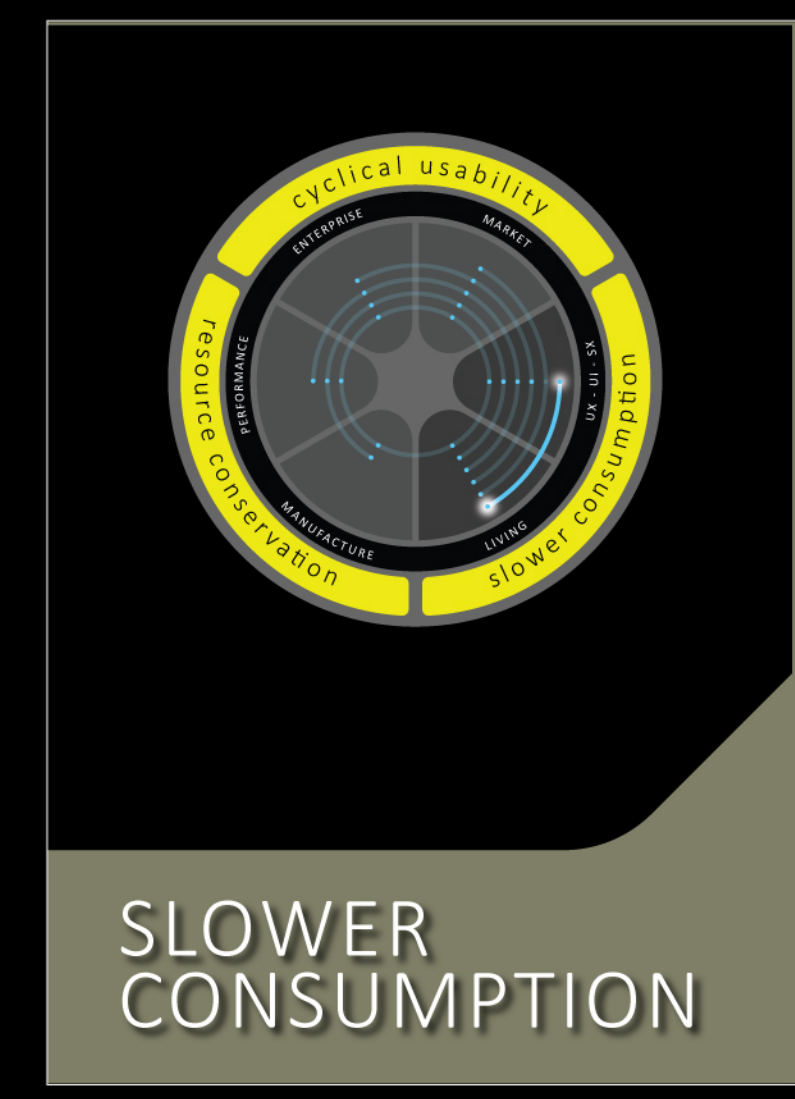
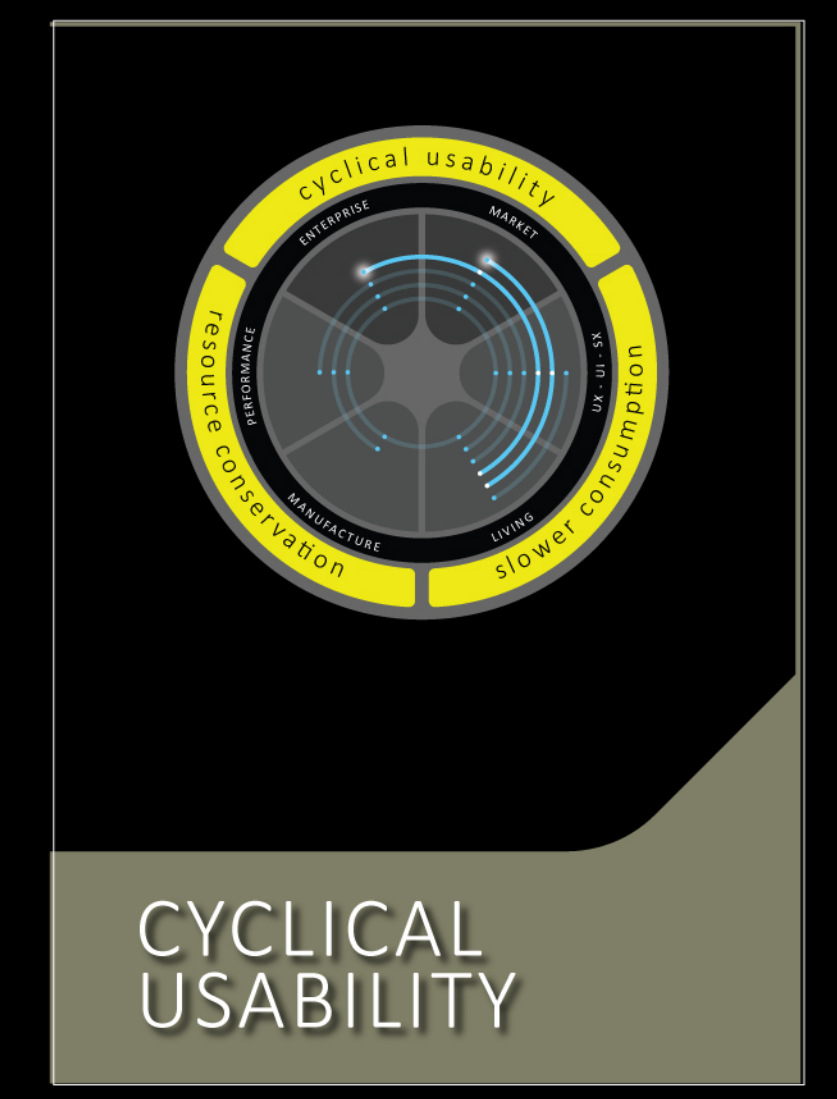
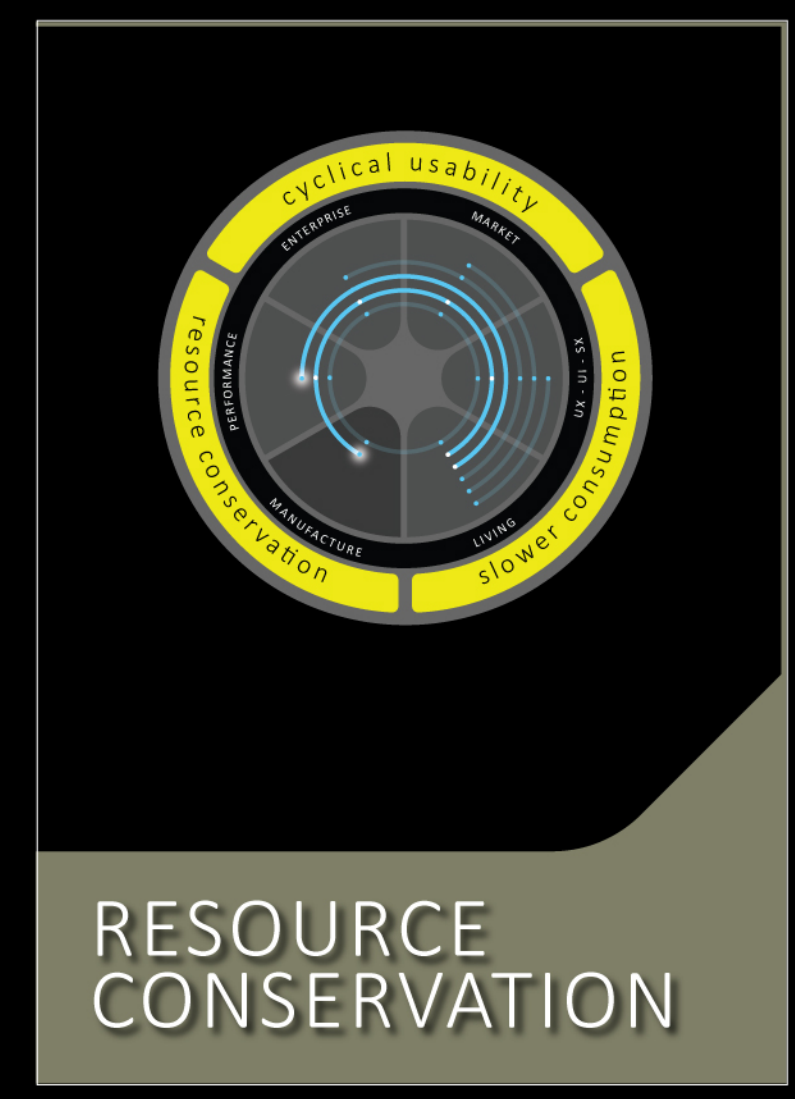
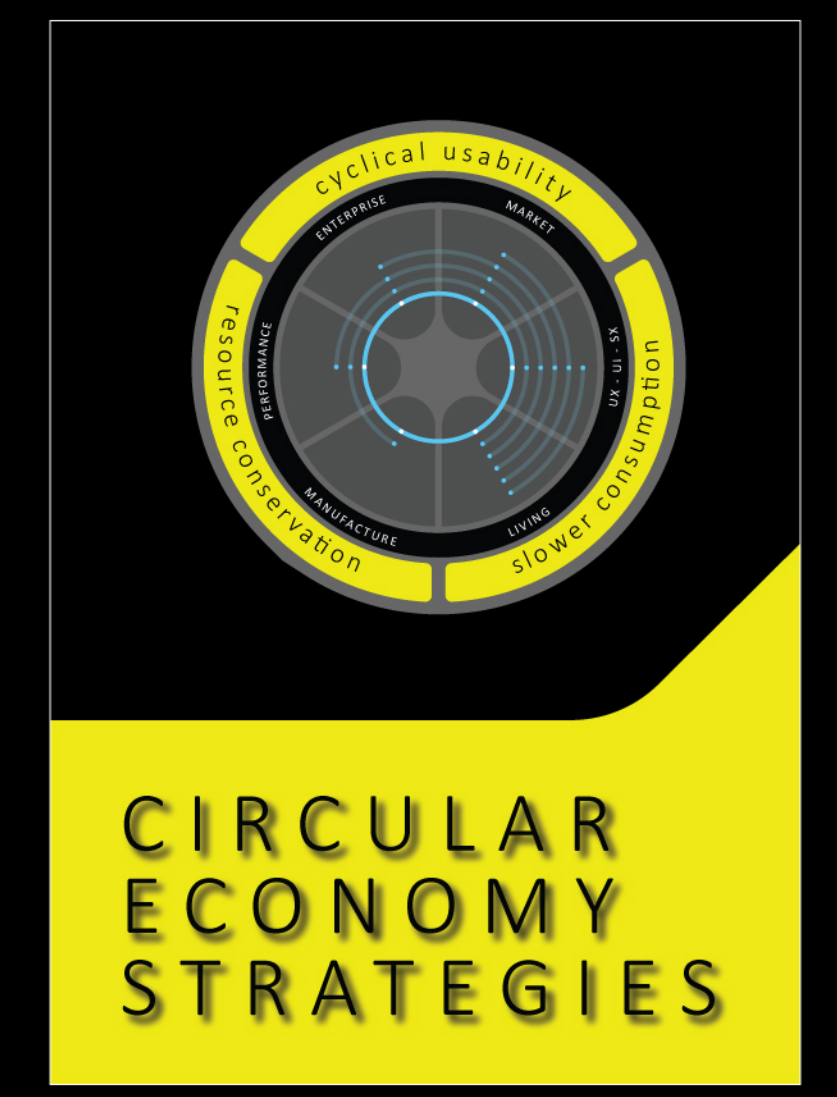
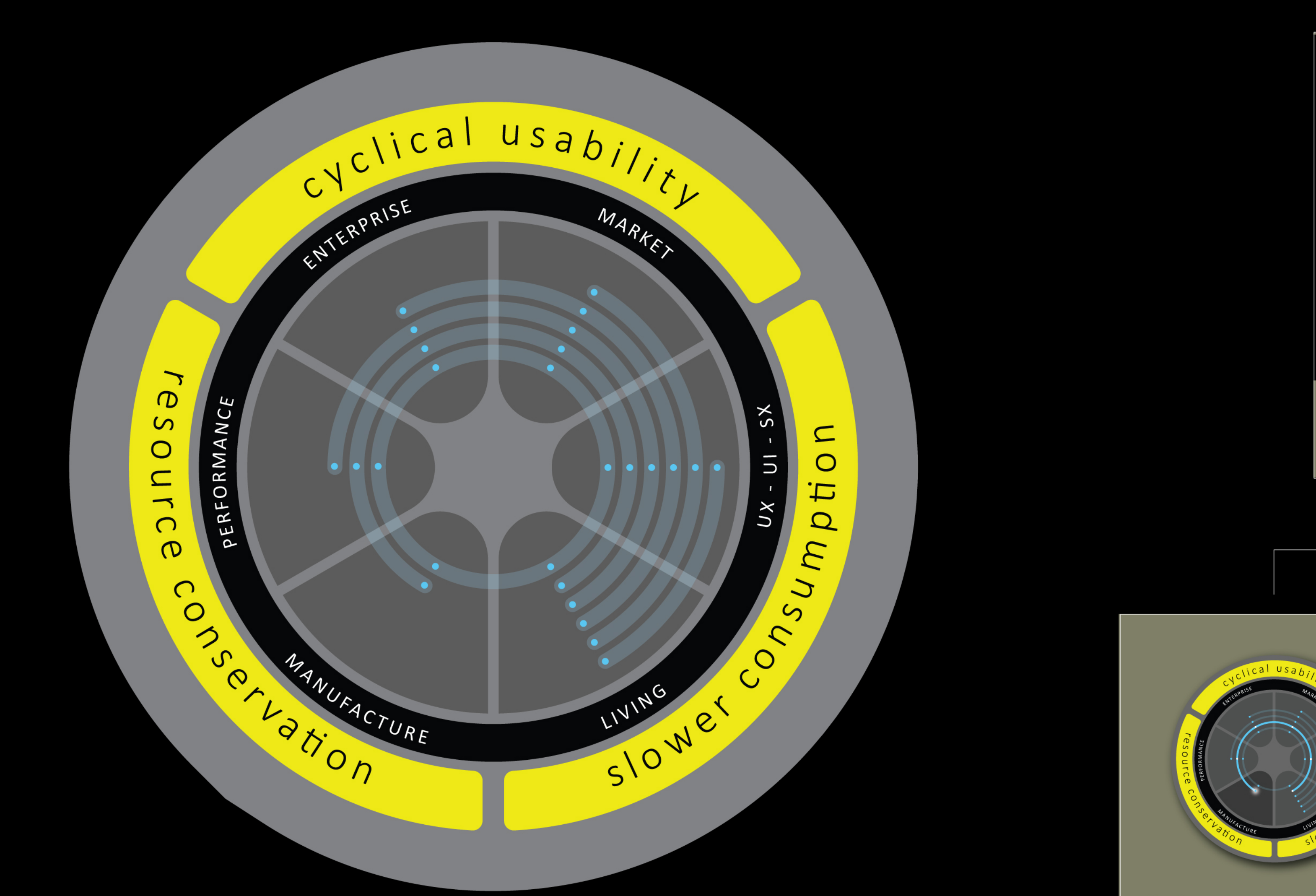


PARAMETERS	SUSTAIN-DRIVERS	INNOVATION CHANGE TRIGGERS	DESIGN PARADIGMS
resource conservation	1. product greening 2. product recycling	renewable materials - zero footprint remanufacture - zero waste	Fair, Ethical, Green Procurement + Manufacture Recover + Recycle + Upcycle
cyclical usability	3. product reuse 4. product replace	rental library - multiple use product service - zero consumption	Rent, Loan, Swap Custom Made - Prodluc Care + Repair
slower consumption	5. product resell 6. product for life	product buy-back - extended product life cycle enduring usability - evocative product value	Redesign product Subscription High Quality & Timeless Design

- green technologies
- ethical procurement
- loyalty buy back
- collection services
- product rental
- product library
- premium
- customised products
- subscription products
- product replacement
- life-long service
- evocative products



01:
Circular value chain

resource conservation

02:
Recovery and collection including industrial symbiosis.

resource conservation

03:
Durability, modularity with repair services.

cyclical usability

04:
Personalisation, made to order and lock-in

cyclical usability

05:
Product service systems & dematerialised services

slower consumption

06:
Collaborative/sharing economy

slower consumption

01:
Circular value chain

Production cycles aim to close the loop across the entire value chain. They use fully renewable, recycled and/or recyclable or biodegradable materials that can be used in consecutive lifecycles to reduce costs and increase predictability and control. Products are designed efficiently, minimising material use without affecting performance. Low toxicity materials selected where possible; biological and technical materials are easily separated and recovered or renewed.

02:
Recovery and collection including industrial symbiosis

The focus is on production and consumption systems in which everything that was previously considered as waste is retained for other uses through tracing and recovering products at the 'end of their life'. This feature also includes reclaiming waste and by-products from the production process, and incentivised return systems. The recycling process can include both upcycling (into higher value) and down-cycling (into lower value).

03:
Durability, modularity with repair services

The focus is on increasing or extending the life of products across the whole product lifecycle. This could be by maintaining and improving products through repairs, upgrades, refurbishment, remanufacturing or remarketing. The effectiveness of this feature is impacted on through the design process with a focus on design for disassembly; modular design; material selection for durability and design for repair.

04:
Personalisation, made to order and lock-in

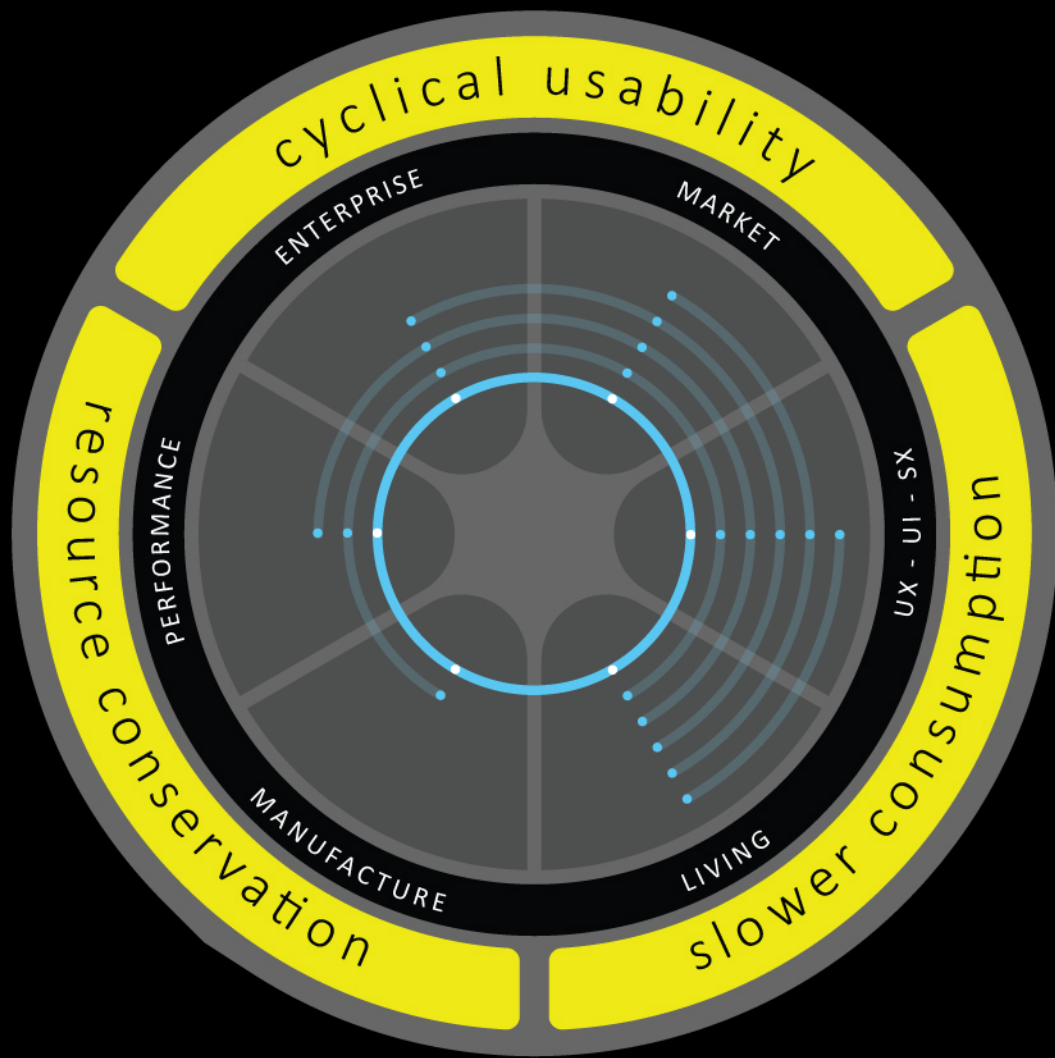
This is about building a more personalised, longer-term relationship with the customer. By doing so, it becomes easier to close loops, recover materials/products and reduce resource use. Made-to-order production minimises material requirements and avoids potential losses from overstocking. Businesses that directly 'lock in' consumers can circumvent the need for a separate retailer, and enable greater insight into the potential demand for the product itself or, where relevant, the product retail.

05:
Product service systems & dematerialised services

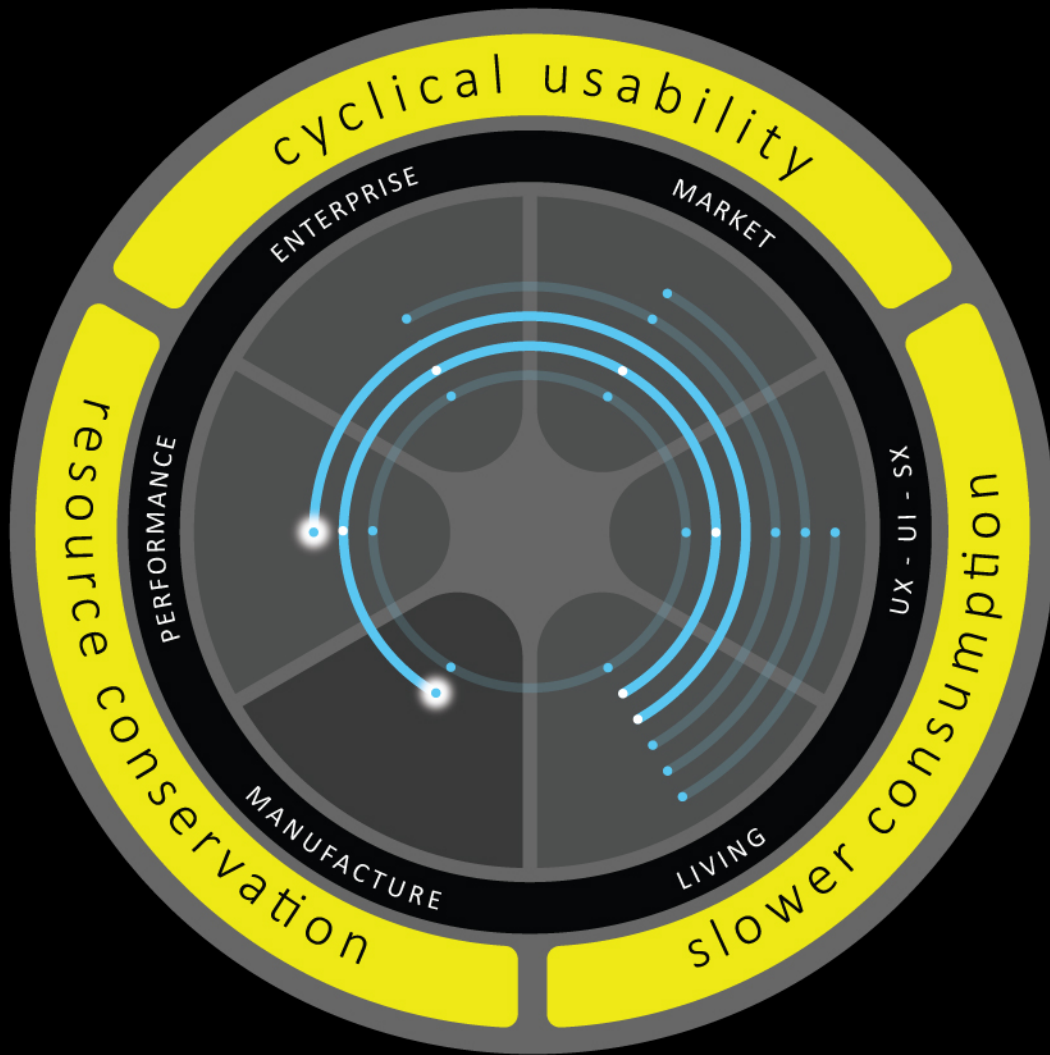
The manufacturer or retailer bear the 'whole cost of ownership' with a subsequent focus on the durability, longevity and reliability of the product along with usage rates and reusability. Also, dematerialised services such as Netflix, Spotify and cloud computing play a big role. Here the business provides access to a service for the customer, rather than the product itself.

06:
Collaborative/sharing economy

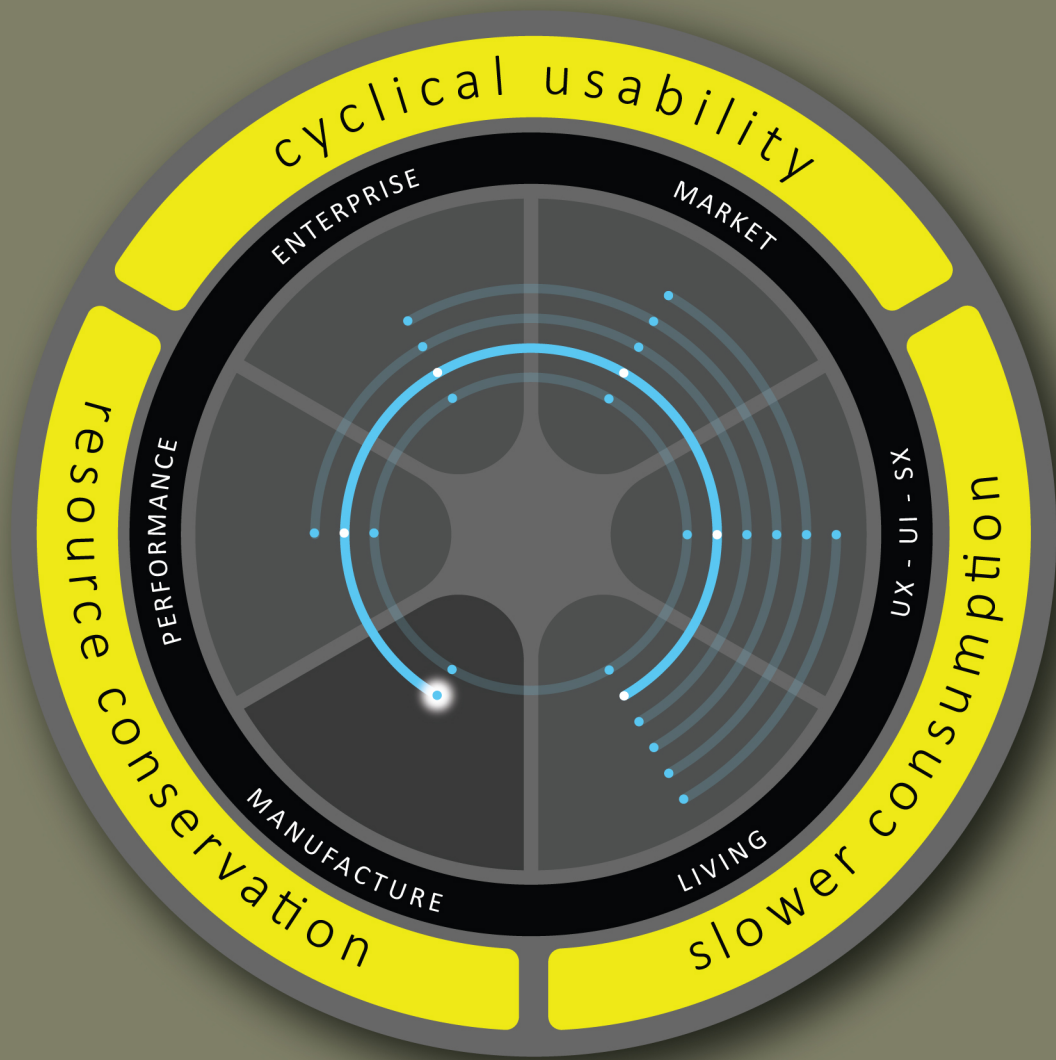
Digital technology is used to create new relationships and business opportunities for consumers, companies and microentrepreneurs to rent, share, swap or lend their 'idle goods'. Fewer resources are required to make products that are infrequently used, and consumers have a new way to make and save money. This feature requires the platform, and the users of the platform, to function effectively.



CIRCULAR ECONOMY STRATEGIES



RESOURCE CONSERVATION



01:

Circular value chain

resource conservation

01:

Circular value chain

Production cycles aim to close the loop across the entire value chain. They use fully renewable, recycled and/or recyclable or biodegradable materials that can be used in consecutive lifecycles to reduce costs and increase predictability and control. Products are designed efficiently, minimising material use without affecting performance. Low toxicity materials selected where possible; biological and technical materials are easily separated and recovered or renewed.

01: MANUFACTURE - *resource metabolism*

Information

WHAT?

Information on active initiatives in relation to sustainable products.

WHY?

Information makes knowledge visible, accessible and transparent to actors such as users, internally within a company and collaborative partners.

CHALLENGES

- To make the information comprehensible, attractive and relevant to the user.
- To get the necessary information from sub-suppliers.

EXAMPLES

- Information on generic material categories such as at Træ.dk - Danmarks Træportal.
- Product information as from the company, Neutral selling B2B clothing.
- Strategic information as from the company, Patagonia.
- The company, Everlane has a concept called 'Transparency Tuesday', where they answer questions from customers using Instagram as a platform.

THIS CARD LINKS TO

/ E-Shop / Ethical Supply Chain / Maintenance / Labelling / Product History / Repair

FURTHER READING

Jorij (2014). Product Information Management: Theory and Practice. Springer
/ Wang & Hazen (2016). Consumer Product Knowledge and Intention to Purchase Remanufactured Products. International Journal of Production Economics 181 Part B, pp. 460–469.

01: MANUFACTURE - *resource metabolism*

Environmentally Friendly Materials

WHAT?

Materials and production methods that in different ways consider the environment in a positive way.

WHY?

Environmentally friendly materials are used to minimize pollution and use of resources in materials and production and disposal.

CHALLENGES

- Environmentally friendly materials can be many things and it is just necessary to define, how it is environmental.
- A product may not necessarily be environmental friendly even if the material is.
- Environmentally friendly materials might compete with less expensive alternatives.

EXAMPLES

- Use of organic cotton instead of conventionally grown cotton; see e.g. the Danish company Organic Basics.
- Conventional plastics (such as Polyester and Nylon) that are made by using renewable components, see for example the Plantbottle initiative.
- The company Stenpapiir has made an alternative to paper made from wood-pulp that is Cradle to Cradle certified.

THIS CARD LINKS TO

/ Labelling / Re-Use

FURTHER READING

Allwood & Cullen (2011). Sustainable Materials – With Both Eyes Open: Future Building, Vehicles, Products and Equipment – Made Efficiently and Made with Less New Material. UIT Cambridge / Fletcher & Grose (2012). Fashion & Sustainability: design for change. Laurence King Publishing, London.

01: MANUFACTURE - *resource metabolism*

Ethical Supply Chain

WHAT?

Initiatives towards responsible labour conditions in a product's life cycle. This is often incorporated in a company's corporate social responsibility (CSR) strategy.

WHY?

Focus serves to ensure that workers involved in a product's life cycle have dignified living conditions taking into ethical concerns of the industry.

CHALLENGES

- Sub-suppliers do not always share a company's values; consequently in some places it is necessary to monitor sub-suppliers, which is time consuming and expensive.

EXAMPLES

- The Code of Conduct is based on International Labour Organization (ILO) standards and seeks to protect the workers in manufacturing.
- The organisation, Clean Clothes Campaign, focuses on improving working conditions in the global garment industry.
- The company, Carcel provides jobs and a fair living wage to women in prison in some of the World's poorest countries
- The company, Fairphone focuses on using materials from conflict-free areas and enabling workers to organise in labour organisations.

THIS CARD LINKS TO

/ Information / Labelling / Local Production / Product History

FURTHER READING

Crane et al. (2008). The Oxford Handbook of Corporate Social Responsibility. Oxford University Press / Moon (2014). Corporate Social Responsibility: A Very Short Introduction. Oxford University Press / Ross (2004). Slaves to Fashion – Poverty and Abuse in the New Sweatshops. Michigan University Press.

01: MANUFACTURE - *consumption metabolism*

Design for Disassembly

WHAT?

Working with materials in a manner that allows for material separation once product is discarded or in need of repair.

WHY?

Design for Disassembly can ease and support re-use of materials.

CHALLENGES

Design for Disassembly may challenge the intended design expression and/or economic considerations.

EXAMPLES

- Design that makes it easy to remove and replace product elements that wear out first. This is often seen with i.e. linings in coats, but can also be collars, sleeves or other exposed parts.
- Design that makes it easy for the user to disassemble the product and replace the exact broken part such as the Fairphone (www.fairphone.com).
- Design where materials can be separated and re-used or
- re-cycled after the product is fully discarded by the user, by avoiding e.g. glues and mixed fibre materials. An example is Herman Miller's Aeron chair.

THIS CARD LINKS TO

/ Modularity / Mono-Material / Upcycling

FURTHER READING

Bakker et al. (2014). Products That Last – Product design for circular business models. TU Delft, Delft, pp. 104-109 / Bogue (2007). Design for disassembly: a critical twenty-first century discipline, *Assembly Automation* 27 (4), pp. 285-289 / Vezzoli & Manzini (2010). Design for Environmental Sustainability, Chapter 9: Facilitating Disassembly. Springer, London, pp. 181-197.

01: MANUFACTURE - *consumption metabolism*

Mono-Material

WHAT?

A product that is composed of a single type of material or a product with components that each are made of a single type of material and that can be split apart.

WHY?

Mono-materials can ease material re-use and recycling of a product.

CHALLENGES

- There are limited possibilities for re-utilisation due to lack of facilities that process into new high value materials.
- Compromises on for example functionality and quality of the product may be necessary.

EXAMPLES

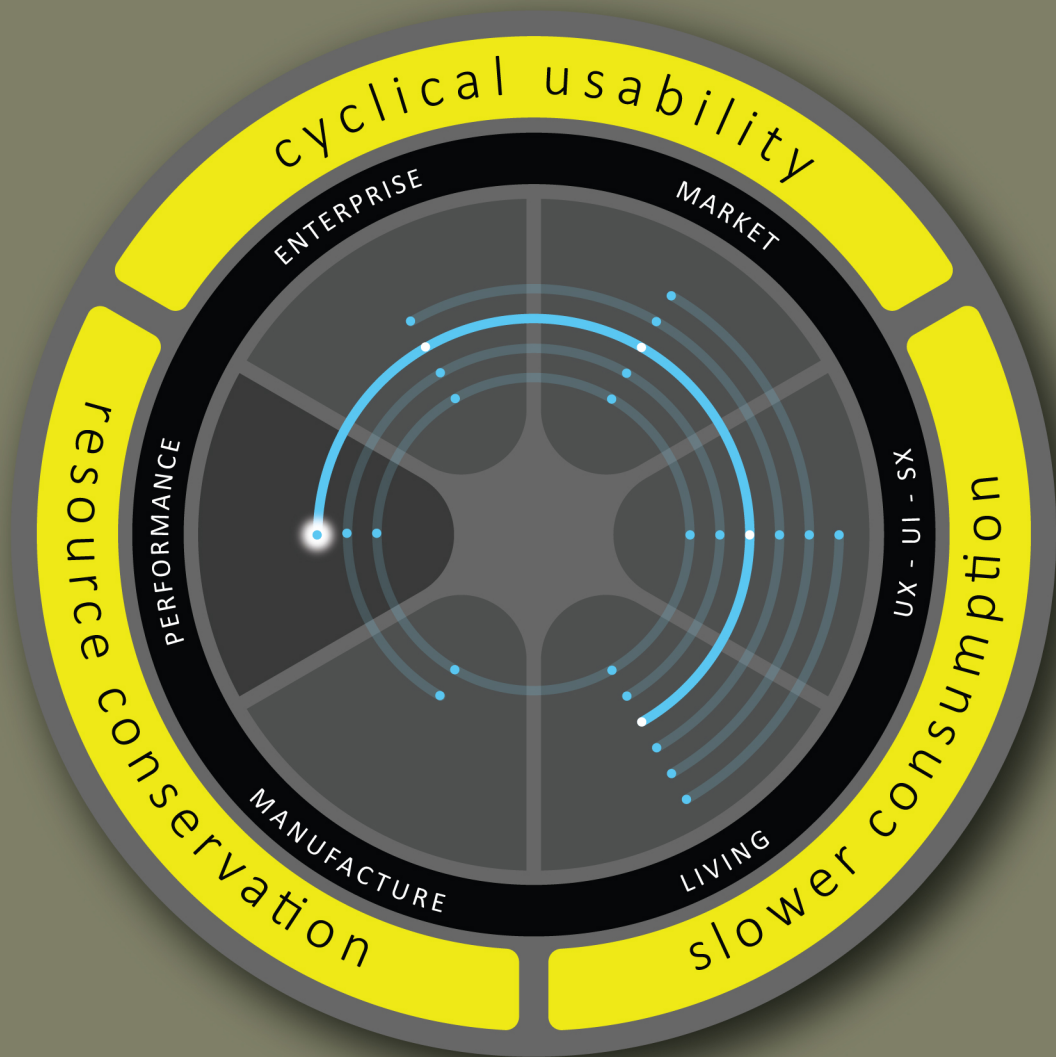
- Mono material can be a creative constraint and concept, see for example Pleats Please made in 100% polyester by Issey Miyake .
- The chair, Nobody by Komplot Design is produced in 100% polyester fibre mat without any additives or additional materials for assembly or reinforcement.

THIS CARD LINKS TO

/ Design for Disassembly / Modularity / Re-Use / Up-Cycling

FURTHER READING

Gwilt (2014). A Practical Guide to Sustainable Fashion. A&C Black / Kappelgaard et al. (2011). Living Lightly – Sustainable Fashion. Design School Kolding, Kolding, pp. 51-63 / Vezzoli & Manzini (2010). Design for Environmental Sustainability, Chapter 8: Extending the Lifespan of Materials. Springer, pp. 171-180.



02:

**Recovery and collection
including industrial symbiosis.**

resource conservation

02:

Recovery and collection including industrial symbiosis

The focus is on production and consumption systems in which everything that was previously considered as waste is retained for other uses through tracing and recovering products at the 'end of their life'. This feature also includes reclaiming waste and by-products from the production process, and incentivised return systems. The recycling process can include both upcycling (into higher value) and down-cycling (into lower value).

02: PERFORMANCE - *resource metabolism*

Zero-Waste

WHAT?

To optimise the use of material in production and use. In the apparel industry this can correlate to optimising material usage through pattern construction.

1. Placing of pattern construction on fabric.
2. Full use of own or others material scraps for other purposes.

WHY?

Working with a zero-waste approach can minimise material waste.

CHALLENGES

- It may demand aesthetic compromises.
- It can be difficult to get access to material 'left overs'.

EXAMPLES

- The production techniques used to manufacture Nike Flyknit sneakers minimise excess materials.
- The company, Carcel works with fully fashion knit as a way to eliminate waste and save valuable materials in production.
- 3D printing techniques that can be applied for multiple materials offer efficient use of materials as well as potential reuse of excess materials. See for example the company, Materialise (e.g. www.materialise.com).

THIS CARD LINKS TO

/Modularity / Mono-Material / Multi-Functionality / Re-Use

FURTHER READING

Johnson (2016). Zero Waste Home: The Ultimate Guide to Simplifying Your Life. Penguin Books / McDonough & Braungart (2002). Cradle to Cradle: Remaking the Way We Make Things. North Point Press / Rissanen & McQuillan (2016). Zero Waste Fashion Design. Bloomsbury.

02: PERFORMANCE - *resource metabolism*

Local Production

WHAT?

Production of product placed locally to either development, material production and/or retail.

WHY?

Local production can:

- minimise use of resources i.e. transport costs, CO² emission and logistics.
- enable design innovation in collaboration with manufacturers within production.
- support local communities.
- support transparency in the supply chain.

CHALLENGES

Lack of locally situated manufactures in Denmark, Scandinavia and Western Europe due to the general outsourcing.

EXAMPLES

- High-end textiles company, Wallace & Sewell use their choice of local production as part of the product history build-up.
- Local Production can be used to promote and invigorate a specific geographical area through a joint platform, see for example MINYC.
- Adidas has launched a Women's Empowerment Programme to improve knowledge and skills and help female workers within their supply chain.

THIS CARD LINKS TO

/ Customisation / Embedded Storytelling / Ethical Supply Chain / Product History / Production on Demand

FURTHER READING

<http://ldcluster.com/wp-content/uploads/2016/01/Masterclass-produktion-i-danmark.pdf> / Clark (2008). SLOW + FASHION—an Oxymoron—or a Promise for the Future ...? *Fashion Theory*, 12, pp. 427–446.

02: PERFORMANCE - *consumption metabolism*

Labelling

WHAT?

Formal information provided by labelling systems. Labelling can inform on aspects such as material composition, production and maintenance.

WHY?

Labelling can represent a guaranty from the user perspective and provide guidelines for the users.

CHALLENGES

- The current labelling 'jungle' creates information fatigue.
- Users do not always read the labels.
- Labelling can be costly – especially if the included information is standardized.

EXAMPLES

- In the European Union, there is a regulation, Regulation 1007/2011, on which information that should be included on labels for textiles and clothing.
- An overview on eco labels can be found in the Eco Label Index.

THIS CARD LINKS TO

/ Environmentally Friendly Materials / Ethical Supply Chain / Information / Maintenance

FURTHER READING

Aspers (2008). Labelling Fashion Markets. *International Journal of Consumer Studies* 32, pp. 633–638. / Hyllegard et al. (2012). Socially Responsible Labeling: The Impact of Hang Tags on Consumers' Attitudes and Patronage Intentions Toward an Apparel Brand. *Clothing and Textiles Research Journal* 30, pp. 51–66. / Krüger et al. (2013). Guidelines II – A Handbook on Sustainability in Fashion. Copenhagen School of Design and Technology, pp. 136-141.

02: PERFORMANCE - *resource metabolism*

Technical Durability

WHAT?

To align a material's durability with the intended product lifespan with respect to functional properties such as abrasion, tearing strength and ageing.

WHY?

By optimising or estimating the product lifespan, use of resources can be minimised. Furthermore this can ensure the right material choice. One example could be that for disposable products (like a paper plate) a criterion may not be long lasting but compostable.

CHALLENGES

- It can be difficult to estimate wear and tear in use contexts.
- It can be costly and troublesome to perform standardised tests.

EXAMPLES

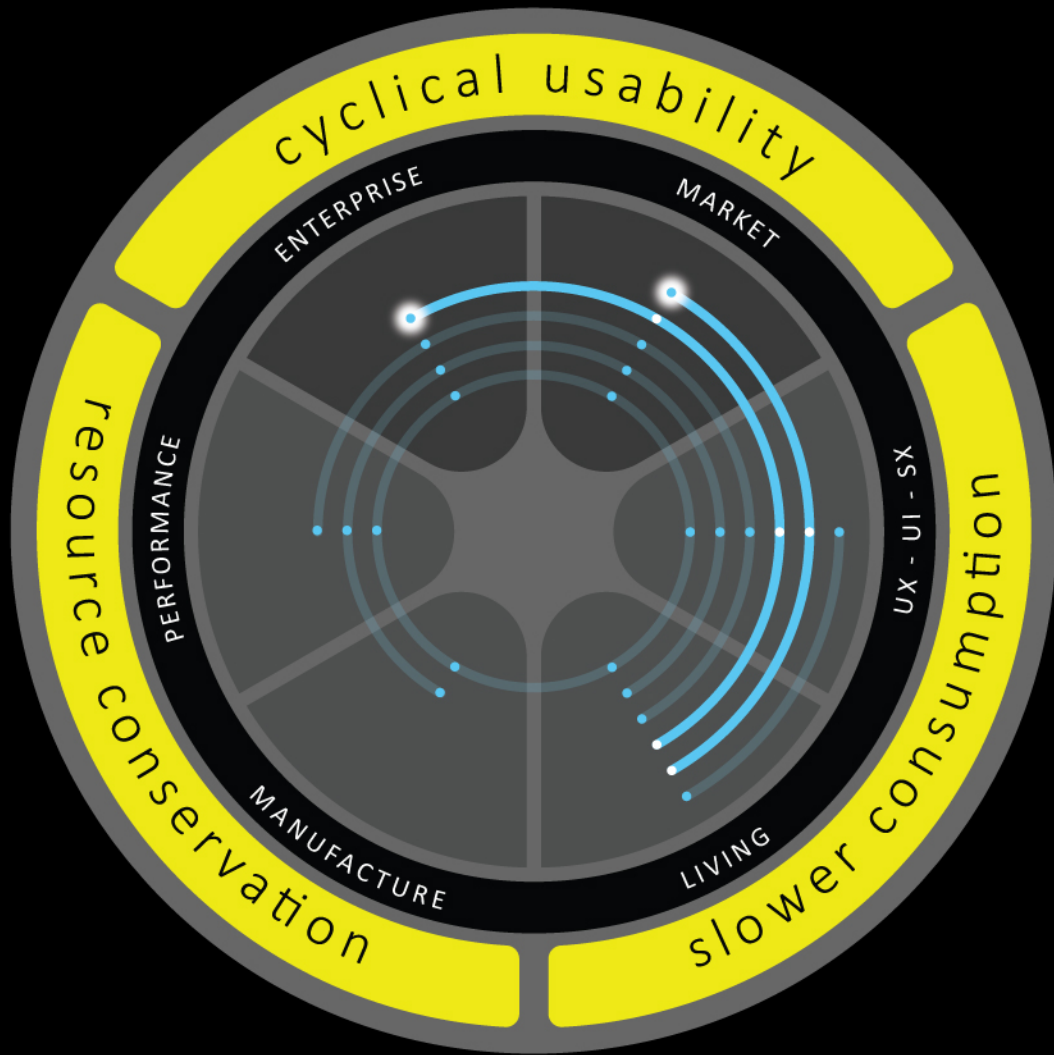
- Waste management plastic bags made of Mater-Bi by Novamont are biodegradable and compostable.
- Product and material specifications that define performative properties, such as abrasion (e.g. ISO 12947-1:1998) and tearing resistance and dimension stability (e.g. ISO 6330:2012).

THIS CARD LINKS TO

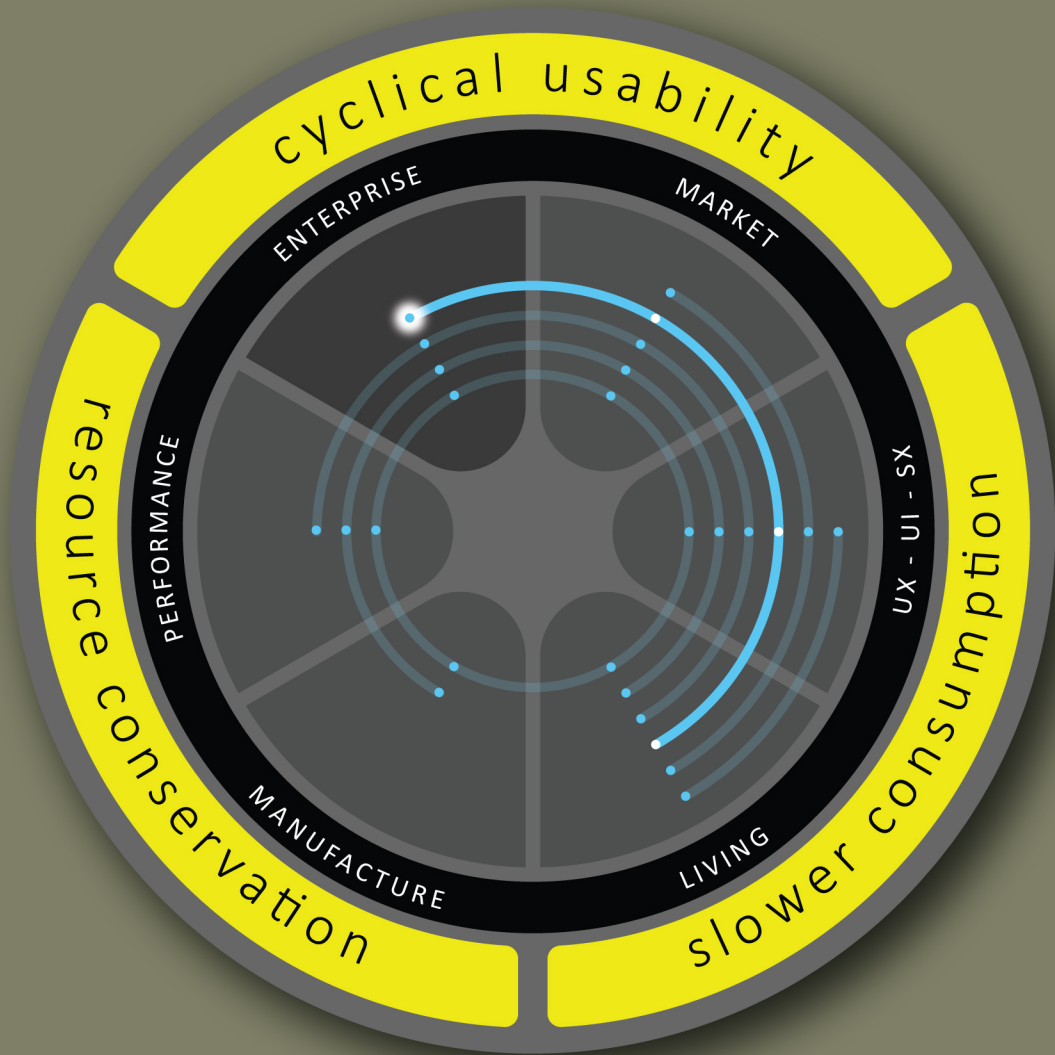
/ Maintenance / Modularity / Re-Use

FURTHER READING

Annis (2012). *Understanding and Improving the Durability of Textiles*, Elsevier / Callister (2006). *Materials Science and Engineering*. Wiley and Sons / Fan & Hunters (2009). *Engineering Apparel Fabrics and Garments*. Woodhead Publishing / Hatch (1993). *Textile Science*. West Group .



CYCLICAL USABILITY



03:

**Durability, modularity
with repair services.**

cyclical usability

03:

Durability, modularity with repair services

The focus is on increasing or extending the life of products across the whole product lifecycle. This could be by maintaining and improving products through repairs, upgrades, refurbishment, remanufacturing or remarketing. The effectiveness of this feature is impacted on through the design process with a focus on design for disassembly; modular design; material selection for durability and design for repair.

03: ENTERPRISE - *resource metabolism*

Multi-Functionality

WHAT?

Product that can serve multiple functions for one or for several users:

1. Transformation of function.
2. Transformation of function to context.
3. Transformation to body-type.

WHY?

Multi-functionality can minimise use of resources by optimising product usability.

CHALLENGES

- It demands user friendly design.
- It creates a risk of low product functionality overall.

EXAMPLES

- Multi-gender garments such as Weekday's S(HE) product line or the garment subscription service Good Practice.
- The EMPWR Coat by The Empowerment Plan is a jacket that can transform into a sleeping bag initially developed to help homeless people (www.empowermentplan.org).

THIS CARD LINKS TO

/ Repair / User Understanding

FURTHER READING

Fletcher & Grose (2012). *Fashion & Sustainability: Design for Change*. Laurence King Publishing, London / Kunha & Broega (2009). *Designing Multifunctional Textile Fashion Products*. Proceedings of the Autex 2009 World Textile Conference, Izmir, Turkey.

03: ENTERPRISE - *resource metabolism*

User Understanding

WHAT?

To understand intended and/or a potential user regarding for example values, economic resources, physique (age and body shape) and or practical life/product use context.

WHY?

Understanding the user can prolong product lifespan through:

- Enhanced product/user match.
- Meeting diverse user needs.

CHALLENGES

- It can be a challenge to incorporate users and user understanding into design processes.

EXAMPLES

- Danish baby clothing company, Viggababy base their business model on in-depth user understanding and community building.
- The Nike Flyease has been specially developed for athletes of all abilities and ages making them easier to take on and off.

THIS CARD LINKS TO

/ Co-Creation / Customisation / Embedded Storytelling / Formal Alteration and Modification / Formal Sharing and Heritage / Informal Alteration and Modification / Informal Sharing and Heritage / Multi-Functionality / Re-Use

FURTHER READING

Gwilt (Ed.) (2015). Fashion Design for Living. Routledge / Laitala et al. (2015). Making Clothing Last: A Design Approach for Reducing the Environmental Impacts. International Journal of Design 9(2), pp. 93-107 / Lamb & Kallal (1992). A Conceptual Framework for Apparel Design. Clothing and Textiles Research Journal 10(2), pp. 42-47

03: ENTERPRISE - *consumption metabolism*

Formal Alteration and Modification

WHAT?

Users and specialists to have products adjusted or modified. This can be part of a larger service system.

WHY?

An existing product have a higher use potential and/or emotional value than a new equivalent product.

CHALLENGES

- Lack of specialists and craftsmen.
- How should the service system be created to support this?

EXAMPLES

- Furriers often offer traditional services to do with modification of garments; see for example Maison Lama.
- The American company Runway of Dreams has expanded on the idea by working with modification of garments for people not applying to the 'fashion-body' norm, identified as 'differently abled'.

THIS CARD LINKS TO

/ Customisation / Formal Sharing and Heritage / Informal Alteration and Modification / User Understanding

FURTHER READING

Fletcher & Grose (2012). Fashion & Sustainability: Design for Change, Chapter 9: Adaptability. Laurence King Publishing / Gwilt & Rissanen (2011). Shaping Sustainable Fashion: Changing the way we make and use clothes, Chapter 3: Use. Earthcan.

03: ENTERPRISE - *consumption metabolism*

Modularity

WHAT?

Design that is based on a modular approach. A product contains several separable pieces that can be assembled in different ways by the user or a series of individual products that may be purchased and used alone, or collected and assembled in different ways over time by the user.

WHY?

Modularity can support the functional lifespan and overall product longevity. Users can choose to buy products according to individual resources (economy), and users can build up their own selection in their own time. Components can be shared and swapped as well as changed to new ones if they become defect or broken (flexibility).

CHALLENGES

- Users may find it challenging and complicated in use.
- Product continuity is needed to secure user satisfaction.

EXAMPLES

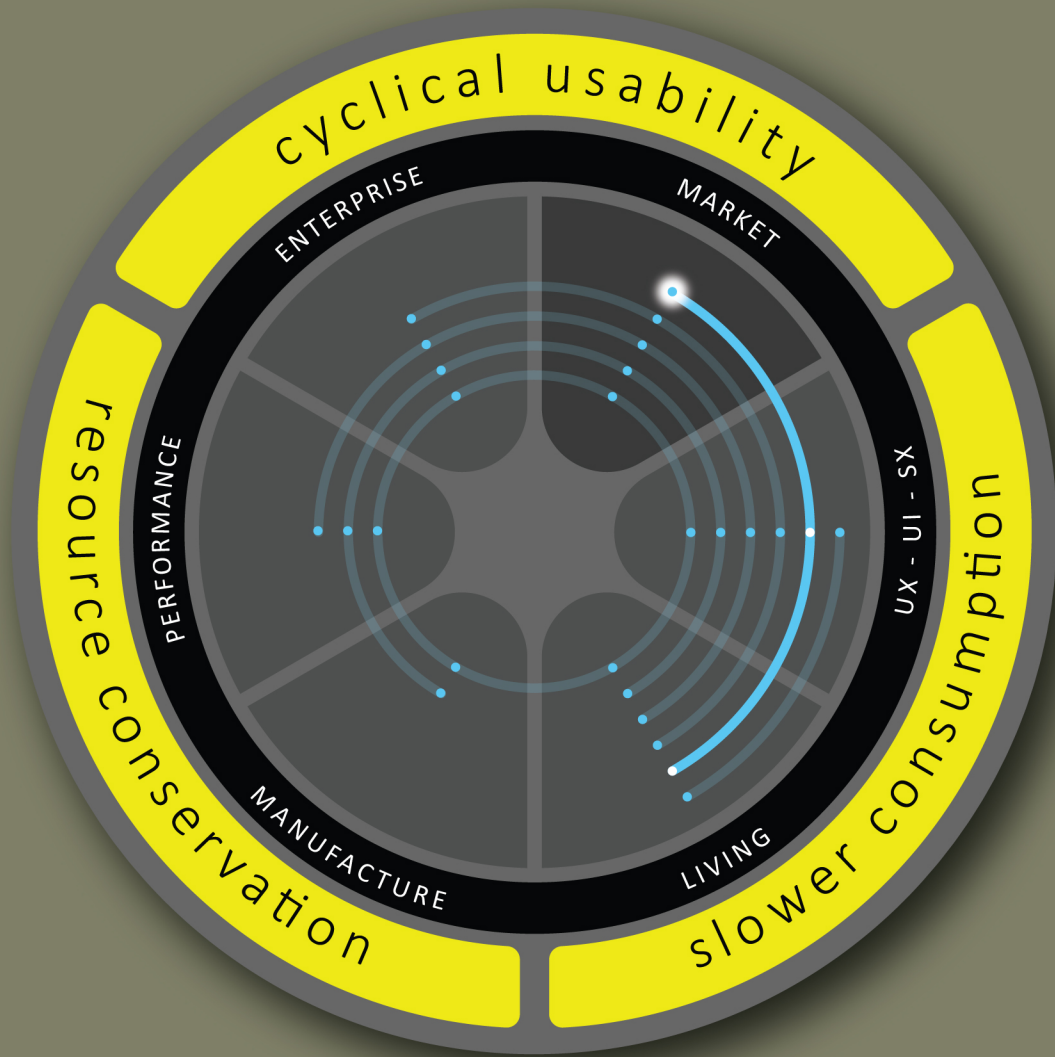
- Modularity understood as bits to be built together by the user such as the garment experiment by Berber Soepboer.
- The platform, Phonebloks informs on companies that work with modular phone concepts.
- The concept, Clouds by Ronan and Erwan Bouroullec in collaboration with Kvadrat provides a customisable sound insulation system.

THIS CARD LINKS TO

/ Customisation / Design for Disassembly / Mono-Material / Production on Demand / Technical Durability / Zero-Waste

FURTHER READING

Niinimäki (ed.) (2013). Sustainable Fashion: new approaches. Aalto University, Helsinki / Ribeiro et al. (2014). Mass customization: modularity in development of fashion products. International Journal of Management Cases 16 (2), pp. 41-45.



04:

Personalisation, made to order and lock-in

cyclical usability

04:

Personalisation, made to order and lock-in

This is about building a more personalised, longer-term relationship with the customer. By doing so, it becomes easier to close loops, recover materials/products and reduce resource use. Made-to-order production minimises material requirements and avoids potential losses from overstocking. Businesses that directly 'lock in' consumers can circumvent the need for a separate retailer, and enable greater insight into the potential demand for the product itself or, where relevant, the product refill.

04: MARKET - *resource metabolism*

Co-Creation

WHAT?

The design process is carried out, fully or partly, in collaboration with future users or other relevant actors.

WHY?

Co-creation can support product longevity:

- Designing for user specific needs and desires.
- Creating a sense of user ownership to product. Users are less willing to depart with products they have invested themselves in developing.

CHALLENGES

- Users may not be conscious about or able to articulate needs and desires.
- Temporal and/or financial limitations within the design process.

EXAMPLES

- Birger Christensen's past practice of involving users in the design process via dialogue between designer, patternmaker and costumer in the shop and during fitting.
- Lego's work with online user co-creation called Lego Ideas.

THIS CARD LINKS TO

/ Embedded Storytelling / User Understanding

FURTHER READING

Gwilt (Ed.) (2015). *Fashion Design for Living*. Routledge / Friis (2016). *Co-Creation Cards*. U-Press / Prahalad & Ramaswamy (2004). *Co-Creation Experiences: The Next Practice in Value Creation*. *Journal of Interactive Marketing* 18(3).

04: MARKET - *resource metabolism*

Embedded Storytelling

WHAT?

Embedded stories can generate emotional value in a product through

- Stories embedded by the designer.
- Stories embedded by the user via use.

WHY?

Emotional value may prolong a product's overall lifespan by making the user attached to the product.

CHALLENGES

- Emotional value is difficult to pinpoint, predict and make tangible.

EXAMPLES

- Storytelling embedded by use can be design steered as seen in e.g. the Pandora concept, where each bead represents something, a personal story, to the user.
- Often designers work with some sort of embedded storytelling. This potential can be further activated by
 1. creating diverse types of stories for diverse user groups.
 2. implementing the story embedded in the design in the communication of the design to the intended user. See for example Kjetil Aas' work with Swakara fur.

THIS CARD LINKS TO

/ Aesthetic Storytelling / Co-Creation / Customisation / Product History / User Understanding

FURTHER READING

Clark (2008). SLOW + FASHION—an Oxymoron—or a Promise for the Future ...? *Fashion Theory*, 12, pp. 427–446 / Fletcher (2016). *Craft of use*. Routledge.

04: MARKET - *resource metabolism*

E-Shop

WHAT?

Online shop and platform that allow customers to purchase products via their computers.

WHY?

An E-shop can support product transparency and economic efficiency through fewer links, increased control and direct communication with users.

CHALLENGES

It might be difficult for users to test and experience the product before purchase if they only meet the product online.

EXAMPLES

- The designer Bruno Pieters uses the e-shop to promote the company/product transparency as his basic approach to design.
- On a larger scale, Marks and Spencer uses their e-shop to tell about their strategic sustainability goal.
- Everlane is another example on a company that is online- based. They have occasional popup events to promote contact with customers and show case products.

THIS CARD LINKS TO

/ Customisation / Information / Production on Demand

FURTHER READING

Koumbis (2014). Fashion Retailing, From Managing to Merchandising. Bloomsbury / Stone (2014). The Everything Store: Jeff Bezos and the Age of Amazon. Back Bay Books.

04: MARKET - *consumption metabolism*

Customisation

WHAT?

Users can influence the final product, before production, in relation to individual user needs and aesthetic preferences.

WHY?

Customisation can support product longevity through stronger user satisfaction and emotional investment.

CHALLENGES

- Users may not want to make choices.
- Requires a user friendly system.
- Requires a flexible production.

EXAMPLES

- Big brands such as Nike offer their users the possibility
- to personalise their purchase.
- Bow and Drape within high street apparel uses a 'coffee to go' strategy, i.e. users choose their own combination of pre-fixed elements.
- In collaboration with the Van Gills Family, the company,
- September Salon provides a made-to-measure collection.
- Suiting such as by the company Creyate.
- Unmade's customised knitwear.

THIS CARD LINKS TO

/ Aesthetic Lifetime / E-Shop / Embedded Storytelling / Formal Alteration and Modification / Local Production / Modularity / Production on Demand / User Understanding

FURTHER READING

Niinimäki (ed.) (2013). Sustainable Fashion: new approaches. Aalto University, Helsinki / Pine & Gilmore (2011). The Experience Economy. Harvard Business Review Press.

04: MARKET - *consumption metabolism*

Product History

WHAT?

Articulation to create transparency on product history regarding development, production and potential former use.

WHY?

Visible and transparent product history supports emotional attachment between the product and the user.

CHALLENGES

- Information must be sorted and selected and who decides what is relevant?
- Credibility can be challenged on how to avoid, or inform on, information biases.

EXAMPLES

- High-end textiles company Wallace & Sewell use their choice of local production as part of the product history build-up.
- Material origin: The Wild Concept as the story of fur design based on hunted fur bought of local hunters made by Marita Huurinainen.
- The company, Lovia Collection work with a 'product DNA' to demonstrate the complexity of the fashion industry and to provide transparency in the supply chain.

THIS CARD LINKS TO

/ Embedded Storytelling / Ethical Supply Chain / Information / Local Production

FURTHER READING

Niinimäki (2013). Ethical design. In: Niinimäki (ed.) Sustainable Fashion: new approaches. Aalto University, Helsinki, pp. 44-45 / Clark (2008). SLOW + FASHION—an Oxymoron—or a Promise for the Future ...?. Fashion Theory 12, pp. 427–446.

04: MARKET - *consumption metabolism*

Production on Demand

WHAT?

Production of product only takes place after a user has placed an order. The concept is also called Manufacturing on Demand (MoD) and Demand-driven Manufacturing (DdM).

An alternative approach to Product on Demand is using crowdfunding platforms to ensure a customer demand before initiating production

WHY?

Less over-production can reduce overall resource wastage.

CHALLENGES

- The user may find it difficult to understand the product if it is not physically available.
- Users must be patient due to increased time between purchase and possession for user.

EXAMPLES

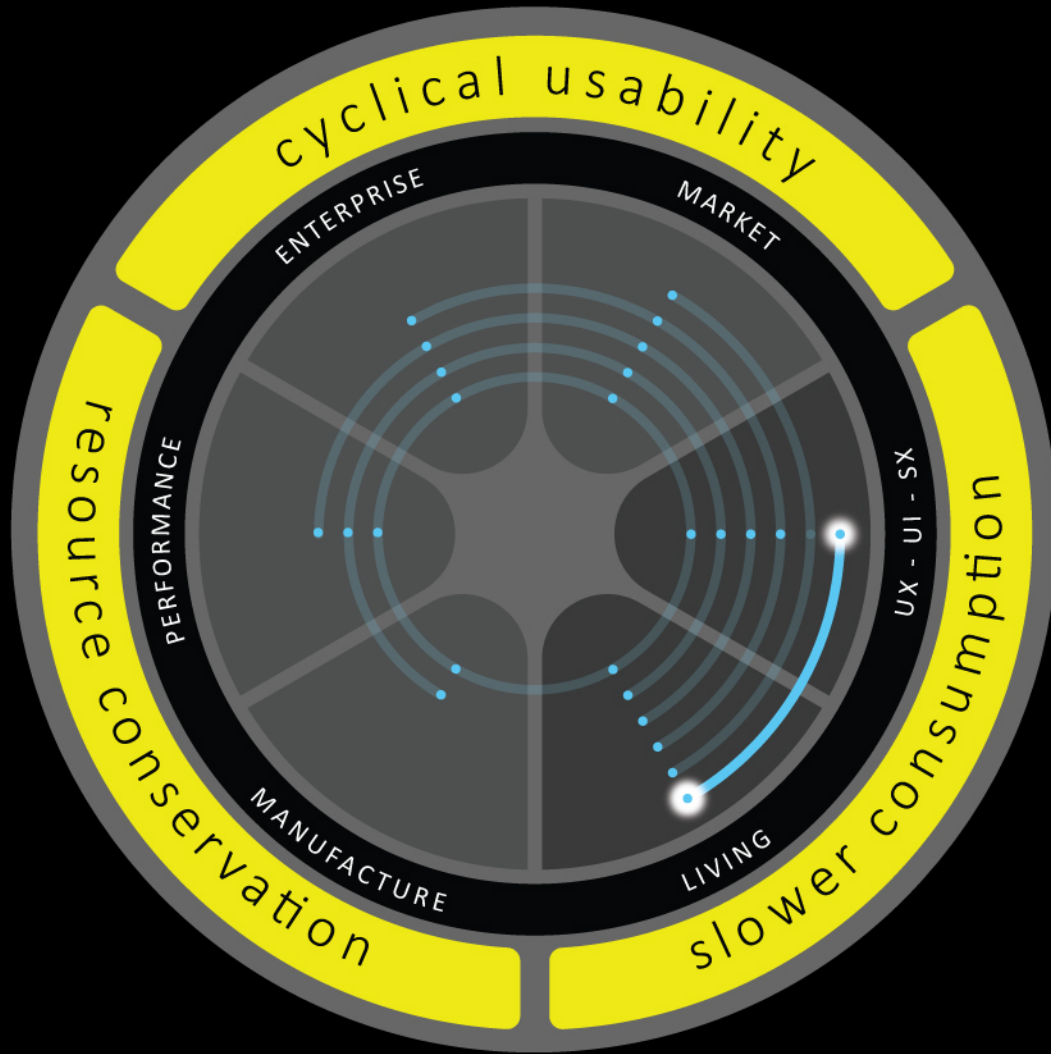
- The Danish Company EE12 produces garments to order and have minimal stock.
- The British company Unmade produces on demand knitwear.
- Small scale cultural initiatives and media productions such as publications and podcasts that have been funded on Kickstarter and Indigogo. See for example the podcast, 99% Invisible.

THIS CARD LINKS TO

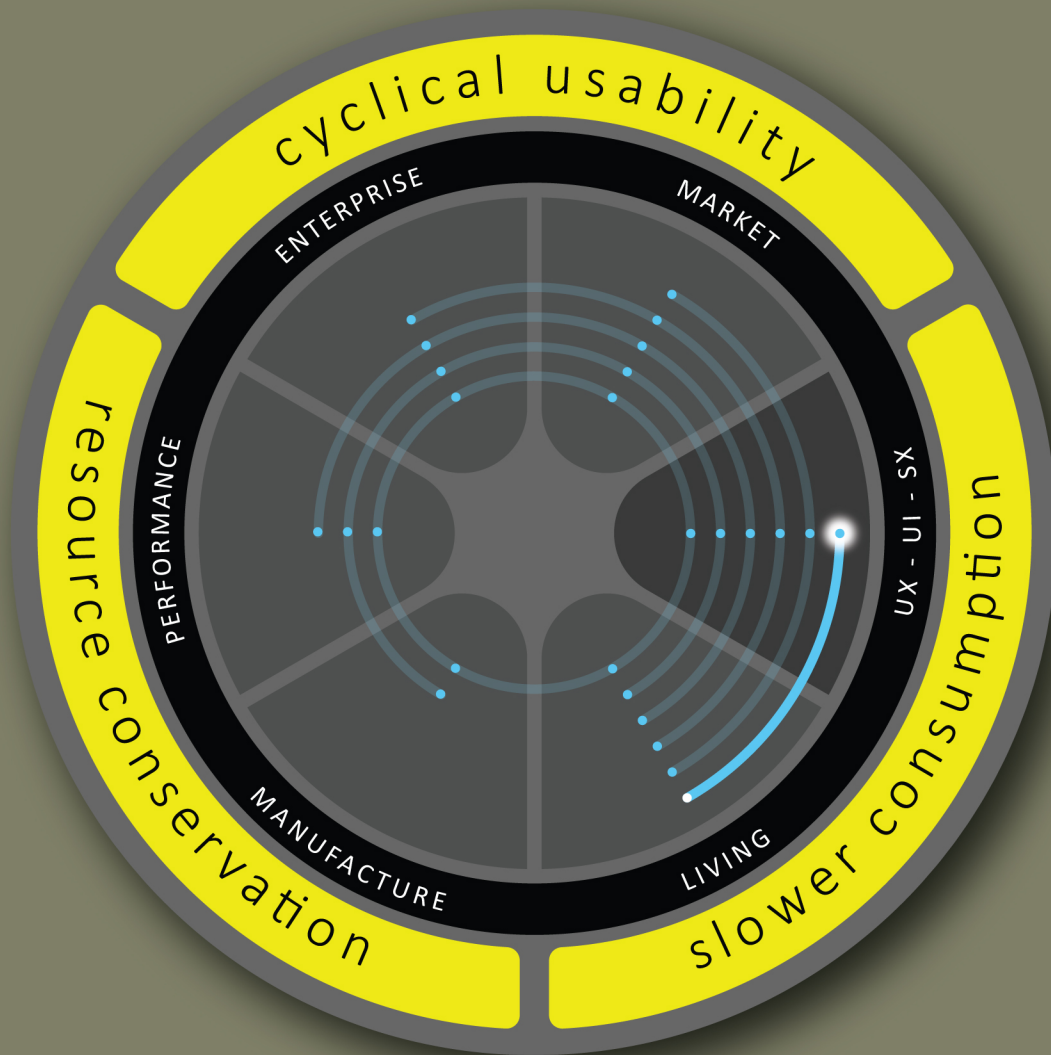
/ Customisation / E-Shop / Local production / Modularity

FURTHER READING

Smith & Smith (2013). Demand Driven Performance. McGraw-Hill Education / Walter, Kartsounis & Carosio (2009). Transforming Clothing Production into a Demand-Driven, Knowledge-Based, High-Tech Industry: The Leapfrog Paradigm. Springer London.



SLOWER CONSUMPTION



05:

**Product service systems &
dematerialised services**

slower consumption

05:

Product service systems & dematerialised services

The manufacturer or retailer bear the 'whole cost of ownership' with a subsequent focus on the durability, longevity and reliability of the product along with usage rates and reusability. Also, dematerialised services such as Netflix, Spotify and cloud computing play a big role. Here the business provides access to a service for the customer, rather than the product itself..

Up-Cycling

WHAT?

To inject new and higher value to a used, and possibly discarded, product through design.

WHY?

Cradle to Cradle considerations to minimise use of resources.

CHALLENGES

- It can be difficult to ensure clean material fractions.
- Access to and development of up-cycling supportive technology are limited.
- It can be difficult to define what 'higher value' is.

EXAMPLES

- Patagonia's fleece jumper is made of old plastic bottles (<https://www.patagonia.com/recycled-polyester.html>).
- The company, Econyl collects nylon waste and processes it into new fibers and products.
- In the initiative, Nike Grind old sneaker soles are transformed into turf surface material.
- The material Newspaperwood from Vij5 is made out of old compressed newspapers (<http://vij5.nl>).

THIS CARD LINKS TO

/ Design for Disassembly / Mono-Material / Re-Use

FURTHER READING

Cassidy & Han (2013). Upcycling Fashion for Mass Production, in: Gardetti & Torres (Eds.). Sustainability in Fashion and Textiles: Values, Design, Production and Consumption. Greenleaf Publishing, pp. 148–163

/ McDonough & Braungart (2013). The Upcycle: Beyond Sustainability—Designing for Abundance, North Point Press.

05: UX UI SX - *resource metabolism*

Aesthetic Lifetime

WHAT?

There are different approaches to working with the aesthetic lifetime of a product – for example to ensure that the intended product-lifespan is supported by the product’s aesthetic expression (1), to ensure that a product age without losing aesthetic value (2) or to ensure that intended aesthetic lifetime is aligned within a circular system thinking (3).

WHY?

The aesthetic lifetime can support product longevity. Aesthetic means can prolong product lifespan when product expression targets user and context of use and aesthetic traces of time and use can add value to a product.

CHALLENGES

- The aesthetic lifetime and aspects that define it are difficult to predict.

EXAMPLES

- Classic and simple aesthetics less influenced by fast changing trends. See e.g. the company Armoire Officielle.
- Aesthetic ‘richness’ that allows the user to ‘read’ and discover a product over time, e.g. through applying craft and couture techniques (Kate Fletcher).
- Working consciously with patina as an aesthetic value, that only increases over time such as full-grain leather and furniture. Someone who works with this is Lovia Collection.

THIS CARD LINKS TO

Customisation / Embedded Storytelling / Formal Alteration and Modification

FURTHER READING

Clark (2008). SLOW + FASHION—an Oxymoron—or a Promise for the Future ...? *Fashion Theory* 12, pp. 427–446 / Niinimäki (ed.) (2013). *Sustainable Fashion: new approaches*. Aalto University, Helsinki.

05: UV:UI:UX - *consumption metabolism*

Informal Sharing and Heritage

WHAT?

Users that share products in a self-driven and un-systematised manner.

WHY?

This approach taps into the current sharing paradigm that focuses on prolonging the lifespan of a product. Sharing and heritage can be:

1. an economic advantage.
2. a way of passing on/creating emotional value in a product.

CHALLENGES

- Products may not fit new users.
- Unwanted traces of time and use in product may occur such as i.e. smell and stains.

EXAMPLES

- People tend to share products that possess value; emotionally, economically or both such as garments made of fur or baby clothes that are frequently shared due to the short use time and thereby lack of wear and tear. Swapping 'parties' are similarly seen as a growing phenomenon. See for example Copenhagen Fashion Exchange.

THIS CARD LINKS TO

/ Formal Sharing and Heritage / Informal Alteration and Modification / User Understanding

FURTHER READING

Fletcher (2016). *Craft of Use*. Routledge / Skjold & Ræbild (2016). *Fur design as mediator of sustainability*. Nordcode Conference, Kolding.

05: UX UI SX - *consumption metabolism*

Rental Service

WHAT?

Re-use of products through rental services such as subscription services and leasing. Rental services as a concept is part of the sharing economy societal paradigm.

WHY?

Rental service models can minimise use of resources by potentially extending the product lifespan.

CHALLENGES

- Products should be designed for extensive use, which can be a design challenge.
- Users may not want to pay for used products.

EXAMPLES

- Rental services can offer complete solutions, like the subscription based baby clothing company Vigga.
- Rental services may provide single items such as designer bags from rentabag.dk.
- Belgian company Mud Jeans leases jeans made of organic and recycled cotton for a monthly fee.

THIS CARD LINKS TO

/ Formal Alteration and Modification / Maintenance

FURTHER READING

Fletcher & Grose (2012). *Fashion & Sustainability: Design for Change*. Laurence King Publishing, London / Petersen & Riisberg (in press).

Cultivating User-ship? Developing a circular system for the acquisition and use of baby clothing. *Fashion Practice* / Schor & Fitzmaurice (2015). *Collaborating and connecting: the emergence of the sharing economy*. In: Reisch & Thøgersen (eds.). *Handbook of Research on Sustainable Consumption*, Edward Elgar Publishing, pp. 410-425.

05: UX UI SX - *consumption metabolism*

Formal Sharing and Heritage

WHAT?

Service design systems driven by sharing of products between actors.

WHY?

It speaks into the current sharing paradigm that serves to optimise resource use. These kinds of systems focus on user economic and support user diversity.

CHALLENGES

- It can be difficult to identify 'how?', 'what?', 'who?' a service system is formalised.
- Formalised sharing can require larger data systems to process information on product flows or users.

EXAMPLES

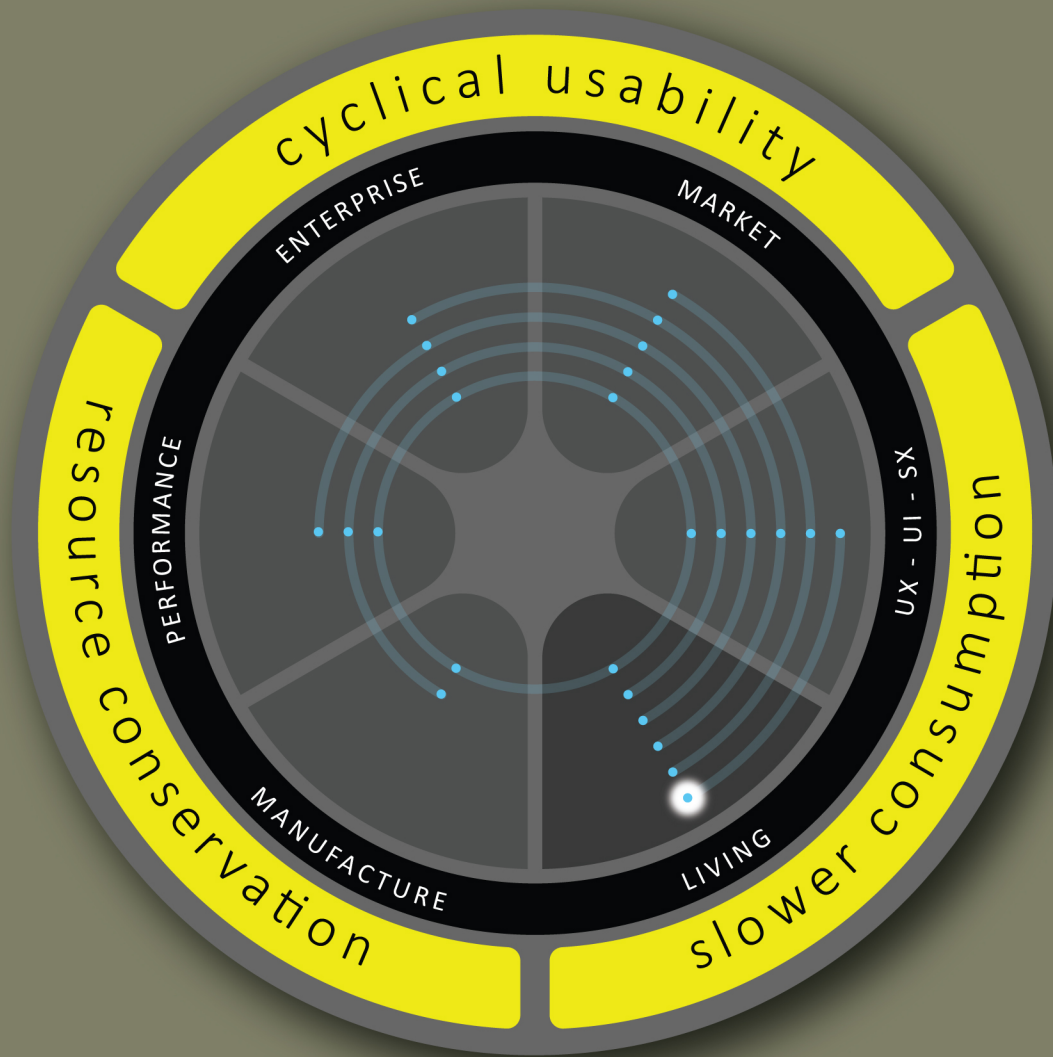
- Systems may focus on optimising the use-extent of a product, as seen at textile rental and laundry service company Berendsen.
- Focus on prolonging product lifespan as i.e. the company Re- second, which runs on membership for sharing and swapping products.
- The company Too Good To Go has developed an App where you can find and purchase food from restaurants after closing hours to avoid food waste.

THIS CARD LINKS TO

/ Formal Alteration and Modification / Informal Sharing and Heritage / Rental Service / User Understanding

FURTHER READING

Fletcher & Grose (2012). Fashion & sustainability: Design for Change. Laurence King Publishing / Sundararajan (2016). The Sharing Economy: The End of Employment and the Rise of Crowd-Based Capitalism. The MIT Press.



06:

**Collaborative/sharing
economy**

slower consumption

06:

Collaborative/sharing economy

Digital technology is used to create new relationships and business opportunities for consumers, companies and microentrepreneurs to rent, share, swap or lend their idle goods. Fewer resources are required to make products that are infrequently used, and consumers have a new way to make and save money. This feature requires the platform, and the users of the platform, to function effectively.

06: LIVING - *resource metabolism*

Maintenance

WHAT?

Motivate users to maintain products with a low level of energy consumption through:

1. Information and guidelines; low wash temperature, zero tumbling, airing.
2. Choice of material.

WHY?

- The energy consumption in the use/maintenance processes can be minimised with the right handling.
- The product lifespan can be prolonged by handling with care.

CHALLENGES

- Users may not read care labels and are habit driven.
- Users on average have limited knowledge on materials and maintenance.

EXAMPLES

- Japanese brand Konaka has developed a 'shower clean business suit'.
- Rubber belt drives by the company Gates Carbon Drive that require less maintenance than conventional steel chains.

THIS CARD LINKS TO

/ Information / Labelling / Rental Service / Repair / Technical Durability

FURTHER READING

Laitala et al. (2015). Making Clothing Last: A Design Approach for Reducing the Environmental Impacts. *International Journal of Design*, 9(2), pp. 93-107 / Skjold & Ræbild (2016). Investigating Fur as Mediator of Sustainability. Nordcode Conference 2016, Kolding / Jack (2013). Fashion Use: A Polemic to Provoke Pro-Environmental Garment Maintenance, in: Gardetti & Torres (Eds.), *Sustainability in Fashion and Textiles: Values, Design, Production and Consumption*. Greenleaf Publishing, pp. 125–133.

06: LIVING - *consumption metabolism*

Informal Alteration and Modification

WHAT?

Users adjust and modify products themselves, for themselves and near relations. This is self-driven and un-systematised.

WHY?

To prolong product lifespan and to adapt a product to its own changing needs.

CHALLENGES

- It relies partly on the product's emotional value.
- Many users do not have the necessary skills to make alterations and modifications.

EXAMPLES

- In the project, Local Wisdom, British scholar Kate Fletcher, has documented ways in which users adjust and modify garments over time.
- Blogging and Youtubing about DIY is a growing phenomenon.

THIS CARD LINKS TO

/ Formal Alteration and Modification / Informal Sharing and Heritage / Repair / User Understanding

FURTHER READING

Fletcher (2016). *Craft of use*. Routledge / Gwilt (Ed.) (2015). *Fashion Design for Living*. Routledge.

06: LIVING - *consumption metabolism*

Repair

WHAT?

Self-driven product repair carried out by users can be supported via the product.

WHY?

Repairs can prolong the product lifespan. This can be motivated by user economy, ideology and/or emotional attachment to a product.

CHALLENGES

- User skills might be limited.
- It can be difficult to get hold of spare parts.
- Users might experience lack of motivation.
- Inexpensive items may not motivate repair.

EXAMPLES

- Online communities for all types of repair is a growing phenomenon such as ifixit.com.
- Websites where users share very basic craft skills for repairing clothes, such as on Lifehacker.
- Christopher Ræburn's remade-reduced-recycled initiative has created the Ræburn Repairs open day, where customers can bring items for repair free of charge.

THIS CARD LINKS TO

/ Informal Alteration and Modification / Information / Maintenance / Multi-Functionality

FURTHER READING

Barnatt (2012). Seven Ways to Fix the World. CreateSpace Independent Publishing Platform / Fletcher & Tham (ed.) (2015). Routledge Book of Sustainable Fashion and Textiles. Routledge / Fletcher (2016). Craft of Use. Routledge / Gwilt,(2014). Fashion and Sustainability: Repairing the Clothes We Wear. In: Gwilt (ed.) Fashion Design for Living. Routledge.

06: LIVING - *consumption metabolism*

Re-Use

WHAT?

Re-use of products and materials based on a deposit system.

WHY?

Re-use can minimise use of resources as they will be used again instead of becoming waste. Re-use can also prolong a product lifespan.

CHALLENGES

- It requires systems that are easy to engage with for users in everyday life.

EXAMPLES

- Re-use of a product in its original form, similar to the Danish bottle deposit system, Dansk Retursystem.
- Re-use of a product material, similar to H&M in collaboration with I:CO-Systems; bring a bag of clothes to the store and get money off.

THIS CARD LINKS TO

/ Environmentally Friendly Materials / Mono-Material / Technical Durability / Up-Cycling / User Understanding / Zero- Waste

FURTHER READING

Niinimäki (ed.) (2013). Sustainable Fashion: New Approaches. Aalto University, Helsinki / Palm et al. (2014). Towards a Nordic textile strategy: Collection, Sorting, Reuse and Recycling of Textiles. Nordic Council of Ministers.