SUPPLY CHAIN IN AN EMERGING JOINT INDUSTRY

Rearranging the supply chain network for a performance - service system

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1 Theoretical Foundations
Circular Economy

◇ What?
An alternative to the traditional linear economy (make, use, dispose) which is based on economic incentive, in which the resources are used in different cyclical material loops.

◇ Why?
Creating economical value by using the materials in different cyclical loops instead of disposing the materials, thus sustainability is an outcome of circular thinking.

◇ How?
It is not about using less material, it is about thinking differently with considering the after-use value in the design of the products.
Performance – Service System

◇ What?
An ideal outcome of circular economy in the construction industry

◇ Why?
In this system the supplier is incentivized to consider the after-use value of the material for other cyclical loops

◇ How?
Offering performance and services to an end-user
Supply chain

- A supply chain is a special type of network involving material and information flows, established around a particular building project.
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Problem Field
Problem statement
The global trends and problems with current construction industry

There is an urgency to implement Circular Economy in the construction industry

Resource scarcity
Landfill costs
Rising prices of resources
Energy concerns
Environmental burdens
Dependency on import
High costs of demolition
Inflexible real estate

Potential benefits of implementing Circular Economy

Construction industry

How can the supply chain be rearranged in order to develop and implement a performance – service system?

Linear system
Circular Economy

Bottom-up approach

How does it affect the supply chain network?
How does it affect the IORs?
What are the barriers?
Problem Field

- Resource efficiency
- Economical benefits
- Sustainable construction
- Flexible real estate
- Building as a value at the end of life stage
Problem Statement

- Split incentives and conflicting interests within the conventional project organization in the construction industry
  - The total mixture of interests blocks the interests that are wider than the project scope
  - The short-term vision of the supply side parties in current construction process

- The need for alignment of supply chain organization towards the effective delivery of performance offering

Empirical evidence

- How does it affect the supply chain network?
- How does it affect the IORs?
- What are the barriers?
3 Research Questions
Main Question

◇How can the supply chain be rearranged in order to develop and implement performance – service system?
Sub Questions

◇ What is circular economy? (Literature review)
◇ What does the construction industry look like? (Literature review)
◇ What will implementation of circular economy mean for the construction industry? (Literature review, Case studies, Explorative interviews)
◇ How can the organizational set-up be developed for a performance – service system? (Scenarios based on Explorative interviews and Case studies)
Research Methodology
Exploratory and qualitative research

- Literature review
- Exploratory and in-depth Interviews: Semi-structured interviews
- Empirical evidence: Multiple case studies

Abductive research approach

Levels of sampling

- Theoretical sampling
- Snow ball sampling
Case selection

✧ Cases
  • Park 20|20
  • Alliander
  • Brummen town hall

✧ Data collection method
  • Semi-structured interviews
5 Case Studies
Case Studies

What?

◇ Investigating how the implementation of circular economy affects the organization of a building project in practice

◇ Analysing the different relations that change under this influence

Why?

◇ Understanding the similarities and causalities between the cases

◇ Exploring the existing barriers within the organizational model for implementing circular economy in practice
Park 20|20

- Office spaces based on end-user functional demands
- Design with disassembly in mind
- Buildings as material banks
- Flexible working places
- Adaptable buildings
- Considering specific time period

Acoustic islands free hanging, all the construction and materials underneath the acoustic tiles can be leased
Analysis of the life cycles

◇ Early involvement of the suppliers in the process
  • Bringing knowledge and innovative ideas
  • Dependency of designers on the suppliers for material selection (availability of products)
  • Special material ambitions (non-toxic)

◇ Early involvement of the contractor
  • Coordinating the process
  • Organizing all the data in one BIM model

◇ Early involvement of the end-user
  • Defining the functional and performance demands
  • Co-creating ideas with the suppliers
Supply chain structure

♦ Integral building team
  • Co-developing new ideas with multidisciplinary team
  • Collaborative approach to find effective solutions for project ambitions

♦ Linear structure
Procurement

◊ Special demands for the project / Changing the purchasing process

• Lack of trust

“all the way down the line people are trying to hit the lowest level of quality for the cheapest price. And squeeze an extra half percent or two percent out of the budget from purchasing”

• Conflicting interests

“cause if they don’t lead and you let the contractor lead then there is no C2C. why would they do that? That is not in their vison.”

• Culture of blame / litigious industry

“So we really want high quality and the first thing the general contractor does is get its lawyer involved and they try and poke as many holes as they can in that”
Material ownerships

◇ Delegating the ownership to the supplier

- Attuning the product for circularity because of the financial incentive
- Win-win situation

◇ Determining certain performance level

“within the service system all companies try to sell the biggest service system possible. Simply because if you have more piping you get paid for, and it doesn’t bring you better quality, or better quality of life. And it is not relevant for your business model. You have to sell as much stuff as possible. CE makes it possible to get paid for the performance and if you get a better performance or the same performance while using less materials as a service company you get more money. Cause you pay less for the materials and you get the same paid or better paid”
Relationships

◇ Process alignment

◇ Incentive alignment
  • Suppliers cooperating with the project ambitions
  • Innovative solutions

◇ Information exchange and communication
  • Effective problem solving

◇ Co-creation with the end-user
  • Facilitating a better value creation

◇ Trust and transparency
  • Long term commitment of the suppliers to the project ambitions

◇ Mutuality
Alliander Headquarters

- Office spaces based on end-user functional demands
- Design with disassembly in mind
- Using waste as a resource
- Flexible working environment
- Using C2C materials
Analysis of the life cycles

◇ Early involvement of the end-user in the design stage

• Co-developing the functional demands with market parties

◇ Early involvement of the contractor

• Creating a consortium that would stimulate collaboration between the stakeholders
Supply chain structure

◇ Integral building team (consortium)
  • Collaborative approach to find effective solutions
  • Co-creative process
  • Working towards the same goal

◇ Horizontal structure
Relationships

◇ Incentive alignment
◇ Long term contracts
  • Created an area for close communication
◇ Information exchange and communication
◇ Joint-decision making
◇ Co-creation with the end-user
◇ Trust and transparency
◇ Mutuality
Barriers

◇ Culture of blame

• Making the end delivery less optimum

“we are very prone to you know putting risks on the other persons in the other person’s responsibility, so what people are trying to do [...] is minimizing their own sphere of influence in terms of risks, so I don’t want these risks, they are yours. And by doing so actually making the end delivery less optimum”

◇ Conflicting interests

• Without the right incentives people fall back into their own goals

“You need to stimulate collaboration between disciplines in the sector, you need to insure this collaboration is not just you know oh yeah we are collaborating, you need to sort of incentivize that.”
Brummen town hall

- First ‘semi-circular’ project
- Design with disassembly in mind
- Flexible working environment
- Considering specific time period
Analysis of the life cycles

◇ Early involvement of the suppliers
  • Setting the performance indicators with the suppliers
  • Co-developing ideas with the designers

◇ Early involvement of the contractor
  • Configuring the material life cycle
  • Contractor as the facilitator

Concept Definition
- Public authorities
- Developer
- Investors
- Consultants
- Architect
- Engineers
- Interior designers

Design
- Public authorities
- Developer
- Consultants
- Architect
- Engineers
- Interior designers
- General contractor
- End user

Construction
- General contractor
- Developer

In use
- End-user
- Owners
- Maintenance contractor
- Developer
- Supplier

End of life
- Demolition contractor
- Supplier

Building delivery and management process
Supply chain structure

- Integral building team
  - Collaborative approach to find effective solutions
  - Co-creative process
Relationships

- Information exchange and communication
- Joint-decision making
- Co-creation with the end-user
- Trust and transparency
- Mutuality
Findings

• Suppliers marginalized role

• Early involvement of the down stream supply chain (suppliers, subcontractors)
Findings

• Short-term involvement of the upstream supply chain

• Long-term involvement of the upstream supply chain
Findings

• Mutually exclusive building process

  Low level of interdependence among supply chain

• Mutually inclusive building process (interdependent)

  High level of interdependence among supply chain stakeholders
  Integral building team
Findings

• Short-term relationships between end-user and supply side parties

• Co-creation with the end-user
  End-user centric
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Normative model
Normative model

◇ The end-user that demands for performance
◇ The supplier that provides performance (Down stream supply chain)
◇ The financier (capital provider)
◇ The realizing parties (Upstream supply chain)
Scenarios

Lease contract

Realizing parties

Contractor
Designers

Owner of materials
Supplier 1 Supplier 2 Supplier 3 Supplier n

Conflicting interests
Culture of blame

Conflicting interests
Culture of blame
Complex contract management
the consultants stop working for the project and start **working for the system**. It can be that the construction company is becoming part of the consultant [...] or the consultant becomes part of the construction company [...] But it will become one entity, one contract. It could be different companies but they have to work into one united group of interests, directly contracted on behalf of real estate developing, on behalf of the end user.

we should make contracts that support **long term strategic partnerships** in the chain. So **interorganizational relationships should not be brief but should have a considerable time span.**

So it is the same as in the human relationship between two people, if you only have the focus on holiday relationship, it would be different when you say well we marry and we stay together for the rest of our lives. Then your **mind set**, the whole thing, the way you are acting is completely different in those cases. So what we need to do is that the inter organizational relationship should be I think such that we have an entrance to keep a good relationship on the long term. So if we do a project, this project should be not be just carried out lousy goosy with a lot of hassle, because after the project we won’t see each other again. But then again the project should be done in the proper fashion because that project is not the last thing that we do together.

And the construction industry being acetic in a lot of ways. It is very **litigious** for instance. So everybody is concerned about their own risk and risk parts down the chains. The current model doesn’t really fit with the CE.
Scenario—Service provider

- Service provider
- End-user
- Contractors
- Design teams
- Financier

Lease contract
Direct agreement

Contractors
Design teams
Financier

Conflicting interests: Working for the system
Culture of blame: Collective sharing of risks and profits
Complex contract management: One company is responsible

One Company
- The contractor and the design team work as a one company

Alliance contract
- All the team win, or all the team lose, depending on outcomes actually achieved (win-win)
- Profit and risk sharing, and not allocated to individual party (no blame culture)
- Open-book transactions
- Communication is open and honest
Scenario—Service provider

◇ The end user specifies the functional demands rather than requirements
  • Co-developing with market parties

◇ The end-user has direct contract with the service provider
  • Solving the complex contract management

◇ The end-user pays for the enhancement of the services during the building life cycle
  • Agreeing on certain performance levels
Scenario - Service provider

- The Financier (capital provider) is only interested in providing services for end-users
  - Owner of the land
  - Owner of the structural elements
- Direct agreement with the end-user that in case of bankruptcy will continue the project, and will be the owner of the materials
Scenario—Service provider

◇ The Service provider team find innovative solutions for functional demands of the end user

• Joint decision making within the team and with the suppliers

◇ Service provider does the design, build, maintenance and operation.

◇ The service provider has tighter partnership with the suppliers
7 Findings and Conclusions
There are Architectural and construction companies that are thinking towards closer relationships and partnerships with the suppliers.

Whether the contractors and the designers would work together for adhering the role of the service provider is not apparent yet.

“The contractor will not be the general contractor anymore. An architectural firm will have a department with subcontractors.”

The lease models may be applicable in long-term because of three reasons:

• At the moment the focus is on business continuity rather than circular economy and the suppliers do not have a view on the inherent value of the materials
• Unstable prices of the materials
• Need for innovation

For successful provision of the performance - service system, there needs to be one focal company that performs as the service provider

The supply chain parties should preferably work in teams under one contract rather than acting as an individual firm
Recommendations
Recommendations

◇ The contract contents between the end user and the service provider
◇ To further investigate the financial models
◇ To find out how the government can have an active role in stimulating circular economy by changing the tax conditions or solving the current legal barriers
◇ Working on new value propositions from the supply side parties
Thank you.