WHERE2PARK: AN INTERNET OF THINGS APPROACH TO MANAGING CARBON EMISSIONS

BUILDING SAFER SMART CITIES: GUIDELINES TO ENHANCE FUTURE SECURITY INFRASTRUCTURE FOR INTERNET OF THINGS DEVICES

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By

Cameron Davis

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SOCIOTECHNICAL SYNTHESIS

The use of Internet of Things (IoT) technology in the development of "smart cities" has become a popular option for mitigating the negative environmental impacts of urbanization. The engineers behind these projects play a unique role in protecting society as the quality of a "smart city" is directly corelated to the safety of the technology implemented in it. The technical research project aims to help users reduce their carbon emissions through the development of a "smart device". The design process highlights the challenges of quickly creating a useable IoT device while ensuring that all connections to and from the device are secure. The science, technology and society (STS) topic provides a framework that contextualizes the social challenges associated with the development of smart cities. The framework compiles perspectives from various groups impacted by IoT development to create a solution that can satisfy all parties. The coupling of the technical and STS topics clarifies the technical scope of difficulty linked with IoT development and describes the major social influences that affect that development.

The technical report details the development of a parking lot sensor that connects to a mobile app to indicate to a user whether a spot is open. The development process required several iterations to decide on the hardware components for the sensors to connect with one another and the most compatible software to develop the application. The final product was not practical for large scale parking garage testing as time constraints limited the team to only completing three sensors. However, this was sufficient for our research as the team was able to create a secure network using the sensors and properly output the status of each parking spot to the graphical user interface.

The motivation for researching the social context surrounding the development of "smart cities" started with a desire to understand the differences between consumer and infrastructural IoT challenges. A comparison of laws between these similar technologies with varying usage highlights how lawmakers do not proactively work to safeguard future of all IoT development. The speed of innovation created knowledge gaps between lawmakers and engineers as well as communication gaps between manufacturers. The research moved towards developing future guidance for manufacturers and legislators after discovering the pace at which IoT technology has outgrown its governing laws. A framework based on Klein's Social Construction of Technology theory was used to address those gaps and became the focal point of this research. The framework defines the concerns of relevant social groups that impact IoT technologies while trying to find an open-ended solution that redefines the problems in a way that no longer negatively affects any social group. The guidance developed using this framework was aided by analyzing current standards regarding IoT technology, case studies of previously suggested frameworks, development techniques used in smart cities, and ethical readings regarding the use of private data.

The early development of IoT technology occurred in a decentralized manner that now requires reconciliation. There are conflicting standards regarding the level of control users have over their own data and what technical requirements ensure a quality level of security. IoT devices should always consider the society they are implemented in and a clear need exists to protect users from the dangers they expose themselves to when using "smart devices". The analysis showed that some concerns overlap between groups, but most have different priorities when it comes to IoT development. Balancing those perspectives while providing a solution to fit each groups objectives proved to be a challenging endeavor. Largely, this research leaned toward

providing guiding principles rather than a set of standards as a solution. This approach provided a more flexible implementation when considering the individuals and companies that shape IoT technology.

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Technical advisor: Harry C. Powell, Department of Electrical and Computer Engineering

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STS advisor: Catherine D. Baritaud, Department of Engineering and Society

PROSPECTUS
Technical advisor: Harry C. Powell, Department of Electrical and Computer Engineering
STS advisor: S. Travis Elliott, Department of Engineering and Society