Supply Chain Management Industry 4.0: Future Research Opportunities

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Who am I?

- Ferry Jie is the Associate Professor in Supply Chain and Logistics Management, in the School of Business and Law. Ferry is currently a Secretary to the Chartered Institute Logistics and Transport (CILTA) Western Australia (WA) Committee. Ferry is also Supply Chain & Logistics Association of Australia (SCLAA) WA Committee. Associate Professor Ferry Jie has maintained a high quality of research throughout his academic career including international scholarly leadership in the areas of supply chain management and logistics, including being invited to be keynote speaker and to give public lectures at symposiums and international conferences in Indonesia, Malaysia, Vietnam, China, UK and Australia. From 2017 to now, published more than 46 refereed journal articles—including 23 articles in Q1-ranked in the SCImago and 22 articles in Q2-ranked in the SCImago, and 8 refereed conference papers. Furthermore, Dr Jie has received research grants/awards adding up to over $1.85 million between 2010 and 2021.

Recent Research Grants (1)

- Developing a Digital Competencies Framework for the Australian Energy Industry, Asset Institute, Grant, 2021 - 2024, $109,688.
- Business continuity and resilience: capacity building and upskilling post-COVID-19, Department of Jobs, Tourism, Science and Innovation (JTSI), 2020 – 2021, $100,000.
- Managing transport system investment risk: enhancing patronage predictions and adapting strategic asset management and appraisal processes to account for emerging trends and uncertainty, iMOVE Australia Limited, iMOVE CRC, 2019 - 2020, $94,008.
- Optimising regional SME resilience and employment workflow by customer-led (DIY) re-engineering of financial planning and advisory services supply chains. , Edith Cowan University, ECU Industry Engagement Grant, 2019 - 2020, $141,452.
- Examining residents waste source behaviour: an indication of the effectiveness of the three-bin rollout campaign by Joondalup City council, City of Joondalup, Grant, 2020, $90,023.
- Planning intermodal and general logistics infrastructure for the future needs of Perth, iMOVE Australia Limited, iMOVE CRC, 2018 - 2019, $321,200.
- RailSmart Wanneroo Planning Support System, Department of Industry, Science, Energy and Resources, Smart Cities and Suburbs Program, 2018 - 2019, $777,000

Supply Chain Management (SCM), Part 1

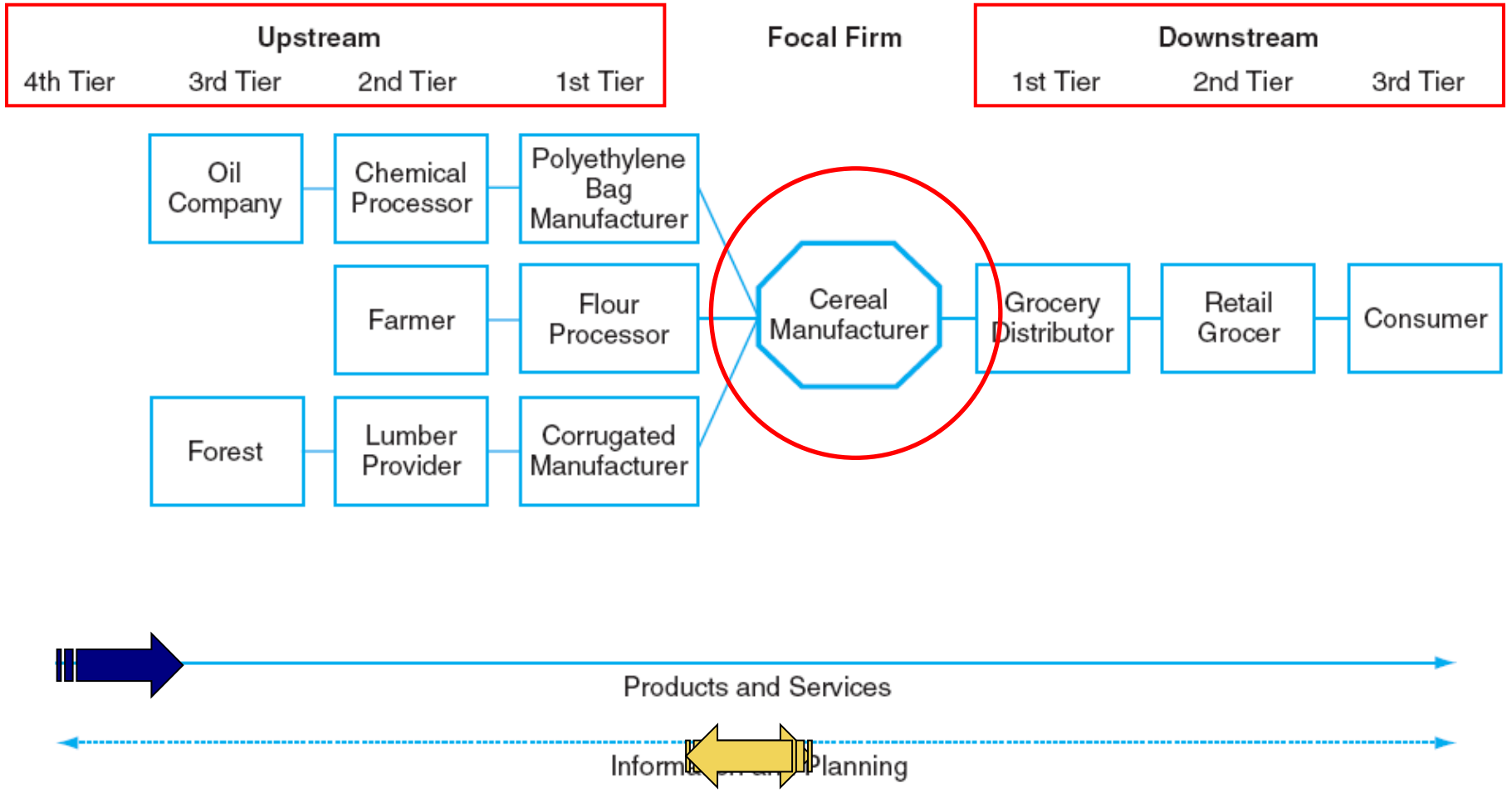
- Management of all activities that facilitate the fulfillment of a customer order for a manufactured good
  - *To achieve customer satisfaction at reasonable cost*
- Requires several operational activities
  - *Working closely with suppliers*
  - *Purchasing*
  - *Transportation*

Supply Chain Management (SCM), Part 2

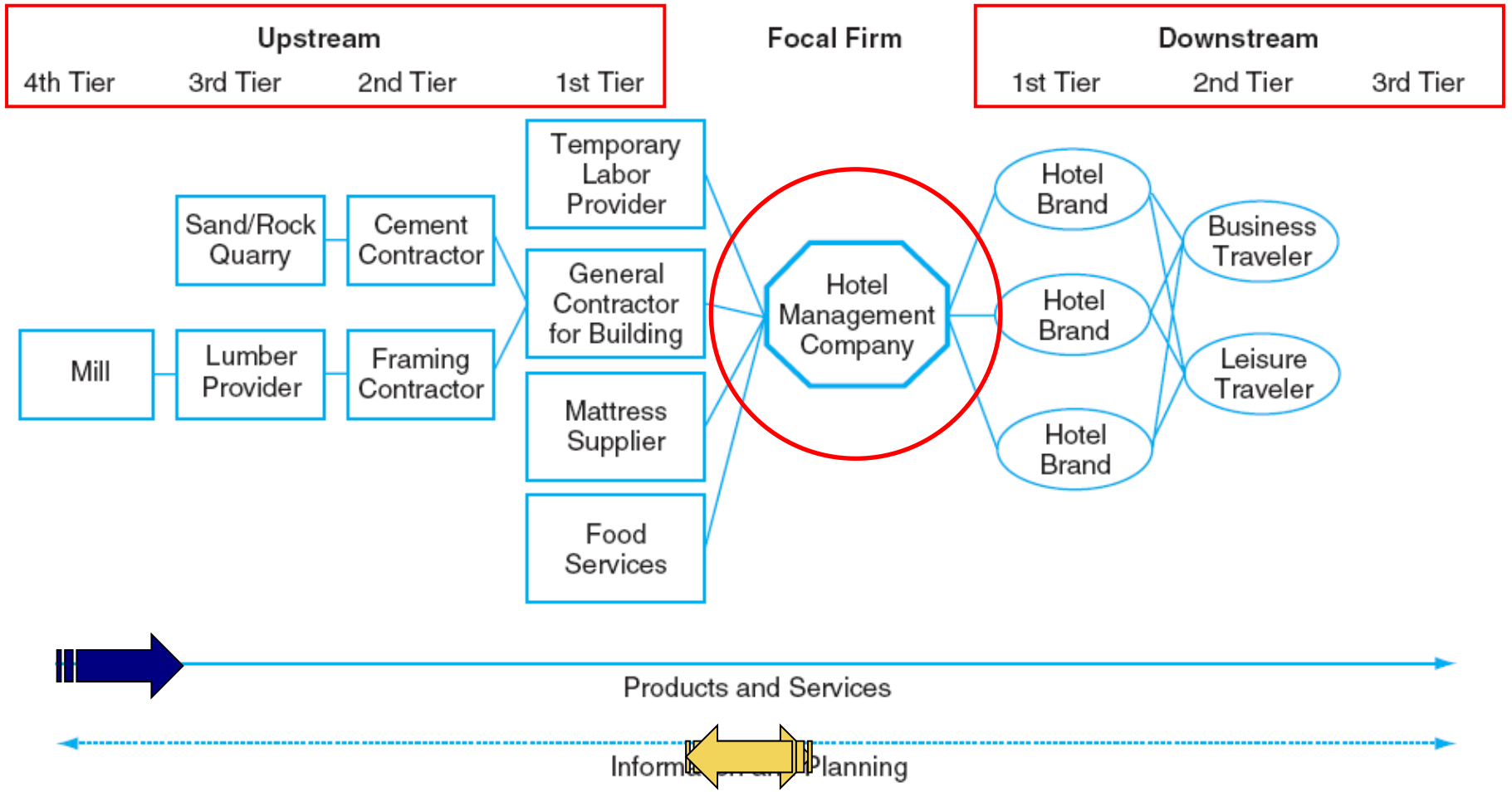
- *Inventory management*
- *Managing risks that may disrupt the supply chain*
- *Measuring supply chain performance*
- *Ensuring sustainability*

- *https://www.youtube.com/watch?v=00wOf3xEQD4 DHL Data Analytics*
- *https://www.youtube.com/watch?v=wYchTbJ36bk Logistics firm enables big data and analytics to transform supply chain management*

Supply Chain: Manufacturing Example



Supply Chain: Service Example



What is Supply Chain Management?

The planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities … also includes coordination with channel partners, which can be suppliers, intermediaries, third party service providers, and customers.

Council of Supply Chain Management Professionals

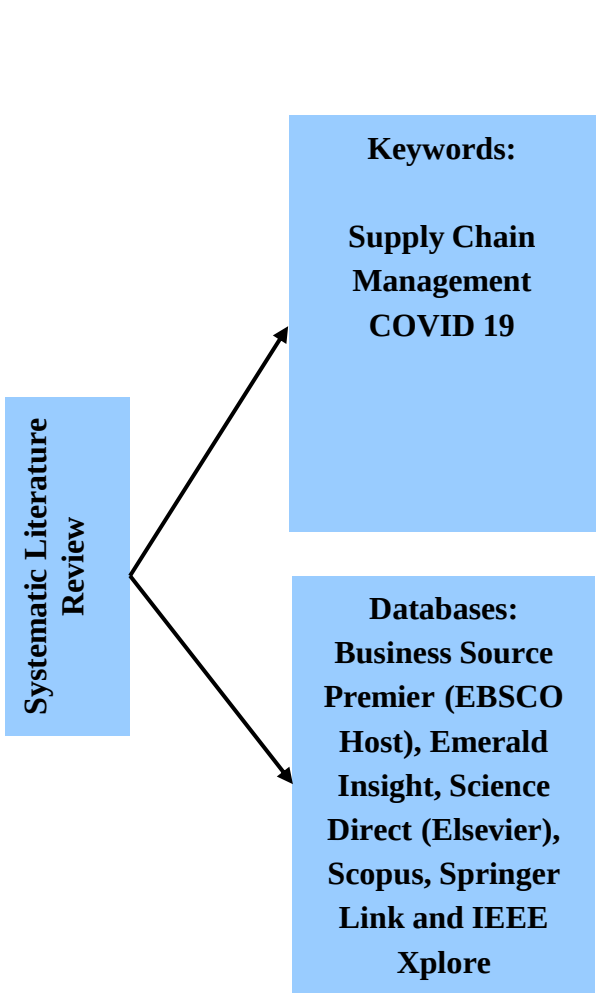
The design and management of seamless, value-added processes across organizational boundaries to meet the real needs of the end customer.

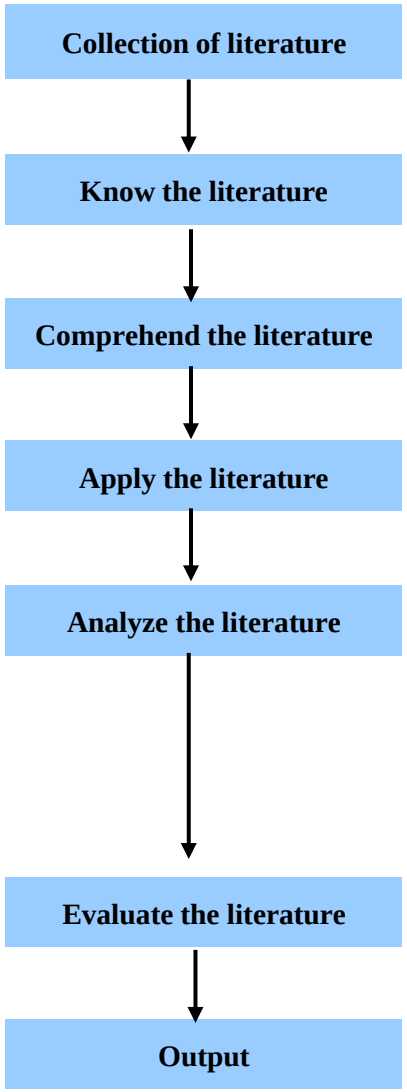
Institute for Supply Management

The design, planning, execution, control and monitoring of supply chain activities with the objective of creating net value, building a competitive infrastructure, leveraging worldwide logistics, synchronizing supply with demand, and measuring performance globally.

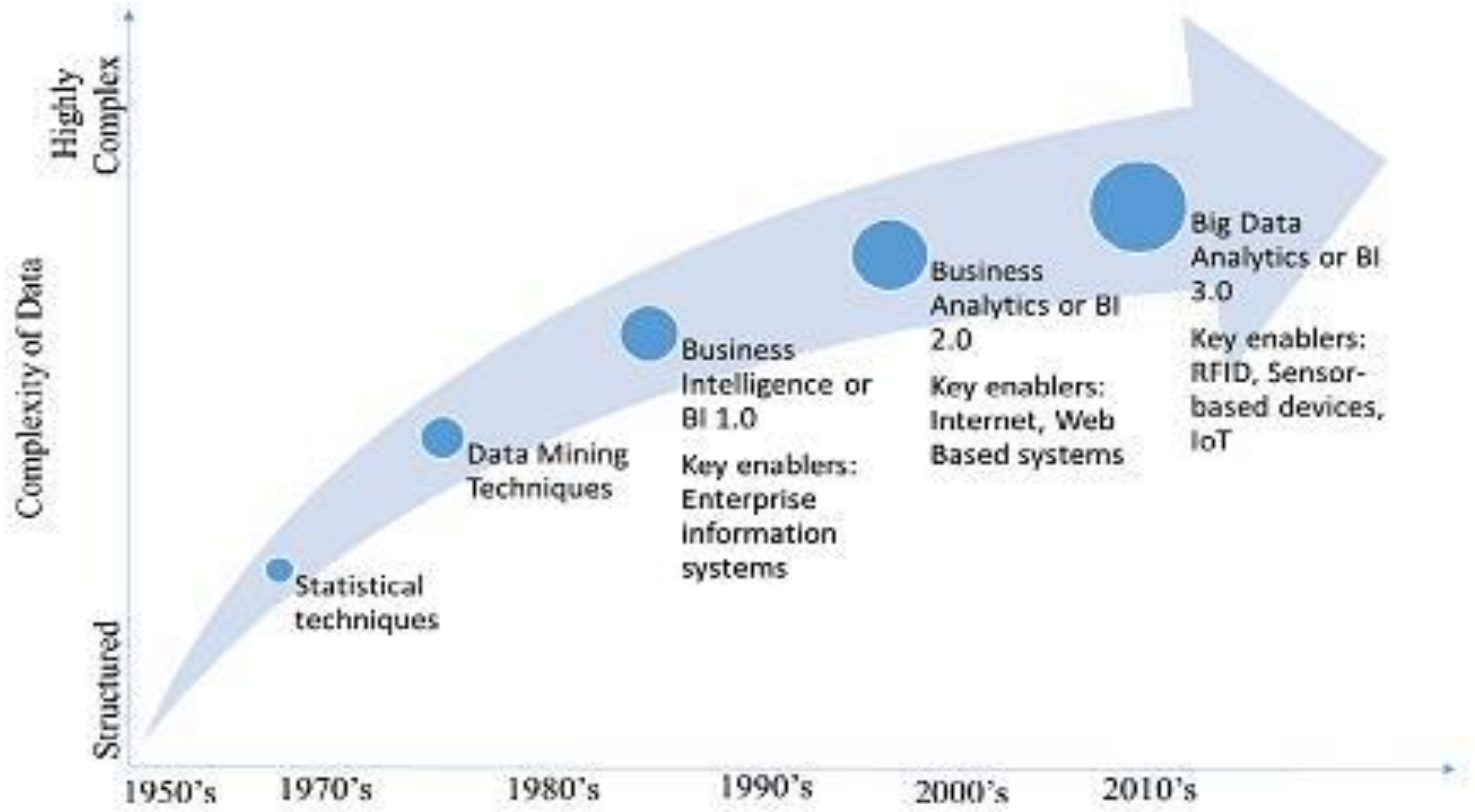
Association for Operations Management

Research Methodology





Evolution of Big Data Analytics (BDA)



SC Big Data Analytics (SC-BDA)

- Benefits of SC-BDA:
  - to provide the tools to support decision making in global, volatile and dynamic value networks;
  - improve demand forecasts,
  - reduce safety stocks, and
  - improve the management of supplier performance.
- Several research studies indicated the big data applications in various sectors such as financial services sector, marketing, bank industry, insurance industry, logistics, and manufacturing.

Literature Review SC - BDA

- A systematic literature review to investigate the application of BDA in SCM areas. The results indicated that BDA techniques usually use the predictive and prescriptive approaches rather than descriptive approach (Barbosa et al., 2018)
- To identify the effects of big data and predictive analysis on two aspects of sustainability, including environmental and social aspects (Dubey et al., 2019)
- A systematic literature review based on 28 journal articles to investigate the impact of using BDA techniques on humanitarian SCM (Gupta et al., 2019)
- Theories: complexity theory, transaction cost economics, resource dependence theory, resource-based view, social network theory, institutional theory stakeholder theory, and ecological modernization theory.

Literature Review SC - BDA

- A multi objective optimization model for green SCM using BDA approach. They considered three different scenarios for optimizing the inherent risk associated with hazardous materials, carbon emission, and overall costs. They utilized a big data approach to acquire data and manage their quality (Zhao et.al., 2017)
- Problems and challenges arising due to big data in the context of environmental performance evaluation along with summarizing latest developments in environmental management based on big data technologies (Song et. Al., 2017)

Literature Review SC - BDA

Research	Research Objective	Country	Context	Methodology & Theory
Verma & Chaurasia (2019)	The Investigation of BDA adoption determinants	India	Different industries	Survey-based TOE framework
Lai et al. (2018)	The Investigation of BDA adoption determinants	China	Different industries	Survey-based TOE framework & DOI theory
Verma & Bhattacharyya (2017)	The Investigation of BDA adoption determinants	India	Different industries	Semi-structured interviews TOE framework
Chen et al. (2015)	The Investigation of BDA adoption determinants	The US-based organisations	Different industries	Survey-based TOE framework & dynamic capability theory
Agrawal (2015)	The Investigation of BDA adoption determinants	China and India	Different industries	Survey-based TOE framework
Ramanathan et al. (2017)	The Investigation of BA adoption determinants	The UK	Retail sector	Case studies TOE framework
Zhu et al. (2018)	The effect of SCA on operational supply chain transparency	The USA, Asia, Europe	Different industries	Survey-based Information processing theory
De Oliveira et al. (2012)	The effect of BA on supply chain performance	the USA, Canada, Brazil, Europe, and China	Different industries	Survey-based
Trkman et al. (2010)	The effect of BA on supply chain performance	the USA, Canada, Brazil, Europe, and China	Different industries	Survey-based Information processing theory

Supply Chain Digitalisation

- *the extent to which a focal plant implements novel digital technologies in their supply chain processes to conduct business with its suppliers and customers and the degree to which these technologies transform supply chain capabilities and supply chain performance (Ehie & Ferreira, 2019).*
- *Several Studies (Gurria, 2017, Laaper, 2017, and Dall'Omo, 2016) have shown that digital technologies play a critical role in managing supply chain processes.*
- *Digital technologies allow for the integration of data and information from disparate sources and locations to drive the production and distribution of goods and services (Mussomeli et.al 2016)*

- *https://www.youtube.com/watch?v=3kAByQnkctM*

- *https://www.youtube.com/watch?v=y1wA-C2Q_1s*

- This research will describe the main concepts and theories associated with the movement towards the digital supply chain (DSC). The digitalisation of the supply chain is an industry advancement which focuses on creating further efficiencies within the value chain breaking down the silos between internal and external parties alike and making moves towards the supply chain network as opposed to divisional segregation (Schrauf & Bettram, 2016).

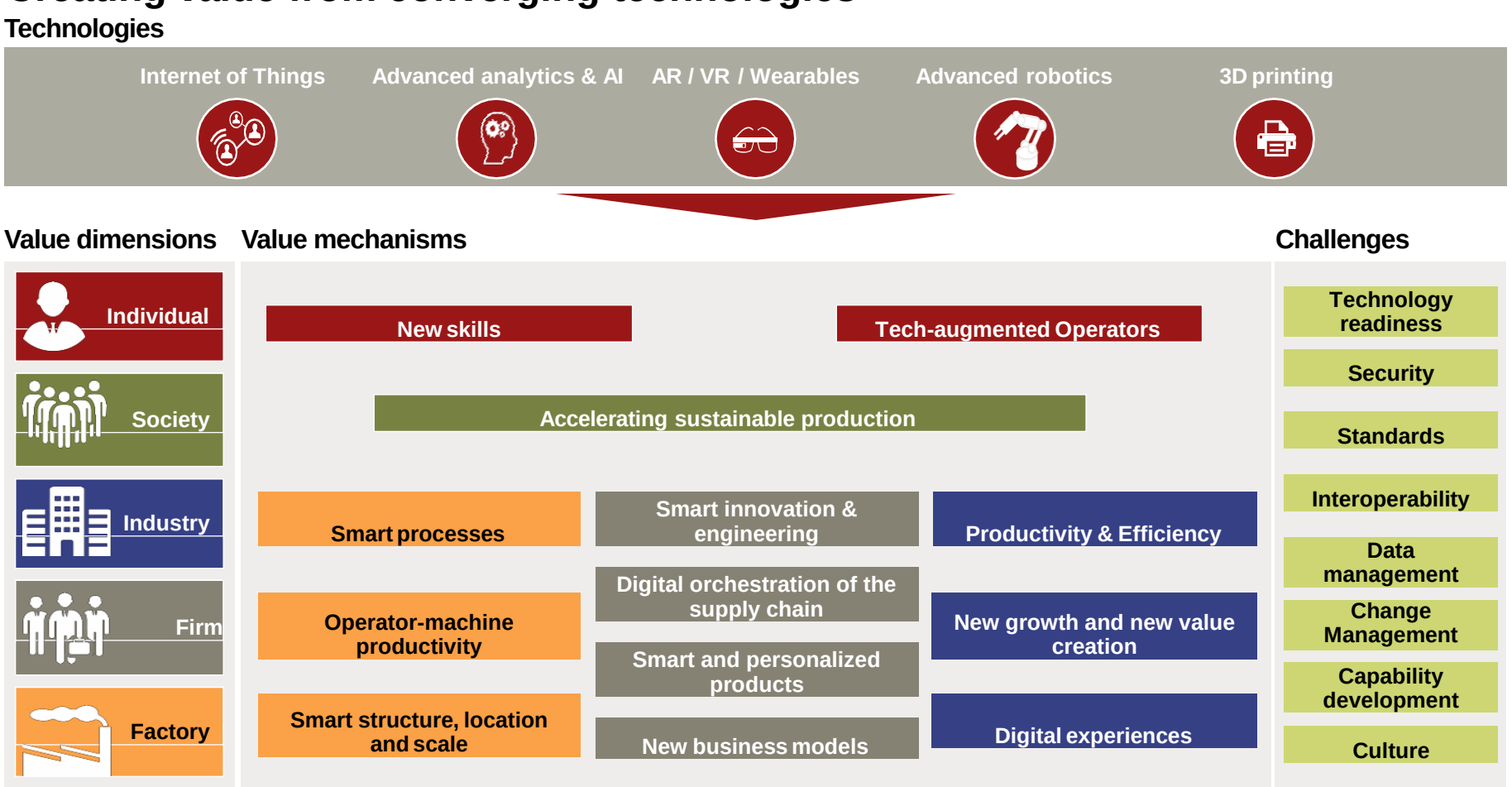
- The technological advancements of Information Technology (IT) have acted as a catalyst for digitalisation (Preindl et al., 2020), allowing firms to achieve efficiencies in areas pertinent to competitive advantage (Coyle et al., 2017). Horizontal alignment is progressively realised in the context of firm goal coherency across internal functions where vertical alignment is achieved throughout the value chain extending to encompass both external suppliers and the consumer (Schrauf & Bettram, 2016).

- These advancements are facilitated by the introduction of automated processes and technologies that generate cost efficiencies, operational streamlining, enhanced visibility and analytics (Grzybowska et al., 2020).Practical applications will be discussed in the context of Industry 4.0, The Internet of Things (IoT) and Automation, which are cohesively shaping the next generation of supply chains in agribusiness and food sector.
- This study, along with examples, will demonstrate the way in which the DSC movement is impacting current supply chains and paving the way for the future.

- Findings in this paper will demonstrate the way in which Industry 4.0 has acted as a catalyst for prompting traditional supply chains into the next chapter of evolution, driving the need for automation and requirement to facilitate new demands brought about by e-commerce. Coined the 4th industrial revolution, Industry 4.0, IoT and Automation has served to illuminate the benefits of supply chain digitalisation across all functionalities including, but not limited to, management, marketing, sales, human resources, finance and operations in any sectors.

In the long term combined and connected technologies will unlock new mechanisms for creating and distributing value

Creating value from converging technologies



Source: WEF – A.T. Kearney: Technology and Innovation for the Future of Production: Accelerating Value Creation

Research Agenda

- How ready are organisations for Supply Chain Big Data Analytics?
- Technical issues
- Contextual issues
- Methodology issues
- Measuring the benefits and the business case for SCM Big Data Analytics
- Organisational impact and HR skills
- SCM Big Data Analytics and sustainability context
- SCM Big Data Anlaytics (Policy and regulation)

Future research in SC - BDA

- Supply Chain Big Data Analytics – Supplier Relationships Management
- BDA and Supply Chain Network Design
- BDA Product Design Development
- BDA Demand Planning
- BDA Procurement Management
- BDA Customised Production
- Supply chain cyber security
- BDA Inventory Management
- BDA Logistics
- BDA Agile Supply Chain
- BDA Lean Thinking
- BDA Le-Agile
- BDA Sustainable Supply Chain
- Application of BDA in different types of SC (Manufacturing, Finance, Healthcare)

Future research in SCM

- Supply chain practices, Supply chain performance
- Sustainability SCM;
- Supply chain quality management (SCQM);
- Supply chain project management
- Supply Chain Human Resource Management
- Strategic Supply Chain Management

- Supply chain cyber security;
- Supply chain information systems;
- Internet of Things;
- Blockchain;
- Supply Chain Management 4.0
- Automated Warehouse;
- Warehouse Management Systems;
- Transportation Management Systems;
- Logistics Information Systems

List of my publications related to Supply Chain and Logistics Management

- Jie, F., Gengatharen, D. (2019). Australian Food Retail Supply Chain Analysis. Business Process Management Journal, 25(2), 271-287. https://doi.org/10.1108/BPMJ-03-2017-0065
- Masudin, I., Jie, F., Widayat , W. (2020). Impact of halal supplier service quality and staff readiness to adopt halal technology on halal logistics performance: a study of Indonesian halal meat supply chain. International Journal of Agile Systems and Management, 13(3), 315 - 338. https://doi.org/10.1504/IJASM.2020.109258
- Ding, M. Jie, F. Parton, K. and Matanda, M. 2014, 'Relationships between quality of information sharing and supply chain food quality in the Australian beef processing industry', in *International Journal of Logistics Management*, Emerald Publishing, United Kingdom, vol. 25, no. 1, pp. 85-108 ISSN: 0957-4093
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List of my publications related to Supply Chain and Logistics Management

- Zulfakar, M., Chan, C., Jie, F., Sundram, V. (2019). Halal accreditation and certification in a non-muslim country setting: Insights from Australia halal meat supply chain. International Journal of Supply Chain Management, 8(1), 10-17.
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- Jie, F. 2012, 'The roles of trust and commitment in the Australian Lamb Retailers/Wholesalers', in *Australian Farm Business Management Journal*, Charles Sturt University, Australia, vol. 9, no. 1, pp. 49-56 ISSN: 1449-5937
- Jie, F. 2010, 'Customer relationships strategy: An Australian cattle producers case', in *Australian Farm Business Management Journal*, Charles Sturt University, A F B M Network, Australia, vol. 6, no. 2, pp. 97-101 ISSN: 1449-5937
- Jie, F. Parton, K. and Wang, K. 2010, 'Supply chain analysis in the Australian lamb processing industry', in *Proceedings of the 8th ANZAM Operations, Supply Chain and Services Management Symposium*, Monash University, Sydney, Australia, pp. 1-19
- Jie, F. and Parton, K. 2009, 'The need for improved skills in the Australian meat industry', in *International Review of Business Research Papers*, World Business Institute, Australia, vol. 5, no. 4, pp. 257-269 ISSN: 1837-5685

- Thank you very much indeed for listening
- Any questions