"Digital.Labor" – Co-Creation for the Digital City of Tomorrow

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1 ABSTRACT

In ordert to design and develop urban solutions successfully, the need to include a wide and diverse range of stakeholders is becoming evermore apparent. These tasks must be recognized as a societal task and perceived jointly, and provide a platform for bringing together several actors to colaborate effectively. Digitization is providing new orrprtunities to integrate a large number of (local) actors into decision-making and implementation processes, relevant to urban development through both conventional and innovative participation methods (HANZL;2007). But, how might such new integrated approaches look? How is it ensured that the impulses of a heterogeneous stakeholder landscape are equally taken into account? Moreover, how is it guaranteed that cities integrate the results of open idea processes into traditional urban planning?

One such emergent approach is that of co-creation (ALVES;2013), which focuses on the collaboration of transdisciplinary actors who jointly address challenges in a "process of creation" to develop new and successful solutions to existing problems. Practical experience are combined with expertise knowledge and specialized skills and solutions are developed "on the ground", regardless of professional background. In such a co-creation process, all backgrounds and approaches are recognized as equally valuable and accompany all stages of the process, from the initial idea to (prototype) implementation. Thereby such approaches promise the creation of holistic and sustainable (systems´) solutions with a high innovation potential. They offer a new format for stakeholder participation in urban processes, given the wide variety of urban challenges we are currently facing.

The Fraunhofer Institute for Industrial Engineering IAO, in cooperation with the Institute of Human Factors and Technology Management IAT of the University of Stuttgart, has launched the Municipal Innovation Center (Kommunale InnovationsCenter (KIC@bw)). The focus is on creating experimental spaces and new innovation partnerships between administration, business, science and civil society. The goal is to develop and implement innovative solutions for cities, towns, counties and regions. The Municipal Innovation Center is funded by the Ministry of the Interior, Digitization and Migration Baden-Württemberg as part of the digitization strategy of the state government of Baden-Württemberg digital@bw.

To test the possibilities of digitization for cities, the Fraunhofer IAO has developed a process for prototyping. Central is the "Makeathon" (from "to make" and "Marathon") as a format in which local actors from the city administration, politics, civil society, business and the creative sector are brought together in a limited period of time. In the process, which is moderated by Fraunhofer IAO and Tinkertank, not only ideas are developed and conceptualized, but also implemented as prototypes. The format can be individually adapted and enables almost all questions relating to urban digitization to be tackled jointly. In total, eight of these digital laboratories, in cities and municipalities, will be completed by mid-2020.

Keywords: Future, City, Mobility, Scenario, Planning

2 CO-CREATION - CREATING SOMETHING TOGETHER

The origin of the Digital.Labor is the endeavor to establish a format to support all urban actors around the topic of digitization. It builds on the principles of co-creation and participation, which is why these principles are considered in more detail below.

The step model of the participation of Sherry Arnstein, the "Ladder of Citizen Participation", which defined eight intensity levels of participation, clearly shows that participation not always means participation. Arnstein defines the lowest form of participation as the provision of information, which is countered by the complete relinquishment of decision-making power (ARNSTEIN;1969). According to the authors' understanding, participation should be interpreted as a color palette: for each question, an individual mix of participation intensities is necessary to achieve a successful result.

The central aspects of co-creation are generating ideas and cooperation. In order to develop new solutions according to urban challenges, the co-creation approach focuses on the cooperation of transdisciplinary

actors who jointly address challenges in a "process of creation". Regardless of the professional background, something is created together at eye level, from the first idea to the concept, to the (prototype) implementation. The following three basic rules are considered essential for co-creation by the authors of this article:

- Creativity: Finding answers to complex questions and challenges requires a correspondingly complex set of skills, (everyday) knowledge and expertise. Co-creation formats promote creativity in the development of innovative and diverse solutions by integrating heterogeneous actors.

- Identity: When designing new digital services or physical urbane environment, the identification of users with the public space is relevant. By addressing needs and jointly developing solutions, the identification potential can be maximized, which in turn leads to a sense of responsibility for what has arisen and its context and is accordingly relevant for the acceptance of new solutions.

- Solidarity: For the integration of heterogeneous skills, expertise and knowledge, the cooperation of the various actors is necessary at eye level. The "learning from each other" in the creative process is in the foreground and relates to the everyday knowledge of residents and users, the knowledge of formal urban development processes (legal restrictions, process flows) and technology knowledge.

We can encounter co-creation in different contexts. In this article, the Makeathon will be discussed later as an event format, which takes up and applies the principle of co-creation.

3 DIGITAL.LABOR - PROTOTYPING PROCESS FOR DIGITAL URBAN SOLUTIONS

3.1 Makeathon-Format

To test the possibilities of digitization for cities, the Fraunhofer IAO has developed a process for prototyping. Central is the "Makeathon" (ZHANG;2012) (from "to make" and "Marathon") as a format in which local actors are brought together in a limited period of time. In the process, which is moderated by Fraunhofer IAO and Tinkertank, not only ideas are developed and conceptualized, but also implemented as prototypes. The format can be individually adapted and enables almost all questions relating to urban digitization to be tackled jointly.

3.2 Actors

One of the special features of the process is the heterogeneous mix of participants. The aim is to mix as many actors of the city society as possible and to win them over as participants. These range from city administration, politics, civil society, business to the creative sector. They all represent a differentiated set of skills and knowledge while sharing a local identity.

The selection and invitation will be made in coordination with the cooperating municipality. Targeted addressing by the city administration can lead to a limited representation of the group of civil society participants. Against this background, cooperation with the local adult education center is sought where possible. It includes the format in its program and offers the opportunity for interested people to apply.

3.3 Process

The Digital.Labor also lives from the active participation of all attendees and their exchange, not only during the implementation itself, but from the very beginning. The process from the first contact to the continuation of the project can be divided into four phases, each of which has a corresponding scope: On the one hand, the preparation of the Digital.Labor with the identification of the main topics, as well as the implementation and the processing of the Digital.Labor itself. On the other hand the continuation. For the Digital.Labor and the participants themselves is it essential, that not only ideas are developed and conceptualized within this process, but that they are also implemented as prototypes.

3.3.1 Preparation

The biggest challenge when preparing a laboratory is to understand the respective municipality and local conditions. In order to guarantee this as best as possible, a core team is defined in a first step, which accompanies the entire process. This includes representatives of the city administration and the Fraunhofer Institute. The city administration is responsible for the selection and addressing of the participants, the provision of suitable rooms and the catering during the event.

Fig. 1: Digital.Labor localities Illertal und Constance[1]

In joint coordination meetings on site, up to three questions are set which need to be dealt with in the laboratory. It is important to find the right framework between a specific challenge and creative freedom. The selection of questions is based on experience from previous laboratories and can be refined as the number of events progresses. Experience has shown that not every question is suitable for the process. If these are spatially too extensive or thematically too complex, targeted processing by the participants is unlikely. The same applies if the questions were chosen too specifically and there is no longer any space for creative approaches.

Each selected issue is accompanied by a responsible person from the city administration. This supports the participants in the process with comprehensive information and prevailing framework conditions.

3.3.2 Implementation

The 1.5 day or about 15-hour makeathons are divided into three phases: idea generation, experimentation and prototype development. Each participant is welcome to find a challenge that suits his/her interest. Continuous dialogue between the working groups and exchange with the assigned mentors ensure the integration of the results.

An exemplary process of a Makeathon can be divided into four phases, which can be flexibly adapted to the circumstances in the respective municipality, the participants and the premises.

(1) Thematic introduction and background information

(2) Idea development and conception

(3) Experimentation and prototype development

(4) Presentation

The focus of the overall process lies in the area of "Experimentation and prototype development", which takes up 70 to 80 percent of the time. Iterative testing of the designed approaches without intellectual restrictions is essential. Mentors support the participants in the implementation with technical and procedural know-how. Regular exchange between the individual thematic groups helps to refine solutions and to solve possible problems with a new approach.

The conclusion of a digital laboratory is the final presentation in front of top administrators, community council members and other interested parties. It is important to clarify that the developed products are prototypes and not finished products, so that there are clear expectations.

3.3.3 Processing and continuation

All of the results will be prepared appropriately after the event and made available to the participants as well as to those responsible for the municipality. Developed digital prototypes are handed over to the city and analog exhibits remain with the organizing municipality immediately afterwards.

All results are also presented to the city council. Not only are the prototypes presented, but parts of the laboratory are also exhibited and the process can be experienced. Every laboratory is committed to putting at least one prototype into practice. Appropriate funding programs at federal and state levels are identified and the municipality is supported in the application process. This forms the basis for the fact that the laboratory was not a one-time beacon, but a continuous process.

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[1] Photos: © Ludmilla Parsyak, Fraunhofer IAO

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237

4 MOBILE LAB

4.1 The development and necessity

In order to create an experimental space and to initiate innovation processes in different cities, communities and districts, a mobile lab has been developed, which makes it possible to carry out the format on site. For this purpose, a scenario simulation was carried out in the first step of the development process. In the next step, the toolset was defined, whereby the requirements for the mobile laboratory were derived and thus the individual modules determined. Afterwards all modules were transferred into an overall concept.

4.2 Modules and field of activity

In total, the digital lab consists of four modules; a planning table, a sensor station with LoRaWAN transmission technology, a Virtual Reality station with multiple VR-Headsets and a coffee station. All modules were installed in flight cases with castors, whereby the individual walls of the flight cases as well as the flight cases themselves functionally serve as station or tables.

Fig.2: Digital.Labor modules setup[2]

4.2.1 Planning Table

The module "planning table" contains a notebook, a projector with digital pen, Lego Serious Play and various materials with which building, handicrafts and haptic work can be done. At the planning table the participants should be able to plan and replant different areas, sites and buildings together by drawing changes with the digital pen into projected maps or by tinkering and building with the different materials available to them.

4.2.2 Sensor system for recording real-time data

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[2] Photo: © Ludmilla Parsyak, Fraunhofer IAO

On the basis of an open LoRa infrastructure and an intelligent sensor system, municipal and economic actors are enabled to codesign their future city. This infrastructure is provided by the Fraunhofer IAO within the mobile labs in order to develop new sensor applications with local actors and ultimately to be able to implement them in the field. The resulting prototypes can, for example, record environmental data (particulate matter, NOX, humidity, noise) but also more complex movement data of the city in order to generate new data-based value-added services.

4.2.3   Virtual Reality Station

The "VR Station" is another experience station within the Digital.Labor. Here the participants can experience their own city, streets, houses, regions, areas in 3D. They can walk through their streets, draw buildings, change paths or build bridges within virtual reality. It is also possible to create your own virtual reality environments using 360° photography. The corresponding camera technology and software are available for this, which are accompanied by the simplest possible process. The aim is to reduce fears of new digital tools and changes and increase their creativity.

4.2.4   Coffee Station

The module of the "Coffee Station" will serve as a meeting point for the participants within the Digital.Labor, inviting them to a further relaxed "group-spanning" exchange and thus offering the experimental space even more room for creativity and innovative ideas.

Fig. 3: Impressions Tools and Prototypes[3]

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[3] Photos: © Ludmilla Parsyak, Fraunhofer IAO

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239

The Digital.Labor should not only create added value for the local players, but should also provide all interested parties with an insight into the participating community and access to the prototypes developed. For this purpose, the so-called "digital road show", a web-based story telling with map elements, is currently being developed. All the laboratories, the process, and the prototypes are shown there. Completion is scheduled for summer 2020.

5 PERFORMED LABS

In order to be able to spread and replicate innovative solutions, it is necessary to clarify their potential and added value and to make them tangible. In this way, possible barriers to entry can be reduced and a broad understanding of the added value and applicability of solutions can be gained. The digital roadshow of the mobile laboratory is thus intended to illustrate the opportunities and possibilities of municipal digitization using concrete exhibits and prototypes. For this reason, seven digital labs were carried out in different regions, cities and districts within one year. Explicit attention was paid to a healthy variety of different thematic focuses such as mobility, tourism, data infrastructure, the living space per se with air quality, traffic and noise as well as regional needs. The Digital.Labor travelled from the very rural areas to the more or less well connected rural areas and into cities. Design thinking workshops were held in the Black Forest, Illertal, Baden-Baden, Constance and Tuttlingen.

The Digital.Labor in the northern Black Forest for example was preceded by the Oberwolfach mobility project "Mitfahrbänkle", which impresses with its uncomplicated and simple application. Pure red-marked benches along certain streets of the community signalise a need for a ride along by a citizen. The content of the Digital.Labor workshop was to develop solutions that would make the offer more attractive and visible. Initial problems were the late visibility for car drivers, the sometimes too long waiting times and the lack of information about where to go. In order to make the offer generally more visible and to increase the attractiveness of the bench with its functionality, the group designed an induction sensor for the bench, which signals to approaching drivers that someone is sitting and waiting on the bench. In addition, a display with a timer was intended to increase the awareness of passing cars to the waiting ridesharer. In addition, extensions to the bench's range of functions, such as QR codes for information about the communities and their bus schedules, which would also be accessible without the network, were also considered. This further developed idea of the mobility project won a call for proposals after the Digital.Labor, so that it can be turned into reality.

In Baden-Baden the topic of volunteering and the digital flow of information was addressed. Associations and voluntary institutions should achieve more visibility. Therefore, the participants came up with the idea of a "digital flow", i.e. to install a media installation of screens in public space, on which Instagram or Twitter feeds, for example, 'flow' along. Associations and institutions can be added to the stream and thus send their own current Twitter or Instagram content on its journey through the digital flow. The aim is to raise awareness of the associations and their content among Baden-Baden's passers-by, regardless of age, and to create broad accessibility with an artistic installation.

In Constance, the Digital.Labor with the participants dealt, among other things, with the topic of concept development of a multimedia communication of urban development and urban planning processes. A concept was developed to visualize urban development projects and to follow their progress virtually. In the first virtual step, Constance should be considered in its entirety, the second level then leads into the district which is currently planned and/or already under construction and provides more detailed information and descriptions of the district design. It should offer the citizens of Constance and all interested parties the possibility to inform themselves about individual concepts and to observe their progress virtually and digitally visually. This concept will now be implemented in the city of Constance and made possible for citizens who are interested in this media communication.

In the municipal administration association of Illertal, consisting of the municipalities of Erolzheim, Berkheim, Kirchberg a.d. Iller, Kirchdorf a.d. Iller and Dettingen a.d. Iller, the Digital.Labor with its mobile modules focuses on mobility in the context of digitization and rural areas. Four ideas could be presented as a result, the autonomous local bus, the RegioMove App, the crawlways and the traffic evaluation, one of which, the idea of the local bus, is to become more permanent. The idea of the "autonomous local bus" developed from the desire to have a more "lively" public transport system. The idea of the "autonomous local bus" was born out of the desire to have a more "lively" public transport system, acting like a shuttle service,

travelling the same route every day, stopping at nodal points such as the kindergarten, the shopping center and various residential areas to allow people to get on and off. One should never have to wait longer than 30 minutes for the shuttle. The concept is currently being examined for feasibility, discussed and made realizable with experts from business, science and politics and should be submitted as an idea within an application if the call for proposals is suitable.

Part of the Digital.Labor is not to let ideas and built prototypes be forgotten after the workshop, but to examine their suitability for current and future calls for proposals and to consolidate them within a joint draft proposal. Furthermore, it should be possible to realize individual prototypes directly.

6 CONCLUSION

Digitization offers great opportunities and also serves as an instrument to "overcome economic and social challenges". (HABBEL;2017) It enables all those involved to have easier access to knowledge by making it easier to use information sources and the resulting possibility of simplified networking. The use and generation of data can open up far-reaching options for action at the federal, state and local levels and thus help to prevent and avert problems and change situations. The central element is the citizen, because he is the user and resident of a city. Their interaction with the various systems is significant for an overall urban view. If citizens are the central element of an overall urban view, then their opinions, ideas and fears should play a significant role in planning and development and urban concepts should be developed through citizen participation - including those who will live in the city in the long term (e.g. the younger generation). Just as companies and platform operators have been using personal data for many years to provide "commercial offers based on individual preferences", cities should try to provide citizen-specific offers using new technologies and analysis methods of individual needs. Therefor privacy and data protection must play a central role. Only in this way, as well as by raising citizens' awareness of certain risky issues and by transferring knowledge, can a city achieve its development goals and generate acceptance and support. Citizen participation in times of digitalization should, in addition to the classical participation formats, "take into account alternative forms of participatory urban development with socio-economic relevance". Participation independent of location and time of day - owed to digitization - has a positive effect on this process and should be used even more as an advantage. With this background, the Digital.Labor wants to help cities and municipalities to use digitization as an opportunity and to think about and integrate possible developments. However, since analogue and physical participation procedures should not be completely replaced by digital tools, since both personal and direct exchange will continue to be of high relevance, "multimodal solutions" will be all the more important in the future, as will the case-oriented use of suitable participation instruments. (BBSR;2017)

The Digital.Labor combines both variants. The handling and work with digital tools and the physical and analogue work on the tools, with a group experience as a further factor. In order to be able to continue to generate new knowledge and new insights, the Digital.Labor should not and must not be allowed to rest in its existence and must be continuously developed. This is one of the reasons why the mobile laboratory of the Digital.Labor will be given a stationary counterpart so that this format can also be carried out in the premises of the Fraunhofer Institute with other target groups. The so-called Next.Lab (stationary counterpart) was developed and is currently built with the help of the knowledge generated and the findings of the mobile labs roadshow.

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