Streamlining City Sustainability Data Reporting

Recommendations

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MEMORANDUM

TO: Kara Gross, Joint Venture Silicon Valley
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DATE: June 7, 2012

RE: Recommendations for a Sustainability Data Reporting Tool

This memo outlines our recommendations to Joint Venture Silicon Valley for the design and implementation of a sustainability data reporting tool.

Throughout the quarter, we investigated several different pathways to find, report, and communicate sustainability data. After considering several alternatives, including a sustainability dashboard and a sustainability data hub, we ultimately conclude that **there is an immediate and demonstrated need for a tool to streamline sustainability data reporting for cities in the Bay Area.**

Such a tool will allow cities to send their sustainability data to one source, from which multiple other tools and organizations can access the data for reporting purposes. This preferred alternative is worth pursuing because it serves several stakeholders and helps advance sustainability efforts and knowledge:

- **Cities:** Such a data repository could save cities time and energy by reducing the redundancy of reporting similar data to multiple organizations.

- **Sustainability organizations:** External reporting regimes, such as those that produce reports or tools, would benefit from the ability to access relevant data in one place rather than piecing together data from disparate elements.

- **Researchers:** Students and researchers granted access to the data repository would also be able to access relevant data in one place.

- **The state of sustainability knowledge:** Because the tool removes a barrier to participation in sustainability tools, organizations may be able to recruit more cities that can find their tools useful that previously may have elected not to use a tool due to the time cost of reporting sustainability data.

We reached our final recommendation by performing one-on-one interviews with several representatives of different stakeholders, including Sustainable San Mateo, Redwood City, and

Benetech. Our team created several prototypes of how this web-based solution might function, based on stakeholder feedback and an in-depth literature review of strategies to enact behavior change for environmentally sustainable outcomes.

Our final deliverable prototype is a social central hub for regional sustainability information reporting. It is composed of a public-facing front page and a secured backend for data reporting:

1. **Public-facing interface:** The public-facing interface presents regional sustainability information and news, fosters dialogue surrounding pressing issues of note, and presents Joint Venture's annual Index in an engaging, digital form.

2. **Encrypted data reporting/downloading interface:** Behind a login, officials from participating cities and sustainability organizations can log in to report and receive sustainability data.

Further discussion of the final prototype design, beta prototypes, and our stakeholder conversations may be found in the Appendices of the report.

We believe that the proposed project merits further development by Joint Venture Silicon Valley. To reach implementation, the following action tasks must be completed:

- Continue mapping out the data reporting chain
- Identify any heretofore unidentified barriers to consistent reporting
- Engage stakeholders and get buy-in
- Refine tool design
- Construct and implement Reporting Tool

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§1 INTRODUCTION

§1.1 THE COLLABORATION

The Stanford Program in Urban Studies is an interdisciplinary, undergraduate program at Stanford that combines academic approaches with real-world experience to understand cities. As part of URBANST 164, "Sustainable Cities," students studied prospects for urban sustainability, including social, economic and environmental dimensions. A central component of the class was a team-based service learning project that partnered students with local organizations. This report constitutes the final work of one Stanford group's collaboration with Joint Venture Silicon Valley's Climate Task Force.

Joint Venture Silicon Valley's Climate Task Force interfaces with dozens of regional and local public and private organizations in order to address the regional response to climate change. The Task Force includes representatives from municipality and local government in Silicon Valley, in addition to several special districts and other public agencies. The group also includes advisory members from local organizations in the sustainability sector and select representatives of for-profit firms in relevant capacities.

§1.2 PROJECT OVERVIEW

The original objective of our project with Joint Venture Silicon Valley was to create an interactive sustainability dashboard. The goal of the dashboard would be to provide decision makers with clear indicators of their communities' sustainability benchmarks, goals, and current status. As detailed below, our end-goal shifted as we researched the needs and capabilities of local governments with respect to sustainability goals. Due to "tool fatigue" and the current state of data reporting among local governments, we determined that streamlining the data reporting process would be a more impactful project than adding another dashboard tool to the plethora of like tools.

The end result of our research led us to the design of a sustainability data hub that would allow for streamlined data reporting. The tool is designed to act as a data repository for local governments, allowing cities to submit their sustainability data into one central location. From this hub, external reporting organizations will be able to extract necessary information from one place. Such a reporting tool would be useful in reducing the redundancy of cities reporting the same data to multiple organizations and would streamline the process for external organizations that currently have to piece together data from many different sources. The final product of our research combined some of the facets of the initial concept with newly designed aspects based on our research.

§2 FINAL RECOMMENDATION

Our final deliverable prototype is a social central hub for regional sustainability information reporting. It presents the information and reported data in a user-friendly manner, while providing cities and organizations with a streamlined method for data reporting.

The preferred prototype offers a solution to three demonstrated, unmet needs within the sustainability community:

1) There is no central hub at which to get sustainability information.
2) There are few easy ways for decision-makers to find sustainability information in a digestible, easily comprehensible format.
3) Current data reporting processes between cities and organizations that produce tools and reports are redundant and inefficient, taxing the resources of reporting institutions and likely limiting how many tools a city will choose to use.

Consequently, we have concluded that **there is an immediate and demonstrated need for a tool to streamline sustainability data reporting for cities.** Our working prototype allow cities to send their sustainability data to one source, from which multiple other tools and organizations can access the data for reporting purposes.

§2.1 PRELIMINARY DESIGN

Note: A detailed screenflow of the sustainability platform can be referenced in Appendix B.

The design of our final prototype consolidated suggestions and recommendations from city officials and community partners into one unified design. It was heavily influenced by our user experience testing for our initial three prototypes. We were able to take the positives from the previous user interfaces and extract them into our final deliverable. More importantly, however, was the ability to review existing prototypes and the literature around them in order to develop a unique tool that would represent what was desired according to our need-finding process.

It must be remembered that the following constitute only a preliminary, early-stage vision of how such a platform might function. Next steps that must be taken in order to refine and implement subsequent prototype iterations are outlined in §4.1.

§2.1.1 HOMEPAGE

Our tool begins at a city-centered homepage (in this case Palo Alto) accessible by the entire public. A user is able to briefly read the sustainability goals and achievements of the city on the left hand text box. This text would be generated and maintained by the cities themselves. Above the welcoming text, the user is presented with a variety of sharing options. A user could email the page or link to a friend or colleague, they could assign the city page to their favorites and they could also directly tweet the page or like/share the city on Facebook.

The body of the platform includes 4 interactive rows with informative displays. The top row contains city specific sustainability data that is available to the public. In our provided screenflow, for example, the user has scrolled to find electricity, greenhouse gas and transportation data as it relates to the city of Palo Alto. If the objective of the user is to research sustainability data similar to a traditional dashboard, they are able to with one click. Once a specific data set is selected, the remaining bottom three rows make way for detailed data representation. Graphics are shown on the right of the body to show changes in emissions levels, while charts and graphs are provided in the center of the page. The user is then presented with options to understand the data better,

download the data for their personal use or research, send an inquiry, view the history of this data and publicly comment on the data.

If the user is interest in sustainability media and social feeds, he or she is able to view it all on the homepage. Videos and Images are presented below the data row. A user is able to watch a video directly on the website as well as view images. Scrolling left refreshes the feed and up to date multimedia repopulates the row.

Below the multimedia row is the Social row. In it, users are able to read the chatter on Twitter and Facebook regarding sustainability and their city. Users can stay connected with what is happening in the city around them and continuously be informed. This also promotes the sharing of sustainability ideas as well as providing a venue for sustainability criticisms on the part of the citizens.

The last row contains the news of the city as it relates to sustainability. This can range from a new sustainable development, advances in sustainable technologies, or even the reporting of government policy. Similar to the previous two rows, the news row is time based: allowing the most immediate information to be presented at the front of the row. Users can read the articles directly on the website in a text friendly version.

§2.1.2 DATA REPORTING

Both city officials and community organizations have the ability to log into this website to report or inquire about sustainability data. For a city official, clicking the green input data button, located in the top right of the public page, sends them to a calendar/schedule/reminder page. On this page, the city official is able to view upcoming deadlines and questions posed by different organizations. They can export this calendar, as well as send direct messages to different community stakeholders. The event details and deadline descriptions are located on the left hand text box. Clicking 'next step' takes the city official to set permissions and report data.

On the permissions page, the city official is able to select the organizations he or she wishes to report the data to. The official has the option of making the data public to everyone or select groups of organizations. Clicking the green button sends the user to the 'report data' page.

The data-reporting page has a very simple layout. The problem or question posed by the member organization (or general public) shows up with a corresponding text box for an answer to the inquiry. The city official is also able to browse his files and upload an already created spreadsheet or data file. Once the question is answered, all parties involved in this exchange of information will receive an email confirmation and notification in the 'calendar page'.

Organizations and the general public are able to request more information, while the city can now report data in a streamlined manner. This prototype is a front-end design of what our final functional prototype should look like when developed. It was created using Adobe Fireworks, Microsoft PowerPoint, and Balsamiq Mockup software. The simple layout and social aspects enable this prototype to be used on mobile platforms, such as smart phones and tablets, in order to expand its audience and capabilities.

§2.2 SCALING & FUTURE OPPORTUNITIES

The central value proposition of our proposed tool is its ability to streamline the data reporting process, creating a common hub for data reporting. As such, we recommend that implementation focus first and foremost on the reporting functionality of the tool. Later-stage functions that would enhance the tool include:

- Social integration, as in our preliminary prototype,
- Collaboration with data sources, such as PG&E and other utility companies, so that the tool removes intermediary reporting steps,
- The ability to easily transform reported data into the many different file formats required by different data-receiving organizations.

Further discussion of next steps can be found in §4.1.

§3 PROCESS

Throughout this ten-week partnership with Joint Venture, our project has evolved from a dynamic dashboard for sustainability metrics into a standalone sustainability data hub and, finally, into a preferred alternative that fills two main functions:

1. Serves as a hub for publicly-available sustainability information
2. Serves as a centralized data-reporting service through which cities can release their sustainability data to selected organizations and/or the public

This section discusses the process behind the development of our preferred prototype, outlining the basic methods used as well as the lessons learned from each prototype along the way. By outlining the thought process behind our preferred alternative's evolution, we will demonstrate that it is the alternative with the highest potential for being a useful product.

§3.1 NEED FINDING

The majority of our eight weeks dedicated to this project was spent "need finding." This concept, coined by a former head of the Stanford product design program, is "a qualitative research approach to studying people to identify their unmet needs" (Patnaik & Becker). In such an approach, a designer begins his process by speaking to his target audience, developing a product based on the needs expressed by his client rather than tailoring a preconceived product to the specifications of the client. Such an approach helps minimize the risk of developing a product that is ultimately not found useful.

Patnaik & Becker outline the benefits of conducting the project scoping process through need finding as follows:

Justification	Explanation
"Needs last longer than any specific solution."	Solutions (e.g., iPhone, iPhone 2, iPhone 3, etc.) come in and out of vogue; needs, on the other hand, endure longer.
"Needs are opportunities waiting to be exploited, not guesses at the future."	When there is a demonstrated need for a solution, a designer can be sure that his solution will be immediately needed and does not have to try to prognosticate the future for an upcoming need that may or may not materialize.
"Needs provide a roadmap for development."	Once a need is identified, the intermediary steps necessary to create a full solution can too be identified and acted upon.
"Needs spur action."	A demonstrated need reveals a problem that can be solved.
"Needs are obvious after the fact, not before."	People become acclimated to their problems and are not always able to identify something they take for granted as problematic. Thus, the need finding process depends on uncovering these hidden needs.

With these principles in mind, we began more detailed research, conducting literature reviews and interviewing many stakeholders throughout the quarter. Through the iterative process of prototyping and getting stakeholder feedback on our prototypes, we were ultimately able to refine our stakeholder input into a set of easily defined, demonstrated needs that we were able to address in our preferred prototype.

From our initial meeting with Kara Gross and John Sztukowski of Joint Venture Silicon Valley, we distilled a few broad, underlying goals of the project that we carried throughout all of our prototype iterations:

- To promote better dissemination of information,
- To foster more informed decision-makers,
- To inform more targeted policies.

Through the need finding process, we were able to better operationalize and refine these goals.

§3.2 LITERATURE REVIEW

Our literature review was instrumental in shaping the requirements and needs of both our initial and final prototypes. Various sustainability dashboards were researched for aesthetics and design objectives. We also researched other creative methods of sustainability reporting in order to better understand existing products in the marketplace. Our review led us to a plethora of behavior change literature. We found three specific points that were influential throughout the entire process: people respond well to dynamic data, people like to win, and people don't mind numbers if they can interact with them.

- **Responding to Dynamic Data:** Frequently updated measures and indicators with real time data are effective at motivating behavior change. For a reporting political member, dynamic data is also the most reliable and most responsive to a group of people.

- **People Like to Win:** Competition and comparison are two different methods for changing behaviors and should be viewed as such. Competition is a proven method for encouraging more sustainable behavior. Furthermore, while people like to win, nobody likes to lose.

- **Interactive Data:** Data-driven interfaces that encourage user interaction with both the data and each other are a very effective means of behavior change. Common examples include the gamification of the data and values. Dashboards tend to be dry and least effective when limited to only viewing numbers.

There was one existing product in the market that was developed through years of research at Dartmouth College that encompassed all three important take-home messages of our literature review. The Polar Bear Project was a college project that provided the foundation for a private company called Tellemotion. Tellemotion brings sustainability to life by using real-time energy feedback to motivate people to change behavior and conserve resources. Tellemotion is known for having an animated polar bear that alters his mood based on energy use and amount of waste. In addition, features such as competition, additional animations, detailed graphs, and historical data are mixed into this device to engage the user. The technology was developed based on research from sociology, behavior psychology, interactive design, as well as computer science.

The literature review informed the approach and psychologies behind our prototypes.

§3.3 ALTERNATIVE 1: SUSTAINABILITY DASHBOARD

The initial vision of the project as presented to us by Joint Venture Silicon Valley was to create

> *an online tool for reporting municipal greenhouse gas emissions across the 35 cities / towns and 2 counties [Joint Venture] serves. The analysis, and subsequent dashboard, would include easily accessible and understandable information on local government energy use, average residential energy use and solar / renewable energy generations portfolios by community, as well as a summary for each locality about what they have already done and are planning to do to reduce energy use and greenhouse gas emissions.*

Our initial client meeting underscored that the intended audience and key benefactor from this product would be key decision-makers in local government. The overarching goal was to provide decision-makers with a platform that would demonstrate the state of each city's emissions performance. We agreed that expanding the focus of the envisioned dashboard to include more sustainability data beyond emissions would be beneficial to politicians as well.

To that end, we outlined three main considerations that would need to be investigated further in the development of a prototype:

- **Data considerations:** Assess the availability, scale, and comparative potential of data between municipalities

- **Psychology:** Investigate different methods of creating a tool that motivates behavior change, preferably with positive incentives rather than negative incentives.

- **Potential for expansion:** Consider how this product could grow to fulfill more needs: Could this project also benefit researchers? Could it serve as the tool to bring together all of the disparate sustainability information sources on cities?

§3.3.1 INITIAL DESIGN PHASE PROTOTYPES

Our project steps began with a data search and rough prototypes after an extensive literature review of market comparables. Our initial concepts are outlined as followed and are shown in full in Appendix C:

- The **behavior change prototype** influenced a user's emotions by giving them a graphical representation of their city's sustainability use. If the city were presenting sustainability data that placed them over their emissions limit as set by a city policy, a tree would begin to lose its leaves and change color. The concept was based around the idea that user's would immediately reduce their energy usage in order to see something they strongly associated with grow into a healthy tree. As we found in our literature reviews, people like to win, as competition is a proven method for encouraging more sustainable behavior.

- The **analytical prototype** was a data-heavy front-end design that presented raw data with charts, graphs, and numbers to the user. The concept attempted to present real time data for surrounding municipalities. In our assessment of sustainability literature, studies clearly show the effectiveness of real-time, dynamic data. Frequently updated measures and indicators with real time data are effective at motivating behavior change.

§3.3.2 ISSUES & STAKEHOLDER FEEDBACK

While literature shows that competition drives sustainable behavior change, cities who work with **Joint Venture** would voluntarily participate in such a program. Kara Gross emphasized her concern that cities might opt out if they felt they would not compare favorably to other cities.

Shortly into our analysis of sustainability data, we found that the available data were largely static, updated only once every year, at best. Because our literature review had shown us that it is dynamic data that effectively motivate behavior change, we were concerned that the nature of the data rendered the utility of a "dashboard" ineffectual. Subsequent conversations with Gerardo Capiel of stakeholder **Benetech** supported that concern.

Based on this feedback, we decided that neither a dashboard interface nor direct competition would be an appropriate approaches.

§3.4 ALTERNATIVE 2: SUSTAINABILITY HUB

Following stakeholder feedback on our first alternative, we were able to refine our goals. We identified the following needs:

1) There is no central hub at which to get sustainability information.

2) There is no easy way for decision-makers to find sustainability information in a digestible, easily comprehensible format.

Our second prototype was thus a standalone sustainability data hub with a user-friendly interface atop that data repository that would make data access intuitive and simple. This prototype can be found in Appendix D and is discussed herewith:

- The front page of the website would allow the user to select the city he is interested in. By allowing users to only select one city at a time, side-by-side comparison is avoided.
- Once a city is selected, users are taken to a city profile page. This page has content that is managed entirely by the city itself. By allowing a city to manage the first impression it gives of its sustainability activities, the cities are given control of their own narratives, encouraging buy-in.
- From the profile page, users are able to see upcoming sustainability events, browse ongoing projects, look at sustainability reports, and investigate the data behind the sustainability reports.

§3.4.1 ISSUES & STAKEHOLDER FEEDBACK

While a sustainability hub alone answers the two unmet needs addressed above, discussions with stakeholders underscored concern over "tool fatigue:" with so many tools available to cities, the value propositions of any new tools needs to be very high to ensure repeat visits and high usage. Ultimately, we were unconvinced that the value added from a standalone sustainability hub would surmount the activation energy required for cities to keep their data up-to-date and to frequently use the tool.

In contrast, we feel that our final, preferred alternative offers a value proposition that will satisfy unmet needs while also motivating participation by making already-required data reporting regimens more efficient.

§3.5 IDENTIFIED NEEDS

Ultimately, through this process, we identified the following needs:

1) There is no central hub at which to get sustainability information.
2) Current data reporting processes between cities and organizations that produce tools and reports are redundant and inefficient, taxing the resources of reporting institutions and likely limiting how many tools a city will choose to use.
3) There are few easy ways for decision-makers to find sustainability information in a digestible, easily comprehensible format.

We believe that it is the first and second needs that are the most immediately important: they are not being addressed, and they impede upon the ability to meet Need #3. Furthermore, our research shows that Need #3 has already been recognized by many parties in the sustainability community, resulting in the many sustainability tools we see today.

§4 CONCLUSION

We have zeroed in on creating a tool designed to streamline data reporting for cities. In our current prototype, we have created a front-end design for a tool that allows cities to send their sustainability data to one source, from which multiple other tools and organizations can access the data for reporting purposes. Such a data repository could save cities time and energy by reducing the redundancy of reporting data to multiple organizations. Additionally, external reporting regimes would benefit through the ability to access relevant data in one place rather than piecing together data from disparate elements.

§4.1 NEXT STEPS

In order to fully implement a sustainability data reporting tool and data hub, there are several significant next steps that must be taken. To begin, more work needs to be done **mapping out data reporting chains**. Through our conversations with local sustainability organization and city officials, it is apparent that the data used in sustainability reporting come from very disparate sources. For instance, the electricity and gas consumption data may be directly reported from Pacific Gas & Electric, the diesel fuel consumption from the city fleet manager, and waste and recycling data from the facilities manager. Our own research into the topic has lead to a rudimentary understanding of the reporting web. However, more detailed identification of the data sources and to where the data is reported will provide a knowledge base from which we can identify inefficiencies and areas for improvement in data reporting.

In conjunction with the above mapping, it will be necessary to **identify barriers to data reporting faced by cities and local governments**. In our conversations with officials, a major barrier that became clear is the lack of resources among city governments. The departments that are required to report data, such as for waste/recycling and air quality, report their numbers to the required agencies individually. Beyond these mandatory reporting regimes, cities do not track or report other data that may be useful in completing sustainability reports. Many cities lack the resources to staff a sustainability staff-member who can compile such data sets. Other barriers surely exist in the realm of sustainability data reporting. It will be imperative to identify and find solutions to such barriers in order to completely streamline data reporting.

The critical step, **stakeholder engagement**, comes once the data reporting chains and barriers to reporting are identified. Stakeholder engagement will be necessary to maximize the effectiveness of the data hub. Participation from the cities will be imperative in order to compile the data in the first place. Creating consistent, widespread, and standardized reporting regimes for the city governments to follow will maximize the effectiveness of this data hub. Through widespread municipal participation, the data hub will be more useful in that comparisons between cities could provide information on areas of strength and areas for improvement for decision-makers. We identified several tactics for ensuring reliable data collection from participating communities:

- Having PG&E (or local utility) send pre-specified energy use data to the data hub twice per year – bypassing communities that may be too overwhelmed otherwise

- Compiling publicly available Census information and updating as needed

- Sending annual surveys to city governments for additional/missing data

These methods of data collection would require some extra attention by a city official, but would hopefully be minimally intrusive into the usual operations of the requisite departments.

Engagement with sustainability organizations will also be crucial, although the benefits of this tool may require less effort on these organizations part. It will be important to alert these groups to the existence of the tool and how it works in order for the organizations to take full advantage of the streamlined process.

Once enough organizations are committed to the effort, focus can be shifted to **redesigning the reporting tool** based on the newly acquired information and implementing the working online version. This step will require working with web developers to build a working version of the tool. Testing and implementation can then occur.

These next steps in the process of streamlining sustainability data reporting will require significant efforts and cooperation from many sectors. However, our research convinces us that significant improvement in reporting regimes can hold great benefits for future sustainability programs among Silicon Valley's local governments. This streamlining can lead to better-informed decision makers and more targeted, effective policies. Putting forth the cooperation and effort that is needed for this project could therefore lead to great gains in creating healthy, sustainable communities in the future.

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APPENDICES

APPENDIX A: CONTACT INFORMATION

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