The Maker Movement

"Making is fundamental to what it means to be human. We must make, create, and express ourselves to feel whole. There is something unique about making physical things. These things are like little pieces of us and seem to embody portions of our souls"

- The Maker Movement Manifesto

Today's consumer desires products perfectly fit to their unique need. While companies have perfected their systems for mass-production, today's competitive advantage lies in the realisation of high product variation, in Germany often referred to as the "trend towards batch size zero". The Maker Movement creates an environment that allows the consumer to become a part of the production process in order to achieve a higher level of customisation. A consumer who engages in the act of production is called a 'prosumer'

The Maker Movement is a technology based extension of the 'Do It Yourself' culture. It's about old arts and crafts, but by adding in electronics and programming, it becomes a real source of innovation. Following the motto, *"If you can imagine it you can build it"*, the Maker Movement can be characterised by three main guiding principles.

Do It Yourself Culture
The one mentality all makers share is to DO-IT-YOURSELF. So, they produce, repair, improve, personalise and recycle. While the specific motivation may vary, it's simply satisfying to be able to say "I did this" after finishing a project.

Open Innovation
Being eager to show what they made and how they did it, Makers document their projects with step by step instructions and publish them online. However, besides sharing knowledge, also low-cost and easy to use hard- and software are needed to truly engage everyone. A mind-set of stimulating common based peer production and development of open source software leads to technological advancement focused on societal benefit rather than stakeholders profits.

Democratization of Technology
To make things, having the right tools is essential, but 3D printers and laser cutters are rather expensive. Therefore, makerspaces provide access to various technologies for free or in exchange for a small fee. By doing so, they often specifically aim to democratize technology. Following the ideology of unlimited access to knowledge, makerspaces become a centre for education. Young and old find opportunities to learn how to manufacture goods albeit for personal use or as the basis to start their own businesses.

Bringing the maker mindset to students

The Maker Movement provides non-experts with powerful but easy-to-use tools enabling them to realise projects which were previously only reserved for students of electrical engineering or computer sciences. The access barrier to highly complex digital tools has become very low, and typical maker projects can be implemented with relatively little effort. By sharing experiences with other makers, the student who becomes the new maker can benefit. Building on previous work and knowledge, students can focus on their own creativity. The Maker Movement allows easy handling of advanced technology, playfully developing new products and the maker's self-esteem as well as their experience grows from project to project.

Trying to understand the objects they use and their relations, and critically questioning what is known, they can break familiar thought patterns showing great imagination and improvisation.

Editing a maker project promotes communication in the team and with other makers worldwide. This promotes both the competence to solve technical problems as well as the social competence.

Global networking allows very direct feedback on projects and depending on the response, the step to marketing via a kickstarter platform is not big.

As students desire a more practical approach to their studies, a maker workshop was developed at the TU Dortmund / Chair of Materials Handling and Warehousing (FLW) to provide students with a better understanding of existing systems and techniques. At the same time students are encouraged to develop and implement their own concepts related to the Internet of Things, actively shaping digital change in logistics

Instead of following a step by step instruction, replicating something existing on their own the students create something new and valuable.

The workshop at the FLW is designed to stimulate interest in applied electrical engineering and programming. Creating direct experiences, the workshop makes a sustainable way of learning possible.

Task Example of the workshop at FLW:

In your warehouse you will find raw materials for high-quality medicines, which must be stored in a defined temperature range. Your customer asks you for a complete documentation, which is accessible online. Construct a device that measures the temperature value every 60 seconds and inserts it into a Google Spreadsheet, which is stored on a Google Drive. Write the program for the device.

Without prior knowledge, the participants manage this task in about 3 to 4 hours within a self-found group. While a few years ago an engineer's degree would have been required for the development of such a device and the processing time would have been several days.

The workshop was developed in close co-operation with students of Logistics and Economics, in other words: specialist foreigners, and has been successfully carried out with several trial groups. As a next step, the concept of 'learning by means of a workshop' is intended to be included in the study plan within the next few semesters.

"Creating the workshop showed me that the Maker Movement is truly for everyone. Normal students contributed to the workshop, learned the topic step

by step and outdid our expectations by far. A big motivation for me was teaching other people. It was the perfect opportunity to use my knowledge and provide it for interested students."

- Jens Sarachman (3rd from left) Logistics student at TU Dortmund who was involved in developing the Maker Workshop)

If you got curious about the workshop, then have a look at the project's website, which provides further information on the used tools and materials, as well as programming examples. Become a maker!

http://makerworkshop.flw.mb.tu-dortmund.de/