

City of Linköping - a smart city!

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I. Abstract

Linköping is the 5th largest city in Sweden, constantly increasing in population, making it one of Sweden's fastest-growing cities. Linköping is a part of the expansive East Sweden Business Region with a clear high tech profile with development comprising, among other things, medical IT, telecommunications and advanced aeronautics including fighter jets. Furthermore Linköping University is a leading European innovative university along with a hospital environment being cutting edge in several fields.

The city has high ambitions for a clean environment and the fight against climate change, thus, a smart city is much more than IT, sensors and data. It is all about meeting the needs of businesses and the citizens and creating the city of the future.

This abstract describes smart city projects in Linköping managed by the city. The projects were compiled following a survey with municipally owned companies. The purpose of the survey was to compile an overview of the current projects. In Linköping municipality there are a variety of activities in the area of smart city. The projects are divided into the following categories: *Real estate, Municipal services, Environment, Mobility, Future of care, Public safety and Strategy and architecture*.

II. Results & Discussion

Real estate

Technologies to optimize property management is perhaps the most developed area in terms of technologies supporting environmental as well as business values. Linköping is a national driver in establishing a digital twin, a concept for digital planning, design, construction, and management of a sustainable, intelligent, and liveable city by 2030. Knowledge of energy consumption is used for maintenance of buildings but also storing and optimizing Cetetherm technologies. Smart watering systems of city plantations reduce water consumption as well as optimize travel for municipal employees.

Municipal Services.

Unified digital-/self services for citizens and business are developed to increase the quality of service as well as external and internal effectiveness.

Environment

A wide range of technologies use environmental sensor data, from city air quality, public bath temperatures in nearby lakes, to “live” fish recognition in nearby streams, in order to base discussions and decisions on facts and to create a data driven development of the metrics. In smart waste management, GPS and waste bin level sensors are being used.

Ebbepark, a new city district, has been declared a “test bed” for smart applications, which has generated solutions for storing and sharing energy in the city, as well as fossil free logistics with the help of mobile cistern of renewable biodiesel. District heating is being optimized by Hot remote technologies to store energy in buildings. The university is researching ways to harvest energy for IoT sensors. This research might help create a more sustainable environment.

Sewers are monitored when large amounts of rain put pressure on the sewers. In order to release pressure, the sewer will flood into a river. The amount of flooding is registered and measured by level sensors at the water's edge.

Mobility

The city's public transportation system, based on anonymized counting of individuals, helps the city and people to plan their routes. They can see how long it takes to move from one place to another in a car or on a bus. This will help the city know what is wrong and what needs fixing so everything is better for everyone.

Self driving busses have been active for a few years in defined areas and have now started running in regular traffic with the ambition to learn how it should be incorporated in the regular planning of the city.

Public safety

Political initiatives on camera surveillance have included projects for other smart technologies that support public safety in the city, incorporating a holistic view on sensors, for both visual as well as sounds with AI.

Public lighting as well as other actions are triggered to increase the perception of safety in the city.

In collaboration with the housing companies a concept is developed to accommodate safety solutions at home, the primary target group being the elderly and their relatives. The concept has the aim of improving the possibilities for old people to stay healthy in their home as long as possible.

Future of care

Instead of traditional personal oversight to pay attention when a person needs help, projects on how to use security and safety-creating technologies in care are being deployed, in order to create an environment without unnecessary intrusion of privacy.

Strategy and architecture

For development of a smart city strategy, the reference architecture is of paramount importance. Linköping is an active part in the development of national standards of IoT and closely follows European initiatives on interoperability, for example Open and Agile Smart Cities, OASC, MIM initiatives.

Linköping participates in a range of national projects like City as a platform to develop national interoperability, but also innovative projects like playground and city gym projects for the development of IoT in public spaces.

III. Conclusion

Building a smart city incorporates all aspects of a city and must be aligned with the strategic objectives of citizens, businesses and the political leadership. A smart city is more than smart sensors and technologies - it is value creation. However at the end of the day, technology is a key component of almost all projects.

The biggest challenge is to align the objectives and work together in the different professions to create the city of tomorrow. Linköping's brand promise to its citizens "where ideas come to life" and the positioning of the city of Linköping is "future now". Only with great collaboration and hard work to create a better life for the citizens of Linköping, will we be able to meet the promise.