FUTURE-ADAPTABILITY FOR ENERGY AND RESOURCE EFFICIENT VEHICLES

Energirelaterad fordonsforskning 2017

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- Framtidsadaptivitet för energieffektivare fordon: (Huvudstudie)
- Energieffektiva fordon 2015-2019
- Stödbelopp 4,5 milj
- 2016-12-06 - 2018-12-31

**Project goal:** to lay the groundwork for a main study project that will create a design method for framtidsadaptiv products.

**Project goal:** Development of a framework for adaptive product design, applicable in business and design development (with low thresholds)

**Project goal:** Apply framework and study feasibility on participating company cases

**Effect goal:** To create business opportunities and conditions for automotive companies to bring out radically more energy-efficient mobility, by adaptable products. Products that can both lower business risks in functional and performance based offerings and save energy and resources.
PARTICIPATING COMPANIES

HDK business and designlab

GÖTEBORGS UNIVERSITET
HÖGSKOLAN FÖR DESIGN OCH KONSTANTVERK
INTRODUCTION

In a circular economy there will be increased incentives to design products with controllable and longer lifespans that systematically can be reused, upgraded, remanufactured, and as a last resort be recycled.

Pay per use, performance or "x"?

Hardware: Slow & expensive to change

Service content & software: Fast & cheap to change
HOW CAN ADAPTABLE DESIGN HELP OEMS IN THE TRANSITION TOWARDS A CIRCULAR ECONOMY?

How: Future adaptable products make it possible to use products and components over a longer period, and thus reduce waste, and benefit from technological innovation by upgrading components that improve environmental performance.

Why: This is critical for manufacturers who want to offer products, features through service-based, circular business models.

Hypothesis: The increased business risk for vehicle manufacturers & customers that vehicle remains attractive and functional over time can be managed by making vehicles more future-adaptive.

There is a large potential for energy efficiency through reuse, remanufacturing and upgrading of propulsion technology.
RESEARCH QUESTIONS

• How can adaptable design help OEMs in the transition towards a circular economy?

Sub questions:

• What factors drive obsolescence of different types of vehicles today?

• What are prerequisites for design of future-adaptable vehicles that could perform better over time?

• What are examples of adaptable design that can lower business risks in a circular business model?
THEORY: What makes products obsolete?

Drivers for product obsolescence
- Aesthetical
- Social
- Functional
- Technological
- Physical
- Economical

(Kasarda, 2007)

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(Cooper, 2004, 2010)
- New safety or emission legislation
- New procurement criteria's
- Physical wear
- Fuel & service costs

"Product life ends because a product is unable to adapt to change."

(Kasarda, 2007)
RESULTS: For levels of adaptivity

1: Adaptable infrastructure
   Possibility for renewable fuel or energy supply for the specific vehicle need

2: Adaptable fleet
   The right vehicle or combination of vehicle for the right need/task

3: Adaptable vehicles
   - E.g. a possibility to change drivetrain from ICE to Electrical drive
   - Change of battery capacity during product life.
   - Updates of interior
   - Software upgrades

4: Adaptable sub systems/components
   E.g. an interior designed for easy upgrades with new functions.
   - A particle filter that can be upgradeable to meet new legislation.
   - Original components designed for reman.
Perceived "problematic" situation (OEM’s worldview)

Main drivers; primarily designing vehicles for:
- cost-efficient production.
- New aesthetics
- Improved user experience

Major work efforts are on design and manufacture of the vehicle

What happens with the product during use is of less importance (except for the warranty period)
- Hard to argue for future profits (even though aftermarket services are very profitable compared to vehicle sales)
- Reman., limited to some parts

Upcoming challenges
- Increased complexity, costs to compete (imbedded ICT, UX)
- Disruptive actors (Uber, low price competitors)
- Changing customer/user behaviours (leasing, buying services etc.)
- Legislation (environmental, social, economical)
RESULTS:

What are prerequisites for design of future-adaptable vehicles that could perform better over time?

Drivers for obsolescence, can be used as enablers for future adaptable design

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A conceptual framework with main and sub “enablers” for design of future adaptable vehicles
PROMISING EXAMPLES OF ENABLERS FOR ADAPTABLE DESIGN IN INDUSTRY TODAY

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Ett ramverk som ger stöd vid affärsutveckling av cirkulära produkt/tjänsteerbjudanden och produktdesign av framtidsadaptiva och energieffektiva produkter/delsystem som minskar affärsriskerna i cirkulära affärsmodeller.

- Ramverket kommer (tentativt) att bestå av:
  Ett antal "systemvillkor" som bedöms nödvändiga för att öka möjligheterna att fordonprodukter blir anpassningsbara för estetiska, sociala, funktionella, tekniska och ekonomiska förändringar.

- En arbetsprocess för att designa framtidsadaptiva produkter
- Ett urval och ev. anpassning av stödjande utvecklingsverktyg (som är etablerade idag) som kan ge konkreta stöd under olika utvecklingsfaser.
- En inspirerande exempelsamling av lovande lösningar som är i användning idag, har varit eller är under utveckling inom en rad olika branscher. Men som kan relateras till fordonsområdet.
- En praktisk handbok för designers och affärsutvecklare som vill utveckla framtidsadaptativa produkter i cirkulära affärsmodeller.
DELMÅL

> Identifiera organisatoriska barriärer som idag bromsar eller försvårar framtagning försäljning och inköp av framtidsadaptiva produkter.

> Med kunskap bidra till organisatoriskt lärande hos deltagande företag kring cirkulära affärsmodeller och framtidsadaptivitet.

> Facillitera erfarenhetsutbyten mellan aktörer som har praktiska erfarenheter av adaptiva lösningar, deltagande företag och övrig fordonsindustri (underleverantörer)

> Hur kan energieffektivitet och hållbarhetspåverkan analyseras från en förlängd fordonslivslängd med flera användningscykler för olika delsystem och komponenter?

> Identifiera framgångsrika exempel där lång livslängd och radikal energieffektivitet har samverkat?
CONCLUSIONS

• Design for future adaptable products will challenge designers, engineers and business developers, not only to identify today’s users’ needs, but also to broader imagination about future needs.

• Today, islands of knowledge and excellence applicable for developing adaptable products exist, in the automotive industry as well as in research.

• However, in most examples and research areas, the main focus has been on a more efficient production, and not on making products more adaptable during its use phase!

• Available methods and tools for adaptable design have a theoretical and technical focus, not aligned with business and design logics, making them difficult to use for practitioners within business and design.
QUESTIONS?