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Published version

DOGU, D, PINTO, R, OZCAN, A, VIERA, J, ATKINSON, Paul and CARVALHAIS, M (2016). Designing research tools : empirical knowledge as a base for future beekeeping. In: "Survival": UD16, 5th Phd In Design Research Meeting, Aveiro, Portugal, 22-23 July 2016. (Unpublished)

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Designing Research Tools: Empirical knowledge as a base for future beekeeping

Abstract

The world-wide phenomenon of the disappearance of bees with the consequential imbalance of ecosystems is a problem that needs to be addressed in order to guarantee a sustainable future. Beekeeping is an activity, generally associated to agriculture, that allows small farmers to generate more food and income, this reality has had a shift in recent years with the number of small beekeepers decreasing, and big corporations gaining control over the industry. Regulations and the *Colony Collapse Disorder*, among other factors, may have a major role in these phenomena.

With the intent to contribute to a more sustainable beekeeping practice, this research is being conducted to better understand this reality, looking for design driven opportunities.

The challenge is to gain a deeper understanding of the beekeepers, a practice that is understudied by designers, particularly considering in-depth research methods. This paper discusses an experimental design study in the Turkish Aegean region that was conducted with local beekeepers to better understand the existing specifications: by discussing their business models, in order to understand and analyze socio-cultural factors that contributed to the existing system, and propose changes for a more sustainable practice. As a starting point for a first phase survey, the intent is to generate original data which will serve as the foundation for future works.

Beekeepers in this scenario are mainly senior male farmers that belong to a low literacy audience, who learned the practice from their predecessors. In order to identify the problems of beekeepers, we needed to design and adjust our research methods according to the specifications of the audience. For this reason, a three stage inquiry

was designed to better communication in order to extract measurable data from their empirical knowledge through a series of workshops.

The case study reports the workshop sessions for identifying the design strategies with a focus on voicing the beekeepers problems. The first level draws upon explicit knowledge to identify the audience. For the second level an illustrated questionnaire was designed to visually represent the quantitative data about the business. The process is exercised with a new design because the content of knowledge is tacit and personal. Finally, the third level is an interview session to validate the data gathered from the previous stages.

This paper will present the findings of the workshops with the aim to formulate an appropriate way to employ new approaches to exploring and defining design problems with visual representations. We also seek to extend our research in other contexts that will help discuss the role of design as a tool for developing new methodologies of design research.

As a consequence we will propose prototypes of artifacts that will consider the implementation into beekeeping of new biomaterials, technology, branding and commercialization planning, etc., that may help create a more sustainable beekeeping practice. Beekeepers will be invited to analyze proposals and give their contributions. This process will render into redesigned optimized artifacts that will merge empirical knowledge with the needs of sustainable beekeeping.

Keywords *design research tools, beekeeping, sustainability, eco-innovation, cooperation*

1. INTRODUCTION

The world-wide phenomenon of the disappearance of bees with the consequential imbalance of ecosystems is a problem that needs to be addressed in order to guarantee a sustainable future (FLYNN, 2013). Beekeeping is an activity, generally associated to agriculture, that allows small farmers to generate more food and income, this reality has had a shift in recent years with the number of small beekeepers decreasing, and big corporations gaining control over the industry. Regulations and the *Colony Collapse Disorder*, among other factors, may have a major role in these phenomena (KLUSER, S., NEUMANN, P., CHAUZAT, M.-P., & PETTIS, J. S., 2010).

This paper discusses an experimental design study in the Turkish Aegean region that was conducted with local beekeepers to better understand the existing specifications. By discussing their business models, in order to understand and analyze socio-cultural factors that contributed to the existing system, the medium-term aim is to propose changes for a more sustainable practice.

With the intent to contribute to a more sustainable beekeeping practice, this research is being conducted to better understand this reality, looking for design driven opportunities.

This paper will describes the preliminary actions, workshops and the specific tools that were designed to obtain a solid database that will underpin future works. The aim is to formulate an appropriate way to employ new approaches in defining and exploring systemic problems with visual representations, which will outcome in new data that will contribute to a better understanding of local beekeepers and their practice, allowing future design proposals to be properly contextualized and with relevant impact.

2. BASIC LOCAL BEEKEEPING FACTS

Turkey is the third largest honey producer in the world with 7.7 million colonies (BEEKEEPING DATA, 2016) ranking after China & India (FAOSTAT, 2016). However, the honey yield per colony is respectively lower than the global average production value (SANER, G., ENGINDEZ, S., TOLON, B., & CUKUR, F. 2004; KIZILASLAN, H., & KIZILASLAN, N., 2007). The reasons for poor honey production rates are mainly attributed to poor management abilities and low literacy of beekeepers (Saner, G. et.al., 2004). Despite several empirical investigations on honey production, there are limited

investigations about beekeepers, user-specific problems and beehive design, which are poorly understood and represented. The core of our project is structured around a series of workshops designed to identify, present and communicate our audience and their problems.

In the initial contacts with beekeepers, three significant characterizing aspects emerged that we consider being key factors in the understanding of the beekeeping scene in this particular region:

1. Most beekeepers are senior males that have inherited their knowledge from their predecessors and the younger generations do not seem to be attracted to the practice, the aging of active beekeepers brings new concerns that have to be addressed, specifically: how to attract younger generations, how to include the female population and what has to be rethought considering the specification of senior users.
2. Beekeeping is growing in the retired senior male population, where the practice is seen as a hobby or a way to obtain extra income. Most of these individuals are self-taught and are resistant to fit into the existing established system.
3. There is a general mistrust between the different players in the system: beekeepers do not trust the associations, the industry does not trust the beekeepers, the consumers do not trust the retailers, etc.. This general suspicions needs to be dealt with if a change is intended, breaking barriers and promoting healthy dialog is of utmost importance.

UNDERSTANDING THE USER

The majority of the beekeepers in the Menemen region are commercial beekeepers along with some amateur ones. The commercial beekeepers are senior male farmers from a low literacy audience, who have inherited the business from their predecessors, some of which go back to three generations. The amateur beekeepers are retired male hobbyists usually with a higher literacy level.

Our first efforts with the target audience, before we applied the questionnaires, was to make decisions based on the data gathered from two site visits to several beekeepers from the Aegean region to establish a user-oriented methodology.

We initiated our approach with two informal visits to the *Tashan* in the city center of Manisa, where beekeepers normally gather: In the first visit the approach was one-to-one informal and non-focused dialogues, but people were very suspicious and uptight,

communication was not easy and they described their practice as unblemished. In the second visit our strategy shifted: we sat in the center of the plaza talking to one beekeeper, drinking tea and had a beehive on top of the table, slowly we attracted the attention, both of commercial and amateur beekeepers' and an open discussion initiated. We engaged with each beekeeper on a personal level to gain a level of trust and intimacy and asked each participant questions about their businesses and problems.

Although amateur beekeepers own relatively lower number of hives, they were more enthusiastic about our project and were eager to understand the benefits that could be introduced to the local beekeeping business. The second group was also critical about the pattern of secrecy among the beekeepers in general.

Several reasons that discouraged the community were related to previous projects that didn't result in the benefit of the beekeepers. Another level of this trust issue was also reflected upon the Beekeepers Union and the competition amongst themselves.

On the other hand, the beekeepers started to show interest in the possibility of a new project. Therefore, we decided to hold workshops for participants of both user groups. The beekeepers agreed to participate in the workshops.



Image 1 · *Meeting with Menemen Beekeepers*

According to the specifications of the audience we felt the need to design and adjust our research methods to gather knowledge from the three main sources: the people (the

beekeepers) — **this paper focuses mainly on this stage**; the processes (systems and networks involved) and the products (mainly focused on the beehives) (CROSS, 2006, p. 56-57).

To understand the people an inquiry with three stages was designed and applied to better communication in order to extract measurable data from their empirical knowledge through a series of workshops: a closed questionnaire that would give descriptive data that could help characterize the individuals; for the second level an illustrated questionnaire was designed to visually represent the quantitative perception each beekeeper has of his business, the third level is an interview session to validate the data gathered from the previous stages, and generate new discussions on the beekeeping practice.

With the intent of understanding the processes, field trips and interviews are being taken through, focused on the key players involved in the systems (legislators, industry, wholesalers, etc.); and to understand the taxonomy, state of the arte and scenarios of the products (mainly the beehive), workshops will be developed with the beekeepers to analyze existing typologies of hives and confront them with new prototypes.

RESEARCH TECHNIQUES AND TOOLS:

Considering the work group's specifications and because the content of knowledge is tacit and personal, the questionnaires had to follow a new design that would facilitate communication and outcome in feasible data.

The design strategies focus on voicing the beekeepers problems, understanding the subjective and cultural aspects that define the practice and looking for their contributions to the future of beekeeping in a more sustainable reality (MCLENNAN, 2004, p.3).

The first level questionnaire draws upon explicit knowledge to identify and classify the audience: direct yes or no questions and questions with a quantitative paradigm define the first stage, these questions will be presented verbally and the answers will be noted by one of the investigators. We believe that do to the low literacy of some elements this can avoid inhibitions and may open the possibility to spin off conversations with rich contributions.

For the second level an illustrated questionnaire was designed to visually represent the quantitative perception that each beekeeper has of his business: each beekeepers was given a *Lego* 8x8-stud baseplate and several 2x2-stud pieces allowing a total contraction of 16 pieces (a 4x4 square) onto the baseplate (image 2). They were explained that the given area represents their beekeeping practice and that each piece represents a portion of their effort to extract a product from the hive — the pieces have different colors and icons (the icon was added do to the high possibility of color-blind members among the work group (BIRCH, J., 1993), representing the each sub product of the hive: Honey, beeswax, propolis, pollen, bee venom, royal jelly, queen bees and swarms, other. This exercise intends to visualize the perception each individual has between effort and outcome.

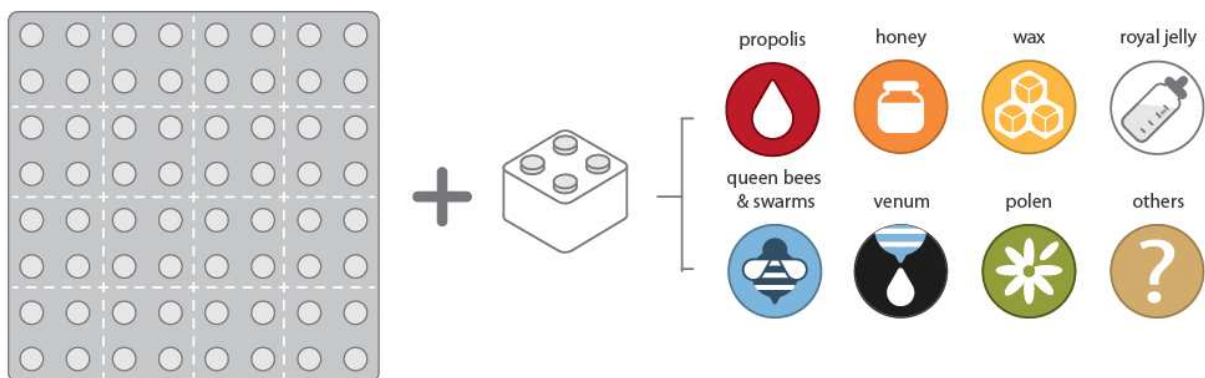


Image 2. Baseplate (left), product studs (middle), icons & color codes (right)

In the second phase the beekeepers were asked to represent comparatively in columns the income each sub-product represents for his business (from 6 pieces most valuable to 1 piece less valuable, (image 3).

The intent of the previous described activity is to understand: what are the beekeepers are extracting from the hive; is there a relation between the effort a sub-product requires for its extraction and its commercial value; are there other factors besides money that drive beekeepers to extract a certain sub-product over another; can this exercise alert to the fact that there are more profitable sub-products that are not being exploited do to the lack of knowledge and expertise.

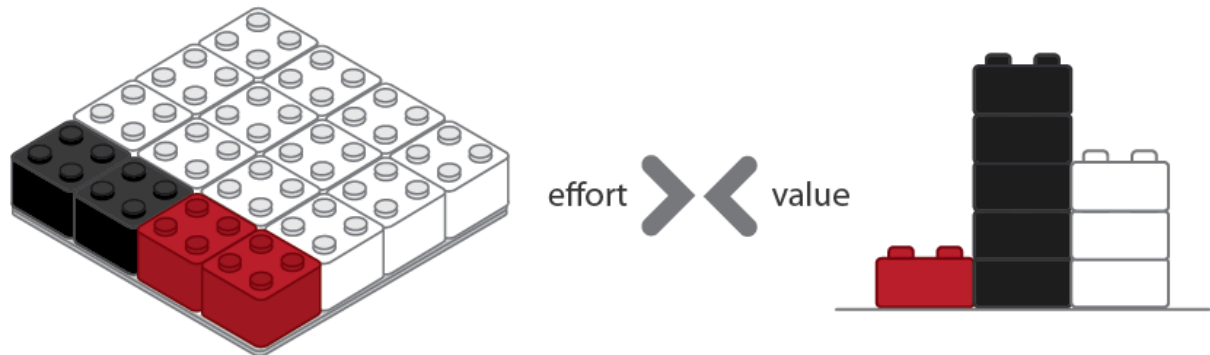


Figure XX. *Effort given into beekeeping business (left), value of effort (right).*

The third level is a semi-structured interview where the phenomenological aspects are in question — learning how the beekeeping scene in this geocultural reality is shaped by understanding the people that shape it and their actions — by analyzing the results from the previous level we intend to enlighten what are the human and systematic factors that define today's beekeeping and its future from a local perspective.

In this level we introduce facts that are global: concerns, practices and opportunities, looking to understand what are the drivers that setback beekeeping locally and which are the opportunities that are being ignored. The principle of *thinking globally, acting locally* (Pojman, L. P., Pojman P. & McShane, K. 2016, p. 105), applies to this case not only because the Global Honey Bee Colony Disorders (KLUSER, S., NEUMANN, P., CHAUZAT, M. P., & PETTIS, J. S., 2010) concern but the fact that Turkey is importing many sub-products that are not being produced locally, and that Turkish honey is not perceived as reliable in internal and international markets (PARLAKAY, O., YILMAZ, H., YASAR, B., SECER, A. & BAHADIR, B., 2008).

PRELIMINARY FINDINGS:

As a base point to prepare the questions and interviews, preliminary field trips were done to grasp an overall awareness of the stakeholders' perspectives on the beekeeping scene in the national market; a series of informal interviews with members of associations, people in the industry and retail, and consumers were established,

looking to understand which were their opinions and concerns related to the existing system.

With the intent to extend our research in other contexts that will help discuss the role of design as a tool for developing new methodologies of design research, and more specifically the need to validate the proposed methodology before applying it, took us to uphold a several of testes with other work groups in order to understand its applicability and if the outcomes could be reliable.

Three distinct groups of 3 elements each were invited to analyze their professional daily chores, crossing: effort expended in each chore with the self-fulfillment each chore offered, and how they perceived the relationship between each chore and their global income.

Staff from: a cleaning company, a security company and a restaurant where the sample groups. All had in common the fact that their work day has various chores that were repeated periodicity in a weekly or a daily biases. All had members from both genders and a wide age gap, different literacy levels and were long term employees.

The preliminary testing revealed two aspects that had not been considered:

1. Most individuals had the need to relate the given area (stud baseplate) with a specific time frame, in their opinion it should relate directly to an 8 hour work day, a 6 day working week, etc.; this led to a 4x4 module that the beekeepers could relate to the 4 seasons;
2. Because each individual positioned their pieces in a different order (from scattered to subjective grouping) there was a need to reorganize the pieces in a homogeneous order to correctly analyze and compare the data; the fact that the pieces were reorganized did not alter the global perception that they had of their work.

Being the questionnaire presented in a hand-on gammy format, the test groups described this activity as: joyful and easy to understand, that the relation between color/icon and task was self-explanatory, and users perceived the task as an opportunity to express themselves in a freely.

CONCLUSION:

The previously presented designed methodology and its findings will be presented at the UD16 seminar, where we intend to contribute to the dialog on design research strategies and the role of designer as research tool developer.

For future works we will take into consideration our findings to propose prototypes of artifacts that will consider the implementation into beekeeping of new biomaterials, technology, branding and commercialization planning, etc., that may help create a more sustainable beekeeping practice. We believe these new artifacts can work as a media do contribute the underlying problems solving, and as a vehicle to provoke new discussions. Beekeepers will be invited to analyze proposals and give their contributions. This process will render into redesigned optimized artifacts that will merge empirical knowledge with the needs of sustainable beekeeping

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