Abstract :

The Additive Manufacturing (AM), popularly known as 3D printing, is constantly evolving and is already regarded as a basic technology for the economical production of individual parts. The digital process chain and the dynamic use of production resources due to the universal application possibilities offer a particularly high degree of flexibility in the production processes. The new geometric freedom for manufacturing parts represents a further added value for manufacturing companies in the design of components, which is particularly advantageous in the field of lightweight construction. As a result, this manufacturing technology is on the threshold of industrialization.

Inexperience and lack of knowledge in the use of this technology, represent a hurdle for the integration of this manufacturing technology into the industry, with the effect that companies are hesitant in adopting this manufacturing process. This results in the need for taking decisive steps to integrate AM processes into industrial information systems in order to enable efficient and effective use of this manufacturing technology on an industrial scale. The handling of production resources is carried out internally by information systems such as the Enterprise Resource Planing System (ERP) for the time- and demand-oriented provision of resources and the Production Planning and Control (PPC) for the efficient use of production resources. A major obstacle for the integration of this manufacturing technology is therefore the lack of PPS support, which must be adapted to the changes caused by the new digital process chain and the special features of this technology. In this research project, this problem is considered and analyzed according to the Design Science research methodology and an artefact is developed as a solution. The literature analysis examines the special features of AM and presents them from an entrepreneurial production point of view on the one hand and shows the tasks of the PPC information system on the other hand to transfer them into the context of the adaptation of AM. The transfer takes place as the design of an artifact that forms the core of this research work. The developed artefact is then implemented and tested by simulation runs with artificial business data to determine whether it offers a suitable solution to the problem from the entrepreneurial point of view. In addition to the problems described above, the new possibilities offered by the use of AM as a plannable operational production resource are also highlighted and taken into account. Current digital technology drivers such as the blockchain, the Internet of Things and machine learning are considered and show how these can further increase the entrepreneurial potential for the use of AM and how new innovative business processes can be created through the combination of new digitisation technologies and technical innovations through their joint application.

Relevant publications

1. Schuhmacher, Jan, Baumung, Wjatscheslav and Hummel, Vera. "An Intelligent Bin System for Decentrally Controlled Intralogistic Systems in Context of Industrie 4.0". Procedia Manufacturing 9 (2017): 135–42. https://doi.org/10.1016/j.promfg.2017.04.005, indexed by Scopus

2. Baumung, Wjatscheslav, and Fomin, Vladislav V. "Optimization Model to Extend Existing

Production Planning and Control Systems for the Use of Additive Manufacturing Technologies in the Industrial Production". Procedia Manufacturing 24 (2018): 222–28. https://doi.org/10.1016/j.promfg.2018.06.035, indexed by Scopus

3. Baumung, Wjatscheslav, and Fomin,VladislavV. "Increasingtheutilizationofadditiveman- ufacturing resources through the use of blockchain technology for a production network". CEUR Workshop proceedings 13 (2018): 134-141. https://hdl.handle.net/20.500.12259/36849, indexed by Scopus

4. Baumung, Wjatscheslav, and Fomin, Vladislav V. "Framework for Enabling Order Manage- ment Process in a Decentralized Production Network Based on the Blockchain- Technology". Procedia CIRP 79 (2019): 456–60. https://doi.org/10.1016/j.procir.2019.02.121, indexed by Web of Science, Scopus

5. Baumung,Wjatscheslav,Glöckle,Herbert,andFomin,VladislavV."BlockchainalsEnabler eines dezentralen Produktionsnetzwerkes". Industrie 4.0 Management (2019): 39–42. https://doi.org/10.30844/I40M_19-1_S39-42