

# powerWING: Modular power bank with academic character

Degree programme : BSc in Industrial Engineering and Management Science | Specialisation : Industrial Engineering

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The powerWING is a modular device that merges the educational interests of the industrial engineering education with the characteristics of a conventional power bank. An innovative and tool-free plug-in system allows individual functions to be connected modularly. This artefact is both a learning tool and an useful gadget – developed by WING students for WING students.

## Introduction and Objectives

To charge devices on the go and conveniently, people often reach for a power bank. Such products are widely available on the market in different variations. But how would such a power bank be if more functions could be added?

The thesis develops a product that represents the contents of the WING study degree by means of modules and integrates the typical functions of a power bank. A prototype designed in the preliminary study serves as the basis. In addition, further requirements are elaborated from an empirical study which integrates the customer-oriented perspective.

## Research Design

A quantitative survey method was used to elaborate customer requirements. By means of an online survey, alumni, enrolled students as well as lecturers answered questions about needs, usage, functionality and design preferences in relation to a conventional power bank.

As an engineering method, an iterative development process is followed. The iterations consist of the steps (1) Concept & Planning, (2) Design and (3) Testing & Evaluation. This method promotes a high degree of agility and interdisciplinarity. This is necessary so that the mechanical as well as electrical specifications can be developed on schedule.

## Results

With n=64 participants, the qualitative study provided important insights about what differentiates a power bank. Technical insights, e.g., desired minimum capacity = 10'000 [mAh] or number of charging options = 2, were identified. Besides that, other functions, such as the integration of a USB-C charging cable, have been evolved.

The powerWING consists of four modules which can be connected. The first module contains the typical features of a power bank such as plugs for charging devices, and a visual battery level indication. The second one can be used to feed the battery by means of a solar panel, as the third module adds “smart” capabilities to the product. With the integrated microcontroller (ESP32), IoT projects can be operationalized. An LED-flashlight completes the set of modules. An innovative and tool-free system was developed to connect the individual modules both electrically and mechanically. With the help of two-sided hooks, the modules are locked together and thus enable a user-friendly and seamlessly assembly.



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## Implications and Recommendations

This thesis advanced the product development significantly towards series-production readiness. By integrating the customer's point of view and the applied technical improvements, the project goal could be fulfilled. The base for further project work around the powerWING is developed. Further add-ons or adaptations of various needs can now be realized.

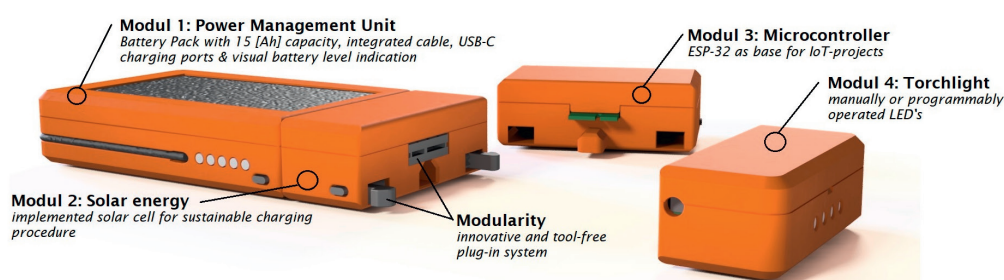


Figure 1: Exploded view of the powerWING - Explanation of the modules and their contents