabitants of a community, whether geographically located or specific to a particular group. Conclusions are drawn from the evidence of experience.

Utilization of the knowledge gained through first-hand experience is valued in both planning and architecture, (Al-Kodmany, 1999), and can often be described as “community design” or “participatory design”, where users and communities are involved in the design process (Francis, 1983). This type of design focuses on close dialogue with actual users of a space, and is concerned with addressing and understanding meaning, context, and appropriateness of design for the users. Participatory design techniques have effected positive change in communities through small-scale, inclusive methods, as opposed to the traditional approach of single-client, user exclusive design practice by larger firms (Francis, 1983).

Defined broadly as “non-expert”, local knowledge takes into account the culture and social context of people based upon tradition and historical experience (Brabham, 2009;
Corburn, 2003). Individuals bring knowledge of specific characteristics, circumstances, past and present events, and relationships, as well as important understandings of the meaning of these types of knowledge in a local context or setting. The importance of local knowledge becomes more evident when it is explored in the context of a specific subject or concern, when people are empowered to provide information, opinions and anecdotes regarding issues that might not otherwise have been known. Aspects of history, cultural values, and understanding exist in local knowledge, and are difficult to obtain without the engagement of the community (Al-Kodmany, 1999). Local knowledge is separate from professional knowledge.

Professional or “expert” knowledge is considered to be expertise gained through experimental methods, disciplinary tools, and scientific processes (Corburn, 2003) and “is generally tested through peer review, in the courts, or through the media” (Brabham, 2009, p. 244). Professionals are typically known to have technical skills and knowledge regarding a specific design discipline that local community members do not; it is the combination of the contributions of “technical expert” and the “community expert” that creates the participatory process often used in planning and design (Al-Kodmany, 1999).

Traditionally, the inhabitants of a local area - citizens that live in a particular neighborhood, block radius, or other local community – both posses local knowledge and can benefit most from its use. Information regarding past history, building use, safety issues, or other time and space specific facts are often passed from neighbor to neighbor, store employees to customers, etc. People ask for recommendations and opinions from others: where it might be safest for children to play, where people walk their dogs, shortcuts across town. Local citizens have intimate knowledge about areas of gridlock, the easiest places to get drive-thru coffee, even intersections where the most car accidents occur. Each fact has both personal opinion and place
associations, creating a very individual view; however, when multiple individual views are aggregated together, generalizations about “lived space” (Carp, 2004, p. 244) begin to form.

Brabham (2009) described the importance of local knowledge as it “adds the perspective of the future user of a designed space and the insights about environment and place that the planning discipline might never have approached or might have already forgotten” (p. 244). Local knowledge has the benefit of being comprised not so much of simple opinion, but of knowledge which includes “important understandings of…meaning, in local contexts or settings; often acquired though life experience and is mediated through cultural tradition; …evidence of one’s eyes tested through years if not generations of experiences; and legitimated…public forums” (Brabham, 2009, p. 244). Although this type of information may not be based in theory, it includes multiple ways of “knowing” a space and the implied meanings that it may have for a community. Quick (2011) indicated that “communities can be defined by situated practices that produce distinct ways of knowing and learning,” and “as long as people are engaged in practices, community is being created, and the character of the practices defines the community” (p. 273). The very nature of a community and its impact on the environment around it is created by the people and practices that exist within it.

**Current Models of Knowledge Acquisition**

Research shows that public participation provides design professionals with a method for accessing a community’s local knowledge (Al-Kodmany, 1999; Brabham, 2009; Carp, 2004; Corburn, 2003; Quick, 2011). Participation can also build the ability of the community to increase the input and implementation of decisions, as well as to address related issues (Quick, 2011). The incorporation of public input can lead to better plans and designs, with observed benefits to the community of increased sense of commitment, user satisfaction, realistic
expectation of outcomes, building of trust, and increased social inclusiveness and social capital (Laurian & Shaw, 2009). In an effort to tap into this existing knowledge, planners and architects have historically looked for ways to engage local citizens for input on suggested changes to the urban landscape that might impact them. However, the ways in which this type of information is gathered, processed, and incorporated can vary; depending on the strategies used, these methods can either limit or enhance the impact of local citizens on new directives (Carp, 2004).

Participation methods can be both thoughtfully used to aid design or misused to further specific agendas. Because participation is often initiated by the professional looking for local knowledge input (Carp, 2004), there is always a danger that designers may choose to dominate a process to build support for their own ideas instead of responding to the community by inventing or influencing a client group rather than responding to actual concerns. This can often occur because planners and designers may fear loss of control of the design process of a project if the community is involved too early (Francis, 1983). Professionals may choose to disregard the value of community input since it is not based on technical expertise (Corburn, 2003), and suppress ideas that do not align with their own (Carp, 2004). Designers may also see client input as sufficient contribution for local knowledge, culture, and practices, a view which aligns with traditional user-exclusive methods of design input (Faulconbridge, 2009).

Due to the potential and perceived manipulation of the participation process by professionals, community members may feel ignored and disrespected, especially when past input has not been valued (Laurian & Shaw, 2009). As a result, not everyone may choose to participate, both due to distrust and to intimidation; community members that do participate may do so as a means to organizing opposition to top-down design that ignores users (Francis, 1983;
Al-Kodmany, 1999). Special interest groups who choose to participate this way may prevent full representation of the whole community (Brabham, 2009; Laurian & Shaw, 2009).

Power dynamics between professional and public as described above can often influence the level of participation (Laurian & Shaw, 2009). Since many traditional methods do not include the community at early stages of design but at the decision-making stage after solutions have already been created, these tendencies can place the types of engagement into two general types of relationships between professional and community in terms of participation: adversarial and collaborative (Quick, 2011). The adversarial mode is the most common form of public participation, and is the most likely to become aggressive in the roles that each opponent plays (Quick, 2011). Most public participation is solicited through public meetings that are held to inform the community of changes to occur and sometimes to gather input or feedback on previously decided options. Community members are invited to share their opinions, but these may or may not have any bearing on the execution of decisions made by professionals. Although input is requested, the perceived failure to incorporate citizen ideas engenders distrust for future initiatives, which can then lead to citizens becoming more insistent on participation. This leads to participation engaged through a desire of the public to be involved, typically choosing to demand a role in the decision making (Quick, 2011) and includes organized community groups and community advocates. Citizens are often prompted to act due to a desire to impact their community for what they consider positive, or citizen-centric change (Campbell & Marshall, 2000).

In addition to struggles in power and perception between professionals and community, issues with standard methods of engagement often include aspects regarding time management and availability. Meetings are by nature limited in length, and some discussion subjects may be
postponed to additional meetings or missed all together. Meetings scheduled for engagement will include only attendees that are available to attend, and may not capture the local knowledge of those who could not (Campbell and Marshall, 2000; Nuojua & Soudunsaari, 2010).

**Evolving Models of Acquisition - Primary Sources**

Gathering local knowledge requires strategies that allow use of methods which can incorporate data gleaned from personal experience. Current ideas of public participation need to be refined to allow for sourcing knowledge through more than traditional procedures of gathering input. In an effort to gain access to the local knowledge that might inform planning and design, multiple approaches have been deployed in an effort to reach participants that might be missed through traditional means of information gathering and engagement. Most obvious is the opportunity to utilize primary sources of knowledge as in traditional methods of participation, through contact with the people who have personal interest and experience with the location.

Quick (2011) described an understanding of the idea of “communities of practice” (Lave, 1996; Wenger, 2000) as key to creating a communication and participation framework for including a range of stakeholders to create collaboration in public planning. Explicitly designed methods of engagement which incorporate a broad base of participants from numerous industries and community groups were targeted to facilitate intentional ownership of ideas and solutions by community members instead of city officials in the Master Plan process for Grand Rapids, Michigan, resulting in ideas, solutions, and execution strongly backed by both the community and governing officials (Quick, 2011). The concept of “inclusion” as a method of creating connections allows for the ongoing communication and sharing of specific knowledge among groups with different perspectives, experiences, and needs. Specific practices that incorporate
ongoing inclusion of the community shows people how their input affects process used by professionals to shape decision outcomes (Quick, 2011).

In a more informal manner than organized participation groups, Hou and Kinoshita (2007) advocated building upon existing social networks for the associated trust inherent in many community-based groups and organizations. Social events and relationships created among evolving networks can become a basis for accessing opportunities to engage diverse stakeholders and leaders that can influence community attitude and provide local knowledge sources. Information gathered from these groups can also enlighten existing issues of conflict between diverse groups within the community, knowledge which might not be immediately available to planners and designers outside of these social circles (Hou & Kinoshita, 2007).

Further development of this idea for utilizing informal processes for gathering local knowledge has evolved beyond traditional means of engagement to include new modes of engagement. Where once ideas and intentions of planning or design might have been gathered and disseminated via public postings, newspapers, or other analog means, the ever growing prevalence of the internet and digital technology has also influenced means of collecting local knowledge. By enlisting the participation of numerous individuals through the connective power of the World Wide Web, possessors of local knowledge are encouraged and given opportunity to participate in planning and design tasks in an effort by those outside of a community to tap “non-expert” knowledge. For example, the city of Tampa, Florida, utilizes quick response codes, or QR codes, to provide land development information to the general public. Smartphone owners are able to scan the code with special software for access to a website or other up-to-date information at a specific location (http://www.tampagov.net/dept_Land_Development/). The use
of QR codes within public access has the potential to facilitate social interaction through social media (Shin, Jung, & Chang, 2012).

The broad understanding of web utilization to coordinate the efforts of numerous users has been introduced as crowdsourcing, in addition to being identified as collaborative systems, crowd wisdom, collective intelligence and numerous other terms (Doan, 2011). Simply put, this type of effort commonly “enlists a crowd of users to explicitly build… [an] artifact that is beneficial to the whole community” (Doan, 2011, p. 87). Users are given both license and direction to work individually towards a common goal. In the view of public planning and design, the crowdsourcing model has the potential to obtain and aggregate information from the local community in formats that do not have the usual constraints of time, location, or face-to-face contact. For the individual or group seeking local knowledge, the opportunity to request access to others’ personal experiences or ideas can be framed in an online system or website. Contributions can be visible or invisible, shared or critiqued, built or refuted (Brabham, 2009).

Brabham (2009) stated that the “crowdsourcing model can tap the possibilities for digital communication networks to mobilize citizens, foster creative input, and produce plans through democratic processes which more accurately address our lived experience within organized networks today” (p. 247). Many of the issues associated with social context and non-verbal politics in traditional public participation models where public officials and special interest groups monopolize or channel discussions can be mitigated through the use of online participation. Non-expert contributions can be given with freedom and attributed equal weight with technically-supported knowledge and the combination of both can lead to more effective use of comprehensive skills through collective intelligence (Brabham, 2009). Local knowledge
based in personal experience can augment the process of forming solutions intended to benefit the community as a whole.

The use of web applications to assist design with local knowledge and to facilitate participation by community members not often represented has been exemplified in recent studies. Nuojua and Soudunsaari (2010) developed a tool – WebMapMedia - for use in improving communication between citizens and planners during early stages of planning in Finland. Local participation at all levels of design is important; the first stage of planning focuses on the impact and relationship of the project to the existing social context of the site (Carp, 2004). In this case, citizens were invited to place comments about their living environments on a map, and were also able to view and comment on planning sketches during the ongoing process (Nuojua & Soudunsaari, 2010). The web application was utilized during planning in three different cities over the period of three years. While the intent was to extend participation beyond traditional forms of involvement, the diversity of users allowed the planners to take into account contributions of opinion outside of the established reference group, such as the students from a local school. The online forum also allowed local users to participate in planning when they would otherwise not have had the opportunity, which specifically in one city, occurred during reindeer roundup season. For planners and the groups charged with design, the application allowed further elaboration and development of issues brought up in meetings, as well as sometimes providing comments for opening meetings. While the application provided opportunity for significant positive input, an emerging negative result where internet connections were not available or users were not specifically introduced to the application was reduced usage and interaction (Nuojua & Soudunsaari, 2010).
A second example of an explicitly designed system to capture local knowledge is described by Seeger (2008) in the aggregation of Volunteered Geographic Information, or VGI. The general public has embraced the generation of spatial data content through web and mobile technology, and when viewed through a digital mapping interface, can provide design professionals with “local, detailed, and spatial information that can be used to create a more informed design solution” (Seeger, 2008, p. 199). Seeger (2008) stated that engaging the public allows them to share their collective expertise of a local space. Facilitation of VGI is accomplished through sharing and compiling of geospatial information, collecting individual or collaborative opinions regarding existing situations or proposed modifications, and by identifying potential conflicts early in the process to allow for resolution (Seeger, 2008, p. 201). Variations on his early prototypes of River Notes and Digital Chip Game use basic concepts but include changes to allow for more targeted use (Seeger, 2008). By designing detailed filter and validity assessments to qualify user contributions, data collection can be targeted to specific concentrations: local knowledge, site programming, or preference studies.

Certain limitations must be addressed in the programming of these types of designed systems. Specific to the system itself, interface design should allow users to easily navigate and contribute. Assessments for validity of both knowledge and user background are essential to create meaningful output, and can be determined within the application itself, with the crowdsourcing model of aggregation to quantify corroborating information (Seeger, 2008). As mentioned in the earlier study by Nuojua and Soudunsaari (2010), availability of internet access and technology should also be taken into account when seeking to collect representative local knowledge with a system designed to collect information from primary sources. If access to technology is not readily available, it will need to be provided for online sources to be
considered representative of the whole community. This directly affects the quality and quantity of users, which can impact the levels of actual participation.

In addition to the logistical limitations that a designed system brings, some of the same social concerns which emerge within traditional modes of engagement can materialize within the online digital modes as well. Maintenance and sustenance of an online community can have similar challenges of inclusion and resistance (Brabham, 2009). The free and open nature of an online community can foster the anti-social behavior of individuals who react against the idea of collaborative design and knowledge, exhibiting negative opinions, targeting other users that may be effecting positive results. *Crowdslapping*, as it is known (Brabham, 2009), may require specific programming and system guards to reduce its negative effect, or in a strong community, may be regulated by the users themselves.

**Emerging Models of Knowledge Acquisition – Secondary Sources**

Most typical participatory design systems are designed for explicit collaboration, where users collaborate in a standalone environment to achieve a specific purpose. In contrast, implicit systems can be either standalone or piggyback, utilizing the traces of another system to solve a problem, sometimes with users’ knowledge and at other times without it (Doan, 2011). These emerging uses of secondary sources combine user-contributed knowledge with a facilitator-filtered perspective to create meaningful data interpretation. While these methods require significantly more filtering, validation, and interpretation on the part of the facilitating system, many of the issues that can arise from use of primary sources – maintenance, access, sustenance, resistance – are not as prevalent since users are not explicitly contributing to a single intent, but their information is implicitly useful. Information exists due to “the public’s infatuation with online socialization and sharing of ideas, experiences, and philosophies that has created a wealth
of geo-referenced information” and awaits only the application of creative frameworks to disseminate meaning (Seeger, 2008, p. 201).

Leveraging existing VGI data as a means to understand a community is a logical use of photographs, one of the more readily available data sets online. Newsam (2010) described a number of systems which progressively annotate images from sources such as Flicker to associate them with location and semantics, using tags associated with photographs and their locations. By moving beyond the obvious VGI characteristics to the social media aspects of users’ photo collections, conclusions can be formed not only with regard to physical aspects, but also in cultural and behavioral aspects (Newsam, 2010). Cultural differences in keyword tags manifest in concepts’ appearances (in his example, “wedding cake”) through the system’s spatial clusters, and “authors then manually compare representative images for different regions” of the world (Newsam, 2010, p. 43). Clustering of images can also indicate movement of people in specific area, like tourist attractions, lending to the idea that social media can be used to generate certain behavioral maps (Newsam, 2010, p. 43).

In more direct uses of social media to power secondary sources of local knowledge, systems have been designed to consolidate and activate the streams of Twitter feeds that occur around specific emergency incidents. Twitcident (Abel, Hauff, Houben, & Tao, 2012) is a framework specifically designed to filter, search, and analyze information about real-world incidents or crises in an automated, web-based system. The system first relies on emergency broadcasting services to detect an incident, but then uses profiling, aggregation (through application programming interfaces, or APIs), semantic enrichment, and filtering to deliver information found in Twitter streams in a comprehensive manner. This includes images and videos that occur in Twitpic or Twitvid. Users of the web application are then able to retrieve
FINDING PLACE: DISCOVERING WHAT EVERYONE ALREADY KNOWS

information to analyze what is personally relevant. Similarly, Ushahidi (www.ushahidi.com) is an open source crisis map platform created to integrate data from multiple sources – phones, web applications, email, and social media – to provide up-to-date information to relief organizations (Gao, Barbier, & Goolsby, 2011). While hardly perfect in accuracy and delivery, systems such as these show the benefits of aggregating data into formats that allow users to make use of the varied streams of information as needed.

As a response to the burgeoning data streams and collections that require more and more management, Google introduced Fusion Tables in 2009 (Gonzalez et al., 2010) to propose appropriate visualizations and to allow filtering and aggregation of selected data. While the original intent was for users to host their own databases online for visualization, content has grown to include other available public data tables. Bigtable is one such system. It is used to support a subset of Structured Query Language (SQL) queries, providing selections, aggregations, and joins on primary keys through the three basic operations offered by Bigtable: key lookup, prefix scan, and range scan (Gonzalez et al., 2010). The emphasis of the platform is collaboration and visualization, rendered in a browser using JavaScript or Flash (Gonzalez et al., 2010). An API allows external developers to write applications that use Fusion Tables as a database. Many of the current applications utilize the component that can render large geographic data sets.

A Framework for Future Methods of Acquisition

In 1978, Burns suggested that architects could learn more about the users of an environment by observing and understanding the direct and implied meaning found in community communications. The formal and informal messages that people leave through both deliberate means and every day activities are opportunities for designers to learn more about a
location. Burns explained that formal and informal communications could be visible in more than one way in a community’s existence: graphic, non-graphic, physical, and non-physical. Environments are always full of the “messages” left by the people who have used the space. Traces of meaning can be found in the ways that people have treated these spaces: with care, ownership, thoughtlessness, intention, or habit. While most formal communications at that time took the form of petitions, manifestos, demonstrations, and newspaper opinions, in this technological age, much of these types of communications can now be found online, in various social forums and online communities. Blogs and organized websites may give similar clues to the meanings and intentions that a community may hold – calls to action, care for members, disrespect for authority, or concern for crime. In many cases, virtual “home” pages may hold as much unspoken meaning as physical environments. Burns advocated that design and planning professionals utilize community communications to enrich “funds of resources to work with” and to “expand conceptual horizons” (p. 7). Designers today have the opportunity to access new forms of communication on the Social Web, “the emerging use of the Web to socially mediate…information environments and communications” (Chi, 2008).

The Social Web has evolved into a place where people are able to facilitate social activities in virtual spaces. Personal knowledge and experience is documented and captured through sharing, tagging, and collaboration. This includes uploading various types of files to share with other users; these files may be tagged with keywords to make them easier for users to find, resulting in a collaboratively formed information structure that can be used to navigate, search, and browse content (Chi, 2008). Social Web streams can be characterized in applications such as Twitter, Facebook, and Flickr, where information from users is constantly updated.
In contrast to Social Web streams, data streams are comprised of information received from intelligent sensors that generate data, including fine-grained data on the movement of people and goods. Sensor networks typically generate streams of data that are characterized by infinite length, continuous arrival, high data rates, and are usually time-stamped and arrive in temporal order (Olken & Gruenwald, 2008). Examples of data streams include event notification systems, financial transactions, and even Web click streams. Dissemination of data notices to interested parties is commonly achieved through applications that manage content routing or subscriptions that continuously query publication streams (Olken & Gruenwald, 2008). Common applications might include financial news or network monitoring systems.

The potential of combining both existing social web and data streams holds promise as a method to be employed for allowing both representation and visualization. In many of the examples referenced previously, system designers approached the collaborative endeavor with desired, and often expected, outcomes. The flexibility of Google’s Fusion Tables to allow users to filter and aggregate data according to their own needs (Gonzalez et al., 2010) begins to suggest the power of allowing users to associate users’ meaning with outwardly disparate data streams and to thereby uncover local knowledge. For example, there may be an implied relationship between the locations of existing bicycle paths and intersections with the most car accidents, but the meaning in the context of what decisions could be made in terms of a new local park must be made by the individual(s) who will use the information. The connection that might have been made by local residents who see the near misses every day could be formed by an outsider with expertise gained through training and experience to understand the implications of bicycle paths which incorporate busy traffic intersections near the local school when superimposed through a visualization tool.
The expectation that users can select seemingly disparate data streams in order to apply meaning is based in theories of expertise in content knowledge. Expertise in specific content has been characterized as the ability to notice features and meaningful patterns in data (Bransford, Brown, & Cocking, 2000). The level of expertise is often a result of acquiring deep understanding of subject matter, and reflects contexts of applicability. Individuals organize knowledge in efficient ways that include the meaningful relations between elements that combine into underlying concepts and principles; these informational units are then retrieved for application in problem-solving contexts (Bransford, Brown, & Cocking, 2000). For designers specifically searching for information that can inform their knowledge of the everyday experiences at a site over time, correlations may exist between public festivals, walking paths, and local parking restrictions. The ability to realize possible relationships between these streams of data as reason to plan for a front yard and landscaping to accommodate off-street parking and plantings that can withstand abuse at a future residential location is dependent upon an individual’s previous experience and knowledge of how to react in a given situation (Ericsson, 2006).

Meaningful representation of data streams is essential to facilitate visualization that is usable in the designer’s process. Design thinking requires representational environments in order to be performed and developed (Abdelhameed, 2006). Initial design ideas may arise from different streams, including subjective interpretation of the design-problem (Abdelhameed, 2006). Imagery and media can be actively used by designers to form design ideas, and structure supports the occurrence of associations (Abdelhameed, 2006). Simon (1962) described how complexity can be broken down into hierarchies, with the subparts of different parts interacting in an aggregative fashion; detail is not necessary, as the major parts hold enough information
about the overall relationships. In proposing a tool to allow users to visualize and interpret relationships between data streams, a model that facilitates simple, straightforward representation in a clearly viewable manner is of utmost importance. Users should be able to filter level of detail in a graduating fashion to simplify data to the point where the first relationships between data fields is easily seen.

In order to provide users with information that is of potential and intrinsic value to the architectural design process, data streams that provide insight into the physical, cultural, and behavioral environment of a location are likely the best candidates for visualization. Geo-tagging within the data or social stream for use in an application that allows representation through a geographic information system (GIS) is essential to locating the local knowledge in the requested context. In Newsam’s (2010) study, images and the locations where they were taken were the foundation for drawing conclusions regarding culture and behavior. Doytsher, Galon, and Kanza (2012) described a socio-spatial network (SSN) as a graph which combines social network, spatial network, and the life patterns of the users in the social network within the spatial network based upon location services. GPS-enabled devices and data streams which record user behavior within an area can reveal patterns of building use, such as circulation and occupancy. Combining this information with other data streams such as public transportation paths may aid a designer in the process of incorporating building changes to improve and augment the surrounding uses of the local area, such as locating entrances and exits to in a manner that will allow exterior lighting to provide ambient illumination for a nearby bus stop.

Social information networks are often filled with discussion and related content information that is accessible only to those users participating in the discussion, and streams of social data are not necessarily linked to each other on the basis of context. Complementary
information may be found elsewhere on the web, but linking and access to this data is difficult. Common standards for information exchange and interoperation are not yet commonplace (Bojars, Breslin, Peristersa, Tummarello, & Decker, 2008). “Semantic Web” technology has been introduced to define required semantic information from online communities, with the intent of providing the framework for building semantic applications on top of the existing Social Web (Bojars et al., 2008). Universal adoption of Semantic Web frameworks will allow online community sites to express data in a format to facilitate rich interlinking, enabling future internet web browser developments that will be able to connect information from formerly unlinked streams (Bojars et al., 2008).

While the World Wide Web as it currently exists is a source for many different data streams, there is difficulty in searching for results between communities with differing methods of categorization or indexing; text-only searches often produce results that have little connection to a specific subject (Hendler, 2003). The push for emerging technology that can provide machine-readable descriptions of web pages and resources has led to the idea of the semantic web and development of the Resource Description Framework, or RDF, a language for representing information “based on the idea that the things being described have properties which have values, and that resources can be described by making statements that specify those properties and values” (W3C, 2004). Identification of things is done using web identifiers, or uniform resource identifiers, abbreviated as URIs (W3C, 2004). As RDF statements are more effectively used in web pages, relevant search results using queries designed for databases stored in RDF format may become more viable. Further resources of probable data streams may be accessible through the use of these RDF queries (Le-Phuoc, Parreira, Reynolds, & Hauswirth, 2010) and access to datasets within the Linked Data cloud (Araujo, Houben, Schawabe, &
Hidders, 2010). Linked Data is “a term used to describe a recommended best practice for exposing, sharing, and connecting pieces of data, information, and knowledge on the Semantic Web using URIs and RDF” (www.linkeddata.org). Continued adoption of the Semantic Web will widen the possibilities for discovering and combining useable data streams which may currently exist.

**Challenges for Future Methods**

Current technologies and web practices limit the feasibility of the deployment of an application to facilitate representation of local knowledge on a scale useful to designers. Based on the literature reviewed, the aggregation of data streams and data tables holds promise for the collection of personal experience, knowledge, and behavior in specific locations. However, at present, due the public scarcity of specifically tagged data streams with particular relevance to design and architecture, in addition to the complexity of identifying individual pieces of data, aggregation of sufficient data to apply to any specific project is beyond the scope of this paper and available technology. In addition, publicly available geo-tagging of information is not an inherent attribute in social data streams. However, the increasing public affinity for social media and connection via technology in combination with adoption and development towards the “semantic web” may provide further foundation for exploration of a web application to visualize representation of these relationships in the near future.

The gradual but slow adoption of Semantic Web frameworks also restricts the amount of useful information able to be determined from social network data streams. While common standards do exist, linking previously produced streams of data is not likely to occur in the near future. The “data silos” that currently prevent cross linking of information continue to prevent
synergy among many sites, communities, and services (Bojars et al., 2008). Aggregation of the many information streams may not occur until interoperability becomes more prevalent.

Another challenge to the visualization of aggregated data streams is the relative newness of data stream mining, or knowledge discovery via data stream mining (KDDM) (Osei-Bryson, 2012). Extraction of meaningful pattern information from data sets requires the formulation of multiple criteria decision aids (MCDA) within a framework to explain contextual information. While frameworks have been developed for healthcare and business (Haghighi, Zaslavsky, Krisnaswamy, Gaber & Loke, 2009; Osei-Bryson, 2012), the evolution of context-aware data mining is hardly prevalent for the architectural discipline. Although data streams may exist that have relevance to extracting local knowledge, at the present time meaning cannot be attributed via KDDM, but must be done through inference provided by personal expertise within the field.

**Conclusion**

Local knowledge can be described as information that does not come from professional techniques, but is collective and rooted in place (Corburn, 2003). The process of gathering such information has presented challenges to planners and designers over the years, pushing many to search for alternative methods, while persuading others to place less and less value on its use (Carp, 2004). Our review has shown that technology use has begun to improve and supplement the acquisition of local knowledge, providing new and novel ways to reach and create the connections needed to foster sharing of non-expert knowledge. With time and further development of the use of the internet, social media may one day allow connections to occur without the need to actively seek participants, supplementing traditional methods of gathering knowledge in even more ways than before.
References


Linked Data - Connected Distributed Data Across the Web. (n.d.). Retrieved from Linked Data: linkedata.org/home


