2017

Dynamic Modelling of Production Supply Chains of Small and Medium Enterprises with Large Original Equipment Manufacturers in DIGICOR

Asia Ramzan
University of Manchester, asia.ramzan@manchester.ac.uk

Sonia Cisneros-Cabrera
University of Manchester, sonia.cisneroscabrera@manchester.ac.uk

Pedro Sampaio
University of Manchester, P.Sampaio@manchester.ac.uk

Nikolay Mehandjiev
University of Manchester, n.mehandjiev@manchester.ac.uk

Dynamic Modelling of Production Supply Chains of Small and Medium Enterprises with Large Original Equipment Manufacturers in DIGICOR

Asia Ramzan, Sonia Cisneros-Cabrera, Pedro Sampaio, Nikolay Mehandjiev

Alliance Manchester Business School, The University of Manchester, Manchester, United Kingdom
Email: {asia.ramzan, sonia.cisneroscabrera, P.Sampaio, n.mehandjiev}@manchester.ac.uk

Manufacturing industries are developing collaboration platforms, tools and services for the setup and management of production supply chain networks. The supply chain systems of large manufacturers are complex and participating in them is often onerous for small and medium enterprises (SMEs), because of the complexity involved in integrating SME services and systems with the platforms of Original Equipment Manufacturers (OEM), and because of the SMEs capacities being unable to fulfil OEMs requirements on their own. Our research aims to alleviate this problem and create a new approach for collaborative setup and management of dynamic supply chain networks, which will be exemplified in a platform developed within the DIGICOR[1] European Union (EU) funded project. The solution we propose envisions a platform which will support the dynamic modelling of systems and services provided by SMEs and integrating them in the dynamic supply chains of large OEMs, enforcing case-specific governance rules, and procedures for knowledge protection and security, supported by Industry 4.0 solutions [1]. As such, DIGICOR will make new businesses opportunities available to SMEs through collaboration. DIGICOR will support the efficient formation and management of SMEs joining together to fulfil an OEM request and realise a business opportunity. To facilitate adaptation to changing requirements, the platform will be open, allowing third parties to add tools and services and provide seamless connectivity to new real-time data sources across the network. Together with other features envisioned for the DIGICOR platform, we expect our approach to have a significant impact, facilitating the participation of SMEs in the future of digital manufacturing.

The creation of a platform providing such a support requires an extensive analysis of SME requirements, and the challenge is to design an optimal solution that satisfies the needs of all the stakeholders involved, whilst at the same time covering all aspects of supply chain formation in a manner aligned to the Industry 4.0 paradigm. For this, our research considers the opinions and requirements of OEMs and SMEs within the automotive and aerospace Industry to support the initial stages of DIGICOR, integrating machine-to-machine (M2M) communication and even connecting shop-floor data in real time to our specialised tools for partner profiling and search. We are also focusing on tender decomposition where we coordinate the contributions of multiple parties in a collaborative planning fashion; and on providing the team formed with resilience and adaptive capabilities able to cope with the dynamic environment. Our approach and platform is illustrated in Figure 1 to have a significant impact, facilitating the participation of SMEs in the future of digital manufacturing. Our extensive analysis of existing platforms and technologies in this area has revealed that current systems do not have effective mechanisms for supporting SMEs in forming partnerships [2], and instead rely on vertically integrated Industry 4.0 adoption models to deliver some level of agility and product personalisation. DIGICOR will address these gaps and support collaborations from the setup to the termination, integrating technological means to aid the whole production supply chain towards advancing on the fourth industrial revolution vision in an open and flexible manner.

[1] Decentralised Agile Coordination Across Supply Chains (DIGICOR), www.digicor-project.eu

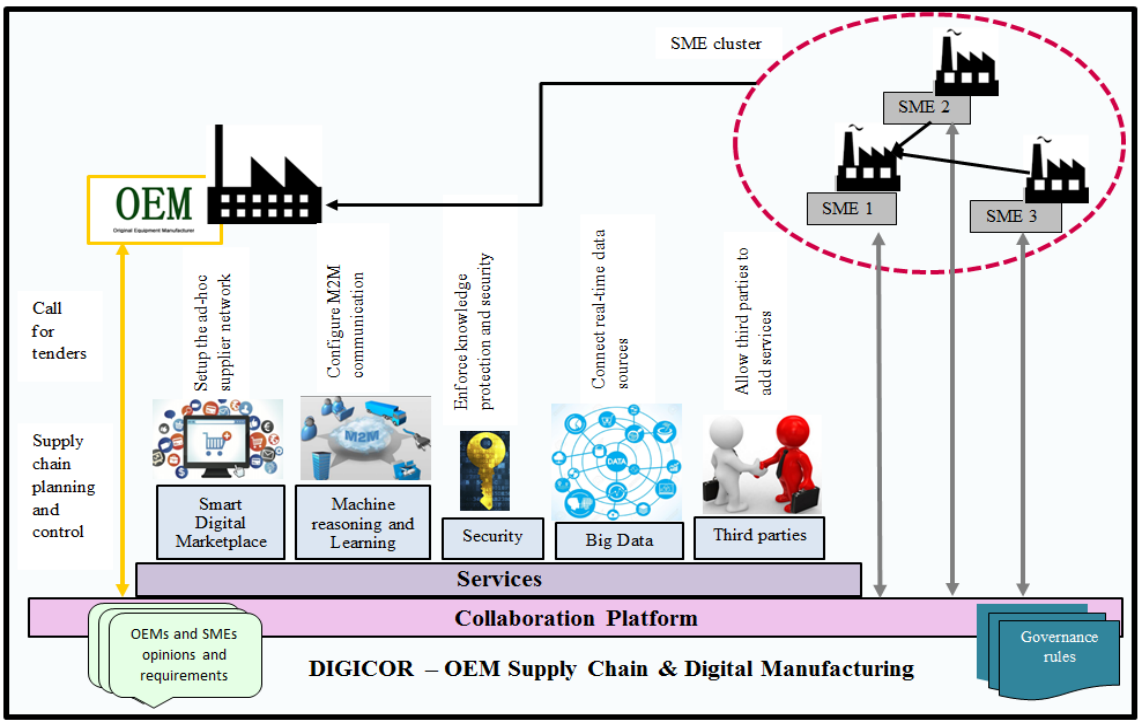

Figure 1: DIGICOR platform illustration

Keywords: Small and Medium Enterprises, Original Equipment Manufacturer, DIGICOR, platform, supply chain systems

References

[1] Keliang Z., Taigang, L., Lifeng Z., 2015 Industry 4.0: Towards future industrial opportunities and challenges, 12th International Conference on Fuzzy Systems and Knowledge Discovery (FSKD), 2147-2152, IEEE.

[2] Cisneros-Cabrera, S., Ramzan, A., Sampaio, P. and Mehandjiev, N. 2017 18th Working Conference on Virtual Enterprises: Proceedings of 18th Working Conference on Virtual enterprises. Springer, LNCS Service Science Series, 10 p.