Developing resilient plastics manufacturing supply chains for sustainability

Dr Michael W. Zhang

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NBS Nottingham Business School
Nottingham Trent University

Organisation of the presentation

- Context of today's presentation
- The role of the plastics industry in the global Grand Challenges
- Plastics manufacturing and supply chains for sustainability
- A network perspective
- The factor of trust in supply chain relationships
- Building and nurturing micro-structural ties
- Conclusion and takeaways

The context

- One of the BPF highlights in 2024: GRIPS (Global Research and Innovation in Plastics Sustainability) in Sheffield
- Proud history of BPF since 1933 and the oldest plastics trade federation in the world, still influencing the global plastics trade
- The grand challenges the world plastics industry faces today are sustainability in general and plastic pollution in particular
- In addition, current trade wars and regional conflicts have great impacts on the global supply chains
- As a result, the need to adjust and realign supply chains becomes imperative
- The critical question is How to build resilient supply chains

Source: BPF website

Source: WEF 2024

Some facts

- the average annual consumption of plastics in western Europe is about 150 kg per person, 2.5 times of the global average of 60 kg (EEA, 2024)
- the consumption trend has been accelerating since 2000, but only 9% of the plastics is recycled and 12% incinerated (EEA, 2024)
- every year we (humans) release 19-23 million tonnes of plastic waste into the world aquatic ecosystem (UNEP, 2024)
- furthermore, it is estimated that the global plastics industry will contribute to 20% of the total oil consumption and 15% CO_2 emissions by 2050 (WEF, 2024)
- plastic pollution is persistent and may take 100 or even 1000 years to decompose (EPA, US)

Source: The Guardian

Source: World Bank

Source: EPA

The timeline of our current plastic crisis (UNEP, 2024)

- From the 1950s to the 1970s, plastics production was in small scale and plastic waste did not become an issue of concern
- Between the 1970s and the 1990s, plastic waste was tripled.
- The plastic waste generated in the 2000s was more than the total of the previous four decades.
- Now we produce 400 million tonnes of plastic waste annually.

Innovations and new business models

- BPF members have made great strides in innovations in technologies and business models in transforming the plastics industry and redefining productivity (see BPF website for details)
- BPF members can also influence the global plastics industry by building resilient supply chains to overcome disruptions and improve competitiveness and collaboration

Supply chain disruptions

- Most supply chain disruptions, 58%, are caused by the first-tier suppliers (Business Continuity Institute, 2013, cited Scholten and Schilder (2015))
- Conventional approach to such disruptions is developing supply chain risk management systems
- Nonetheless, increasing uncertainty (pandemic, trade wars, regional conflicts, and global climate change, etc.) adds increasing complexity in the management of global supply chains (Supply Chain Quarterly, October 2023)
- What we need now is considering the formulation as well as implementation of proactive strategies of building supply chain resilience

Definitions

According to Christopher and Peck (2004, p. 2, bold added), a supply chain is "**the network** of organizations that are involved, through upstream and downstream linkages, in the different process and activities that produce value in the form of products and services in the hands of the ultimate consumer".

Source: Demand Solutions Europe

Definitions (cont.)

Furthermore, they define resilience as “the ability of a system to return to its original state or move to a new, more desirable state after being disturbed” (ibid.) As such they create a resilient supply chain framework with four major factors:

- Supply chain (re)engineering; **Supply chain collaboration**; Agility; Supply chain risk management culture

Source: Flex

Supply chain collaboration: From market transactions to inter-organisational relationship (IOR) management

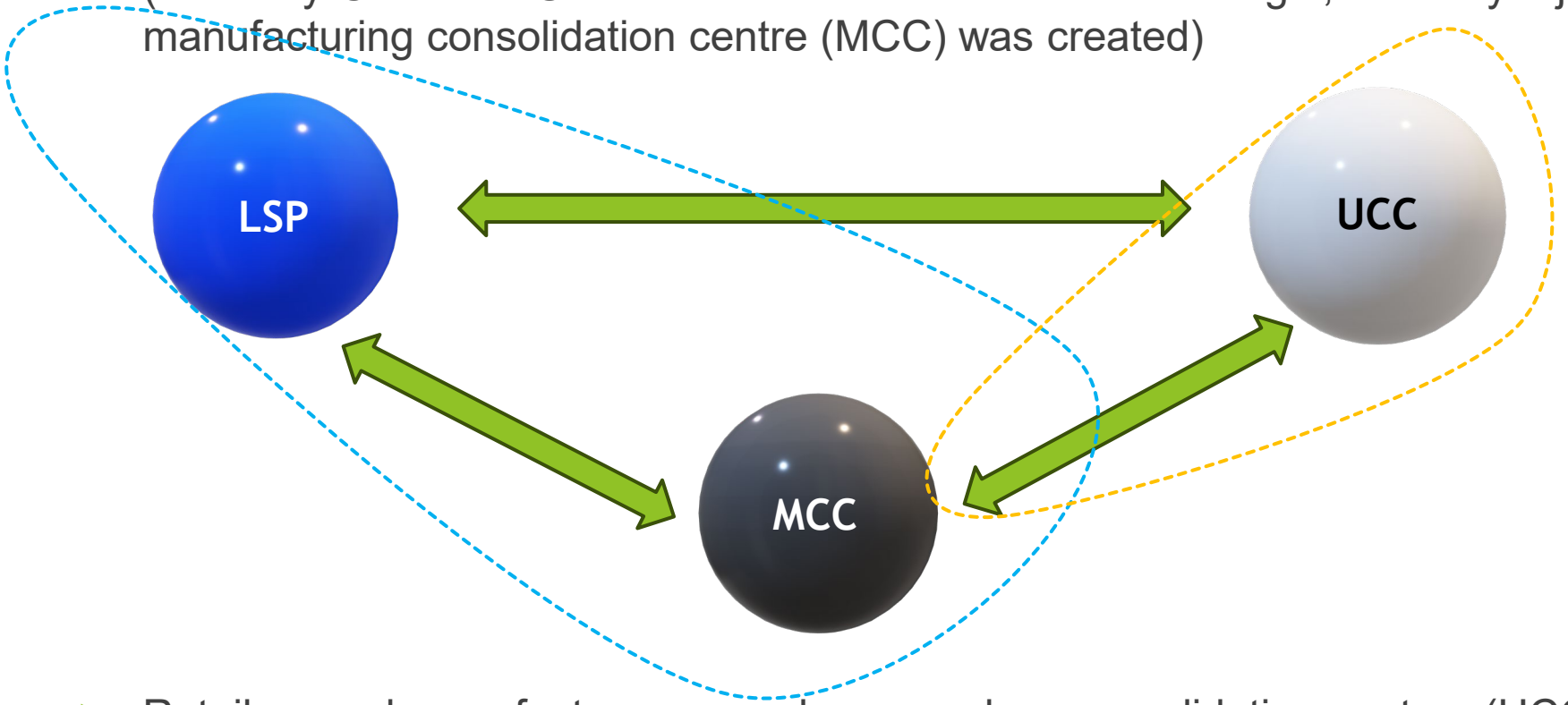
More like horizontal rather than vertical integration, network approach helps identify collaborative opportunities and better manage inter-organisational relationships.

For instance, collaboration between warehouse management systems and transportation management systems can improve operational efficiency and sustainability (Jamili et al., 2022). In their study of order picking and dock door scheduling, they find that collaboration between the two activities leads to 32% decrease in the total tardiness of shipping trucks and an average 61% overall improvement.

Total tardness	Overall performance
- 32%	+ 61%

Forms of supply chain collaboration (Jamili et al., 2022)

- Retailers can find a logistic service provider (LSP) to establish a horizontal collaboration (Kimberly-Clark and Unilever collaborated with Kuehne+Nagel, whereby a joint manufacturing consolidation centre (MCC) was created)



- Retailers and manufacturers can also use urban consolidation centres (UCCs) created by many local authorities, akin to the business model of Last Mile Delivery services in one of my studies (Zhang, 2019)

Competition, cooperation, and collaboration

We argue that possessing both competitor orientation and alliance orientation (Chen et al., 2022; Kandemir et al., 2006) has become a business norm for strategic approach to network partnership, including supply chain, management.

Table 1. Characteristics of Competition, Cooperation, and Collaboration

	Competition	Cooperation	Collaboration
Trust	Arm's length	Secured by contracts	High
Motivation	Extrinsic	Extrinsic	Intrinsic
Information and communications	Tightly held	Selective	Open, shared
Goals	Succeed over competitors	Work together to achieve desired outcomes	Work together to achieve new solutions

Source: adapted from Snow (2015, p. 435)

Trust relationships as micro-structural ties (Zhang, 2018)

- Trust can reduce transaction costs and the level of risk, discourage opportunistic behaviour, and improve partner cooperation (Williamson, 1993; Zaheer et al., 1998; Zhang, 2018).
- A better understanding of the process of building trust, and the functions of boundary spanning will enhance supply chain management through knowledge transfer, innovation, augmentation of social capital, and effective leadership.
- In the process of building trust, I recommend considering the following strategic factors from the perspective of network analysis (a) network governance; (b) ownership structure; (c) resource commitment; and (d) inter-partner relationship management.

I have proposed an analytical framework to examine the relationship between trust/distrust and the levels of uncertainty and complexity, which is pertinent for our discussion of the micro-structural ties for managing supply chain resilience.

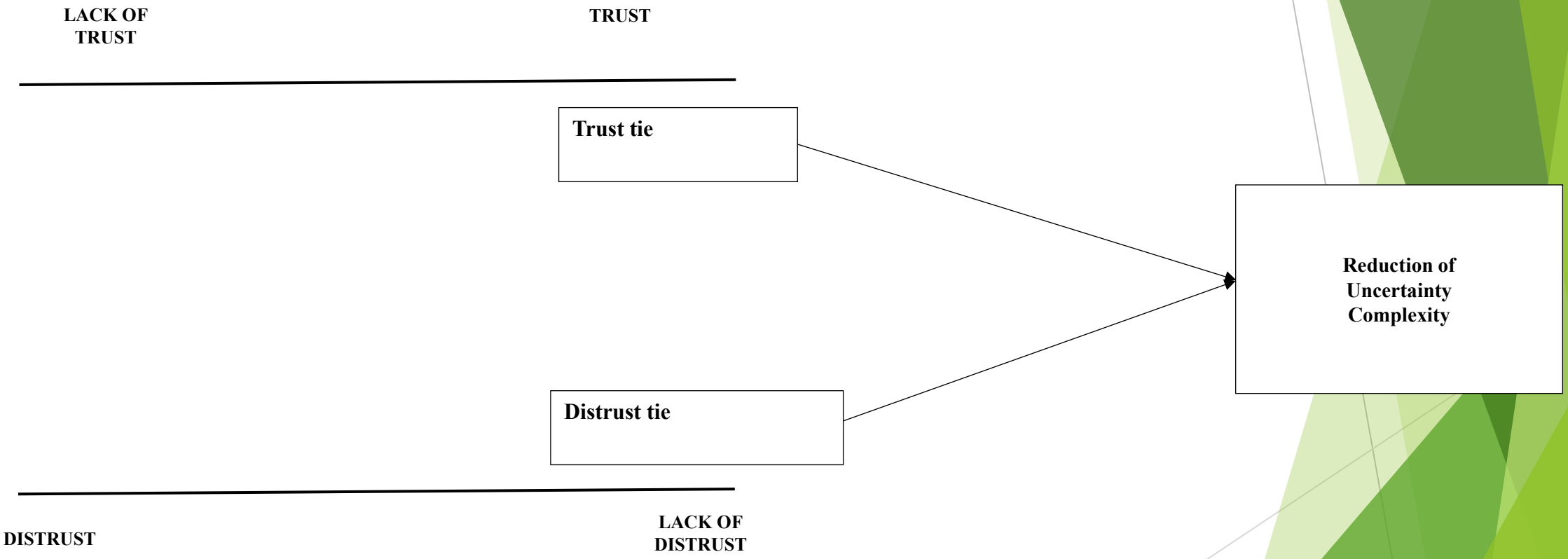


Figure 2.4 Micro-structural Ties of Trust/Distrust Connecting IORs (Zhang, 2018, p. 27)

Some practical implications as takeaways

- For building trustworthy networks of collaborative partners for sustainability you can find information and support from industry/trade networks such as UK Circular Plastics Network (UKCPN) in the UK, and
- Globally the Geneva Environment Network (GEN) where resources are available for businesses on topics of Plastics and the Environment

Thank you for your attention!

Any questions?