THE TOWNHALL PLATFORM
Team 17

Prakash Mishra | SSE
Harry Prevor | CIS
Shadrack Lilan | SSE

Advised by Robert McMahon

II.   Executive Summary

In the first four months of 2019 alone, CNN reported over 20 stories of town hall meetings which had only 1 member in attendance. Town halls are supposed to be the city council's venue for convening stakeholders from across the locality to discuss the wicked problems[1] of social policy. This purpose does not pan out in practice. Our platform, aptly named townhall, makes government a stakeholder on the same platform as citizens, businesses, and nonprofits and uses the power of new internet tools to remove the frictions that keep people from having the chance to participate in local democracy. The platform ensures users are completely verified for location and their accounts are tied to their actual identity in public record, protecting against trolling. By building accountability into the platform, the system allows robust and faithful polling, referenda, and discourse in its working group system. Constituents can post issues on the site which government employees can claim in real-time, allowing constituents to track where potential service requests, complaints, and petitions are in the bureaucratic process. The system also leverages the use of a well-planned database to allow employees and interest groups alike to requests "reports" of posts in working groups which returns the posts themselves and any structured data attached to them (for example, in a working group for reporting potholes, reporting would return the address of reported potholes). The platform is fully open source and is distributed as a containerized webapp which can be obtained from our GitHub page by any government ready to begin establishing the application locally.

III.   Overview of Project

A functioning democracy depends upon citizens' faith in government to handle issues transparently. There is no better example of this than the local or municipal government, where daily issues ranging from basic services like sewage and police to political issues like district-drawing and school catchment are played out in their most visible and, in many cases, their most important. Yet, current systems hardly afford citizens the speed and transparency of government response that an ideal democracy would provide.

For example, Boston's 311 system, the status quo dominant design for responsive governance systems, still relies on text message-based notification of issues (like potholes or water main breaks) which are processed by a black box call center on the other end of the system and handled on a timeline which is entirely invisible to the citizen. Even more pressing are issues like the lack of consistent attendance at critical public fora. The namesake of this project is the Town Hall, a public forum which in most counties is attended by a small minority of highly leisured citizens, usually omitting key voices. The space of responsive democracy is one that feels in need of upgrade.

---

[1] For more information on wicked problems, see Ritter & Webber, http://www.sympoetic.net/Managing_Complexity/complexity_files/1973%20Rittel%20and%20Webber%20Wicked%20Problems.pdf

The townhall platform creates an online space where the entire range of stakeholders in a democracy, including citizens, local businesses, nonprofit organizations, student groups and activists, and importantly government officials and departments are able to interact all in one place. Each has the ability to create and track issues, procure clients, and discuss ongoing municipal projects in a common forum. In a cultural moment where faith in government is increasingly shifting to the youth and the urbanist, this platform seems like an important opportunity to bring government into a space where it can interact in a modern, accountable, and responsive way with its stakeholders.

An important aspect of this is trust. The "competitive advantage" of any platform which attempts to address this problem is going to be the degree to which each type of stakeholder can trust the final product, as government is a societally, ethically, and politically vital function of a group of people. A social contract undergirds the project. To this end, making sure the platform is open source and deliverable to government in a way that does not make it difficult for officials to monitor the use of government servers and which does not require exporting any functions to third parties without consent is absolutely critical. Allowing localities to run localized versions of the applications rather than having a centralized server, especially after municipal disputes with AirBnb and Uber over data sharing agreements, is simply part of the platform's mandate.

On the citizen side, integrating consent on all levels of data collection and allowing the citizens to select exactly what types of data are being collected for use in the public forum is similarly a non-negotiable requirement. Ensuring citizens can see who is responding to their new issues in government, and that governments are held accountable for each step of bureaucracy through which issues posted to the system are passed becomes a key philosophical victory for the platform.

Trust also encompasses the important function of representation. The platform requires complex authentication so that only those stakeholders who have a stake in the city, be it via living in the city or having operations in the city, are represented on the platform. At the same time, the platform should have methods for ensuring that all or as many of these stakeholders as possible are represented on the platform in a manner which does not skew in favor of any possible majority vision of an issue.

Finally, trust encompasses censorship, or the lack thereof. In a truly democratic space, being able to moderate is simultaneously important and important to check. The platform requires a functional mix of moderation and limits thereupon. Moderators for content relevance are generally deemed acceptable, but moderators for type of contribution or censoring perceived pejoratives require larger discussions of the values of the city. In this way, having a transparent set of rules of who moderates, what their powers are, and whether there are any checks on those powers, are a piece of the puzzle.

Each of these design requirements are non-optional; they become key features of the platform if it is to be accepted by its stakeholders. We describe our technical approach to developing each in turn below.

IV.   **Technical Description**:

The platform is a web application which can be downloaded off of a GitHub page as a containerized application (e.g., using the open-source Docker platform). The key metric is the number of mouse clicks between download and complete application on a local machine. The end-user, a government, should be able to set up the platform in a manner that has limited technical strain on their end due to potentially limited technical resources. Local governments are asked to select various features including: moderator privileges, local government hierarchy, and color schemes and logos. The platform will likely have an API that allows for further aesthetic customization of the platform for cities which have technical capabilities to do so.

The moderator scheme has a variety of options. Moderators can select whether there is any automatic text screening which ensures that certain content standards are met, and whether these are applied across the platform or only to specific groups. Moderators can be either restricted to local government officials or can be assigned within specific issues (e.g., a discussion fielding ideas for developments on a new lot can be moderated by the owning developer rather than the local governing body).

The platform walks the local government user through the steps of setting up a database on their local server and inviting local users through voter or Department of Motor Vehicles (DMV) records which contain their contact information. Users receive a customized welcome email and are invited to set-up their account. Governments can also use local tax records to invite local businesses, nonprofits, and operating interest groups to invite these other stakeholders to the platform as well.

Users, once they open the link in the e-mail or physical mailing which invites them to the platform, set up a unique log-in. From here, they are presented with a screen in the style of Medium which allows them to select topics of interest to them from a range of different existing working groups. The platform suggests working groups for them to enroll in, while also enrolling them in a core set of working groups which governments can define. We are currently also attempting to develop a suggested set of required groups. They can then access their user feed.

The user onboarding process was one of our key deliverables for the project. It is attached to this document in Appendix A. The flow chart demonstrates that when the government establishes the application they can use several methods for actually crafting a representative stakeholder set, including mobilizing third-party organizations in addition to enlisting residents and citizens they are able to register based on records. Importantly, it also describes limited privileges for non-profit and business organizations; the former is limited to certain working groups (discussed in greater detail below) and the latter to localities in which they have a physical presence. This stymies such interests from having over-representation in discussions across the city without prior referendums to upend these rules.

From here, users are able to subscribe to various working groups, each of which are dedicated to a particular issue (e.g., a new development, zoning policy, parks and recreation, etc.). Discourse groups for more general back-and-forth around political issues are also included. Discourse groups will generally have less strict moderation than the working groups dedicated to specific issues or policy areas. Relevant government employees are also enrolled in the groups which are relevant to their current work. Thus, stakeholders on specific issues are

all able to co-exist in their local working groups. Users are automatically subscribed to specific groups - in particular, groups like potholes or permit requests which tend to be basic request-based working groups. They can create new groups for relevant issues, and request to be added to groups which affect their local area (neighborhood). They cannot enter the issues of other neighborhoods unless the creators or moderators of that working group approve their request.

Working groups can be oriented around a specific issue. We walk through an example here which also describes the various features of a working group:

A developer wants to build a new apartment complex on the site of a now-vacant lot on Spring Garden St., near 16th. They open a group called "16/Garden Apartment Complex." Everyone in the surrounding neighborhood is notified and are automatically added to the group, as are relevant government officials including zoning and permitting, city planning offices, redevelopment authorities, mayor's office, and public works. Nonprofits which are focused on tenants' advocacy are also automatically notified and added. The developer has moderation privileges over the discussion, limited to flagging posts as irrelevant. The developer posts a proposal document for the new apartment, and creates a thread for discussion on the proposal for 1 week. The week elapses, and the developer has a response period where it can follow up with all of the individuals and organizations which comment on the issue. Once this is complete, the developer can call for a referendum on whether the community supports the motion, which can be used as a piece of its proposal to a government agency when the time comes.

The referendum is successful, and the developer creates a new official filing with the permitting office within the same group. They are able to track as it goes through the planning department's environmental assessments, the zoning code assessments, and other related processes. The government officials involved update the community working group as it progresses.

If the filing gets passed, the community working group might transition to a Construction process discussion group which can be used as a forum for noise complaints. At this time, a new referendum might be opened to change the operating rules for the group - to change it from a pure discourse group to a functional group for noise complaints, or to retire the group altogether.

If the filing fails, the developer may repost their proposal and get further feedback on a new design. Citizens may also form operating rules referenda to add new developers to the working group who could craft competing proposals, or the government could create a larger request for proposals (RFP) working group.

An example of the strength of townhall is it mitigates the power of single stakeholders like the developer by forcing a more open forum than a mid-day townhall. For example, dissident citizens can post polls for ideas for use of the same Spring Garden lot, allowing community members and even the developer themselves to post suggestions. These develop into debates of the pros and cons and finally government officials can organize a method for determining stakeholder preferences like a referendum or a more complex voting procedure like ranked choice. This level of interactivity and stakeholder-driven conversation sets us apart from the status quo.

As demonstrated above, users are able to open new issues, like the existence of a pothole, on the platform. Government employees can then mark the issues as being in progress and at each stage of the resolution of said issue, a key contact person with a brief description of ongoing tasks is provided to the stakeholder who opened the question. Users can thus track progress in real time. On the other end, governments can download preformatted reports which describe where key issues in their city have arisen and what users are generally saying in specific working groups.

An important function of the working groups is self-improvement; users can vote on the rules of moderation, the external parties which can be added to the group, and to ban fellow group members. All such rules are handled by the API of the platform so that the individual marked as the group administrator is able to easily use a checkbox list of various features to change how the group functions. However, government individuals cannot be banned, and if the group attempts to ban members to bar them from discourse, this is deemed as a check on that power (presuming the government itself is not privy to any interests which would purposely exclude that third party, in which case, nonprofit watchdogs would hopefully call out this behavior). Then, this **operating system referendum** feature is fairly robust.

The platform is largely determined by user feedback. However, every product concept should have some guiding measurable metrics. We have three key objectives for technical completeness of the platform.

1. **Mouse-clicks** between download and complete functionality. We are aiming for no more than 10 clicks. Currently, the Dockerization allows a 3-command download and set-up, meaning that only 10 minutes are required to set-up in the worst case scenario.
2. **Size** of the application. The application should be limited in initial database size and mapped to a scalable Docker container that makes it runnable on any system.
3. **Complexity** of user profile records in the database. We want to optimize the number of data points included for each user. Currently, the database only stores a location structural variable which includes the full hierarchy of local government under whose purview the individual falls, a contact email, name, working groups to which they are subscribed, and a hashed version of a Voter ID record label which corresponds to an ID system the local government uses.

We have considered several alternative implementations of the platform as well. Importantly, we considered a centralized system in the early stages of the project, but quickly rejected it in favor of the federated (distributed) one we describe in this report because the centralization of the system violates the trust factor which makes the platform useful to a government in the first place. We are still experimenting with how to present data entry and report creation in the platform, as will be discussed later, so the platform itself and the various nuances of the solution we have presented here are very much still in the works.

The approach to designing these iterations is much like the structure of this report; we began with key requirements for the platform and an understanding of what stakeholder demands should be. We drafted and re-drafted this in collaboration with subject matter experts. We then transitioned to a parallel development process. Two team members were dedicated to develop the platform itself, and two were in charge of systems design, including user onboarding, user profile design, and platform feature research. Using some of the

object-oriented features of Python made it easier to modularize the project to achieve these goals.

The platform is able to handle user database uploads (e.g., government officials can upload a csv file from Voter ID rolls or DMV records). It can handle user creation of working groups, has a visually appealing UI, and has been containerized. The platform leverages PHP for client-server communication, as well as CGI scripts for programmatic tasks. Once the user clicks on the report generation button, a Python CGI script is executed. This CGI script leverages in the `mysql_connector` library to execute a predetermined SQL query in our web app's database. Once the data is retrieved, it is styled and rendered on the client side for the users' consumption. The report's data is rendered in a format that also makes it easy to save it as a CSV to be used with more sophisticated data analysis tools.

The database schema used was intentionally simplistic so as to make additions and parsing as accessible as possible. Tables exist for users, posts, and votes -- see Appendix D for a list of such tables. Each user has a unique internal "user id" distinct from their username to allow for the possibility of username changes. Generally speaking, most structures in our database have a subject and object ID, indicating that an action (such as liking a message) was performed by a subject (the liker) onto an object (the post).

We were able to leverage this subject-object database structure with real-time notifications, maintained by a set of cron scripts set to run every minute on the host machine. The notification process is convenient but also completely optional to set up in case the hosting provider does not support automated scripts. By default, both the subject and the object (when the object is a user) are notified whenever changes are made to data they are both connected to, and the cron scripts comb through the database to log those changes and report them to the logged in users in real-time via AJAX calls.

The other feature we considered while creating the platform is the ease of set up. A key factor for implementing a system like this is the ease of installation. Many local governments may not have the resources to create their own stack that can readily integrate with our web app. If we can design the application such that we can minimize the set up time/eliminate the complex set up process all together, then we can encourage more governments to try it out. Another minor feature to complement the ease of installation is the ease of update. Like any other software, our web application will also require updates. To implement these features, we decided to put the application into a docker container. This allows us to isolate the app, customize the environment, and guarantee easy installations and updates. The code in the docker container is synchronized with the code on Github to ensure a standard framework across all users, whether they are using a custom software stack or our pre-configured docker container.

We used data from Boston's Open Data portal from the status quo alternative to town hall: the 311 phone line. The database is a live-updating large file that contains records on types of complaints, from potholes to more serious concerns, as well as geotags and other metadata for the post. Our testing consisted of uploading these posts to the server of our system and simulating the posts on our website by creating bots which would post these particular complaints to the correct working group. Then, a report creation request should essentially recreate the .csv file from which the data was initially corrected. Phase 1 involved doing this for

just 1 working group, while phase 2 involved expanding this to multiple working groups. We started off with a test of potholes only, and then tested whether we could handle multi-group upload and multi-group report creation. The point of this test is to establish we can handle the load of the status quo system in addition to our features which allow for discourse and discussion beyond the conventional 311 line. See Appendix A for links to screen caps of key tests.

The final test was to determine whether an individual who was entirely not involved on the development team, doing outreach and systems design instead, would be able to download the platform off of Github. This tests whether a technologically less sophisticated user would still be able to walkthrough the process of setting up the database and whether our ReadMe was complete.

In conclusion, using a simple systems approach has allowed us to develop an initial demo application which already is able to meet a number of the demands of a stakeholder-driven democracy application. We are fine-tuning the features that will make it possible for governments and non-government stakeholders to directly see the information most relevant to them once they are onboarded, but have already developed the groundwork for the platform.

V.   **Self-learning**.

While developing this platform, a number of new skills were required to put the project together. Importantly, the discipline of drafting requirements and iterative design became critical to our approach. Suggested by our advisor, Bob McMahon, requirements drafting kept our development in check as we tackled what originally seemed to be a vaguely defined project but quickly became a clear and tangible one.

Beyond this, we became intimately familiar with a number of government processes. In particular, we learned about government procurement. The complexity of trying to ensure every vendor in a city has access to a new request for proposals is a key step in including local businesses in the mix of stakeholders on the platform. Learning about the various contracting processes which exist at a local level allows us to create business-relevant stakeholder features on the platform.

On the coding front, we became familiar with data handling and security standards for web applications. While there are general standards that need to be adhered to, there are additional standards that have to be followed depending on the different use case e.g the standards for a standalone social media app are different from a government service app. During development, we have to stay up to date with any news regarding the technologies that we are using so that we can address them in our application's context.

In the spring, we also learned that it was difficult to present an unfinished product with limited internal testing to high-maturity institutions. If you consider a capability maturity model, we were hardly even a Level 3 organization and we were trying to reach Level 4 or 5 organizations with our original focus group or active beta testing trials. These were predestined to fail especially since our senior design team would leave the project at the end of this

semester. We had to become clever with developing truly incisive testing that simulated the needs of a target organization without actually putting that organization at risk. We thus used the data and expertise of these organizations from open source forums and implemented them on our platform as a proof of concept and case for future usage.

VI.   **Ethical and Professional Responsibilities**.

There is a heavy onus on the team to develop an ethical platform. In order to develop a platform which will be used by a government, we need to meet the political, moral, and ethical standards people expect of that government. The platform represents an entire city and doesn't privilege any one group in key conversations. The platform should not give government undue powers of moderation over their citizens. Most importantly, the platform should not give the team undue control over the data of citizens because this violates trust and makes the platform less likely to be used.

The moderation question was the stickiest one since the first draft of our project requirements at the beginning of the semester. In particular, how much censorship power can be considered ethical on the part of a government stakeholder in an online setting is a difficult discussion. Where private third-party vendors have the liberty of setting their own forum rules, governments walk the constitutional line when they do this. One the one hand, the right of free speech governs such online spaces. On the other hand, governments have a mandated duty to protect citizens against violent or seditious speech, including hate speech. Respect for diversity can create a paradox of tolerance, however, suggesting a balance of these two objectives must be reached. Our solution of creating a set of potential features, including basic text moderation, with which the government can target certain discussions and not others in a manner that is clear to all users of the platform, mitigates our ethical quandary and passes the discussion on. We also believe that in the end this is the only solution to a problem which might be addressed differently in different contexts. Moderators cannot ever edit discourse working groups. New projects should be moderated by those who suggest them, and can be passed on to government officials who then take over moderation. This basic ethical rules around moderation seem to be universally appealing.

The next question is one of representation. Internet polls are famously unreliable because they capture disproportionately younger, more leisured (wealthier) individuals. In the same way, this platform would likely privilege the voices of similar individuals in conversations around policy. One could argue that the physical town hall meeting, which is the alternative, similarly imposes costs which place emphasis on the wealthier leisured - usually older individuals as they occur during the day - so we are simply shifting the bias. But we feel we must do better still, which places the project in a tough ethical situation. The reason Selena and Prakash spent much of the fall semester charting a diverse user onboarding strategy for the potential types of users in a city was to make sure there were ways for individuals in localities where ID laws might be restrictive or individuals with limited internet access still could keep accounts and at least have a presence in the space. Having advocacy groups present for such under-represented groups will be a core recommendation on the platform when governments

have first established it natively. As for us being able to streamline this process a priori, we have little ability to do so.

New ethical issues arose as we began the testing phase of the application. In particular, we realized that if we were not entirely confident in the data infrastructure and security standards internally, we needed more internal testing in order to deliver on our promises of external testing. Thus, partially for ethical reasons, we pivoted our testing strategy this semester.

VII.   **Meetings:**

Our team kept a practice of meeting at least once a week to check in on the progress individual teams made. This often consisted of Harry proving development updates and collaborating with Shadrack, and Prakash drawing up design specifications for new tasks.

Because Bob is frequently off-campus, we largely communicated over email throughout the two semesters. We were responsible for sending weekly updates after our team meetings on Fridays and fielding any relevant questions. When Bob was able to make it, we would update him and show him our in-class deliverables, such as our executive summaries and presentations, so he was in the loop on all of our official communications. During the spring, Bob has been away on travel frequently so we kept him updated as often as possible and ensured he was aware of our ongoing improvements to the platform.

We met with content matter experts Anne Fadullon and Dr. Andrew Coopersmith virtually as well. This was in a fashion that was more on-demand after the initial in-person meetings, as both are interested in the development of the projects but have difficulty committing to the project for testing without seeing more of the development cycle completed.

During the Spring, we scaled up contact with other partners. Prakash contacted Stefanie Costa-Leabo at the city of Boston to establish testing standards for the platform. He also reached out to the Department of Technology Office in South Bend, Indiana, to assess whether the needs of a technologically sophisticated smaller city were still feasibly met by the platform in its current form.

VIII.   **Proposed schedule with milestones with highlighted Spring feedbacks.**

The following section is summarized in Appendix C. The project is currently in a skeletal form with key technical frameworks all implemented. The containerization of the app is complete. The working groups are fully scalable with all requisite features like time-specific referenda and automatic subscription for local users. The database structure can accommodate geography and geographical hierarchy, meaning that users can interact with various levels of disaggregation of municipal structuress. We also have developed a content recommendation model which will likely not be a piece of the final project because we have decided to place a greater emphasis on the core platform and stakeholder needs. We have mapped out moderator privilege API functions, operating system referenda functions, and GUI functions. Implementing some of these customizability systems is the critical next step for our project.

Next semester, we intend to quickly complete the remaining features on the platform. Over winter break, we will map out the structured data entry and report creation templates so that there is a process diagram and series of examples in place for development in January. Creating a rich series of APIs now that all of the features have been mapped out should be finished by mid-February. Then,

> **Milestone I.** *Full customizability of working group settings, operating system referenda rules, and visual elements via a simple API.* ***Due: Mid-February***

[SPRING UPDATE] We found that this milestone was largely met but the referendum piece on the working group rules was not completed because we prioritized other features. We also leave the GUI API to future work because we found other pieces of the project had a higher priority level.

While this is occuring, we will begin discussions of a trial run with organizations around Penn campus. Some of the organizations we intend to meet with include:

- The local rotary club (located in West Philadelphia)
- The Philadelphia Orchard Project
- MUSE marketing group
- The Philomathean Society
- The Government and Politics Association
- Rodin College House

All of these groups run key campaigns around a variety of issues with stakeholders which range in a manner similar to the stakeholder variety of a local government, such as nonprofits, local businesses, and individuals. The groups would function as the government party or be given the option to test another stakeholder as their government. This gives rise to:

> **Milestone II.** *Complete interviews and proposals to various candidate organizations for testing and narrow down to 2-3 top issues.* ***Due: Mid-February***

[SPRING UPDATE] We reached out to all of the above organizations. We found that few were willing to test a platform that did not have guaranteed longevity (e.g., that would not expire after the spring semester). We updated our testing strategy as reflected in the technical description so that internal testing was conducted for functionality and pivoted to collecting feedback from contacts in various local governments.

With a chosen organization, we can then run testing with a series of focus groups with users consisting of questions around usability, desired new features, bugs, engagement, and likelihood of usage. This testing phase will have a minimum of one focus group with each type of stakeholder - be it a client for a particular group (e.g., a garden for the Philadelphia Orchard Project or a volunteer organization like the local rotary club) or a student within the organization itself. Then,

> **Milestone III.** *Complete focus group interviews and a process report of various new features to be developed by the end of April.* ***Due: Mid-March***

[SPRING UPDATE] See the above update.

With these milestones in place, we will begin final development, as well as any graphical user interface projects which are suggested by subject matter experts after seeing the fully functional product, by mid-March. We will by the end of the semester be able to summarize feedback on

the current iteration of the product with a complete API that targets key features that users have requested throughout focus-group interviews.

> **Implementation.** *Explore options for implementation in government branches such as the City Council.* ***Due: Mid-April***

[SPRING UPDATE] We spent much of the semester developing a robust report creation framework in the backend that allowed governments to easily download their data based on feedback from South Bend, Indiana. This feature proved to be one of our key value-adds. See the business analysis in Appendix C. to understand why we prioritized these new features. With the feedback collected from stakeholders and the complete API we will then meet with different City Council representatives to discuss further areas of improvement to the functionality of the platform that would allow a real-life implementation. Therefore the goal for the end of the semester is to identify the most beneficial area of application and engage in discussions about the real-life functionality and usefulness of the complete product.

IX.   Discussion of teamwork.

Our team consists of two subteams: the process design team and the software development team. Process design is headed by Prakash and Selena, while software development is helmed by Harry and Shadrack. Prakash also functions as the key communications liaison with our advisors and the senior design class, drafting executive summaries, weekly update e-mails, and drafting slides, as well as outreach with key outward partners.

Harry's background in CIS gives him the background required to build a scalable and replicable application which can run natively on different servers in such a disaggregated fashion. Shadrack also has extensive background in web development which helps ensure that there is a team on the current iteration of the platform.

Prakash's background is in procurement systems and government systems architecture, which allows developing effective models of local governance and disaggregation. Working alongside Selena, who has a background in agent-based modeling, the team keeps updated records of the various parties, government hierarchies, and local business agents involved in individual government systems. This allows for integrated communication with subject matter experts that can keep the platform as true-to-life as possible.

X.   Budget and justification

We originally projected the following budget for this semester:

> *In particular, incentivizing participants is likely one of the only ways to try to obtain a fully representative sample of stakeholders. Because the stakeholders in question are likely going to be students and faculty and other Penn partners, such incentives can be limited to largely potables and comestibles for potential participants. We project conduct 5-6 focus groups throughout the next semester, with a per-group cost of about $50 (pizza and drinks, most likely). Any additional costs will be restricted only to licensing and*

certification of the platform, but the most we anticipate spending on these is about another $95.

We realized, however, that the platform required further internal testing protocols before it was ready to be taken to full focus groups. As a result, we did not require any additional funding for this semester.

XI   **Standards and compliance**:

Since our platform serves as a mediator between citizens, the government, and third-party organizations we have established several standards that would require the interface to be easily adoptable by the employing government agency. These are essentially related to **(1) Content**, **(2) Accessibility** and **(3) Open Data** standards. Our objective in implementing these standards is to deliver a platform that complies with the requirements of the government institutions that we have been considering for the implementation process with minimal additional adjustments. Contingent on the goals of the employing institution, these additional standards should be considered in the testing and execution process.

1. The content related standards that we have outlined for our platform follows the City of Boston's writing guide for content[2]. Specifically, we will be following the City of Philadelphia's guide for design and development which outlines visual and technical details that ensure the consistency and legitimacy of their official websites. In addition, the content of the website follows a set of style, tone, and efficiency standards for writing set by the city of Boston, the leading city in open source and government technology. These standards focus on the conciseness, readability and reader engagement of websites that serve the city. Our goal and vision is to create a platform where users find it easy to navigate, communicate and access information through the website, and one that is also implementable by influential organizations or government branches.
2. A key aspect of the platform is that it should be accessible to and accommodating for all members of the society. We have given significant thought and importance to the incorporation of accessibility features into the website and aim to make the final product fully compliant with ADA (Americans with Disabilities Act of 1990) . We plan to implement visual and auditory accessibility features that make it easier for people with disabilities to browse and participate in the platform, such as keyboard shortcuts, closed captioning, and text-to-speech options.
3. Our current version of the platform is built with software that complies with the Open Source Initiative's Open Source definition.[3] The Open Source Initiative of 1998 defines certain requirements based on the sharing and collaborative improvement of software source code. These are that the program does not

---

[2] See here. https://www.boston.gov/departments/innovation-and-technology/brand-guidelines
[3] See here. https://opensource.org/osd

restrict the redistribution of the software, includes the source code and allows its distribution, and other requirements related to the infringing on other software licenses. In addition, we are aiming for the final product to include the specifications provided by the Popolo ontology for government actions under the Open Standards Directory, which addresses data models and formats.

Furthermore we aim to reach a Level 2 confidence in the electronic authentication guide defined under the Requirements for Accepting Externally Issued Identity Credentials by the government in 2011[4], which requires that the platform provides a "single factor remote authentication" using available technology. Our plan is to create an authentication system whereby different stakeholders can access the platform through the most efficient way to prove their identity. Due to security and privacy concerns, the method of authentication depends on the type of stakeholder and the logistics of the adopting government branch. Identifying a transparent, efficient and protective authentication method ultimately relies on the scope and function of the organization operating the platform.

XII. **Work done since last semester**.

We improved on last semester's product by redesigning some of the components to make it more modular and easy to distribute. Therefore we implemented the following:
1. Modularization of the CGI script update process on the platform to make it modular enough to fit the specification of a federated system.
2. Design and completion of the report creation feature which allows summary tables of all posts by working group.
3. Implementation of a notification system.
4. Built out infrastructure in the back-end for issue tracking so issues can be assigned to government employees.
5. Ran a full-scale test of the system by using bots to post 311 data from Boston Open Data and generated a report to compare results to Boston data, resulting in a full replication.
6. Dockerized the application and tested it live for judges at Demo Day to show that the system could be up and running with 3 copy and paste operations.

XIII. **Discussion and Conclusion**

The progress we have made in the past year has primarily been based on formulating the necessary features that ensure the transparency, efficiency, adaptability and functionality of the platform and building a prototype of the final product. Our key lessons for this project boil down to drafting requirements for each level of a new project. We defined the key functions to implement and outlined steps for the process through which a stakeholder uses the platform.

---

[4] See here for full draft.
https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/assets/egov_docs/ombreqforacceptingexternally_issuedidcred10-6-2011.pdf

Next, we built a website with basic functionality such as authentication, creation of working discussion groups, generation of posts and user engagement options such as voting, liking and commenting on posts. Finally, we built out requested features based on our market research. In particular, we built reporting mechanisms, notification systems, and a tracking system that developed a new dominant design for the transparency feature. Furthermore we outlined specific standards to meet, further functions to implement and the types of stakeholders we want to be able to incorporate in the final version of the platform.

The complexity of the stakeholder democracy concept was daunting at first, and the creation of a platform around what felt a bit vague even more so. By using iterative requirements drafting, we were able to define the project to a few key issues: having a flexible moderator framework, having a framework for working groups which is flexible according to the changing nature of political discussions, and having stakeholder-sponsored issues underpin our platform. We have been able to implement a skeletal version of this platform fairly quickly given these design parameters.

The initial choice of LAMP stack served the purpose of a fully functional website with a robust backend. However, today's internet standards demand web apps to be lightweight, fully functional on all platforms and low on data consumption. Modern web apps are also encourage to become progressive web apps i.e. they can utilize some of the native infrastructure to make the interaction seamless. This demands that our current infrastructure be optimized for mobile, therefore future iterations will have to optimize our LAMP stack for mobile as well, or abandon it altogether in favor of more modern approaches to web design.

The key challenges we anticipate are the potential threat of disengagement should stakeholders find the platform not as engaging as other platforms which compete for its attention, including Facebook, Twitter, or tumblr. We need to analyze exactly what drives disengagement or in what cases users find the platform engaging, so we can optimize the platform to be a full community where all parties feel they can interact in a single space.

XIV. **Appendices**

Appendix A. Video Demos.

Demo Including Report Creation feature available at https://vimeo.com/330690940.
GitHub commands found at https://github.com/stakeholderdemocracy/townhall.

 Appendix B. Platform Demo.

User administration

| Users | Settings | Profiles | Groups |

Overview

[+ Add new user] [⬇ Export ▼]

| Search | 🔍 | | Active users (6) ▼ |

Name	Email	Last login	
Selena Akay selena	akayse@seas.upenn.edu	never	⚙▼
Prakash Mishra prakash	mishrap@seas.upenn.edu	never	⚙▼
Shadrack Lilian shadrack	slilan@seas.upenn.edu	Dec 7, 2018	⚙▼

TownHall   🔔 ✉   **Harry Prevor**
Elected Official ▼

⊙ MY SPACES ▼   🚲 DASHBOARD   📄 DIRECTORY   🔍

Administration menu

- 👤 Users
- 🖥 Spaces
- 🚀 Modules
- ⚙ Settings
- ℹ Information

User administration

| Users | Settings | Profiles | Groups |

Overview

[+ Add new user] [⬇ Export ▼]

| Search | 🔍 | | Active users (6) ▼ |

Name	Email	Last login	
Selena Akay selena	akayse@seas.upenn.edu	never	⚙▼
Prakash Mishra prakash	mishrap@seas.upenn.edu	never	⚙▼
Shadrack Lilian shadrack	slilan@seas.upenn.edu	Dec 7, 2018	⚙▼
Sara Schuster sara1989	sara.schuster@example.com	never	⚙▼
David Roberts david1986	david.roberts@example.com	never	⚙▼

Appendix C.

Business Analysis

Value Proposition.

> *For the technologically capable government employee, townhall empowers fully transparent and single-platform interactions with their civically active and technologically empowered population that will improve citizen engagement in daily local operations.*

Stakeholders.

Stakeholders of the townhall platform include
(1) local government employees and offices which would need to digitize much of their workflow,
(2) Local city residents who would need to add a new online service to their rotation of possible media outlets,
(3) Disenfranchised or technologically disempowered individuals who have less navigability of potential new online platforms and software
(4) Local businesses which need to interact with policymakers or local citizens during the course of operations,
(5) Nonprofits which seek to campaign for the implementation of new policies at the local level, and
(6) Activist-identifying residents who spend a large fraction of their time online using social media to express political views.

Each group has its own needs. I address the needs of (1) in the customer base discussion later as they are the target for this platform. Group (2) are time-constrained, often working professionals who require frictionless interactions with government if they are to remain involved. Group (3) are people who will likely be ignored by this project if the project is implemented incorrectly. townhall as a group recommends cities provide explicit education, canvassing, and programming for people-at-risk so that the new platform's benefits can be enjoyed by groups who previously had greater access to services than the new platform might provide. If implemented well, townhall has the potential to generate value for (3) by encouraging greater awareness of who these groups are. Group (4) are individuals who would likely encourage the use of townhall for cost effectiveness but also may experience greater scrutiny as a consequence - particularly developers in cities like Philadelphia where civic activism would significantly hinder normal operations. These stakeholders may attempt to lobby against widespread adoption or use depending on their strategic orientation. Group (5) are likely supporters of adoption, again for reach and ability to penetrate more of the urban social fabric. Group (6), for reasons discussed below, are those for whom value is being generated in droves by the time savings that townhall offers.

Market Opportunity & Customer Base.

One of the key facets of this product is that the customer is a local government organization rather than an individual consumer. This customer base has extremely inelastic demand for certain product attributes, particularly associated with privacy, data security, and ability to moderate platforms. In particular, since the new glut of sharing economy data associated with applications like Uber and Airbnb, local governments have started forming inter-government organizations to begin better consumer advocacy for local data access rights. These groups, ranging from WhatWorksCities to new OpenData initiatives, have become critical voices in defining the local government as a consumer and specific tastes which must be catered to in order to be competitive.

townhall proposes rather than to negotiate on marginally meeting a few of these product specifications, to radically upset the government-business pipeline and instead create a product that is designed for government use without private intentions. This means the product does not harvest and withhold collected data from user bases that gets hidden behind paywalls, but rather outsources data management and data arbitration to technologically capable governments. It also ensures that citizens' rights as individuals in a free speech space are protected, but that there is accountability for free speech in that all users are required to be registered using government identifiers: voting records, a driver's license or Department of Motor Vehicles (DMV) record, etc. Businesses as stakeholders are present but only in districts where they have physical offices or landed business interests. Nonprofits are allowed in all districts which have a relevant institutional partner or afflicted group. This level of design for the customer and with their interests in mind is of a particular importance for this product.

Discussion with officials from South Bend, Philadelphia, and Boston have gone into creating this platform. Each has contributed key design requirements for robust moderation policies, ease of use features, and even clarity of language on-site. This market research suggests that the platform in its current form meets three key attribute requirements:
1. Data sovereignty
2. User identification
3. Stakeholder moderation

I use the language of government because it has been the concern of government for the past decade that corporatism has largely been side-stepping the role of local policymakers in designing efficient cities. Uber's proposition of better environmental effects combats heavy congestion on previously quiet roadways. Airbnb has created a series of new problems for defining homeownership and pricing out low-income residents. Local governments are starved for data tools to combat these issues, and townhall ensures that the most important data - the voices of residents - is entirely public property, not to be claimed as IP.

This is the customer base because designing another application for young adults is not going to increase civic engagement. Young adults use proxy platforms such as Facebook or Twitter to echo social messages around political causes and these technologies serve as a dominant design for political activism in the current age of media. Government, while present as a social entity on such platforms, cannot use them to conduct verifiable and localized polling

services, take a survey of only stakeholders affected by a current project, or call townhall meetings on proposed developments in specific neighborhoods which are not lost in a flurry of other social media noise. Thus, the customer base for which a dominant design is wanting is precisely a local entity in governance.

Market Size.

The current market for such products is among technologically empowered cities. A potential first market is all cities which have increased their use of information technology and data management policies through the WhatWorksCities program (WWC), or a potential group of 100 cities in 39 states. This includes certain flagship markets like the City of Boston, the City of New York, and the City of South Bend. These three cities are seen in many ways as data leaders and are therefore the drivers of what technologies become dominant designs in the market for new civic technologies. An entrance strategy is to present townhall at a civic hacking meeting either sponsored by WWC or one of these big three cities and to encourage continued updates on the GitHub. This would likely promote faster adoption and trial betas in many cities among city employees within a year of introduction when compared to other comparable technologies (such as the BOS:311 application or the CityScore toolkit). The application is built to handle a local government and local government services, however, future iterations which build better backend integrations or allow for better distributed working groups to prevent information overflow might be able to work at levels of higher aggregation like the state or federal level. These future developments would widen the market significantly as these larger governments have better infrastructure for handling such technology than most cities outside the 100 which have worked with WWC or affiliated groups.

Competition.

Currently, the competitive landscape appears to be populated by local 311 phone lines and applications as main direct competitors which are "for-government." These initiatives allow individuals to call in "posts" about complaints and issues in their local areas. Phone lines do not guarantee non-trolling. Such lines also make transparency difficult without a separate platform; citizens cannot see their complaint resolved or trace where their complaint might be in the local bureaucracy. Finally, 311 does not engender consistent interaction by the government with local residents, but rather encourages a single interaction which does not empower non-call-center employees to engage with potential complaints.

Another potential competitive pressure is other open-source hosting services. Companies like Socrata and cKan dominate hosting of public services, often being the main choice of service for hosting local open data initiatives and applications in a manner which outsources much of the database management. While these largely do not currently offer an alternative platform, they often are key power player in determining which government applications are hosted and scaled on local platforms. If a significant number of local governments use townhall to host their data locally with its built-in data management features,

then such companies may push back and release their own versions of townhall as a direct competitor.

A third source of competition is indirect because it serves a different customer base - namely, the resident. Social media poses a significant threat as it currently essentially monopolizes potential user engagement in political settings. Facebook groups and Twitter followings are often arenas of political issues and political tracking, and as a result, these giants have an established network of potential users. While it is nearly impossible for them to serve the needs townhall does due to our robust moderation, transparency, and data management measures, they do present a competitor for the time of users and can thus threaten citizen engagement with local government platforms. A possible step to combat this threat is to build plug-ins which smartly integrate existing social media lives with the townhall platform. For example, allowing Facebook groups to be tethered to certain discourse working groups so that individuals can link their two accounts, or the ability to share potential townhall activity on Facebook or Twitter, will likely vastly improve public engagement.

Several years ago, the platform Nextdoor might have been a serious competitor. However, it did not possess robust enough anti-trolling measures and there was no government-as-a-stakeholder design involved in the process, so it has quickly devolved into a forum for the alt-right. They began the movement towards platforms with better identification, but did not make the leap to actually push government into the role of the customer rather than the citizen.

Then, our differentiators are:

1) Transparency with the public and with governments
2) Integration with existing media platforms (forthcoming)
3) Robust identification of users and anti-trolling measures through moderation

Intellectual Property.

There is no intellectual property involved in this project. The design is open source. The system architecture is the result of a longer series of ideation processes, but this architecture is certainly not intellectually defensible as property. This makes the eventuality of being copied by a cKan or Socrata type corporation more likely, in that once townhall is fully released, it is entirely deconstructible.

Cost and Revenue.

The cost of running such a service to a city is the cost of hosting it on local servers. Often these costs are conducted on a procurement basis, implying that the main cost is a recurring fixed cost of a set of "townhall" servers which handle data management and processing. Currently, the application has run on a Google Cloud instance and has utilized about $100 worth of data in 8 months running about 5000 profiles which regularly post several

times per day. This suggests that the cost to a city of several thousand is minimal, and that the cost scales with city size - as does the budget. The important point is the cost of the counterfactual - the cost of a 311 line, for example, requires expensive call center establishments and hiring, the maintenance of a 311 server, and a potential secondary server for tracking fulfillment services. This comparative analysis suggests **the cost is at least halved**, conservatively, before estimating reduced personnel costs of maintaining the platform. The organized database which comes pre-loaded with the software, which can run on any legacy protocol due to use of CGI-based updates, also indicates that there is **no switching cost** to "upgrade" to the system for the target customer. The average cost of 311 lines is $3 to $6 per call because of diseconomy of scale effects. The cost is so high to cities that when Detroit faced default it was one of their first cost-cutting measures. This cost-cutting feature is a primary value-add, and having data reporting as is built into 311 phone line companies was a key way to frame ourselves as an upgrade.

The revenue generated is not limited to such cost savings. The reduction of needing to double or triple processing resources by having all proceedings posted online in a forum that reaches the entire registered residency of a city will likely cut down on the number (frequency) and time required (intensity) of in-person proceedings. This implies less personnel hours logged in in-person town hall meetings, deliberations, drafting sessions, procurement contract meetings, and more. The time saved by citizens who are passionate about issues but would have to leave a place of work to visit a development site for comment on upcoming projects means the costs of political activism are dramatically reduced by the townhall system. The key "revenue model" is the **time-cost of activism**. When both city officials and citizens are able to interact in a safe and transparent virtual stage at any time of the day without needing to sacrifice productive hours in a place of work, this is a more efficient allocation across all stakeholders.

Appendix D. Summary Listing of SQL Table Schema Used

```
root@localhost > show tables;
+----------------------------+
| Tables_in_townhall         |
+----------------------------+
| activity                   |
| comment                    |
| content                    |
| content_tag                |
| file                       |
| group                      |
| group_permission           |
| group_user                 |
| like                       |
| log                        |
| logging                    |
| message                    |
| notification               |
```

```
| poll                        |
| poll_answer                 |
| poll_answer_user            |
| post                        |
| profile                     |
| queue                       |
| setting                     |
| space                       |
| space_membership            |
| user                        |
| user_auth                   |
| user_follow                 |
| user_friendship             |
| user_http_session           |
| user_invite                 |
| user_mentioning             |
| user_message                |
| user_password               |
+-----------------------------+
```