Critically Assessing Big Data and its Sustainable Implementation in the Spatially Enabled Smart Campus

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Objective
The objective of this position paper is to identify critical factors in the conceptualization and implementation of “big data” in the spatially enabled smart campus. There is a critical need to understand how big data and its collection (e.g., with volunteered geographic information, VGI), distribution and sharing (i.e., cyber-infrastructure) can be undertaken in a fashion that improves human well-being (sustainability) in the spatially enabled smart campus.

The key factors in achieving this objective are to identify how big data can be implemented in a sustainable fashion, that is, how it can improve human well-being on the smart campus. Big data is a commonly proposed solution to a range of problems, including data-driven decision-making and pattern analysis, identifying and tracking diseases, analyzing social media such as Twitter (a billion tweets every 2.5 days) or for enhancing national security. At the same time, it may equally lead to undesirable outcomes such as geosurveillance and privacy invasions. This set of dual-outcomes lead Richards and King to identify three big data paradoxes:

- The transparency paradox, where big data promises the make the world more transparent for problem solutions, while threatening the loss of privacy;
- The identity paradox, in which big data threatens to replace our right to self-identity with big-data-fed options (e.g., locationally driven goods and services);
- The power paradox, in which big data sensors are predominantly in the hands of state or corporate entities.

Guided by these paradoxes, we state that the sustainable spatially enabled campus must ensure that personal privacy is “baked in” to the campus design; that the smart campus should enroll our right to autonomy, especially concerning geolocationally available choices; and that those on campus have a stake in how geodata collected or contributed by them is gathered and shared.

To achieve these ends, we draw on the contributions of sustainability science to examine these paradoxes of privacy, autonomy, and power. There is now much interest in applying

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1 See https://blog.twitter.com/2013/behind-the-numbers-how-to-understand-big-moments-on-twitter
insights from sustainability science to the smart campus—for example, the ninth annual conference on “Smart and Sustainable Campuses” will take place in Baltimore in April 2014. The Millennium Ecosystem Assessment (www.maweb.org) launched by the United Nations over a decade ago identified a framework for assessment of human well-being and the role of ecosystem services in sustaining that well-being. In other words, sustainability is that which is resilient to changes over the long term. If the smart campus is not sustainably designed (does not lead to improved human well-being in the long term) it will fail its objectives.

**Significance and Applicability to the Smart Campus**

The significance of this proposal is that it can enhance the application of big geodata to the smart campus by answering several key questions of the meeting: how do smart campuses contribute to sustainability; are there best (and worst) practice case studies of smart campuses; and a range of questions on how best to engage and empower students. What is not currently possible is to consensually identify proxies (ways to measure) for resilience in our three areas of big geodata concern (privacy, autonomy and power). We seek input from the workshop to develop and refine sustainability proxies for big geodata that can be applied to the smart campus.

In this proposal we use a case study to begin this proxy development process, and then to use the proxies to assess the recent expenditure of nearly $5 million at the University of Kentucky to upgrade campus safety and security. This project includes the installation of nearly 2,000 cameras that can detect unexpected movement in order to send automated alerts, and identification cards that can track students, faculty and administrators entering buildings. To what extent were these systems implemented in ways that enrolled privacy, protected autonomy, and engaged students in the educational mission of the university? Do the technologies address identifiable needs of the campus (and surrounding neighborhoods), for example in traffic management or disability access?

**Conclusion**

In this proposal we draw from sustainability science to develop consensually agreed proxies that can critically assess the implementation of big geodata on the smart campus. Whereas big data is a commonly proffered solution to improve quality of life, it suffers from three contradictions that make it necessary to disambiguate sustainable from non-sustainable uses. Using better measures that resolve these contradictions, for example to resolve whether privacy has been enhanced or degraded by the smart campus, will ensure that human well-being is maintained (sustainable). We propose to apply these measures to case studies of big data usage on campus, beginning with a significant security investment at the University of Kentucky, but with the potential to extend from this use-case to other campuses.

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