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BIG INNOVATION CENTRE

Future Supply Chains with Artificial Intelligence

Achieving AI Success –
Building Capacity & Understanding Complexities

For Innovate UK, by **BIG INNOVATION CENTRE**

Future Supply Chains with Artificial Intelligence is a think piece based on a literature study and Big Innovation Centre Supply Chain Survey 2018.

Professor Birgitte Andersen, CEO & CoCreator
Sayali Borole, Researcher
Michelle Miao, Strategic Analyst
Stephen Newbury, CEO Innovation Intelligence

Any enquiries regarding this publication, contact:
Professor Birgitte Andersen
BIG INNOVATION CENTRE

Launched in September 2011, Big Innovation Centre is the hub of innovative companies and organisations, thought leaders, universities and 'what works' open innovators. Together we test and realise our commercial and public-purpose ideas to promote company and national innovative capabilities in a non-competitive and neutral environment. We act as catalysts in co-shaping innovation and business model strategies that are both practical and intellectually grounded. Our vision is to help make the UK a Global Open Innovation and Investment Hub by 2025, and to build similar initiatives internationally.

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A think piece prepared for

GOV.UK

Innovate UK

Executive Summary

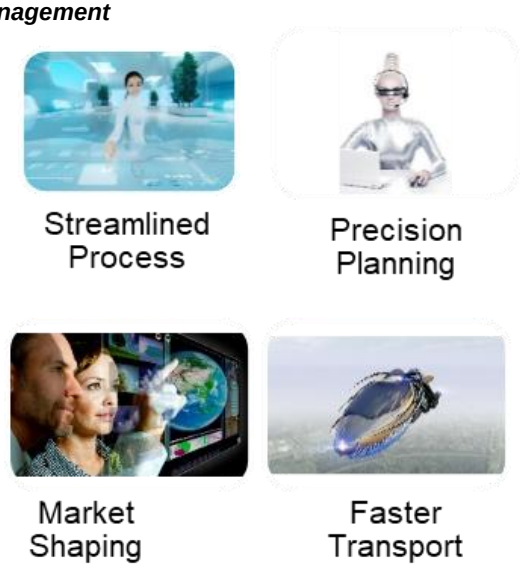
Globalisation and digitisation have transformed the way supply chains work, and the new supply chains are a part of huge digital networks across different sectors and countries. The linear supply chains of 'plan-source-make-deliver' are being transformed into a growing **networked system** using digital tools and AI. The ability of AI to automate, augment and enhance customer experience and decision-making as well as reinvent business strategies makes AI the most current **general purpose technology** compared to other disruptive technologies of today. While many businesses have already implemented AI tools in supply chain management, others are struggling with '*How to use AI?*' in the implementation stage and '*What are the options available*?' in the capacity to pick the most apt solution.

This report commissioned by Innovate UK aims to understand **how AI can be used in transforming supply chains of companies**. Through a literature study and Big Innovation Centre Supply Chain Survey 2018 the report addresses: **Why to use AI in supply chain management (advantages), what problems it solves (business issues), and how it can be implemented.** The highlights of the results are below.

1. SUCCESS WITH AI

AI can be applied across supply chain activities, i.e. from early stages of planning to production, warehouse activities, distribution, communication and logistics; to enhancing the customer experience. AI can optimise supply chains by providing **problem-based specific solutions** within these stages. AI solutions can focus on any given problem that arises during **data handling**, **analysis in finance**, **operations and logistics planning or managing inventory**.

Figure (i): Advantages of AI in Supply Chain Management



AI-enabled solutions will assist the supply chains with a streamlined process (**faster results** with **modest cost**), precision planning, efficiency in the process that shapes markets, and near-perfect logistics and transport. While there are multiple advantages of using AI in s upply chains, it is essential to understand the complexities of supply chain activities before its implementation.

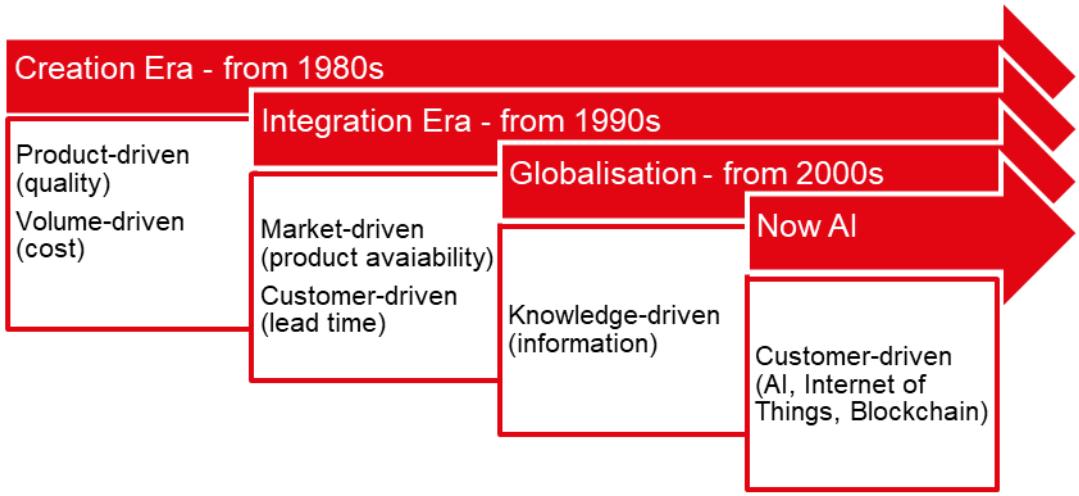
2. UNDERSTAND AI SUPPLY CHAIN COMPLEXITIES

All businesses that are part of a **supply chain are linked by physical or information flows**, and **AI tools can augment or automate those flows**. However, the dynamic characteristics and behaviour of supply chains are case based. They vary with every business and sector, for instance, from bio-medical industry to aeronautics to manufacturing. Thus, there cannot be a standardised AI solution. AI can be applied in various end-to-end supply chain activities with tools that help in **augmentation** [connectivity between businesses and analysis (finance, production, warehousing and so forth)] to **automation** [use of machine learning and robotics].

Supply chain management has come a long way from the 'creation era' of formalising supply chain activities among businesses, to information communication technology (ICT) driven 'globalisation' of supply chain management. AI is now the **next transformer of supply chain management** which follows the customer-driven philosophy.

Customer-experience (end to end) being the key today, the success of supply chain management is completely driven by demands like customised and personalised products which are delivered almost instantaneously.

Figure (ii): Evolution of Supply chain management disciplines



As future supply chains are digital, businesses should not only adopt the AI technology into their process but also undergo a **smooth transition to be successful**. History has shown that in excess of 80% of companies fail digital transition[1]. It is also important to have an easy transition as new supply chain involves different stakeholders, often from different nations, who will be affected in the process.

[1] Minter Dial and Caleb Storkey (2017), Futureproof: How To Get Your Business Ready For The Next Disruption, FT Publishing International

3. GET STARTED WITH AI

Not all business are thinking of applying AI into their supply chains, and some of those who want to are faced with capacity and capability challenges.

(i) Some of the challenges businesses are facing when adopting AI include:

- Ability to **find and choose** an appropriate AI tool available in the market
- Weak or **lack of a roadmap** for implementation and investments
- Capacity to **handle the change** AI tools brings in the supply chain process

With the above-listed challenges, businesses are also resistant to implement AI for a number of reasons including a **lack of availability of usable data; and a lack of skills, know-how and knowledge base**. The **extraordinary range of choices** AI offers means it can be difficult to be decisive.

Progress in adopting AI in supply chains certainly improve their performance. Nevertheless, companies should not rush into AI-enabled supply chains without making sure of the AI pre-requisites and proper implementation plan. Supply chain businesses achieve greater benefits when they have a comprehensive vision, assessment and monitoring mechanisms, and long-term roadmap.

(ii) For achieving AI success in the supply chain, businesses should

- Act fast and start **designing AI roadmaps** immediately
- Target the specific performance problem they want AI to solve (for example capacity, capability, complexity, new opportunity)
- Build **AI readiness** (skills, data handling and so forth)
- **Pilot and test** to learn and scale
- Achieve positive changes in **customer experience**

AI will mark a step forward in the evolution of supply chain and businesses must start building upon it today. The way forward for business is to experiment, adapt and learn quickly.

(iii) Business willing to act now and piloting should

- *Build AI talent system fast*
- *Change technology incrementally*
- *Disrupt the supply chain model radically*
- *Get the respective supply chain ecosystem onboard*

Evaluating the AI-enabled supply chains, we have designed a digital platform, namely, Supply Chain Assistant. The digital solution will assist businesses when they are looking for suppliers globally.

4. BLUEPRINT OF AN AI-ASSISTANT FOR SUPPLY CHAIN OPTIMISATION

Looking ahead, Big Innovation Centre has blueprinted what an AI assistant (digital platform) could offer in supply chain optimisation and solution. The user-based AI-enabled tool will assist businesses to find the most suitable suppliers globally. The platform will focus on five benefits for business users:

1. **Speed**: faster assessment of potential supplier quality and cost
2. **Trust**: trusted online supplier databases using supplier recommendations
3. **Capability and capacity**: ability to compare competing suppliers' offerings, deal with **complexity**, and spot **new opportunities**
4. **Business-needs**: targets to solve supply chain optimisation problems
5. **User-Friendly interface:** Simple software applications

It is essential to understand that the 'AI journey' is in uncharted territory. We are often dealing with the unknown of the unknowns, and that implies high risk. Still, companies who have leapt into AI-enabled supply chains have already noticed huge efficiency gains and rewards.

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Artificial Intelligence and Supply Chains

AI is an opportunity to challenge the existing models of supply chain management. It will help organisations manage the supply chain complexities efficiently and reap all the opportunities using technology in the digital world. There are multiple advantages of applying AI in the supply chain. Despite the opportunities offered, very few organisations are either adopting it or are equipped to adopt AI. **In this report, we discuss the opportunities offered by AI, as well as the roadblocks that organisations are facing to adopt AI in complex supply chain management.** With this understanding, **we explore potential options on how a business can build its capacity and capability to adapt the AI-powered supply chain management**.

To understand the application of AI in supply chains, we start with the fundamentals by answering: What is AI and what can AI do? Is AI all about creating robots or about the creative mix of algorithms used to assist decision-making?

1. What is Artificial Intelligence (AI)?

Artificial Intelligence is about intelligent machines that are capable of carrying out tasks in a way that we consider to be 'smart'. AI is not a field of study but refers to multiple technologies which can be combined in different ways to sense (actively perceive the world around), comprehend (understand and analyse the information collected) and act (take actions through technologies)[2].

> AI can be about simulating human intelligence, incorporating traits such as reasoning, perception, problem solving and forward planning. At its crux, though, AI is about the development and enactment of methods of transforming vast amounts of complex, often unstructured data into intelligent insights.

The potential of using AI cannot be explored in isolation and without understanding its value-added services. As explained in Gartner's Supply Chain executive conference[3], AI can be categorised into two — Augmentation and Automation.

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[2] Purdy, M., & Daugherty, P. (2016). Why AI is the Future of Growth. Management Information Systems, (October), 1–72. https://doi.org/10.1016/j.techfore.2016.08.019

[3] Medium. (2018). 6 Applications of Artificial Intelligence for your Supply Chain.. [online] Available at: https://medium.com/@KodiakRating/6-applications-of-artificial-intelligence-for-your-supply-chain-b82e1e7400c8 *One Network Enterprises. (2017). The 8 Keys to Achieving Success with Artificial Intelligence in Supply Chain Achieving Success with Artificial Intelligence in Supply Chain.*

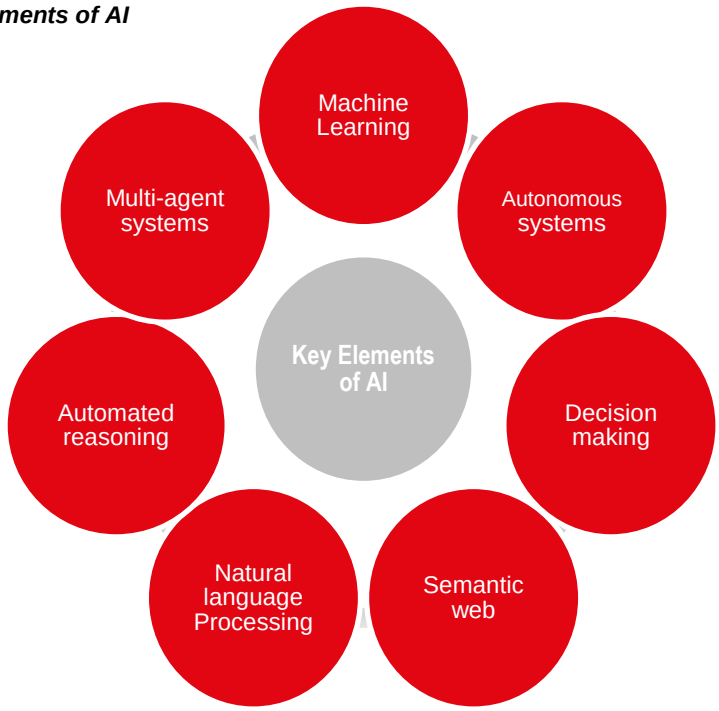
- **Augmentation**: AI systems that assist in day-to-day tasks without complete control over the output. Such AI is applied for data analysis, virtual assistance which usually improves speed and reduces errors caused by human bias.

AI Augmentation is to augment human ability through the aid of Artificial Intelligence and Machine Learning[4].

- **Automation**: AI which works completely autonomous without any human assistance. For instance, robots.

In both of the above categories, data is foundational. Only with the availability of good real-time data, AI can deliver effective decisions. It is only with data machines continue to learn and improve performance. Big Innovation Centre has reviewed the key elements of AI as seen in Figure 1 to be: machine learning, cognitive computing, natural language processing and sentiment analysis, combined with real-time data make it one of the strongest technologies available for supply chain.[2] [5]

Figure 1 Key elements of AI



[4] Crystal Engineering. (2018). Artificial Intelligence: Automation VS Augmentation. [online] Available at: https://www.crystalknows.com/engineering/artificial-intelligence-automation-vs-augmentation/
[5] Big Innovation Centre (2017). The Future of Trade. [online] BIC. Available at: http://www.appg-ai.org/evidence/think-piece/think-piece-future-trade-ai/

- **Machine learning**: enabling machines to learn how to perform tasks without being explicitly told how.
    - Marketing personalisation is just one example of how machine learning is used. Someone might visit an online store and look at a specific product and in the following days, the system might show digital ads across the web for that exact product.

- **Decision making**: enabling machines to make decisions on behalf of people in situations where the decisions are complex or poorly specified.
    - Decision-making algorithms are used across business sectors. For example, algorithms are used to sift job applications, assisting the recruitment process when interviewing potential candidates.

- **Natural language understanding**: enabling machines to interpret and interact in ordinary human languages such as English, French and German rather than in machine-oriented programming languages.
    - Financial markets use natural language processing to analyse text factored into algorithmic trading decisions.

- **Automated reasoning**: enabling machines to derive new conclusions from existing facts or data in a robust way.
    - The most developed areas of automated reasoning include automated theorem proving and automated proof checking, using computer programs that reason completely automatically.

- **Autonomous systems**: enabling machines that can carry out delegated tasks on our behalf without being explicitly told how to carry out the task.
    - It is a network or collection of networks that are all managed by a single organisation or entity.

- **Multi-agent systems**: enabling AI systems to cooperate with each other, for example by forming teams to carry out tasks that are beyond the capabilities of any individual team member.
    - Computer games are a very common example of multi-agent systems, made up of multiple interacting intelligent agents within an environment.

- **Semantic web**: enabling computers to understand and reason about the content of web pages so that browsers can make smarter decisions about what to do with the content.
    - This is a proposed development for the global web so that web pages can be structured in a way for computers to be able to read them directly.

These elements are in use already in a variety of technologies – from the robots that swarm around Ocado's giant warehouses fulfilling orders to the chatbots that answer consumer queries and intelligent agents that help organise our lives to the software that searches for low prices or helps organise logistics.

1.1 What can AI do?

AI can establish rules and deliver analysis as well as predictions using algorithms. Most importantly, it can also analyse to bring insights which are hidden within data and can be missed by humans. This analytical ability of AI makes businesses across service industry make informed decisions, like, predicting the need of customers by analysing historical records.

Insights from data can push technological development and growth by improving services and business efficiencies. AI is not limited to the above mentioned but can be more, which is unexplored.

The ability of AI to automate, enhance customer experience, decision-make and reinvent business strategies makes it more capable compared to other disruptive technologies available today.

> "Opportunity in AI is to automatically search for most up-to-date solution to particular problem. It is also an opportunity for the [cloud technology] provider that automatically reviews your software code to make sure it's up-to-date and virus free".
>
> - Head of Commercial, software industry
>
> *BIC Supply Chain Survey 2018*

2. How can AI be applied in supply chain?

As globalisation continues, businesses are looking ahead to optimise supply chain efficiencies, which in turn maintains the pressure on markets to grow as well as on businesses who are not thinking of adopting AI. Many in the manufacturing sector are already involved in the AI phenomenon, and others are interested in applying it. For instance, companies like Siemens and Amazon are already using AI in their supply chain systems through smart drones and AI robotics. A large percentage of AI is primarily robotics, and software managing the end-to-end process of supply chains is being developed.

While the opportunities with AI are often discussed, there is little guidance on practical aspects of implementing AI. Not all businesses are capable of coping with technological advancement. The complexities of managing different activities of supply chain management cannot be ignored when implementing AI in the process. It is thus essential to discuss AI in the supply chain, understand its eco-system and the pre-requisites businesses need to adopt it.

2.1 More supply chain transparency is needed

A supply chain represents the steps a network of companies and suppliers take for the products or services to reach its customer. However, supply chain management is the management of the activities to optimise cost and maximise customer value. Supply chain activities include everything from product development, sourcing and production logistics to information systems coordinating these activities.

Supply chains include every business that relates to the product delivery. For instance, it also includes companies who assemble and deliver parts to the manufacturer. A company founder from the transport industry who uses AI when looking for suppliers

> "Lack of independent reviews (of suppliers) is a major issue that affects the efficiency of supply chain management. '*Something easy to use like Airbnb*' should be developed to source new supplier and improve business competitiveness."
>
> - Founder, AI transport industry
>
> *BIC Supply Chain Survey 2018*

mentions; ***"recommendations are difficult to obtain in some cases, for countries where we have few suppliers".*** The founder highlighted this as a particular problem for businesses when looking for suppliers in new regions, and how the lack of clear information affects their ability to choose and find the right supplier.

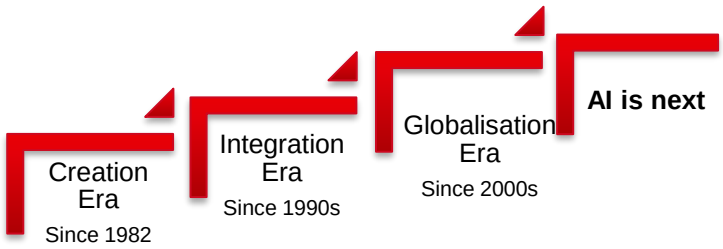
2.2 Focus and supply chain management disciplines evolves over time

Looking back at the evolution of supply chain management; customer-focused corporate vision was at the core to motivate the changes and generate a more efficient supply chain management method. With the aim of customer satisfaction, supply chain management evolves throughout a firm's internal and external links. It also abstracts the synergy of inter-functional and inter-organisational integration as well as coordination. In this context, the definition of integration refers to not only the merge & acquisition of the ownership of other organisations but also to complete and well-connected linkages to the entire supply chain process. (Schlegel[6], 1999)

***Figure 2. The evolution of supply chain management disciplines** (adopted from Hokey[7], 2015)*

Evolution Stage	Time	Philosophy	Key Driver	Key Performance Metric
I	Early 1980s	Product-driven	Quality	• Inventory turns • Production cost
II	Late 1980s	Volume-driven	Cost	• Throughput • Production capacity
III	Early 1990s	Market-driven	Product availability	• Market share • Order fill rate
IV	Late 1990s	Customer-driven	Lead time	• Customer satisfaction • Value-added • Response time
V	Early 21st century	Knowledge-driven	Information	• Real-time communication • Business intelligence
VI	The present, and future	Customer-driven	Technology (Artificial Intelligence, IoT, and Blockchain)	• Actual orders vs Forecast • Actual production vs Planned

Figure 3. Different Stages of Supply Chain Management Evolution



[6] Miller, S., Schlegel, E. M., Petre, R., & Colbert, E. 1998, AJ, 116, 1657 (SPC96) First citation in article | IOPscience | ADS
[7] Min, H. (2018). Evolution of the Supply Chain Concept | Principles of Supply Chain Management | InformIT. [online] Informit.com. Available at: http://www.informit.com/articles/article.aspx?p=2359420&seqNum=2

Creation Era: At the creating stage, the main drivers behind supply chain management are: the need for large-scale changes, re-engineering and downsizing driven by cost-reduction programs.

Integration Era: In the 1960s, the electronic data interchange (EDI) system was widely used in supply chain management. In the 1990s, the enterprise resources planning (ERP) system stood out. In comparison to EDI systems, ERP systems helped companies manage resources not only within an individual company but also within an integrated supply chain efficiently. When we stepped into the 21st century, the Internet-based collaborative system became popular.

Globalization Era: With the development of trade liberalisation policies, it became possible for firms to build-up a global system of supplier relationships. The supply chain management expanded beyond national boundaries in this way[8].

2.3 Physical and information flows are enabled by AI

There are two core ideas supply chain management is based upon – physical and information flows[9], where AI has potential to optimise the process. All the businesses that are part of the supply chain are linked together either through physical flows or information flows. AI can be part of both flows in supply chain management using its core categories – Augmentation and Automation as discussed earlier.

Physical Flows involve the transformation, movement, and storage of goods and materials. They are the most visible piece of the supply chain. But just as important are information flows.

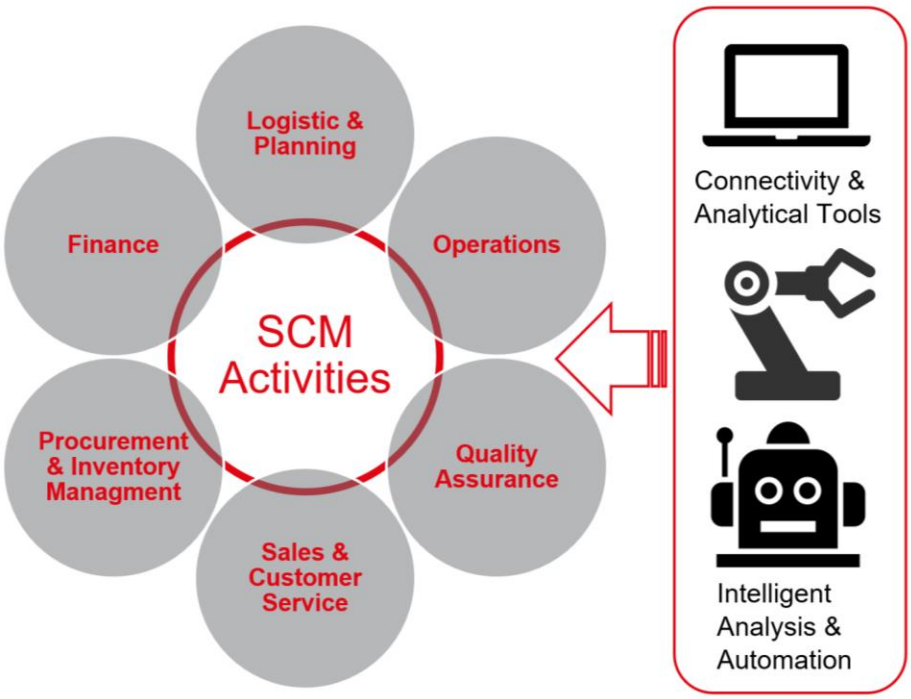
Information Flows allow the various supply chain partners to coordinate their long-term plans, and to control the day-to-day flow of goods and materials up and down the supply chain.

2.4 Augmentation and automation are key for implementation

Understanding of AI categories, Augmentation and Automation, is important for its implementation in supply chain activities. Figure 4 describes the end-to-end business process improvement activities and the potential key AI tools that can be applied to the activities. There are multiple advantages of using AI in so-called traditional supply chain methods that can optimise supply chain management.

[8] Movahedi, B., Lavassani, K., and Kumar, V. (2009). "Transition to B2B e-Market place Enabled Supply Chain: Readiness Assessment and Success Factors". The International Journal of Technology, Knowledge and Society, 5 (3): 75–88.
[9] SME, S. (2018). What is Supply Chain Management (SCM)? | Supply Chain Resource Cooperative | NC State University. [online] Scm.ncsu.edu. Available at: https://scm.ncsu.edu/scm-articles/article/what-is-supply-chain-management-scm

Figure 4. End-to-end supply chain management activities with the potential AI Tools



Advantages of using AI are[10]

- *Streamlined Process*
- *Precision Planning*
- *Market Shaping*
- *Faster and Accurate Transportation*

Figure 5 describes each advantage with examples. The existing eco-system of supply chain management should be flexible for AI to deliver results successfully. For instance, retail supply chains utilise 60-75 days for inventory. Unless AI is delivering to reduce these metrics, it is not really helping in the optimisation of supply chain activities, Arkieva (2018).

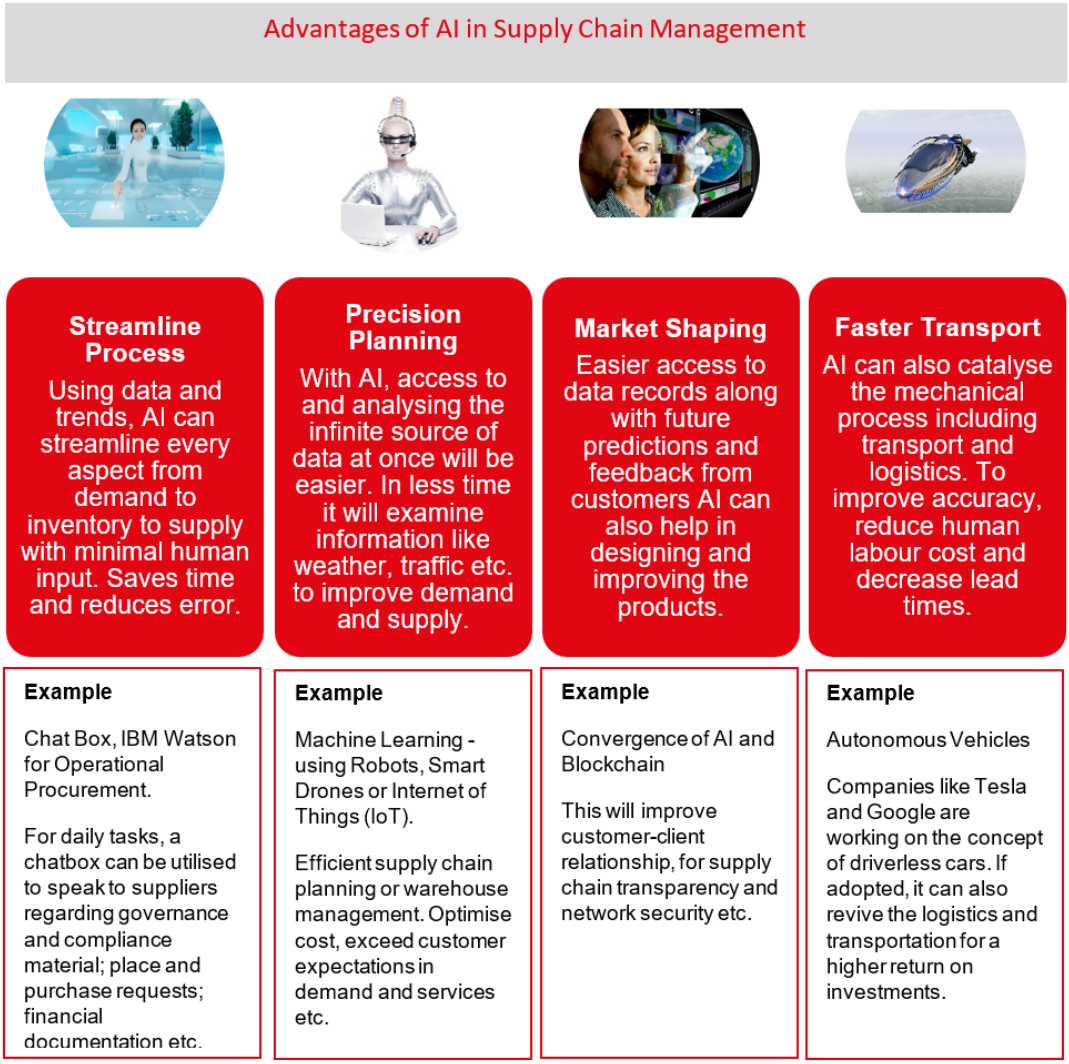
What opportunities do you see for improving ability to source new suppliers and improve business competitiveness?

"Bridging customer demand with supplier capabilities."

- Business Development Manager, food industry
BIC Supply Chain Survey 2018

[10] SME, S. (2018). What is Supply Chain Management (SCM)? | Supply Chain Resource Cooperative | NC State University. [online] Scm.ncsu.edu. Available at: https://scm.ncsu.edu/scm-articles/article/what-is-supply-chain-management-scm

Figure 5 Advantages of AI in supply chain management



We are aware of the advantages of adopting AI, but how can it improve supply chain management? The linear supply chain, with AI, has shifted to a more interconnected network. The information is integrated from multiple sources rather than depending on a selected few, or even just one source at times. As explained by Deloitte Insight, 2018 [11] the shift from traditional linear supply chain to the dynamic network (see Figure 6) will

AI can provide solutions to current challenges faced when sourcing new suppliers:

- Assess quality
- Assess cost
- Conflicts of interest

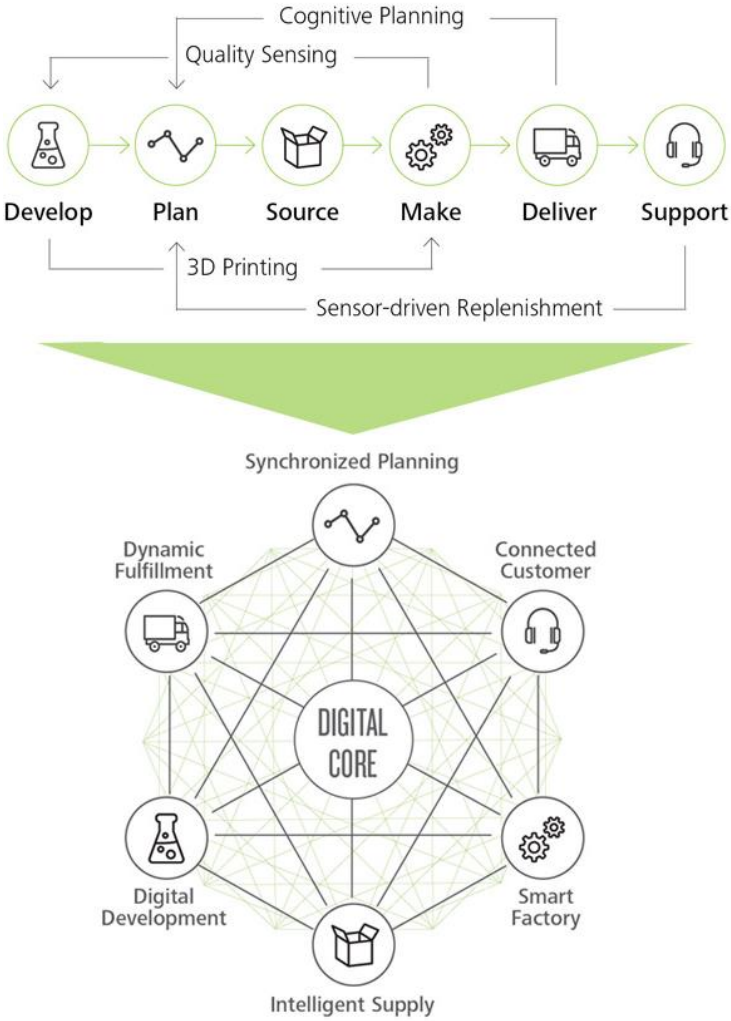
- Patent Attorney, AI & technology industry

BIC Supply Chain Survey 2018

[11] Deloitte Insights. (2018). The rise of the digital supply network. [online] Available at: https://www2.deloitte.com/insights/us/en/focus/industry-4-0/digital-transformation-in-supply-chain.html#endnote-1

usually be part of more than one network. Figure 6 shows the shift from *plan-source-make-deliver* as seen on the top of the figure to the networked supply chain. This generates the possibility of interaction at every node. In the new model, for instance, communication is multi-direction, and all stakeholders have the opportunity to understand and analyse different parts of supply chains to improve their efficiency. This communication was disconnected in the traditional supply chains. For instance, Tesco feeds the weather data into its predictive analysis to manage the supply of products like ice cream and coleslaw that are weather-dependent. The inventory management following this predictive analysis helps the business to minimise missed revenue. [12] Tesco optimised its stock keeping based on historical sales and weather data; this predictive analysis saved them £100 million.

Figure 6 Transformation of supply chain from traditional to AI-enabled supply network. *Source: Deloitte Insights (2018)*



Businesses can achieve new levels of performance and can create new revenue opportunities, but what is restricting them in adopting it? Does AI have pre-requisites? Do businesses lack capacity and capability to adopt it?

2.5 Pre-requisites for AI in supply chain management is a fundamental 'must have'

To successfully implement AI into supply chain management and for a business to achieve optimal results, it is fundamental to have these pre-requisites. Missing few while implementing AI in the supply chain will give ordinary results. AI tools should also have access to data (to see forward-most demand and history); all relevant factors and constraints affecting supply chain; and only then AI results will be better than existing/traditional supply chain. One Network

[12] Patil, R. (2018). Supermarket Tesco pioneers Big Data - Dataconomy. [online] Dataconomy. Available at: http://dataconomy.com/2014/02/tesco-pioneers-big-data/

Enterprise list eight criteria's that are required for AI success, as below.

- Access to real-time data
- Access to multi-source data
- Support consumer-driven objectives
- Decision-making process to consider the cost of change
- Continuous, self-monitored and self-learning process
- Networked decision-making and Scalable tools
- User-AI interaction opportunity

Laying a strong and fundamental AI base pays huge dividends. As per Accenture research, '*85 percent of companies have heavily invested in technologies, but very few succeed in achieving the expected growth value'.* Businesses who are willing to move forward with AI are struggling to implement it.

3. Adopting AI is challenging

AI does not work in isolation. It works within wider networks, and performance improvement of individual businesses are gained at wider levels (more than one network as explained above) with a bigger purpose which includes multiple businesses, supplier and even customers. Consequently, supply chains using AI tools cannot have an opportunistic focus and goal of independent cost reduction. The transition from linear supply chains to more connected supply chains requires the organisation to be flexible and innovative to adopt new ways of thinking and linking the physical and information flow of supply chain. The capacity and capability challenges faced by the business are:

- Uncertainty to choose appropriate AI technology.
- Lack of clear roadmap for investments and implementation of technologies.
- Feeble or no plan to manage the change in the process and governance after introducing new AI tool (automation or augmentation) in the supply chain.
- Not focusing if the AI is positively changing the customer experience. Investments in solutions that don't change customer experience or don't aim to impact service level will not lead to growth.[13]

'To build a successful digital supply chain that unlocks the full growth and value adding potential of digital, companies should adopt a more strategic and customer focused approach by leveraging three main capabilities: **connectivity**, **intelligent analytics** and **automation**. Companies should select the right tools to fully deploy these capabilities'.

[13] Accenture-insights.be. (2018). Digital Supply Chain: how to unlock the real value of digital. [online] Available at: https://www.accenture-insights.be/en-us/articles/digital-supply-chain-how-to-unlock-the-real-value-of-digital-1

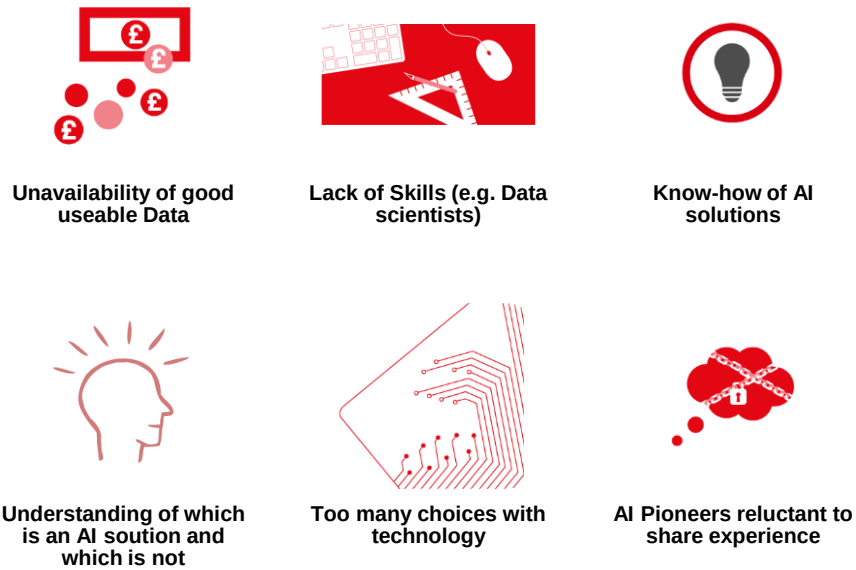
As sketched in Figure 7, there are multiple challenges when adopting AI in the supply chain.

Usable Data: There is not always good and usable data available to efficiently use in the analysis. There is a lot of data available, but cleaning and continuously maintaining data needs much effort and skill.

Skills: Like in many other sectors today, businesses are struggling to find talent with appropriate skills, and later struggle to retain the employees.

Know-how: With the hype of AI, many companies have popped up offering an 'AI solution'. Businesses should have a foundational understanding of what essentially are AI solutions, and what can be adapted for continuous growth.

Figure 7 Challenges for business to implement AI in supply chain management



Other challenges discussed widely are, with many different technological solutions available, not all supply chain leaders have the understanding of how to implement, and how it works. As Gartner's Noha Tohamy explains, the pioneers who have implemented AI in the supply chain are reluctant to share their experiences with the community (a small number have). Businesses will witness a remarkable change with AI; to handle the change they also need to restructure the way performance is measured. Figure 7 offers a glance at the potential reasons for why businesses are resistant to implement AI in the supply chain.

4. Tantrums with AI!

The interconnected networks of the AI-powered supply chain will be equally difficult to control. Among the highest concerns in the digital world today, as with AI in the supply chain, are the

data security, **IT attacks** and the **outdated (or absent) laws governing the technology applications.**

We have discussed multiple advantages of using AI, but automation is the most worrying to society. The fear of technology taking away jobs and **distorting job markets** discourages multiple businesses to implement AI. The counter-argument being, technological and industrial revolutions happened before also witnessed the disappearance of some jobs and creation of new ones too. However, it is more important to focus on how and what training and skills are required now for the existing workforce to retain jobs.

Finally, businesses are also hesitant to adopt AI as we are still unaware of the process with which AI reaches the solution. There is not enough **transparency in the way algorithms work**. There is not enough evidence to prove that this is a threat, but at the same time, it needs close monitoring and regulation. Machine learning also brings in few other risks including; **hidden biases**, they follow only statistical truths, and diagnosing and correcting its errors can be difficult.[14]

> 'While all the risks of AI are very real, the appropriate benchmark is not perfection but the best available alternative'.
>
> Source: Harvard Business Review. (2018)

Despite the risks, AI will mark a step forward in the evolution of supply chain, and businesses who accept it now will lead in the future. Businesses must start building upon it today.

5. Experiment, adapt and learn quickly

The way ahead for businesses is to experiment, adapt and learn quickly. Businesses should be flexible and innovative. As the Deloitte Insights report mentions, immerse yourself in innovation to understand what technology can possibly push your business and allow you to reap the full benefits. Analyse internally on bigger concepts – what capabilities should be built to implement the technology and plan the roadmap for necessary activities. As discussed earlier, implementing AI brings in a significant change to businesses, not only impacting finances but also regarding governance, management and method of working. AI implementation is a continuous and long-term process; businesses should consider starting it small but with bigger plans. Prioritise the areas/activities that are small but can unlock higher values. Businesses might want to focus on fewer activities consequently causing a domino effect in the adoption of AI, following the bigger picture.

As we all are in the phase of experimenting and learning, start scaling with AI tools in the

[14] Harvard Business Review. (2018). The Business of Artificial Intelligence. [online] Available at: https://hbr.org/cover-story/2017/07/the-business-of-artificial-intelligence

activities which will have relatively fewer negative consequences. This gives businesses an opportunity to test, and successful use cases can be scaled consequently.

5.1 Act fast

While it cannot be predicted which businesses will perform better in the world of technology, it is believed that those most flexible and agile will flourish. Businesses willing to act now, and look forward to piloting AI into their supply chains should:

Big Innovation Centre Supply Chain Survey 2018 summarised that most businesses don't have a strategy to find an AI supplier.

- **BUILD AI TALENT SYSTEMS FAST**. Design key performance indicators and start with talent augmentation. Change happens slow. Introduce the idea of technology and build upon it with the employees. This will help businesses to have better control over AI internally.

- **CHANGE YOUR TECHNOLOGY INCREMENTALLY**: Combine the existing technology with self-learning AI for better decision making. Starting with the more established AI tool can build confidence and enhance the growth of the businesses.

- **DISRUPT YOUR MODEL RADICALLY**: AI brings in the change. It also significantly changes the way supply chain currently works. It is advisable to design a completely new plan considering AI tools than simply to replace existing technology with AI tools.

- **GET YOUR SUPPLY CHAIN ECOSYSTEM ONBOARD**: You are integrated into an ecosystem that must change together, including internal departments and stakeholders (employees) to end-to-end supplier networks.

AI compliments the existing process, pushes forward the analytics and technology as well as augments the talent within the supply chain. Implementing AI brings in continuous improvement, sometimes self-improved. It is a platform that will help businesses to be more intelligent, build the customer-focused supply chain, and be demand-sensitive. Figure 8 lays the action points that businesses could follow while adopting AI solutions.

Figure 8 Action points to adapt AI in your business

6. A Supply Chain Assistant builds capacity

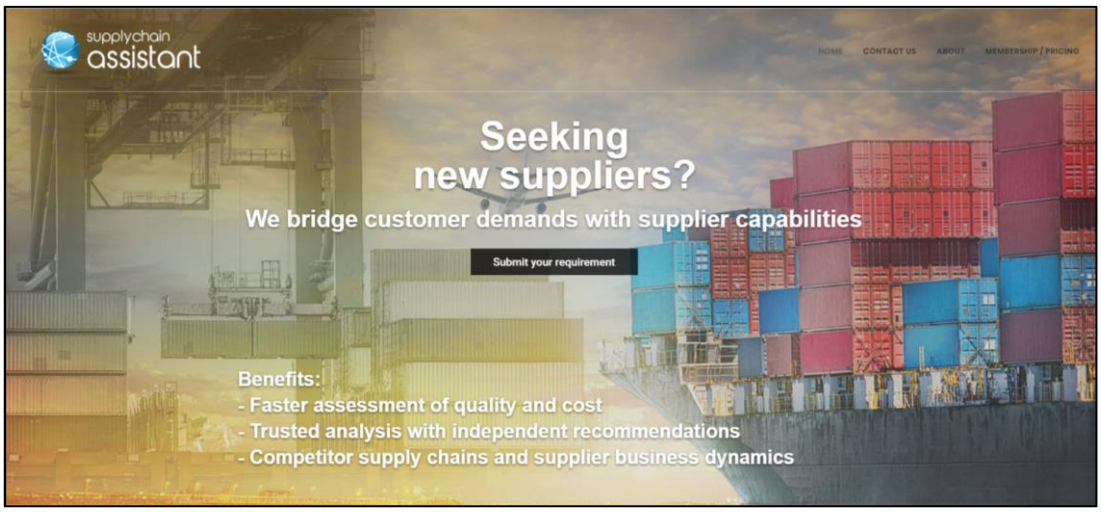
Evaluating the potentials of AI in the supply chain, Big Innovation Centre with Innovation Intelligence is designing an online digital prototype and make it a reality. For supply chain optimisation using AI tools to become a reality, delivering business performance improvement for industry and the UK, our blueprint focus on the following five areas:

1. **Speed**: Any system should enable business with a faster assessment of potential supplier quality and cost compared with current methods.
2. **Trust**: There is a need for trusted online supply databases that carry independent supplier recommendations.
3. **Capability and Capacity**: The ability to compare competing suppliers offerings, deal with complexity, and spot new opportunities.
4. **Business-needs**: Targets to solve supply chain optimisation problems
5. **User-friendly**: An easy user interface and simple software applications

AI can play a role in delivering these requirements enhanced by good customer experience derived from sufficient available data, useful tools, good customer service and an easy to follow user interface. Given the need to bridge customer demands with supplier capabilities there may also be a role for blockchain to aid supply chain transparency in a secure way, such as real-time comparison of actual orders vs forecast, and actual production vs planned.

The screenshots of the website below give the glimpse of a **supply chain assistant** which convenes AI and blockchain for faster and more efficient results.

Figure 8 Digital prototype idea



The objective of a supply chain assistant is to offer a global platform for businesses seeking better insights and tools of a supplier in the respective industry. Below is the business model as currently conceived to deliver a Supply Chain Assistant sustainably. For a supply chain organisation, it provides AI-enabled access to global suppliers which will describe not only the

historic performance data but also potential next steps individual organisation are willing to adopt.

Figure 10 Supply Chain Assistant Blueprint idea

Currently, organisation follow social networking platforms, online directories etc to find suppliers, as noted from Big Innovation Centre Supply Chains Survey 2018. This is followed by their research of the shortlisted suppliers before finalising the option. This information gathering trust building gets difficult when geographical boundaries grow. Global supply chains

perform in multiple nations; our supply chain assistant will give an opportunity to find trusted information in one place. Figure 10 describes the currently conceived business model. The tool assists in scouting and presenting global suppliers of AI, for which the outputs will include a list of suppliers, list of products, topics, patents and publications, and show these as a mapped distribution.

The proposed digital supply chain assistant enables businesses to access AI-platform service-providers, and assists with bespoke services so businesses can transform more easily into AI-enabled organisations.

If businesses don't adopt AI tools now, early adopters will set the 'agenda' and global standards for all.

BIG INNOVATION CENTRE
8th Floor Penthouse
20 Victoria Street
London SW1H 0NF
www.biginnovationcentre.com
email: info@biginnovationcentre.com

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Registered address: 8th Floor Penthouse, 20 Victoria Street, London SW1H 0NF