Research Scholarship

The Warehouse as a Digital Ecosystem

Hans-Wilhelm Renkhoff Stiftung, a foundation, offers a one-year research scholarship open to graduate and PhD students from abroad, who will enroll for two semesters at the University of Applied Sciences Würzburg-Schweinfurt (FHWS, www.fhws.de) in the Business and Engineering graduate program at Schweinfurt campus. The total budget of the scholarship is 16,800 EUR.

The Warehouse as a Digital Ecosystem

Digitization is a megatrend affecting all aspects of human life. In industry, centralized control systems make way for more decentralized systems: Physical objects on the shop floor and in the warehouse collect data via sensors, autonomously communicate with each other and superordinate control systems in real-time, decide on further activities, and put these activities into action by actuators („cyber-physical systems", CPS; "Industrial Internet of Things and Services", IIoTS). Objects in CPS, for example an order on the shop floor or a picking box in the warehouse, know about the requirements they have to fulfill and the resources they can use for this purpose. Hence, they are able to find an optimal way through the factory and the warehouse themselves.

The huge amounts of data ("Big Data") generated by CPS and IIoTS create new value-adding potentials, innovations and business models. CPS and IIoTS data establish a digital ecosystem in manufacturing and logistics, a "*loosely coupled demand-driven collaboration environment where each digital organism is proactive and responsive for its own benefit or profit*"[1], which provides valuable information for staff members and software agents alike.

Much research has been done on the transformation of physical objects into smart objects, e.g. intelligent containers, smart load carriers or AGVs. We, however, believe that it is not enough to make objects more smart or facilitate a smarter representation of information (e.g. by augmented reality solutions). Still, the classical approach to optimization is prevailing: Making decisions based on offline analysis of data from ERP and WM systems and subsequently implementing and controlling these decisions. We believe that in a digital ecosystem information needs to be sensitive to context and available "on the spot", which might change the way optimization projects are done. We can imagine that, in the future, "smart factories" and "smart warehouses" will be able to autonomously identify optimization potentials, trigger optimization projects by informing managers, and later provide all information required for supporting and controlling the optimization project.

The scholarship holder is expected to contribute to this field of research.

The University

Located in one of the most beautiful regions in Germany, FHWS University of Applied Sciences Würzburg-Schweinfurt is a German State university with more than 9,000 students and 200 professors offering future-oriented study and research opportunities. At Schweinfurt campus, the focus is on engineering disciplines.

The Logistics Lab

The research grant is associated with the Business and Engineering faculty's Logistics Lab at Schweinfurt campus. The Logistics Lab provides warehouse infrastructure (order picking, both man-to-goods and goods-to-man), an assembly line manufacturing environment with JiT/JiS material staging, and state-of-the-art IT systems (*SAP-EWM* connected to an *SAP-ERP* system, *VisualComponents* as a 3D-simulation platform, which is able to connect to the PLCs of real-world intralogistics systems). The Logistics Lab is cooperating with other labs, e.g. Big Data Lab and Virtual Reality Lab, and is joining in the university's *i-factory* project, aiming at developing and implementing a vision of the factory of the future.

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[1] Chang, E., West, M., and Hadzic, M. (2006), A digital ecosystem for extended logistics enterprises. In: e-*Networks in an Increasingly Volatile World: Proceedings of the 11th International Workshop on Telework*, International Telework Academy, pp. 32-40

Scholarship

The scholarship carries

- a **travel allowance** of 1,000 EUR,
- a **stipend** of 10,800 EUR, payable in 12 monthly installments, and
- a **lab budget** of 5,000 EUR that has to be spent on equipment for the Logistics Lab at FHWS.

FHWS will provide a workplace for the scholarship holder in its Logistics Lab at Schweinfurt campus.

Eligible Candidates

Eligible for application are graduate or PhD students from abroad[2] who have a strong background in areas relevant for and/or related to the field of research (e.g. digital ecosystems, RFID and IoT technology, VR/AR hardware and software, machine-level programming, software agents) and have already demonstrated that they can successfully turn their ideas into implementable concepts and/or working prototypes. A very good command of the English language is mandatory.

We especially invite applications from students currently enrolled at one of our partner universities.

Application Procedure

We invite eligible candidates to apply via email to the Head of the Logistics Lab, Prof. Dr. Peik Bremer, at peik.bremer@fhws.de not later than **August 31, 2018**. Shortlisted candidates will be informed by **September 15, 2018** and interviewed via Skype in the **first week of October 2018**. The final decision will be made until **October 8, 2018**. The successful applicant is expected to

- confirm **within one week of notification** that (s)he will accept the scholarship,
- formally apply via online registration portal for incoming students **not later than October 31, 2018** for joining the Business and Engineering graduate program and secure a room in the dormitory, and
- start her/his research at FHWS on **March 18, 2019**.

The application (in English language) consists of

- A **cover letter** describing the applicant's motivation and past achievements (e.g. published papers, both university and industry projects, experience in the field of research and related areas),
- a **letter of recommendation** from a university professor,
- copies of **university degree certificates**,
- copies of any **paper authored or co-authored** by the applicant that is considered relevant
- a **research proposal** of not more than four pages.

All files should be in pdf format.

All shortlisted candidates should check the registration requirements in the link below well ahead to avoid any delays in the registration process:

https://international.fhws.de/en/fhws-international/incoming-exchange-students/application/

In case of any questions about the scope of the scholarship or its terms, please do not hesitate to email Prof. Dr. Peik Bremer at peik.bremer@fhws.de

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[2] „From abroad" here refers to students who have received their bachelor degree from a university outside Germany. Applicants must provide evidence that they have or will have finished their undergraduate studies before joining FHWS. The successful applicant needs to be enrolled at her/his home university during her/his stay at FHWS and joins us as an exchange student.