Supply Chain Visibility for Circularity: A Delphi Approach

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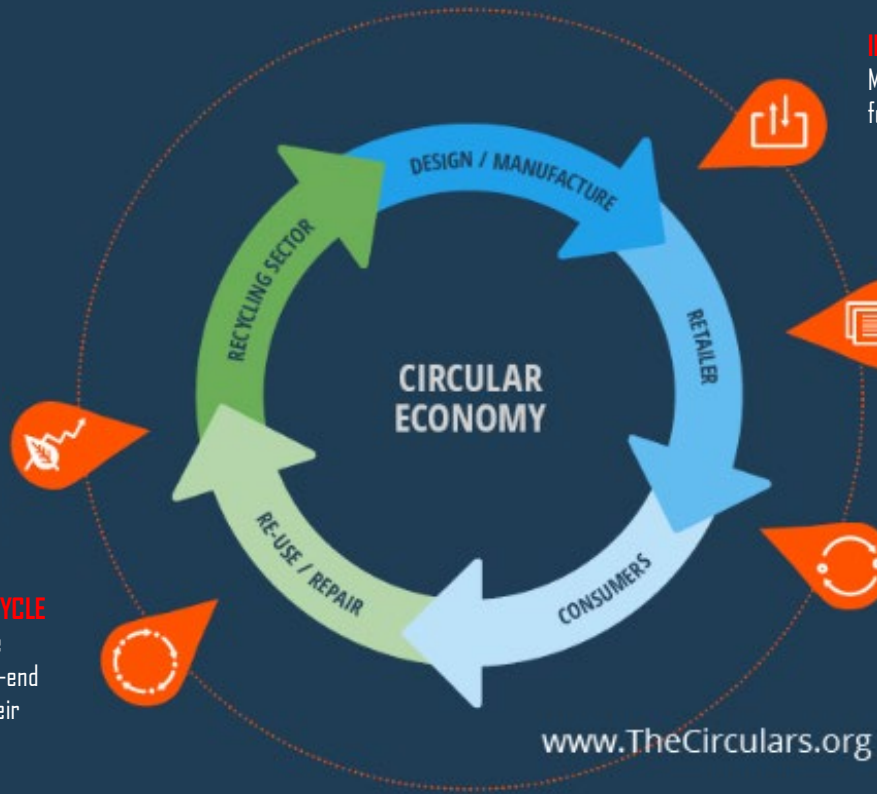
Background and Purpose

- The study aims is to contribute to **resource-efficient manufacturing**
- Examine how **resource consumption and environmental impact** from extended production systems **can be minimized through supply chain information sharing and visibility**.
- Role of **information visibility as an important factor for supply chains circularity and sustainability**.

Industry Challenge related to circularity

- *Product:* Product design, Disassembly, Packaging
- *Process:* Material Handling, Recycling location, Capture return material
- *Transportation:* Mode of transportation, fill rate, Reverse Logistics

WHAT DOES A SUPPLY CHAIN NEED IN A CIRCULAR ECONOMY?



INPUTS & OUTPUTS
Material traceability in forward and reverse loops

CERTIFICATION
Track suppliers certifications and material standards

DATA EXCHANGE
All this data needs to be exchanged among businesses across supply chain

IMPACT
To measure supply chains' sustainability impact

PRODUCT LIFECYCLE
Data needs to be managed end-to-end products and their lifecycles

Created by Tradeshift
Source: Tradeshift / Ellen MacArthur Found

www.TheCirculars.org #TheCirculars

Need of Data !

Consensus!

Methodology - Delphi Analysis

- Developed at Rand Corporation
- Useful to explore and attain consensus
- Responses basis for the input to the following round
- Avoid adverse effects related.
- The rounds continue until a saturation point is reached.
- Gain valuable insights

Expert Selection

- **Senior supply chain and sustainability executives -** These experts were primarily drawn from, or recommended by, industry contacts and research partners.
- **Around 50 practitioners were invited**, and **22 agreed to participate**
- They represent a variety of industries
- The number of participants (22) is in the recommended range for Delphi studies.

Alfa Laval
Assa Abloy
Axis
Ericsson
IKEA
Husqvarna
NIBE
Volvo Group
Scania CV AB
Sandvik COROMANT
Volvo CE
Odette Sweden AB
AstraZeneca
Getinge
Bulten
AC Floby
Veoneer
Perstorp
Ebeco AB
Sandvik
Electrolux

Results

- **First Round :** Four open-ended questions to explore factors
- **Second Round :** Filtering out the important factors
  - Information/Data, Enablers, Drivers, Capabilities, Performance, Barrier/ Challenges
- **Third Round :** Weighting the factors , Likert scale of 1-5
- **Webinar :** Present results and gather commentary inputs (Why and how questions) - To be conducted

First Round

1. Please describe in your own words what circularity means to you in your role, your company, and your supply chains. Please provide examples.
2. Why is circularity important to your company and your supply chains?
3. What factors affect or are affected by circularity of your supply chains and how? If possible, please divide such factors into:
    (a) factors concerned with inbound logistics,
    (b) factors concerned with internal logistics/material handling, and
    (c) factors concerned with outbound logistics.
4. Is there anything else that you think is important in the context of circularity and supply chains that you would like to add?

Resource efficiency
Extended product lifespan
Environmental aspects / To be environmentally friendly
Addressing customer demand (attract investor and customer)
Lower product cost and increase profit
Reduce risk /increase resiliency
New business opportunities

Product design (e.g., recycled/renewable material, design for refurbish and remanufacturing)
Disassembly (e.g., sorting; Design for Disassembly)
Packaging (e.g., ability to re-use of packaging, labelling and legislations for packaging)

Material handling (e.g., new operational and handling procedures)
Recycling location (e.g., location of suppliers and recyclers)
Capture return material (e.g., locate to capture cycled materials rather than virgin raw materials)

Mode of transport (e.g., type of fuel, volume, shipment size, possibility of return flow)
Fillrate (in transportation; degree of achieving full truck loads)
Reverse logistics/Transport of refurbished products (e.g., plan/predict products to be recycled, establish new ways of working)

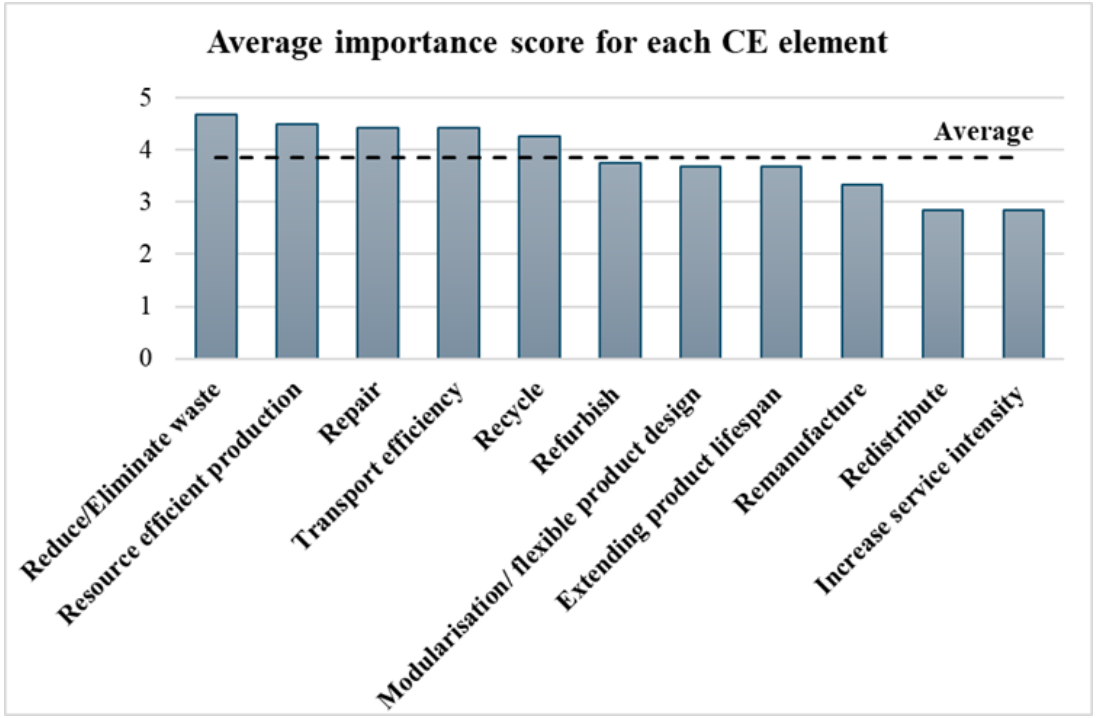
Second Round

How can SCV address challenges related to

- “product” (e.g. Product design, disassembly, packaging etc.)
- “process” (e.g. Material handling, recycling location, capture return material etc.)
- “transportation/supply chain” (e.g. mode of transport, fill rate, reverse logistics/transport of refurbished products etc.)

for attaining higher levels of circularity? For example, what type of information would be useful to address challenges related to transportation factors for attaining higher levels of circularity?

Third Round


Average importance score for each CE element
5
4
3
2
1
0
Average
Reduce/Eliminate waste
Resource efficient production
Repair
Transport efficiency
Recycle
Refurbish
Modularisation/ flexible product design
Extending product lifespan
Remanufacture
Redistribute
Increase service intensity

Third Round

Product data

Item related data (Item identity; Serial number; Item quality; material specification; Supply chain Bill of material (BOM); Product composition data /Supplier BOM; Material origin and traceability data Batch identity

Supply chain data

Location of suppliers of new/virgin material (different tiers, upto origin); Location of recyclers; Installed base of product; Item real-time tracking (forward and reverse supply chains); Inventory balances in the circular supply chain

Process data

Internal inventory data Planning parameters; Process quality data; Scrap threshold; Reasons for scrapping; Product usage data; Item quality after use; CO2 impact; Certification & legislation; Item recyclability; Disassembly instructions; Packaging instructions; Service and maintenance instructions

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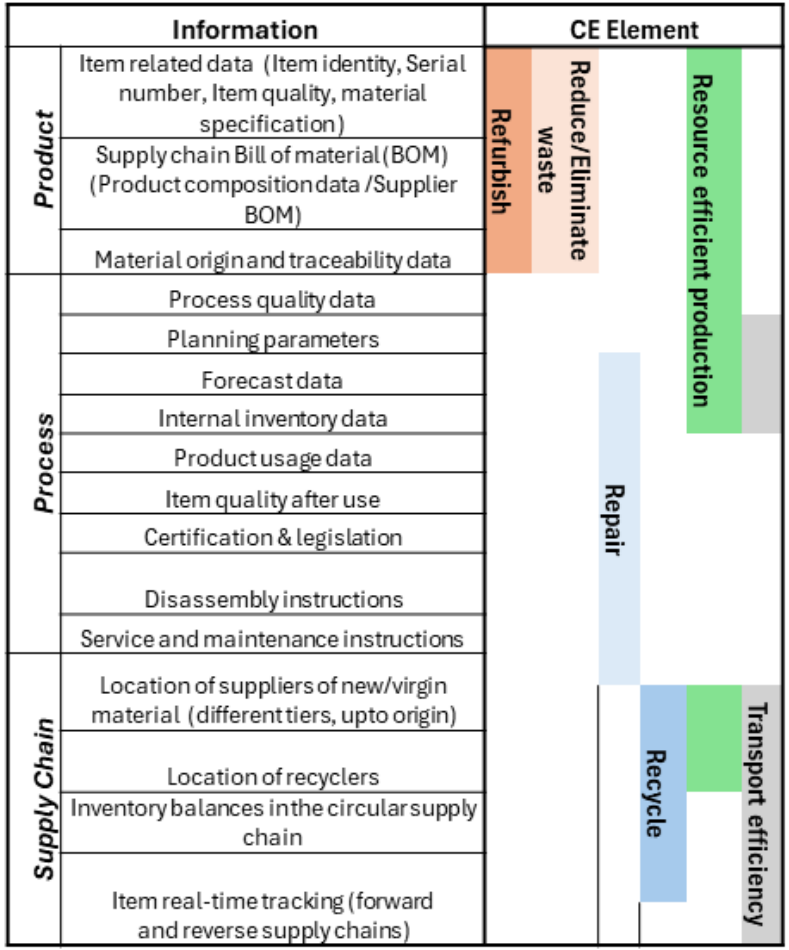
Third Round


Information
CE Element
Product
Item related data (Item identity, Serial number, Item quality, material specification)
Supply chain Bill of material (BOM) (Product composition data /Supplier BOM)
Material origin and traceability data
Process
Process quality data
Planning parameters
Forecast data
Internal inventory data
Product usage data
Item quality after use
Certification & legislation
Disassembly instructions
Service and maintenance instructions
Supply Chain
Location of suppliers of new/virgin material (different tiers, upto origin)
Location of recyclers
Inventory balances in the circular supply chain
Item real-time tracking (forward and reverse supply chains)
Refurbish
Reduce/Eliminate waste
Resource efficient production
Repair
Recycle
Transport efficiency

Concluding remarks

- SCV plays a pivotal role in the successful implementation of circular economy.
- Effective information sharing facilitates collaboration among stakeholders
- A clear distinction is noticeable as to which category of data elements dominates which CE-strategies. While the real reasons are to be explored, some potential underlying reasons can be put forward as arguements.
- In terms of managerial implications, this study offers valuable insights for supply chain and sustainability managers to establish connections with crucial information that should be recorded and shared within the supply chain to effectively implement CE principles.
- In terms of research implications, this study contributes to the literature by providing state-of-the-art empirical evidence on managerial perspectives of SCV and its impact on CE

Reflections and Discussions

1. Do you have (or know of) circularity practices and examples? Define its need for visibility?
2. Do you validate the findings? Are there any insights that are less evident or require further scrutiny?
3. For industry: Is this information readily available within your supply chain? If not, what are the reasons behind its unavailability. Product - Process - Supply Chain