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Topic description of the Distance Learning Seminar 2024

Business models in nascent ecosystems: The example of the green hydrogen powered heavy truck sector

The Distance Learning Seminar is an international cooperative course between i. University of Lodz, Poland, ii. Europa-Universität Flensburg, Schleswig-Holstein, Germany, iii. University of Applied Sciences Kempten, Bavaria, Germany and iv. Radboud University Nijmegen, The Netherlands. The seminar is designed to acquaint participants with theoretical and practical knowledge of the field as specified below. Further, participants gain experience in cooperating in an international research team regarding the related topics.

The general aims and objectives lie in:

- to experience working in an intercultural and interdisciplinary team
- to integrate knowledge from different modules and apply it into a research study
- to learn how to set up a small empirical research
- to learn how to present the research results
- to experience working in a hybrid learning format

In 2024, the course deals with fitting business models for nascent ecosystems. The challenges of business model design in such ecosystems is illustrated for the green hydrogen powered heavy truck sector. Different actors in the green hydrogen ecosystem are included into the analysis to understand the potential and challenges of different business model configurations.

Green hydrogen is called “green” since it is produced from renewable energy sources (e.g., wind or solar energy). Renewable energy is used for decomposing water into oxygen and hydrogen in a process of electrolysis. From the air or production processes, CO₂ then can be added in order to gain a climate-neutral synthetic fuel or fuel gas (see <https://www.bmz.de/en/issues/green-hydrogen> for further details).

Many countries world-wide have high hopes with regard to the usage of green hydrogen. The idea sounds convincing: Using renewable energy for the production of fuel or fuel gas for heavy trucks which then could be used without additional emissions respectively no emissions of CO₂ and thereby contributing to achieving the climate goals of the European Union (or regions outside Europe). Currently, however, green hydrogen is very expensive so that the development is characterized by hesitating actors that are not sure if it will pay to invest in this technology or the ventures that bring it to market. Different technologies such as combustion, battery-electric or hydrogen fuel-cells are currently competing, and it is still not clear which technology will succeed in context of a specific customer application (e.g., long distance transportation or last-mile transportation in cities). That makes it an interesting nascent ecosystem to investigate.

Challenges in the nascent ecosystem for green hydrogen powered heavy trucks lie in the currently high production costs for green hydrogen and in the comparatively low efficiency of the technology. Different market sides have to be initiated before the ball can get rolling: Sufficient renewable energy has to be produced first of all. In addition, a network of green hydrogen fuelling stations has to be established, and trucks have to be brought into the market that can use green hydrogen. These vehicles have to be sold, financed and leased, they have to be repaired and maintained. A whole ecosystem around green hydrogen needs to be established.

We want to investigate business models on different levels and around different actors that respond to the described challenges and thereby better understand the potentials and challenges of green hydrogen in the heavy traffic sector. The aim for all groups lies in the exploration and investigation of these potentials and challenges from the perspective of one specific actor contributing to the establishment of the ecosystem.

The aim of the seminar this year is to come to an in-depth understanding of the following cases along the green hydrogen value system of relevance for the operation of green hydrogen powered heavy trucks:

1. **GP Joule** as a producer of renewable energy (and a strategy to develop an ecosystem for green hydrogen usage in trucks and busses), see: <https://www.gp-joule.com/>
2. **Hygro** as a company aiming to build a complete supply chain for green hydrogen from production to filling stations. The main differentiator for Hygro is a modular concept for H2 storage, see: <https://hy-gro.nl/en/>
3. **Holthausen Clean Technology** as a pioneer in hydrogen technology for more than a decade. They aim at outfitting anything that moves with hydrogen propulsion and quite a number of their vehicles are already on the road. Currently, they also look into the engineering and development of filling stations, see: <https://waterstof-centrum.nl/#>; <https://www.cleantechnology.nl/>
4. **Nikola** as a producer of trucks with hydrogen power. Nikola is based in Phoenix (USA) and was founded in 2014 (by the way, Nikola was the first name of Nikola Tesla – the pioneer in electrical engineering). Nikola is one of the first (larger) players outside the traditional truck manufacturers which is specialized in hydrogen heavy trucks. It is a young company in the phase of entering a completely new market with completely new products. Investor expectations are high while the market environment is still challenging, see: <https://nikolamotor.com/>
5. The joint venture of **RWE and Westfalen AG** as an initiative to build a network of hydrogen fuelling stations esp. for heavy transport providers, see: <https://www.rwe.com/en/press/rwe-generation/2023-05-10-rwe-and-westfalen-group-set-up-hydrogen-fuel-station-in-lingen/>
6. **H₂-Mobility** as a player working at the establishment of a fueling station network with Air Liquide, Daimler, Linde, OMV, Shell and TotalEnergies as shareholders of this limited company, see: <https://h2-mobility.de/en/about-us/>

Relevant aspects to be addressed regarding the different cases lie in the following areas (please set your focus and further specify for the case you are assigned to):

- ✓ Understanding different market sides and market characteristics: Green hydrogen provision, fuelling infrastructure, vehicles equipped with the relevant technology. Size, structure and future potential of the focal hydrogen commercial vehicle market and the impact on the market sides are important information in this relationship.
- ✓ Different distribution models are to be explored to bring the specific product or service (or a bundle out of it) to the targeted customers. Questions about e.g., the distribution strategy, distribution structures, sales channels and their alignment, players involved and how they are embedded in the sales organisation may be important to address. E.g., hydrogen powered vehicles can be distributed by short term rental, longer term leasing or basically by the simple purchase of the vehicles. Those mobility solutions require different forms of financing as well. Besides that, vehicles are products with special characteristics in terms of the need to get repaired and maintained. These activities may therefore to be included in the investigation of competitive business models of some actors.
- ✓ Value proposition (What about cost advantages or disadvantages? How may differentiation advantages be generated by offering logistic solutions without emissions?), value creation (Which actors on different market sides are involved?) and value capture (How can revenue models be designed?) are relevant elements of the business models to be mapped, investigated and evaluated. Here relevant resources and competences of the actors on different market sides have an impact on efficiency-oriented and strategic advantages. In addition, locational specificities may have to be included in the business model analysis and may lead to different value propositions and business models in the context of the conditions (technical, environmental, economic, etc.) of the markets in the respective (1) countries and (2) regions.

Thus, the idea is that in your papers you may go into different directions along the elements sketched above and lay the focus on market structure, product market fit [or strategy], value proposition and capture or regional differences as starting points for posing relevant questions and answering these for the case you explore in your team.

The final goal of this course is the production of a paper dealing with one of the cases in a team of students from the different locations (please see the course guidelines for the research papers for relevant specifications). The student groups are also required to give presentations about their research online and in-person. Next to the Credit Points given for the course at the different Universities, the students get a joint certificate signed by the partners about their participation in the project.