

## Engaging Private Users in Academic Makerspaces: Exploring the Do-It-Yourself Process through a Jobs-to- be-done Perspective

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**Abstract:** This paper explores how academic makerspaces can effectively engage private users. Using a mixed method approach based on the jobs-to-be-done-theory, the study identifies key challenges within the do-it-yourself process, emphasizing the conceptual, research and learning aspects do-it-yourselfers have to master before actually working on a project. The results show that it is not enough to provide machines and offer training. Inexperienced users, in particular, need situation- and context-specific knowledge as well as support in the earlier phases of the do-it-yourself process.

**Keywords:** Makerspace, user-engagement, do-it-yourself-process

## 1 INTRODUCTION AND OBJECTIVES

This paper reports from one of several surveys within the CO-INNO-LAB research project accompanying the founding phase of a makerspace at University of Applied Sciences Wiener Neustadt, namely Innovation Lab. Makerspaces are collaborative spaces that foster learning and innovation by providing non-specialists access to advanced digital and non-digital technologies and enabling users to meet and work with others, to learn about new technologies, and to realize projects [1, 5].

Academic makerspaces are usually aimed primarily at students, lecturers and researchers [2,3] but can extend their services - like the Innovation Lab - to non- university user groups such as start-ups, companies and private individuals [4,5]. Farritor

[6] states that one of the main factors of creating an academic makerspace that encourages innovation is nurturing diversity of ideas, and suggests to bring in new perspectives by opening up to people outside the university.

Earlier studies of the CO-INNO-LAB research project have shown that private individuals like hobbyists, do-it-yourselfers or inventors are difficult to reach as a user group for an academic makerspace, due to low visibility and the institutional context. Private users could utilize many offerings of an academic makerspace, if they surmount entry barriers. This leads to the research question: Which problems and hurdles in the do-it-yourself process can academic makerspaces address with their services?

## 2 METHODOLOGY

The present study used a mixed method approach inspired by outcome-driven innovation (ODI), a methodology used in innovation management to discover innovation opportunities based on the jobs-to-be-done-theory. Outcome-driven innovation combines a qualitative phase to identify customer needs with a quantitative phase to analyze the links between importance and satisfaction of the identified needs [7].

### 2.1 THE JOBS-TO-BE-DONE THEORY

According to jobs-to-be-done-theory, people “hire” products or services to get a task or job achieved. Every task or job can be organized along a universal structure called “job map”, which includes generic steps like defining an activity, locating resources, preparing things and executing the task, as shown in figure 1:

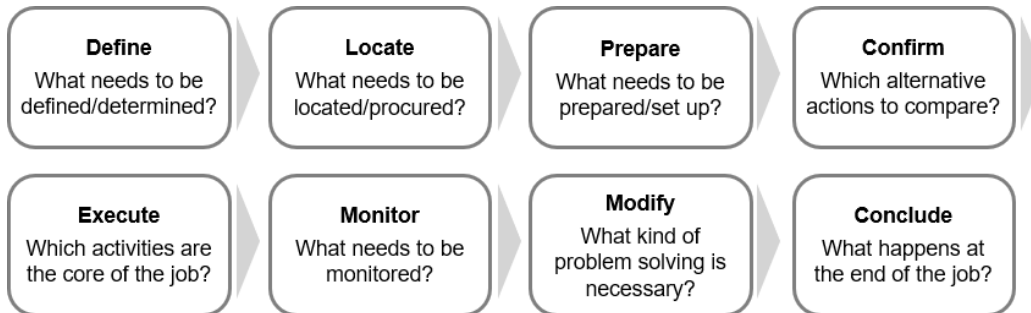


Fig. 1 Universal Job Map based on Bettencourt et al. (2008)

By breaking down the job a customer wants to get achieved into a series of discrete job steps, it is possible to understand the whole process of what a person is trying to get done from a user-centric view. Providers can subsequently identify drawbacks of the products or services customers use and leverage this knowledge for product or service improvements or to develop a new value proposition based on unmet customer needs [9].

## 2.2 FOKUS GROUP DISCUSSION

In two focus group workshops, 13 makers, hobbyists and do-it-yourselfers discussed the process of “making things”, what they actually do when they make things, what problems or hurdles they encounter, and which solution strategies they use in specific situations. Based on the jobs-to-be-done framework, the process of the individual steps of “making things” was structured and visualized by the participants in pin boards to provide a general understanding across various project types and goals.

It was important to the research team to address individuals who are not connected to a makerspace (non-users), but who could be considered as potential users in their capacity as do-it-yourselfers. For this reason, a broad-based recruitment was implemented using different strategies which resulted in a high diversity of the participants. The age was between 30 and 66 years, both men and women attended, and the occupations included both craftsman or technical professions, but also commercial employees, jobs in the HR sector, journalism, as well as civil servants and artists.

A semi-structured interview was conducted with each participant in advance with the aim of checking the person's suitability and finding out more about their individual approach to “making things”. This should help the project team to enrich the data generated in the workshop and subsequently to better understand and interpret it.

## 2.3 WRITTEN SURVEY

Based on the findings of the qualitative phase, 12 customer needs were identified, which were then rated by current private users of the Innovation Lab in terms of importance and satisfaction as shown in figure 2. A written survey was sent out to all private users of the Innovation Lab, with 20 persons responding.

No.	Outcome-Statement
1	Minimize the time required for researching implementation possibilities for my idea, such as how, when, and where can I do it, and what do I need for it?
2	Ensure that the idea aligns with my own implementation capabilities, such as concerning costs, duration, and my own craftsmanship skills.
3	Minimize the time needed to seek support, such as someone who can build it for me, provide implementation tips, or assist me.
4	Minimize the time needed to acquire the necessary skills for the project, such as learning a new technique or mastering the operation of a machine.
5	Minimize the time needed to procure all necessary materials, tools, and machinery.
6	Prevent needing more time for implementation than necessary due to not having the optimal tools.
7	Prevent needing more time for implementation than necessary due to lacking the necessary skills.
8	Prevent disturbances from the environment during the work process, such as loud noises or tools not being within reach.
9	Prevent needing to tidy up or stow away everything again during interruptions in the work process.
10	Ensure that all essential work steps are documented, such as to know what to do in later project phases or for subsequent projects.
11	Maintain an overview of my own material and tool inventory.
12	Minimize the time needed to rectify errors.

**When it comes to crafting/repairing/crafting/something constructing, HOW IMPORTANT are the following points to you?**  
 (5-point scale with '5=very important' and '1=not important at all')

**When it comes to crafting/construction/repairing/crafting, HOW SATISFIED are you currently with these aspects?**  
 (5-point scale with '5=very satisfied' and '1=not satisfied at all')

Fig. 2 Customer needs for survey of existing private users

### 3 RESULTS

The results relate to the analysis of the do-it-yourself process and the assessment of identified needs by current private users.

#### 3.1 UNDERSTANDING THE DO-IT-YOURSELF (DIY) PROCESS FROM JOBS-TO-BE-DONE PERSPECTIVE

Analysis of the data obtained in the qualitative phase provided a comprehensive view at the DIY process from jobs-to-be-done perspective, as summarized in figure 3. While the first four steps are more of a conceptual nature and are characterized by considerations, research and learning, the last four steps focus on actual working on the piece.

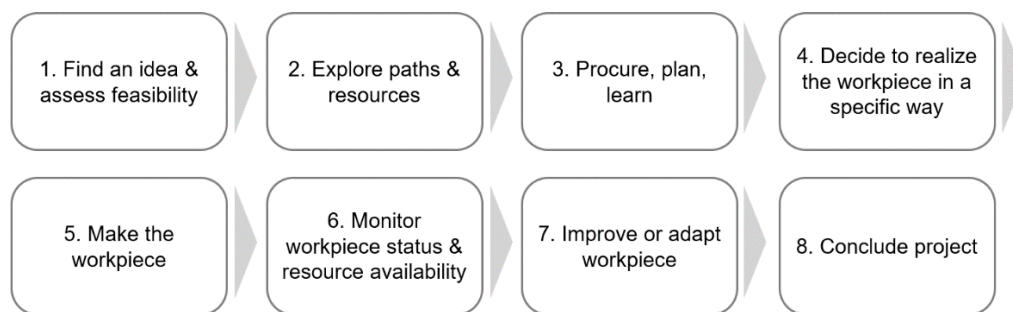


Fig. 3 Job Map for "creating a workpiece"

The following paragraphs highlight main challenges from user's view along the job map.

#### *Transforming an implicit idea into a concept that can be realized with one's own possibilities*

Finding ideas and gathering inspiration are described as a joyful and positive activities by participants. However, there is an uncertain and time-consuming aspect of step 1, where feasibility is assessed and an idea has to be "brought to the ground". In this phase,

realization options are confronted with one's own resources and skills, which was described as particularly challenging, especially for less experienced participants. Hurdles in this phase are a lack of orientation, information overload, lack of self-confidence as well as finding access to one's own implicit and not yet tangible ideas.

*Obtain context- and situation-specific technical knowledge*

Private individuals are interested in expanding their skills and knowledge regarding certain technologies and processes. However, they also have a very specific interest in utilization; that is, they want to apply this knowledge directly to their own projects. They also want to prevent themselves from being unable to apply the theoretical knowledge gained in training courses because, for example, they have forgotten it or have not practiced it sufficiently. From their point of view, the time-consuming learning process may not be worth it, for example if they only use the machine for one project.

For many private individuals, it is not enough to simply obtain technical knowledge about how to operate a machine; it is important for them to obtain this knowledge in a context- and situation- specific manner to be able to apply it directly on their projects.

**3.3 ASSESSMENT OF THE IDENTIFIED NEEDS BY CURRENT PRIVATE USERS**

The results of the written survey revealed that satisfaction is rated higher than importance for the majority of the needs identified, as shown in figure 4. There is a low innovation potential for this group of people with regard to the identified needs. From this it can be concluded that the problems related to the needs have already been overcome for this group of people and other aspects may be more relevant.

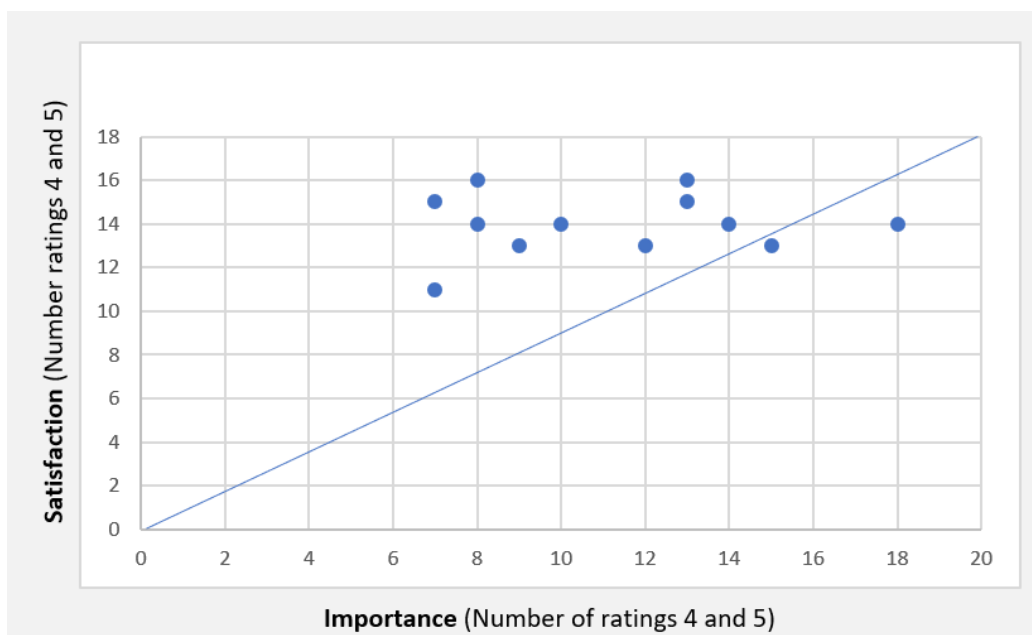


Fig. 4 Evaluation of the identified needs based on importance and satisfaction

#### 4 CONCLUSIO

The results show that, from perspective of do-it-yourselfers, the biggest hurdles have to be overcome before they can actually start working on a workpiece. Private individuals who are already active in a makerspace appear to be further advanced in the DIY process, for whom the needs described are less relevant.

This has implications for addressing and marketing the makerspace offering to private individuals. While makerspaces primarily support the “execute step” by providing machines and technology, there are a lot of tasks and decisions preceding this step in which private individuals are left alone. Similar to companies that focus on their products and services instead of customer needs [9], academic makerspaces may also have a “blind spot” in overlooking or ignoring individual challenges, decisions and activities that are important to do-it-yourselfers.

The prior knowledge of private individuals regarding the technologies and processes offered in a makerspace varies. While some already bring technological know-how or initial experience, others do not even know the basics of the respective technology. This heterogeneity poses a challenge for planning courses, workshops or training sessions.

Einarsson [10] states in her analysis of practices of private makerspace users that especially the group of “connectors”, individuals characterized to be driven by solving an everyday problem or personalizing objects, are just loosely tied to a makerspace, using it for implementation while doing many tasks individually at home. Since connectors are lacking knowledge on taking on more advanced projects, providing them with support and knowledge on job steps carried out before “executing” a project, could be a promising approach to better reach private individuals.

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