WORLD MANUFACTURING FOUNDATION

BACK TO THE FUTURE

EMERGING TOPICS FOR LONG-TERM RESILIENCE IN MANUFACTURING

THE EVOLVING ROLE OF COMPETENCE CENTRES FOR LONG-TERM RESILIENCE IN MANUFACTURING

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October 2021

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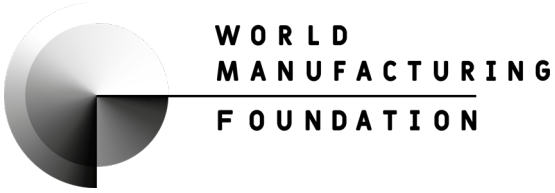

This whitepaper, published in October 2021, is part of the "Back to the Future: Emerging Topics for Long-Term Resilience in Manufacturing" initiative, promoted by the World Manufacturing Foundation, a non-profit organisation with a mission to spread industrial culture worldwide. The initiative involved global focus groups, each exploring a relevant theme for building a resilient manufacturing sector. Each focus group developed a whitepaper identifying key propositions to enable the manufacturing community to thrive in the long term.

The views and opinions expressed by whitepaper contributors are given in their personal capacity and do not necessarily reflect the views of the organisations for which they work or committees of which they are members.

For more information on the project and to read other topic-focused whitepapers that are part of the initiative, please visit https://worldmanufacturing.org/report/back-to-the-future-emerging-topics-for-long-term-resilience-in-manufacturing/

INTRODUCTION

According to the International Labour Organization (ILO), COVID-19-related disruption wiped out $3,500 billion of global income, surpassing the combined impact of all disruptive events that have affected the supply chain over the last 10 years. The challenges are far from over, even though most countries have not been able to quantify the effect of COVID-19, the US Bureau of Labor Statistics reported that in the US, 1.4 million jobs were lost in manufacturing between February- April 2020, and only 900,000 of these jobs had been successfully recovered by June 2021[1]. On the other hand, new opportunities arose for manufacturers, which resulted in the transformation of industries. Manufacturers are trying to embrace incoming turmoil, ensuring safety and security on the shop floor, managing supply and demand disruptions, dealing with competition due to the accelerated digital transformation, and reskilling to build resilience.

The emerging vulnerability of organisations during COVID-19 leads to a different approach for the way forward, as it has to include more resilient systems. The subjects of this study are the role of Competence Centres' effect on the drivers for long-term resilience, the shortcomings of the current dynamics, the capabilities that need to be adopted for future roles, and how these areas can be strengthened by competence centres.

This whitepaper analyses the drivers of resilience, strategies for manufacturing, supply chain, organisations, and financial aspects. Subsequently, it focuses on the role of Competence Centres in long-term resilience.

The document aims to discuss the main problem: Changes beyond organisations' control like COVID-19 have shown the vulnerability of organisations when faced with disruptive changes, therefore a different approach to resilience is necessary.

The World Economic Forum (WEF) surveyed 400 senior executives responsible for manufacturing and supply chain, where only 12% of the companies are sufficiently protected against future disruptions to the supply chain[2]. Organisations lack an immediate response, especially on operations that rely on physical contact and suffer from obscurity in relation to supply and demand fluctuations.

COVID-19 is not the first nor the last disruption that we are going to face. Instability is the new normal for the world's economy. Japan's earthquake and tsunami in 2011, California's wildfires in 2018, and the Suez Canal blockage in 2021 are just a few examples from the last 10 years[3].

The global chip crisis has shown that we are all connected to such a degree that there is no such organisation that will not be affected by disruptions. In the study of the drivers of resilience, we examined four areas, manufacturing, supply chain, organisational and financial resilience.

CONTEXT

Manufacturing

More than ever, manufacturers have been under the pressure of highly customised orders, shorter lead times, and high-quality standards, compared to the pre-pandemic era. Increasing operational efficiency and being more responsive to upcoming trends or potential disruptions is key. Although production is dependent on the input material, there are additional uncertainties to handle on the shop floor. From a resilience point of view, the flexible manufacturing system architecture allows and maintains production continuity. In addition, advanced production planning has a vital role in responsive actions during risk mitigation. Continuously improving new technologies and advanced planning tools throughout the entire product line are developing possible solutions to respond to fluctuations in demand in real time. Since most of

the operations still rely on humans, absenteeism and workforce health & safety need to be addressed by company decision-makers. During these disruptions, workforce flexibility, where operators can effectively work in different positions, is critical for agile manoeuvres on the production line. For example, supporting the production processes with operator assistance systems and effective workforce development programmes with a lifelong learning approach has recently become essential for maintaining manufacturing resilience.

The operations should be transparent to optimise production planning and comply with customer deadlines. Transparency on the shop floor can offer many capabilities to overcome challenges such as optimised energy consumption, smart operator position allocation, and material efficiency.

Data governance of the operations which are fed with seamless connectivity in every aspect from operation to information level plays a critical role for effective management of production. Manufacturers can optimise production planning by considering material shortcomings, available operators, and machine availability. Effective planning and scheduling allow manufacturers to respond to the unknowns of the ever-changing "new normal" with real-time data transparency.

Supply Chain

On average, a local or global disruption can be anticipated every 3.7 years, averaging across industries. The supply chain consists of three components, organisation, customer, and supplier. In the hyperconnected world that we are facing right now, supply chain resilience is evaluated under short-term and long-term response strategies. Time To Recovery (TTR) and Financial Impact are key parameters; TTR is defined as regaining companies' usual level of performance, while total performance loss is defined under financial impact during a disruption[4].

Adaptation is the key for response strategies, according to Belhadi et al, localisation and regional ecosystem, fourth industrial revolution technologies, big data analytics-driven real-time information systems, and digital connectivity are the most preferred response strategies (over 80% prioritisation) for risk mitigation by executives in the automotive industry[5]. A regional ecosystem such as an industrial site that leverages resources nearby with neighbouring cities and advanced technologies would help solve transportation and communication difficulties in times of emergency.

A critical milestone in long-term supply chain resilience improvement is the development of capacities to review and increase awareness of potential supply chain vulnerabilities. According to a study by the OECD, policymakers should put mechanisms in place to detect and anticipate crises[6]. Considering the supply chain, policymakers and manufacturers should have different lenses to identify the risks during their analysis, which should be done at a local, regional and global level to be prepared for the possible butterfly effects. An executive who is responsible for the global supply chain should also follow the local and regional suppliers to have a backup plan at all times. Hence, having end-to-end transparency and an integrated supply chain streamlines the critical business decisions such as responsiveness. Embracing risk management as a key procedure, integrating transparency as a technique accompanied by collaboration from the local suppliers will help bring about responsiveness. This would account for a common data space, which would in turn enable the stakeholders throughout the value chain to be more robust and agile. Emerging technologies can absorb the effect on critical situations, such as scenario planning, demand forecasting, or the setting up of a buffer system. Big data analytics has been a tremendous help to several businesses in enhancing information processing and streamlining their supplier selection process. Manufacturers are evolving their just-in-time strategies to a hybrid model, where it is possible to increase buffer levels in the event of disruption through heavy bulk

procurement. Backing up critical parts with multiple suppliers to reduce risk is embraced more and more every day.

Organisation

Organisational resilience relies on workforce readiness. Companies are facing a key challenge for the future of manufacturing to upskill their workforce. According to the 2019 WMF Report, companies have selected 'attracting and retaining a quality workforce' as the biggest challenge for business, at 71.3%[7]. Creating a human-centred work environment that is rooted in merit, not hierarchy, would help respond to this challenge. A merit-based work environment can be reached by boosting upskilling within the organisation. Organisational readiness is also built on effective business management and understanding the core competencies of the organisations in the era of continuous technological development. Effective business management and understanding the core competencies of the organisations are the determining factors of the winners in digital transformation. Choosing the best technologies according to the value propositions and developing the skills required along with a solid methodology that is linked with companies' cost profile, essential business objectives, and continuous benchmarking with the competition will enable organisations to build on their existing models.

According to a McKinsey survey, executives' mindset on technology's strategic importance has changed drastically during the crisis; the importance of transparency via digital solutions through the entire value chain became a strategic objective for long-term resilience[8].

Strong leadership skills and mindset will drive resilience within the organisation while adopting digital solutions and new technologies. The focal point should be to increase added value with technology which accounts for business literacy at management level, and an integrated approach to technology with the core competencies. Technological advancements should be adopted at every level of the organisation; its effectiveness can be reaped when it is utilised, therefore again underlining the organisational aspect of resilience. On the other hand, leadership competency will be complemented with enhanced workforce learning in a lifelong-learning mentality to secure the talent readiness of the organisation during any disruptive changes. With this mindset, organisations can gain flexible adaptation skills which lead to being responsive to the new challenges by teaching organisation members how to learn instead of how to use.

Increasing collaboration with stakeholders within the organisation, as well as with suppliers, increases the agility of an organisation. Creating win-win strategies with external stakeholders can go beyond trade in extreme conditions. For example, toilet paper manufacturers during the pandemic shared resources to address the increased demand of individuals and communities, which is considered a social responsibility. Thanks to resource sharing, manufacturers were able to supplement the inadequate raw materials of other manufacturers, which increased the availability of raw materials to produce more finished goods[9].

Financial

Regarding the financial aspect of resilience, financial literacy, which directly contributes to understanding financial management, could be emphasised within organisations' agendas.

Focusing on financial resilience through assessments for volatile scenarios and defining supplier pooling identification to ease integration will bring great benefit for insurance progress to address the risk level as well.

During disruptions, companies should quickly access additional capital and adjust the cost base. While remaining cash positive, manufacturers need to create buffer inventories, subsidise key suppliers to ensure input materials to continue production, increase go-to-market channels and customer base, and fund digital transformation projects for operational excellence. However, most funding tools are specifically

targeted at financing the implementation phase. This is not helping companies (especially SMEs) during the problem definition and design phases of the project.

OEMs and suppliers should be able to collaborate more in terms of cost reduction via digital transformation projects and share the risks and rewards for long-term resilience. Compared to larger companies, SMEs often have lower visibility and negotiating power to establish such partnerships. For getting SMEs and vendors together, OEMs could leverage the buying power for their suppliers and partially finance some of the projects. These clustered initiatives are usually incentivised by governments for local suppliers, which will increase the resilience of the ecosystem.

OPPORTUNITIES AND RECOMMENDATIONS

Role of Competence Centres

Most of the participants in the focus group who come from different regions of the world acknowledged that academia and industry are not communicating well with one another. Academia may sometimes not be aware of the needs of industry and in some cases, is unable to keep up with upcoming trends due to different priorities. Continuously revising the learning and development curriculums and enhancing communication with industry such as collaborations for governmental financial grants will benefit academia, future generations, and industry. Besides governmental incentives, Competence Centres could play a role as organisations to bring academia and industry together; this could create common ground for innovation and solutions.

Another conclusion that was reached was the lack of continuous communication in the industry. According to the categorisation the WEF introduced in the "2018 Readiness for the Future of Production Report" as "leading countries", participants repeatedly indicated the lack of long-term vision in terms of skill requirements and the required outcome[10]. Even though these organisations have the financial resources, the resources were often not used correctly, hence the need for business management and ground where you can see the solutions. This is where Competence Centres come into play.

Competence Centres can actively play the role of orchestrator between academy and industry. To attend to the differentiating needs of the ecosystem, Competence Centres need to be agile themselves.

Through their role as a training partner, they should be able to keep their finger on the pulse of future technologies in different industries, and of developments in the industry, and be able to assess their digital transformation potential. The digital blueprint should include maturity assessments and road-mapping, capability building, hands-on experience, and a strong ecosystem. Policymakers can use the findings from the maturity assessments of companies in the same sector, or in the region or value chain to better craft policy interventions and also make the right allocation of limited resources for incentives.

Adaptability became one of the top skills in manufacturing, thus lifelong learning for upskilling should be embraced. Different positions should have customised learning paths that are tailored to different learning styles that do not only consist of hard work skills, but also soft skills. To encourage this practice an AI aggregator could be created. Upon collecting and organising market demand data, these AI algorithms might advise on whether they should reskill or upskill for a new profession.

Providing real practical examples of what a "factory of the future" is, how it works, what it generates in terms of value, and how state-of-the-art technologies are deployed, helps to make digital transformation more tangible for decision-makers.

The industry needs integrated solutions where Competence Centres should provide solutions to industry problems with technology leaders. Model factories provide tested technology use cases as reference points. OEMs and suppliers can access a large ecosystem of solution providers while getting benefits from the technical description, addressed key performance indicators and return on investment (ROI) estimations for their digital transformation projects.

Specialisation of the Competence Centres would help in answering the different needs of organisations. In addition, enhanced communication to share best practices and case studies would drive resilience.

Competence Centres are discussed in the role of long-term resilience in the discussion groups. Government, academia, technology companies, industry, and other Competence Centres are the five pillars in shaping the complete strategy in every aspect mentioned. Thus, communication and collaboration opportunities between pillars are itemised (Figure 1).

Government Competence Centre relationship is emphasised under enhancing the regional trustworthy role in data governance of the SME ecosystem, and the related incentives to create joint collaborative studies between pillars to secure infrastructure readiness. Competence Centres' networking capabilityand the recognition of industry needs ensures transparency and showing the gap analysis to the government level.

Academia Competence Centre connection has a direct impact on talent readiness and sustainability for long-term resilience. Competence Centres' capability building and direct communication with industry create the synergy to define work-integrated learning to students. Competence Centres can also become multitier information providers to build lifelong learning and upskilling programmes in collaboration with academia for sustainable dissemination.

Technology Companies Competence Centres are in a relationship as the pioneers and disseminators of long-term resilience. The testbed ground of Competence Centres brings the opportunity to create innovations in the R&D perspective, transform to pilot cases, and spread tangible results for resilient applications.

Industry Competence Centres are in close contact for digital transformation. In terms of resilience building, there are also joint studies for risk mitigation and response strategies between Competence Centres and the industry. Increasing leadership business literacy is key for awareness. Competence Centres are now consultants for the industry. In managing long-term resilience, Competence Centres provide strategic guidance on coming trends, assess companies to define current situations, and present unique solutions through model factories.

Competence Centres (CC) are founded by different resource-based pillars. NGOs, the private sector, academia, and government are major focal pillars around the world. CC-CC's seamless dialogue prepares society for knowledge of sustainability. CCs specialised in different regions reveal differentiation as well as lead synergy opportunities for collaborative study to understand cultural diversity. It is important to prepare society for long-term resilience.

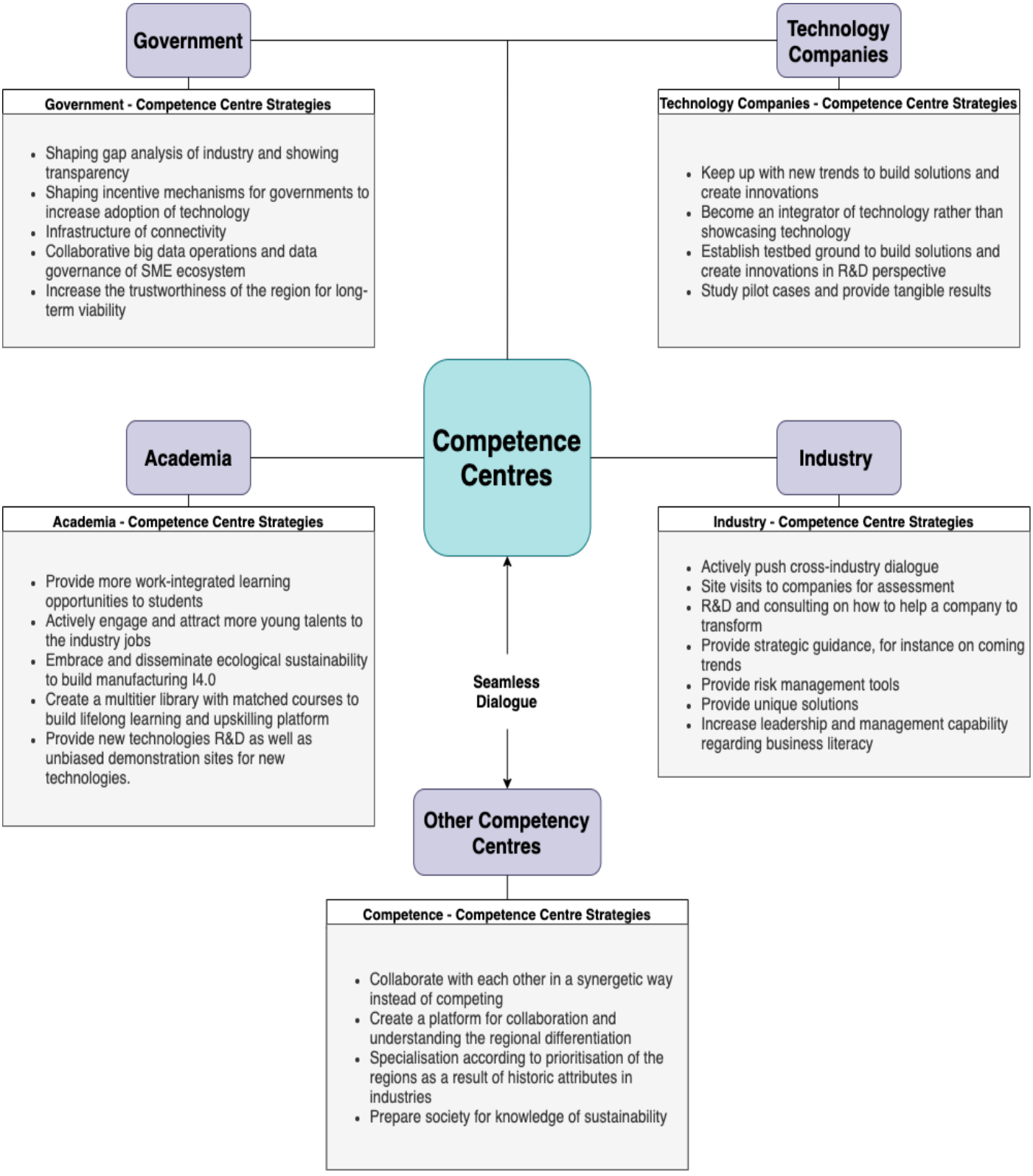

Figure 1: Competence Centres' Role

CONCLUSION

The subjects of this study are the role of Competence Centres' effect on the drivers for long-term resilience, the shortcomings of the current dynamics, the capabilities that need to be adopted for future roles, and how these areas can be strengthened by competence centres.

The effects of COVID-19 are not over and disruptions in the supply chain will continue; however, manufacturers need to accelerate their efforts to gain long-term resilience. One of the shortcomings of the current dynamics was the application of one-size-fits-all strategies. Companies need to acquire a custom strategy to address their target areas of innovation and corresponding strategic objectives. Manufacturing companies' value propositions lie in manufacturing, not the technology itself. Knowing this, technology should be used as a tool to solve problems. One of the capabilities that could be adopted is real-time data transparency that facilitates decision-making, both on the shop floor and in the supply chain. Another is analysing the problems and fostering ground for newer technologies, not just proactive ones but predictive and preventive solutions will increase resilience in all aspects.

Change is inevitable and acquiring the mindset of reskilling, adapting to change, and constant upskilling are crucial in long-term resilience. The workforce should be integrated into the decision-making process through 360-degree decision-making. Besides individual efforts to become more resilient, collaboration among stakeholders helps both parties. Academia, policymakers, OEMs, and suppliers should be able to act together for long-term resilience where extreme conditions like COVID-19 have been a great example to show that even competitors can share resources when needed.

Competence Centres can become hubs for defining a policy framework to accelerate the digital transformation of manufacturers.

Competence Centres can help manufacturers in providing digital maturity assessments, showcasing different technologies, and tested, proven use-cases with a wide ecosystem network, supported by the different and continuously updated curriculum. Lifelong learning for upskilling should be addressed by these centres, as they are interacting with all the key stakeholders in various initiatives.

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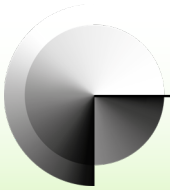

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