

The Circular SCOR Model: Bizarre Theory or Accelerated Shift in Habits?

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Organizations around the world are experiencing Industry 4.0 in full swing. Advancements in technology are happening faster than ever and digital solutions are increasingly more affordable. These new technologies will shift supply chain habits. Supply chain habits are found in the SCOR model, which has guided the supply chain practitioner community for over 20 years. **When combined with the capabilities of Industry 4.0, these habits will accelerate the global transition to a global, circular economy at scale.**

In a circular economy, materials circulate through lifecycles *indefinitely*. This produces value for buyers and sellers by connecting waste and byproduct as process outputs, and raw materials for process inputs. These material loops can be in the same company, in different companies, or across multiple industries. The maintenance, refurbish, and remanufacture industries will dramatically increase. **These circular business models will collectively add \$4.5 trillion to the global economy by 2030.** To realize this value, supply chains habits will shift in many ways. Some shifts will be small, others will be dramatic. This white paper explores a few of the habits which will shift as our global economy accelerates the transition to circular.

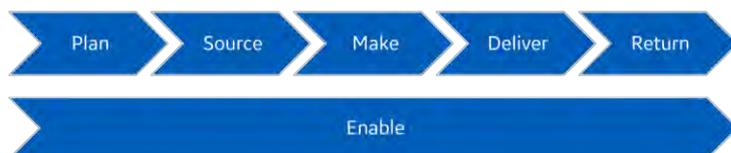
Industry 4.0 and the Circular Economy

The industry revolution changed the course of history 230 years ago with innovations in using water and steam to power manufacturing practices. Coming out of this first industrial revolution was the second industrial revolution, with electricity and mass production at the start of the 20th century. In the 1970s, industry changed again, embracing electronics and IT known as the “digital revolution.” Today, businesses are experiencing Industry 4.0 with emerging technology and practices such as IoT, 3D printing, machine learning and augmented reality. **These technologies are catapulting industry into a new frontier.**

Amongst the transformational power of new technologies in Industry 4.0 is an economic model which **challenges the way our supply chains have functioned since the beginning of global trade.**

The supply chain habits which make up our ways of working have shifted throughout these industrial revolutions and the economic models which have emerged. Today’s habits **are captured in the continuously updating SCOR model** which has led the global supply chain community since 1996. This pulls together a practitioner’s reference model that covers performance, processes, practices, and people.

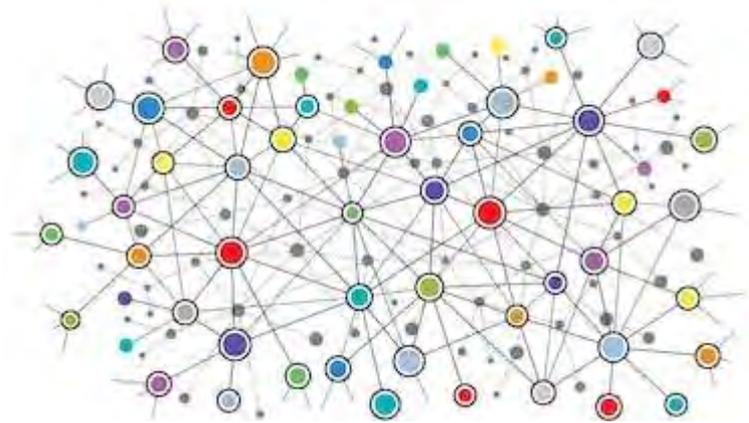
The process steps of the SCOR model describe a linear model: flow of information, money, and goods up and down a supply chain. Imagine if these information, money, and goods flowed instead



throughout **endlessly looping supply networks and industrial ecosystems** in an **omnidirectional value exchange.**

SCOR Processes

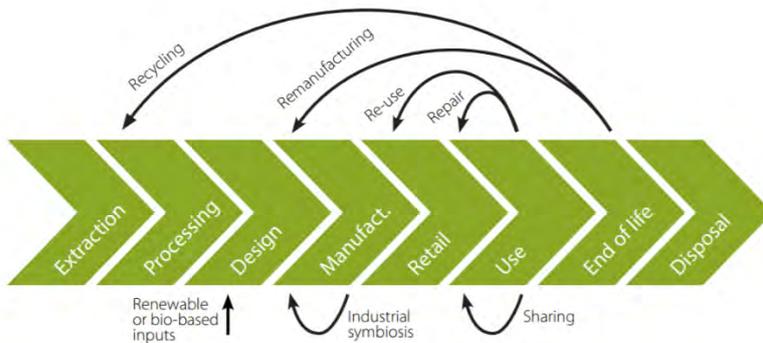
This value exchange network will function at a scale previously unseen. Imagine *all* waste and process by-product in the world will become the raw materials and inputs needed by *all* the processes in the world.



Linear processes will shift to become omnidirectional value exchanges

These supply and demand loops among value networks allow for monetization which were previously impossible. At a global scale, this circular economy is expected to add \$4.5 trillion to the global economy by 2030.

The below diagram illustrates this concept. We see a new take on a linear flow which looks very similar to the SCOR Processes. The diagram highlights loops of materials closing back into the same or different process.



Circular Material Loops (OECD)

An example of these closed loops is a partnership between HP and Sinctronicsⁱ. They faced a challenge of 50 million tons of electronic equipment flowing through the linear economy every year, ending in landfills. As they closed the loop from *end of life* back to *manufacturing* with the *remanufacturing*

loop, they were able to **reclaim 97% of materials which flowed through their process**. They leveraged Industry 4.0 technology through sensors which allow for easier tracking. Some of these materials are returned to HP and others enter the global circular economy market as inputs to other organizations. Since 2012, HP Brazil has reclaimed more than 5,000 tons of HP products. **They are saving money, increasing profits, and adding jobs.**

Another example is remanufacturing in Google data centersⁱⁱ (*end of life* to *retail* with the *re-use* loop). They refurbish inventory and over 75% of the components in their spares program are refurbished. They also remanufacture server units, and 1 in 5 servers deployed are remanufactured. Lastly, they sell more than 2 million units of excess component inventory through the secondary market per year. **They have saved over \$1 billion in energy efficiency gains from leveraging remanufacturing.**

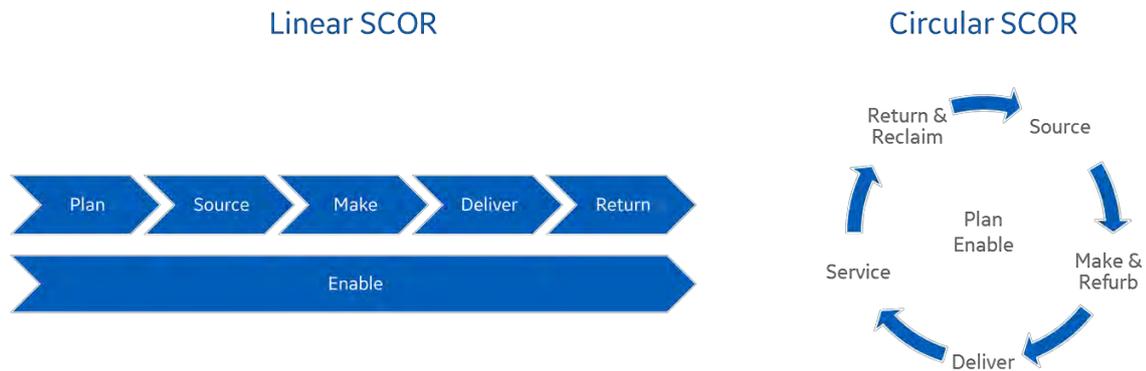
As resources circulate among networks and ecosystems, supply chains around the world will be challenged to shift their habits to support new business models. This will unlock the next major economic revolution which is already unfolding globally with Industry 4.0. **The increased complexity that will be managed by global supply chains will be represented by future SCOR model versions.**

Shifts in SCOR Supply Chain Habits

During the transition to a circular economy, supply chains will be impacted and will need to shift their habits and capabilities. These shifts will eventually be reflected in the SCOR model, **to anchor discussions across the global supply chain community**. This section explores a few examples of potential impacts to the SCOR model, through shifts in existing habits, and shifts in additional habits.

Shifts in SCOR Supply Chain Processes

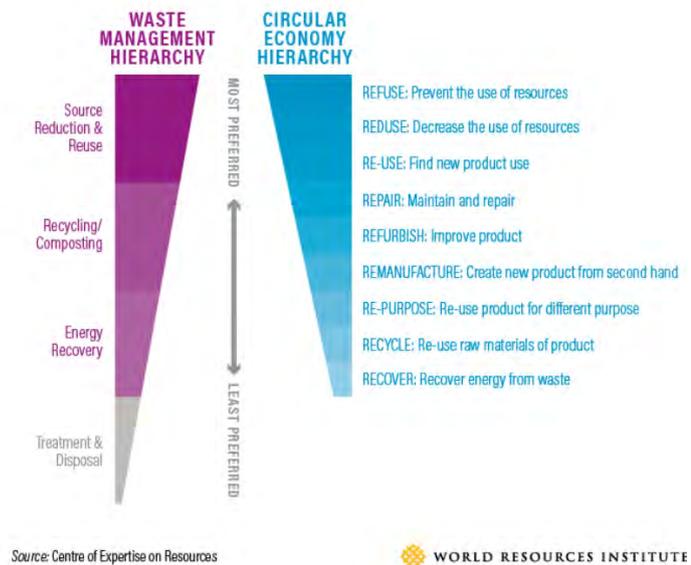
The supply chain processes in the SCOR model may be the most widely recognized and leveraged part of the reference model. A shift from Linear SCOR processes to Circular SCOR processes addresses the **relationship among the processes**. While bending a process into a circle is hardly revolutionary, the work it will take to enable this process flow to happen certainly is.



Shifts in existing processes will happen over time. Two processes which should be expanded from their current state are *Return* and *Make*.

The *Return* process will become *Return & Reclaim* to prepare materials to be used again and again. This process will include activities to prepare materials to be reused, repaired and refurbished, remanufactured, repurposed, recycled, or recoveredⁱⁱⁱ. Then, these materials are complemented by any additional items needed and can move into the next process step, *Make & Refurbish*.

The *Make* process will become *Make & Refurbish* to cover the wide variety of reusing/ remanufacturing activities. This shifts the manufacturing process to expand and include additional processes and activities required to **return materials to the global marketplace** in a circular economy.



Source: Centre of Expertise on Resources

WORLD RESOURCES INSTITUTE

World Resources Institute (Stanislaus)

An additional process will become critical in the SCOR processes. The idea of ***Service* will expand to include the growing focus on repair and maintenance to keep equipment functioning longer.**

Service will also include the role of *Product as a Service*. This new, flourishing category includes consumer items such as *Clothing as a Service* (*Rent the Runway*) and *Cars as a Service* (*Car2Go*, *DriveNow*), as well as industrial models such as *Outcome as a Service* (*Power by the Hour* by GE Aviation), all enabled by Industry 4.0 technology.

Shifts in SCOR Supply Chain Performance Measurements

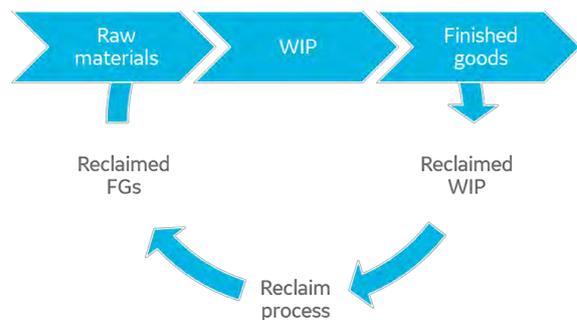
Supply chains enable the organizations they support to achieve nearly any goal. To make this happen, the goals of the organization and of the supply chain must be clear. **Circular thinking will shift how supply chains measure performance.** These performance measures become critical for aligning stakeholders and networks on strategies and goals.

Performance measurements in SCOR fall into: reliability, responsiveness, agility, cost and asset management efficiency. These represent the measurements which supply chains directly impact to add value to the organizations they support. These can also be used as central strategies especially as supply chains become more strategically core to many organizations.

Two notable shifts in performance measurements will be how to measure inventory and costs.

The definition of inventory will be expanded, which currently sits in *Return on Working Capital*. The types of inventory will expand from raw materials, work-in-progress (WIP), and finished goods (FGs) to also include looped materials which have completed reclaim processing and are ready to be monetized.

The cost performance measure will also shift and expand. Cost will soon be connected closely to supply chain revenue, which is currently tucked under *Asset Management Efficiency*. These should be connected in some way as biproduct from manufacturing processes are **captured and monetized**. For example, take a case where a manufacturing process is done at a slightly higher cost in order to maintain the biproduct for the next customer. While this may drive up cost, the revenue received may outweigh the additional cost. Therefore, these should be taken together and expressed as a total landed value.



Materials will be reclaimed in closed loops

Circular thinking will also introduce new cost performance measurements for supply chains. A new cost measurement will likely emerge around *Cost to Reclaim*. This goes beyond *Reverse Logistics* and describes the **entire cost of locating, moving, and processing materials as they re-enter a loop** to be reused by another process.

In the current SCOR 12, there is a Special Application for *Sustainable SCOR*. These metrics align closely with the GRI (Global Reporting Initiative) Standards and provide a reference model around materials, energy, water, and waste. These provide a good basis for supply chains that are starting their sustainability journey. **Circular thinking takes this in an additional step past sustainability** and into a network where the goal is for materials to loop indefinitely.

Shifts in SCOR Supply Chain Practices

The practices in the SCOR model addresses the way supply chain professionals solve problems, and manage and operate a supply chain. These include emerging, best, standard and declining practices. The categories of these practices are outlined to the right. **These practices will shift as circular business practices require circular habits from supply chains** around the world.

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| <ul style="list-style-type: none"> ■ Business Process Analysis/Improvement ■ Customer Support ■ Distribution Management ■ Information Management ■ Inventory Management ■ Material Handling ■ New Product Introduction ■ Order Engineering (ETO) ■ Order Management ■ People Management (Training) | <ul style="list-style-type: none"> ■ Planning and Forecasting ■ Production Execution ■ Product Lifecycle Management ■ Purchasing/Procurement ■ Reverse Logistics ■ Risk/Security Management ■ Sustainable Supply Chain Management ■ Transportation Management ■ Warehousing |
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SCOR Supply Chain Practices Categories

The shifts to current supply chain practices, when viewed as part of circular business models, will be extensive. *Areas of Integrated Business Planning, Scenario Planning, Supply Chain Optimization and Strategic Sourcing* will all expand to include elements of the circular economy and circular business models.

New habits and practices will soon be defined as emerging practices. These will include practices such as

- *Product as a Service*: previously discussed
- *Materials Provenance*: the practice of tracking a single part or material through its lifecycles
- *Industry 4.0*: the practices around the technologies that are developing and becoming more wide spread

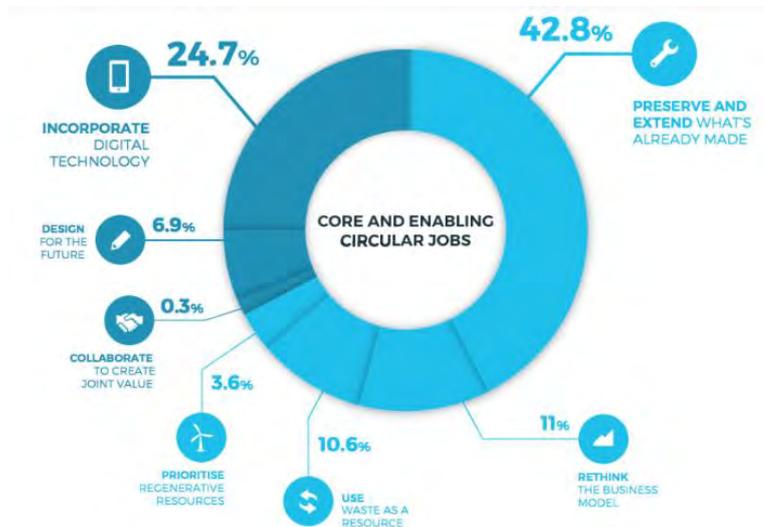
Shifts in SCOR Supply Chain People Skills

Workforce skills, experiences and training become critical for the transition to a circular economy. **Supply chain roles make up 40% of the jobs in the United States** and these roles will shift over time, prompting an update of skills, experiences, and training.

Emerging circular jobs highlight the importance of both maintenance and refurbishment, and of digital technologies.

Several skill areas will shift and expand in the SCOR model. *Asset Management* will become a broader topic. For example, as items remain in use longer, more types of items will be considered assets.

Inventory Management – already a vast skills topic – will become even larger. The definitions and types of inventory will expand as materials circulate and are managed as both raw materials and assets.



Circle Economy ^{iv}

Skills around Performance become even more critical to link performance to the overall supply chain strategy and develop meaningful KPIs which properly balance cost, quality, time and the “circularity” of a supply chain or network.

New skills will also be added to the SCOR model. These may include skills such as:

- *Digital Literacy and Industry 4.0* awareness
- *Digital Value Stream Mapping* and the idea of *Digital Lean Management*
- *Circular Economy* awareness

The SCOR model has reflected the *Processes, Performance* measures, *Practices* and *People* skills for over 20 years. **It will continue to shift to reflect the supply chain habits** required to support Industry 4.0 and circular economy, and supply chains will continue to strategically place organizations to succeed.

Join the just-launched LinkedIn Group called Circular Supply Chains, launching during SAPICS 2019!

SPEAKER/S PROFILE/S + PHOTOGRAPH

Deborah Dull leads supply chain product management at GE Digital which focuses on the supply chain capabilities needed to accelerate the industrial transition to a circular economy. Deborah explores the needs of industrial equipment stakeholders around the world, providing thought leadership on the industrial internet as a strategy for maximizing uptime, reducing cost, and improving time to value. Deborah focuses on building relevant digital industrial supply chain products which address these needs, as well as paving the way to a circular economy.

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