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## Call for Participation

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Internationalisation and expansion of the  
Open Digital Lab for You<sup>1</sup> research project  
by IoT Laboratories

The universities participating in Open Digital Lab for You (short DigiLab4U) can only build and maintain a small part of the useful laboratories in the areas of Internet of Things (IoT) / Industry 4.0 (I4.0). However, as the attractiveness of networks rises with its size, a higher number of IoT / I4.0 laboratories are required to expand the research and learning experience for digitized networked laboratories. In order to expand the DigiLab4U-platform with more learning and research environments, we publish this call for participation. Interested labs can apply and eight internationally renowned laboratories will be funded with up to 25,000 €.

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GEFÖRDERT VOM



Bundesministerium  
für Bildung  
und Forschung

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## 1 Objective / Summary

Digitisation in education and research enables new forms of location-independent networking of laboratory infrastructures. This involves mastering technical, organisational and didactical challenges. A research consortium consisting of the **Hochschule für Technik Stuttgart** (HFT), the **Bremen Institute for Production and Logistics** (BIBA), the **Institute for Knowledge Media** (IWM) of the University of Koblenz-Landau, **RWTH Aachen** and the **University of Parma** is meeting these challenges in the project funded by the German Federal Ministry of Education and Research (BMBF).

Digitalization will change the world of work. The **IoT** alone has an economic potential of up to USD 11 trillion by 2020 (BMW, 2017), especially in industry. The core element for the economy will be intelligent networking. However, the corresponding digitisation and networking of industrial and logistical systems in university environments have so far rarely been implemented, although the new requirements involved are best communicated to students in a hands-on environment. Academics are benefitting more than the middle- and low-skilled occupational groups in I4.0.

However, this only applies if digitisation at universities is reflected in education and research. For this purpose, **students** and **researchers** must be provided with a practical, digitised and networked laboratory environment. The importance of **laboratory-based research** and **teaching** is therefore undisputed. Real laboratory infrastructures are personnel and cost-intensive and are generally only available to the respective research institution. In contrast, purely virtual laboratories offer advantages in terms of security, scalability, remote access and cost efficiency. However, simulations and purely virtual environments cannot replace the success of real laboratory environments, as these require and promote different knowledge. In the research project Open Digital Lab for You (DigiLab4U for short), **real laboratories are digitised**, linked with virtual components and the synergies between the two approaches are explored. Methods of engineering education and serious gaming are combined using learning analytics, mixed/ augmented reality and open badges to form a unique holistic approach in a hybrid learning and research environment. DigiLab4U provides location-independent access to a **digitised and networked learning and research environment**. Multi-user scenarios as well as individual self-directed learning will be supported. The exchange of experiences in research and teaching is promoted beyond the boundaries of individual institutes. As the long title Open Digital Lab for You suggests, the **inclusion of further laboratories** is planned. Further details can be found on the project website <https://digilab4u.com/>

## 2 Request for Participation

Interested laboratory providers commit themselves to the following points:

- (1) active participation in a two-day workshop for instruction in DigiLab4U,
- (2) integration of their own laboratory structures into DigiLab4U including
  - a. technical integration into the laboratory mash-up,
  - b. provision of laboratory data via a corresponding interface,
  - c. consideration of the security concept,
  - d. integration into the booking and accounting system and
  - e. integration into the Learning Analytics (LA) environment.
- (3) creation of a teaching / learning chapter around the own laboratory experiment (a corresponding template will be provided) and integration in the central Learning Management System,
- (4) preparation of a final report on the integration of the own lab into DigiLab4U in the form of a paper to the final IoT conference proceedings,
- (5) obligation to actively support the own laboratory environment until at least September 30<sup>st</sup>, 2024.

## 3 Thematic focus

Possible laboratory learning chapter topics have to focus on IoT or I4.0. Each learning block shall consist of the corresponding lecture material and a (remote, virtual, mixed) lab component. Examples (non-exclusive) are:

- IoT and I4.0 basics including communication protocols, RFID, RTLS, sensors, actuators, CPS, standards, frameworks (incl. OPC UA, EPCglobal, OGC), peer-to-peer IoT computing, data sharing, IoT history, ...
- Data storage, data processing and algorithms, AI, software agents, ...
- IoT-applications (I4.0, Smart Building, Smart Logistics, eHealth, ...)
- Security, privacy, economic, environmental, ethical issues related to IoT

## 4 Time schedule

The laboratory providers are required to follow the schedules below:

DigiLab4U Time schedule	1st funding phase										2nd funding phase		
	1Q20	2Q20	3Q20	4Q20	1Q21	2Q21	3Q21	4Q21	1Q22	2Q22	...	3Q24	
Call for Participation published	■												
Laboratory providers answer the Call for Participation		■											
Request for Tender published			■										
Laboratory providers answer the Request for Tender			■										
Tender review & contracting				■									
Laboratory integration into DigiLab4U-platform					■	■	■	■	■	■			
(1) Two-day instruction workshop						■							
(2) Laboratory integration						■	■						
(3) Teaching / learning chapter							■						
(4) IoT conference proceedings								■					
Laboratory operating phase										■	■	■	

Figure 1: Time schedule for internationalisation and expansion of DigiLab4U (blue: responsibility at laboratory provider; black: responsibility at DigiLab4U)

## 5 Evaluation criteria

The offers will be evaluated by a committee of the five participating universities or research institutions following a review process of the applications. The committee recommends suitable laboratories on the basis of the review process. The committee takes the following criteria into account:

- Compliance with the tendering criteria (mandatory criteria: see paragraph 2)
- Overlapping with the consortium partners' labs (mandatory criteria): the contract will only be awarded if this laboratory does not already exist in the same or similar form
- Didactic usability (mandatory criteria) for the addressed students at the universities and possibility of integration into the overall didactical concept of the project (open science/ open data approaches are favoured)
- Own economic effort foreseen by project partners during integration
- Add-on (soft) criteria: research relevance, (co-) supervision of a doctoral student in the research network, joint publication with one or more of the project members, active participation in the development of DigiLab4U

## 6 Requested information by laboratory providers within Call for Participation

Interested? Please respond latest until the 30.08.2020 with the following information's to [digilab4u@hft-stuttgart.de](mailto:digilab4u@hft-stuttgart.de)

- Lab general description
- Responsible institution
- Labtype (physical / virtual)
- Lab equipment
- Didactical Lab concept
- User groups
- Concurrent users
- Additional Media (e.g. Video, Images, Publications)
- Planned improvements during the following years
- Topic of related IoT teaching / learning chapter

Further information's will be provided to the selected laboratories.