

Undergraduate Thesis Prospectus

Internal Software for More Productive Companies

(technical research project in Computer Science)

The Smart Cities Controversy

(sociotechnical research project)

by

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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General Research Problem

How may digital systems best optimize sociotechnical systems?

The tech sector accounts for 35 percent of the total world market (Flynn, 2022) and for 4 of the top 5 most valuable companies. The global market value of IoT is expected to hit \$1.1 trillion by 2026, and IoT spending will surpass \$1 trillion by 2023. 66% of US cities are investing in smart systems which are reliant upon IoT, and 44% of companies use IoT to reduce costs (Lynkova, 2022). Technology companies often market their products not just as tools, but as “solutions.” Some would argue it is just a tool (Vogels, Rainie, & Anderson, 2020). According to Russell and Vinsel (2017), that innovation is overvalued relative to maintenance.

Internal Software for More Productive Companies

How can internally facing software increase organization-wide productivity?

Briana Morrison is the technical advisor for the computer science department’s capstone solo project of describing a past internship project experience. My intern project experience at a software company called Yext involved implementing feature enhancements for an internal Chrome extension tool based on UX/UI feedback from the consulting organization. Yext, like most tech companies, use internal tools to mitigate operational overhead, which require consistent improvements to remain useful.

Internal tools are an essential component to streamlining a company’s operations, warranting the consideration of this technical problem. “If you want it done right, then do it yourself” is the driving force of internal tools. Organization cost cuts while improving output is any company’s goal. Expensive, off-the-shelf, enterprise software and repetitive employee tasks obstruct this goal. In-house tools are the ideal solution, eliminating licensing costs of external

software while being built to suit the organization's exact needs. They "accelerate digital transformation and supercharge organizational efficiency through increased productivity, cost-effectiveness, improved security, increased control, and improved employee experience" (Johnston, 2022). All but security were similar drivers for the Chrome extension feature enhancements at Yext. Most companies use these tools to "handle logistics and make it easier to respond quickly to customers in the case of technical issues" (Fanchi, 2022). This applies for Yext's extension as it is designed for the consulting organization where a client account manager can quickly notify a dev through the tool about a client site bug.

The goal of the project was to improve usability of the extension for it to eventually be a useful tool outside the consulting organization. The methods used to improve usability involved JavaScript, HTML, CSS, changes to add autocomplete search to a 3,000+ option select dropdown, and Figma to redesign the extension's authentication login screen. The figma file provided the font, color, and spacing values to achieve the look of the new login screen. A u-hidden CSS class and JS logic for when to apply and remove this hidden class to certain HTML elements achieved the login logic to the extension. Changing the HTML code to use a datalist for listing the 3,000+ clients provided the autocomplete search functionality. The changes were significant enough to bring employees back to the extension, and immediately improved the consulting workflow. The manual selection of a client from the 3,000+ long dropdown was the greatest complaint from the UX/UI feedback, and the addition of the autocomplete search functionality turned a 5-minute-plus task to a 2-second task. Based on the employee feedback, future improvements should include draggability of the extension and customizing tab order within the extension.

The Smart Cities Controversy

How are advocates and critics of smart cities competing to advance their respective agendas?

The term “smart city” refers to an urban area that integrates information and communication technology (ICT), and internet of things (IoT) devices to optimize city operations, services, and interconnectedness. The Community Analysis Bureau proposed the smart city concept in the 1960s to manage disaster and poverty (Shea, 2020). In 2010, a smart city initiative in Vienna was among the first to apply networked digital technology (Buntz, 2016). Today Singapore, Helsinki, Zurich, Oslo, Amsterdam, New York, and Seoul are among the top smart cities (Lai, 2022). The global smart cities market will reach nearly \$7 trillion by 2030, translating to a CAGR of roughly 24%. US city governments will invest around \$41 trillion over the next 20 years to upgrade infrastructure and implement IoT systems (Hawkins, Versace, & Absy, 2022). Such investment opportunities have attracted Siemens, Dell Technologies, Cisco Systems, General Electric, IBM, Microsoft, and Schneider Electric (Kumar, Borasi, & Kumar, 2022).

According to Veselitskaya, Karasev, and Beloshitskiy (2019), proponents of smart cities claim they will improve management and develop human capital, while critics argue that smart cities can have unintended and undesirable effects. They warn that implementations of smart systems must comply with legal and other standards. In a case study of Barcelona, Charlotte, Shanghai, and Tokyo, they conclude that advanced infrastructure, ICT, citizen participation, and public-private partnerships can promote smart city development. Barriers to smart cities include divergent interests among citizens, private capital, and political elites; intellectual property disputes over open data and big data; the security of automated systems; and the confidentiality of personal information. According to Androniceanu (2017), collectors of big data can monetize

it and use it to improve their systems. Carvalho (2015) argues that the smart city transition is not only an issue of pushing the right technologies, and that the change has a clear and challenging socio-technical nature.

Tech companies generally favor smart cities, as projects offer lucrative markets. The Welding Institute (TWI), a trade association, represents such companies' interests. It promotes markets for its members' products and services to maximize their profits. TWI claims that smart cities promote economic growth and improve residents' quality of life (TWI, 2022). ASCN, a collaborative platform for ASEAN smart cities development, claims its "vision is to achieve a connected and integrated ASEAN that will promote competitiveness, inclusiveness, and a greater sense of community" (MLIT, ASCN & ASEC, 2022). Thales, a French multinational that develops electrical systems, presents smart city controversies, such as those about data privacy, in a positive light (Thales Group, 2022). India's Ministry of Housing and Urban Affairs similarly claims that data collection in smart cities can mitigate pollution and congestion (MoHUA, 2019). Charter for Compassion claims it promotes compassion worldwide. It argues that smart city schemes are inflexible and deterministic, and will stimulate commodification and data monetization (CFC, 2013).

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