



## Intelligent recycling hubs for high-quality material flows

**This project has developed Hubbe, a prototype of an intelligent recycling hub. It has monitoring sensors, a communication platform for feedback on recycling and energy saving, and a multi-purpose logistics system for collecting the waste.**

Today's systems for waste separation at source are often boring, ugly and hard to understand. Myths flourish and people ask themselves if there is any point in source sorting. Now, it is more crucial than ever to utilize material and energy resources more efficiently, however it should also be easy to do the right thing.

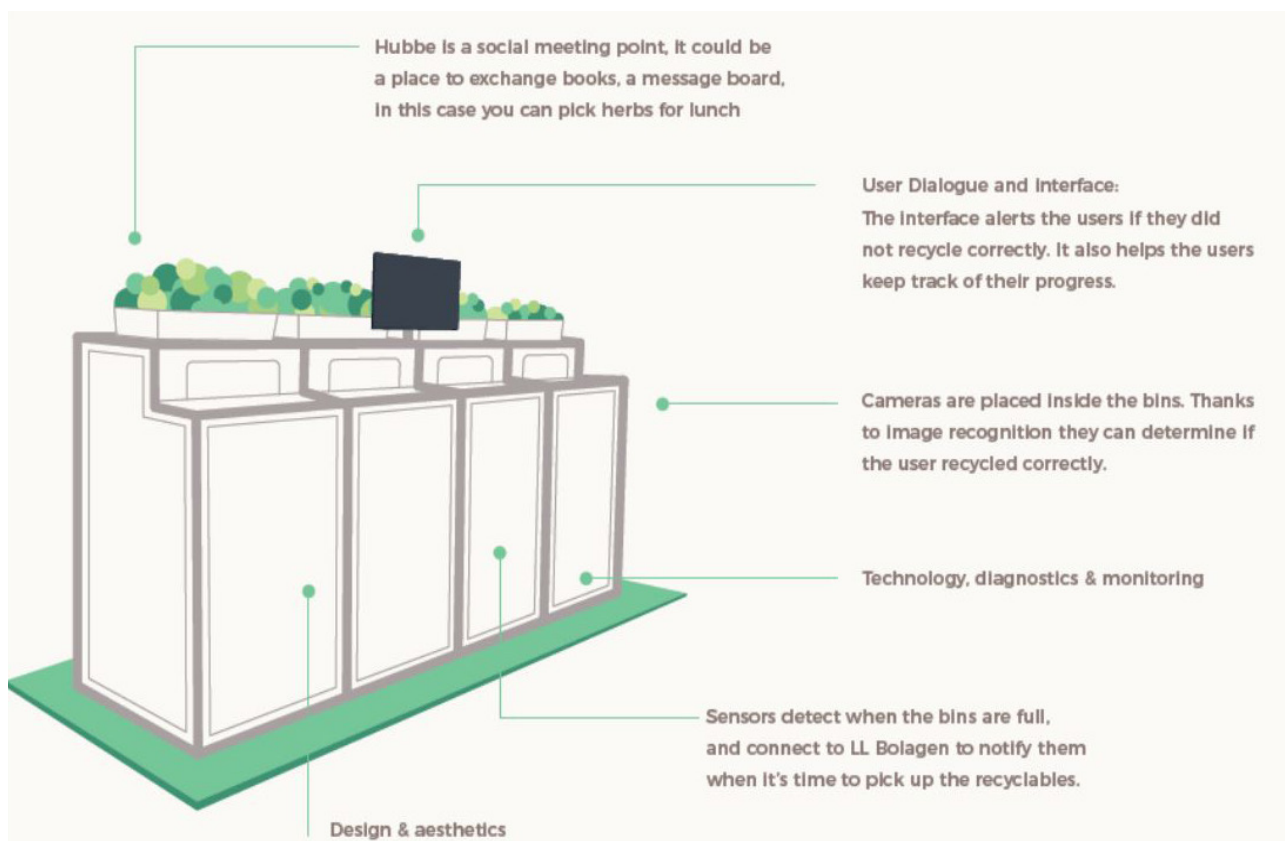
In this innovation project, we have developed an attractive, smart and educating hub – named Hubbe – for waste separation at offices and schools, where people can go and sort their

waste as thoroughly as possible.

- Hubbe assists the user in sorting correctly by detecting the type of material and communicates the environmental and climate benefits in a fun, relevant and pedagogic way. Thus, we get cleaner material fractions and higher recycling yield, and take important steps towards a circular economy.

- Hubbe monitors the filling levels and is constantly on-line with a waste collection entrepreneur, who picks up the bins only when they are full. This leads to less vehicle movements and reduced emissions.

- Hubbe is attractive enough to be placed centrally, easily accessible for all and always displaying interesting information.



In this project, a waste management entrepreneur (Liselotte Lööf Miljö AB) has been cooperating with an industrial designer (Above AB) and a hard- and software developer for industrial applications (Dametric AB). In this way, we have combined waste management expertise with new IT solutions, user interface and dialogue, and modern design.

### Effective and educating waste separation

We have developed a full-scale Hubbe – two prototypes with four bins each, equipped with camera sensor technology, user communication platform/touch screen and wireless connection – and tested it in a real user environment.

The results from the test sites are very good and our assessment is that it is indeed feasible to utilize Hubbe, after some adjustments, for a more efficient, educating and fun waste separation in accordance with the project's goals.

Following the tests, Hubbe can detect different materials – paper, plastics, glass and metal – with accuracy up to 99 per cent. Measuring the filling levels and monitoring of the same through internet work well. The chosen method with broad spectrum camera gives considerably more information on filling levels compared to the prevailing ultrasound technology. More efficient logistics on-demand has been noted despite the short testing period.

### Many have sorted more than usually

The users have been curious and positive towards Hubbe as part of the office environment, and almost half of them state that they have sorted more than before it was installed.

Still, they have not fully availed themselves of the screen's information, mostly due to the fact that a glitch made the screen go black from time to time, and that the communication on incorrect sorting had not yet been launched. A faster, interactive and tailor-made feedback is necessary to get their attention.

### The next steps are to

- refine the object recognition method and communication on incorrect sorting of waste
- further utilize data on filling levels to enable prediction of need for waste collection in an optimized logistical model.
- further develop the user dialogue with interactive presentations and tailor-made information, and the connection to a "user cloud"
- plan for a production phase by reviewing choice of construction materials and costs.

We also would like to elaborate on the possibilities to use Hubbe as a digital educational tool in schools, and to develop apps and games.

### Show environmental goals in a fun way

We strongly believe in digitalization, not least for sustainability applications, for which it will be increasingly important to present e.g. environmental goals and achievements both externally and internally in an accessible and fun way. Thus, Hubbe shows up at the right time to contribute to a more sustainable society.

We hope to soon be able to offer a tailor-made Hubbe to various office environments in Sweden as well as internationally.

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## Project facts

**Project name:** Intelligent recycling hubs for high-quality material flows

**Keywords:** Waste separation, recycling, material recognition, fill rate, logistics, user dialogue, smart, environmental awareness

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