1) Differentiation in a cost-competitive industry using savings-based business models, 2) world is changing

Data

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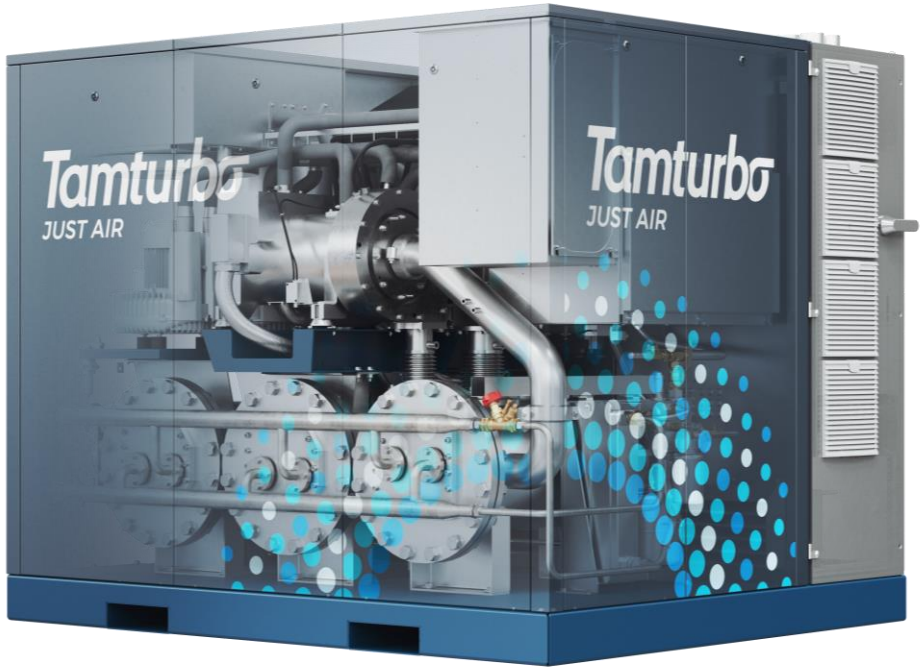
Part I

Differentiation in a cost-competitive industry
using savings-based business models

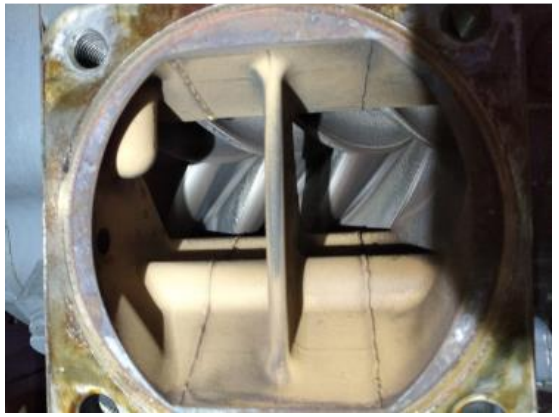
New tech to solve customer need – competing with near monopoly competition



Oil-free compressed air
Sustainability improvements

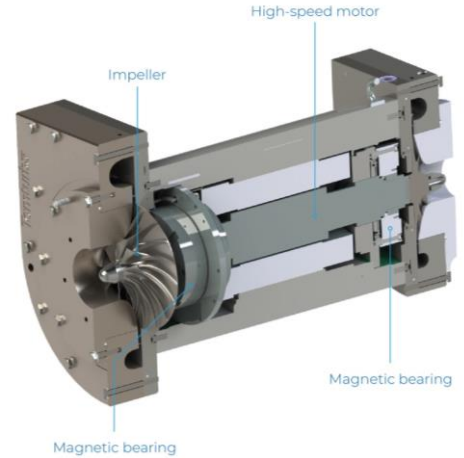
Long life cycle equipment

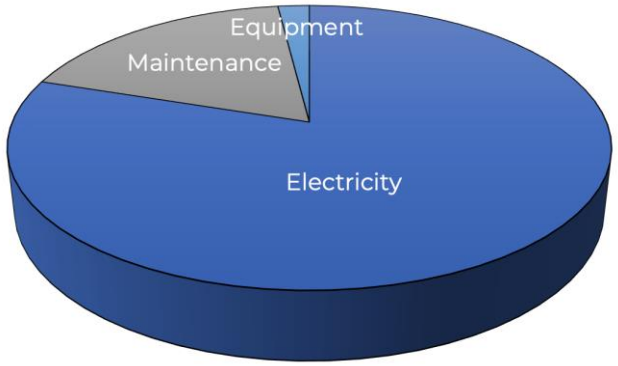
Differentiation through life cycle cost / total cost of ownership

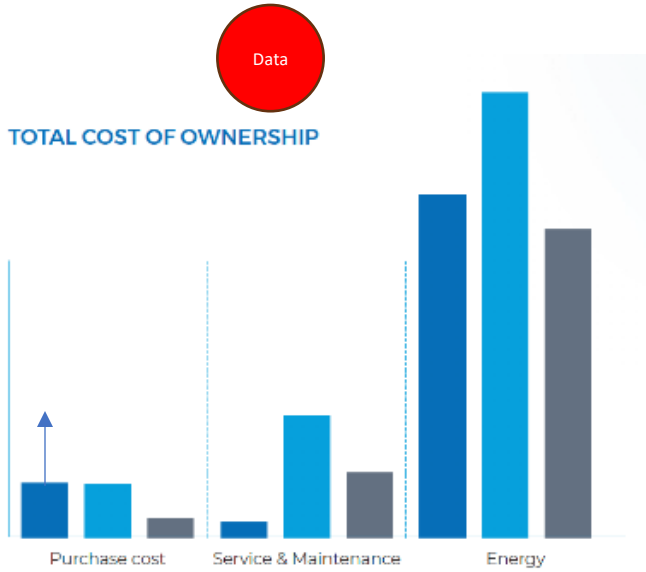


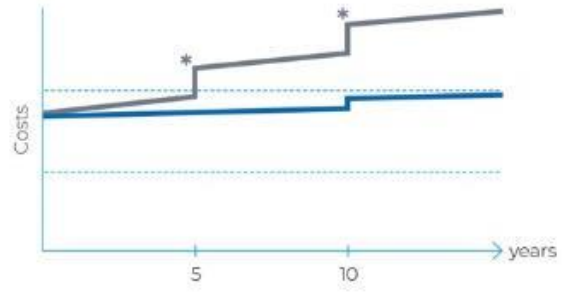
- Requires oil
- High maintenance
- Efficiency loss

→ **Technology shift to high-speed turbo** →









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Heat recovery

- Capture the heat from
  - Compressed air
  - Frequency converters
  - Electric motors
  - Turbos.

- Recover up to **90%** of the input energy, up to **90°C steady temperature**, independent of compressor load

  →Hot water for process, lowering **primary energy consumption**

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Our challenge

- Very high technology COGS cost
- Very low service revenue (-90%)
- New technology in a conservative market

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Our opportunity

- Clearly the lowest TCO
  - Efficiency
  - Maintenance
  - “Waste” heat recovery

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→ as-a-Service business model to
1) customers ease-in and
2) capture added value

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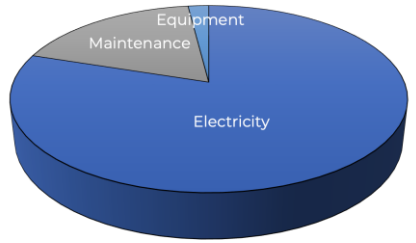
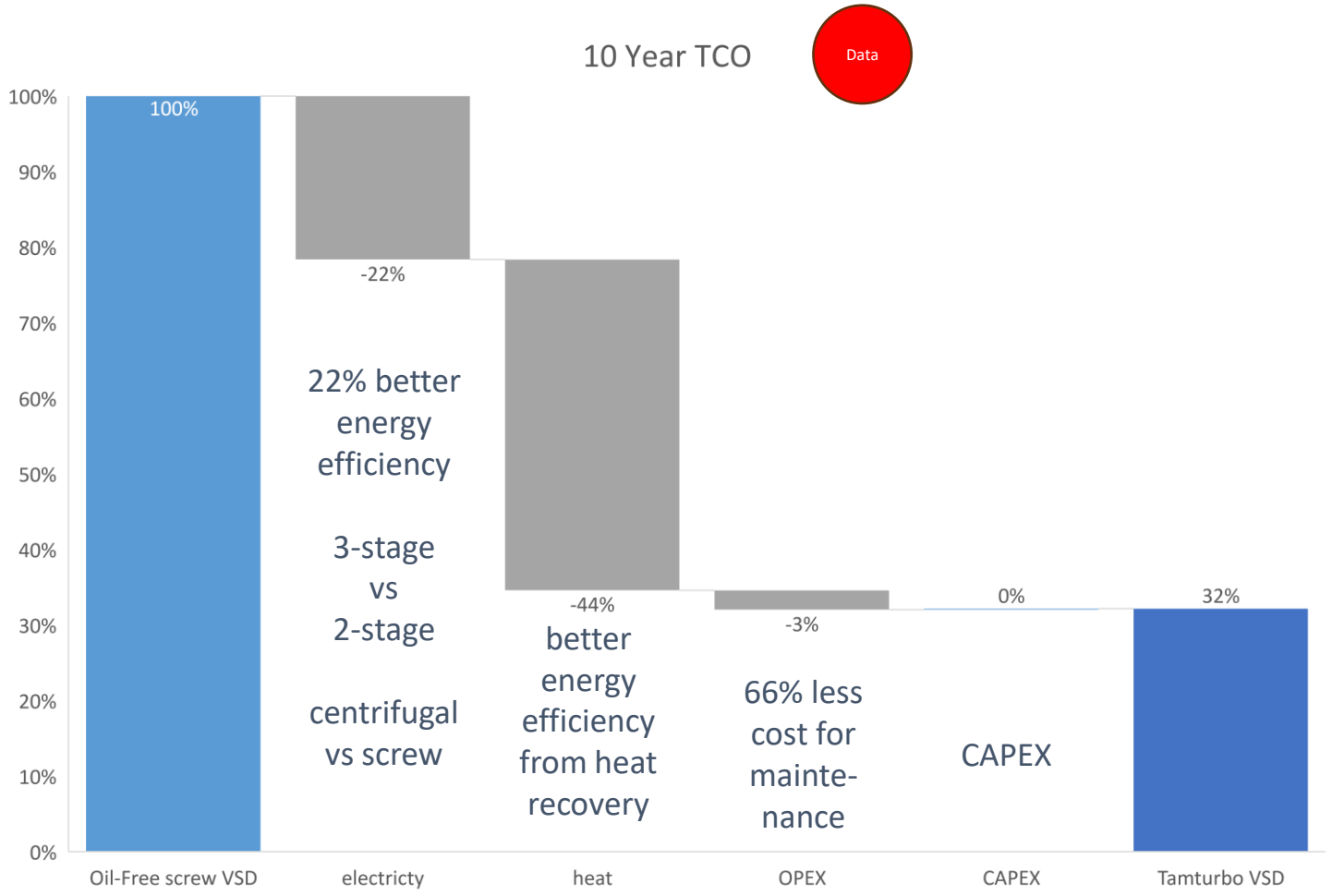
Case in US: Lowest total cost of ownership





Savings through
Electricity consumption
Heat generation
Maintenance

Environmental benefits

Payback time INSTANT

REVENUE MODELS

Investment + maintenance
Traditional compressor business

Investment + Care-Free Service
Up to 10 years. All wearing parts, spare parts and labor included

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Touch-Free™ Air
Compressor + all related expenses included
Pricing: €/m^3 and €/kWhe
→ production changes easy, adaptive to customer needs, OPEX

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Real-time remote monitoring and optimization

Predictive Maintenance

Touch-Free Air – Case financed by savings

- Customer had no need for a new compressor, had 10+ compressors in different operating conditions
- Carbon neutrality targets
- Savings targets, but limited CAPEX
- €/m3 of air + €/kWhe of returned energy

Case example, no budget impact:

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Annual price with estimated usage	101 483	€
Annual savings with estimated usage	101 751	€

1. Savings through lower electricity consumption
2. Maintenance savings
3. Savings through energy reuse (Boosted Heat Recovery)
4. Savings through more optimal compressed air production

TT325 BHR customer in Europe, additional benefits on top of monetary (electricity and energy recovery) savings

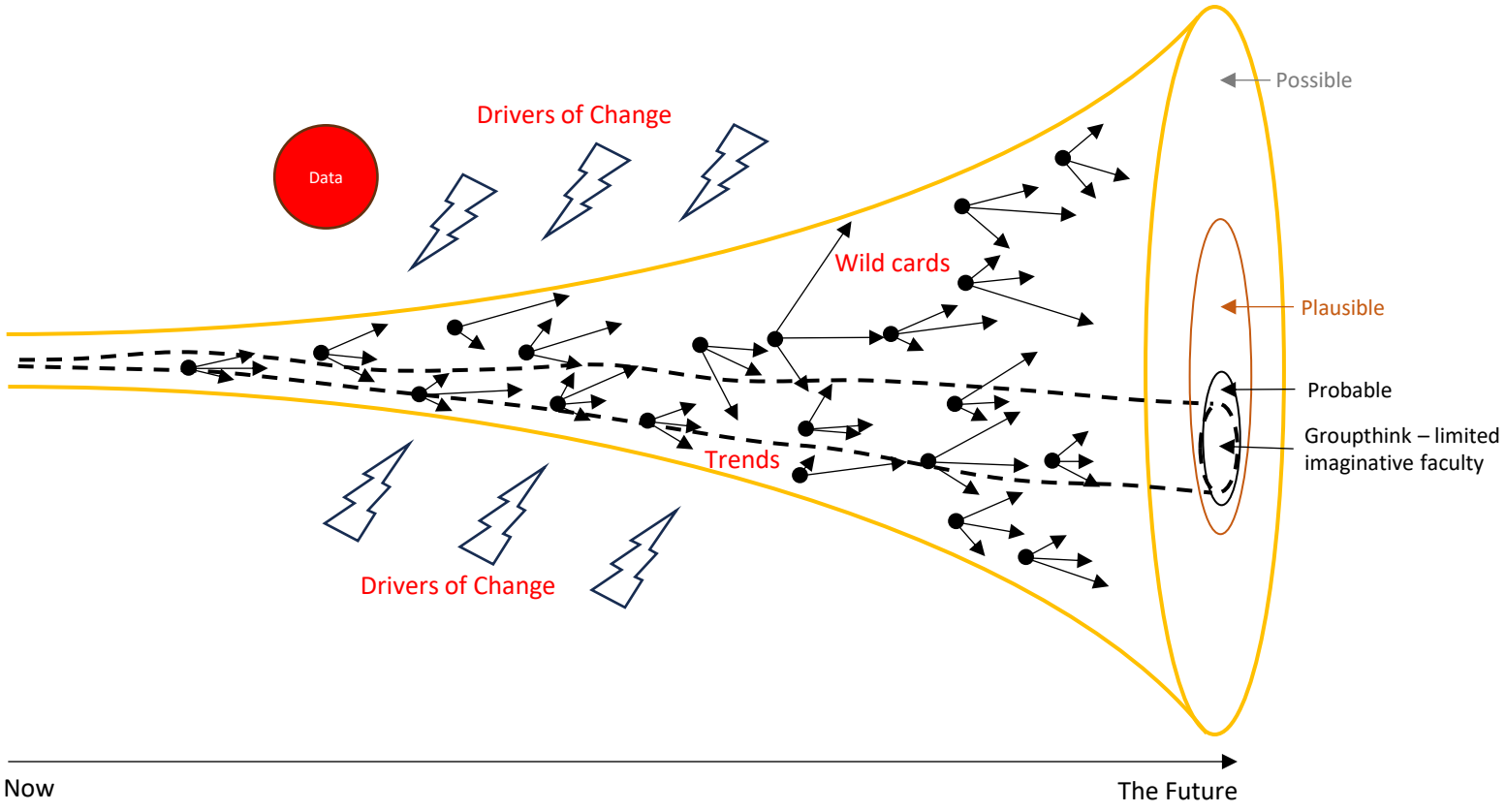
Our customers

Part II

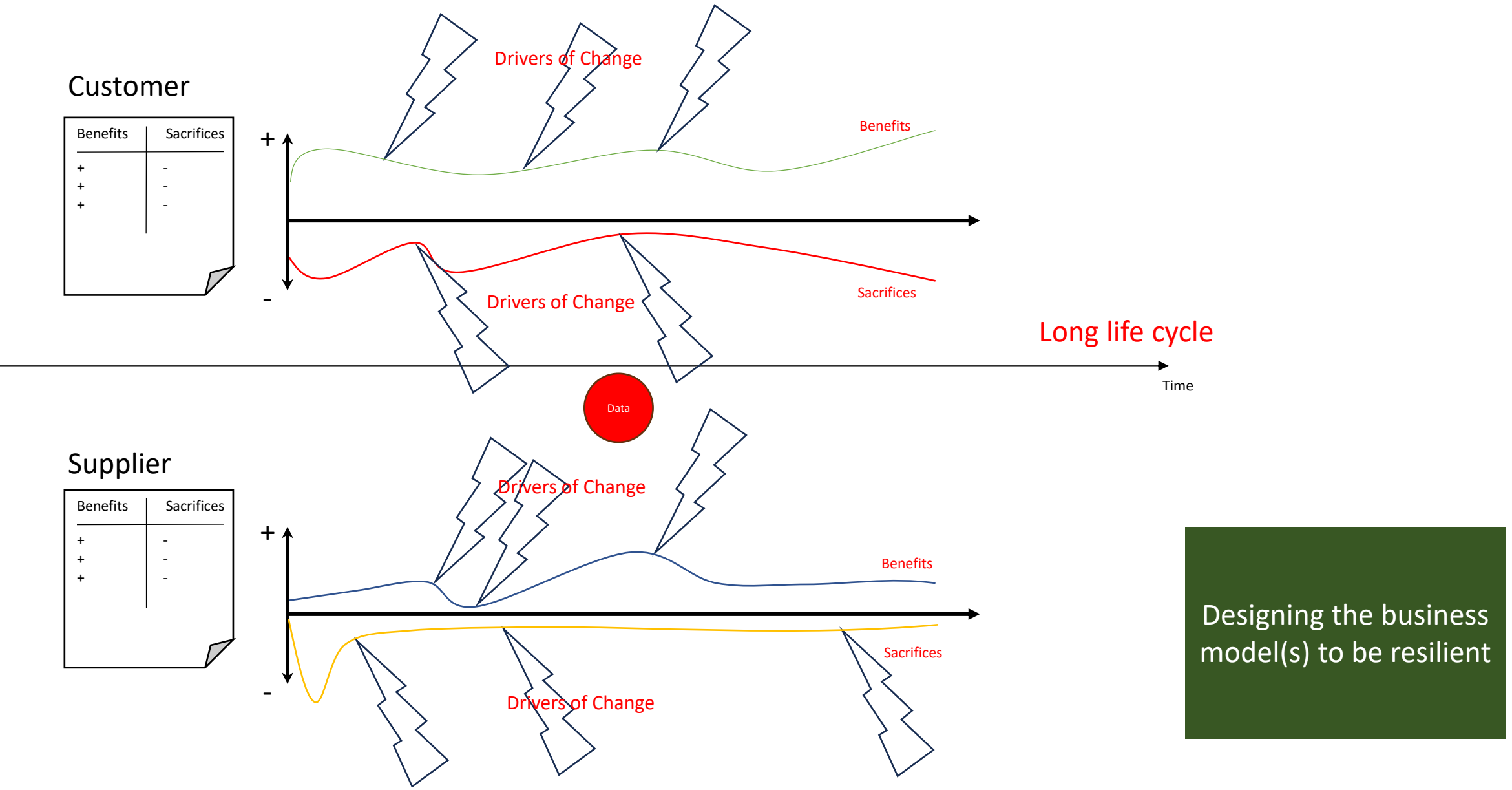
...when the world is changing

But then…
Long life cycle equipment
→ long contract and responsibility

Changes, changes

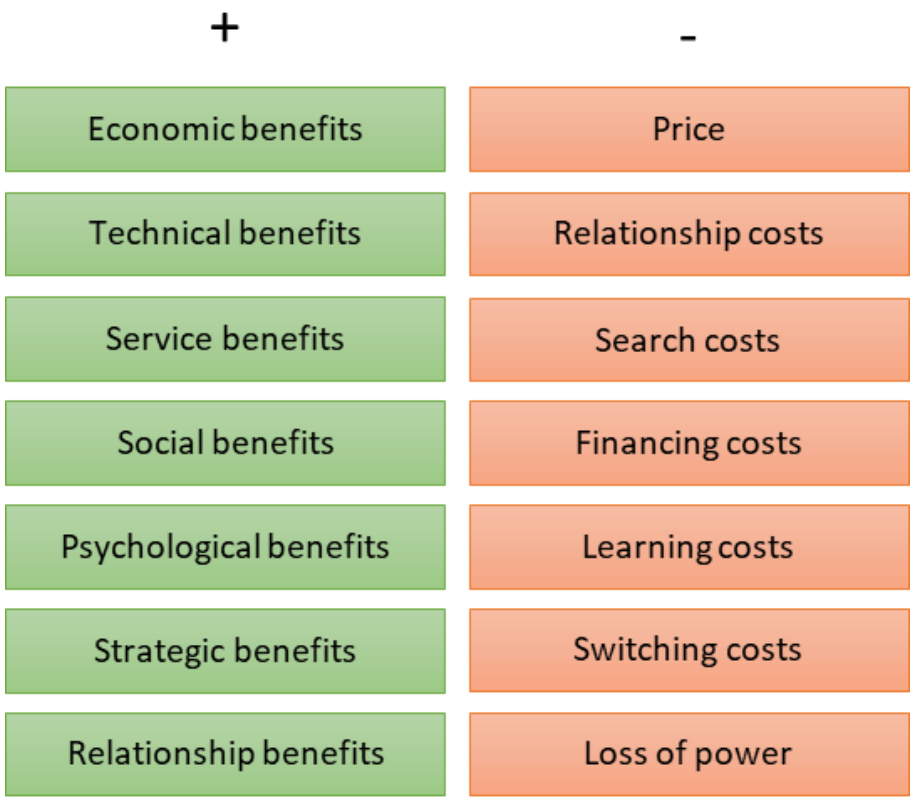


Bood, R., Postma, T., 1997. Strategic learning with scenarios. European Management Journal 15, 633–647. https://doi.org/10.1016/S0263-2373(97)00047-9



Designing the business model(s) to be resilient

Benefits and challenges vs. uncertainties



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Driver of Change	Probability Mean	Impact Mean	Criticality
Changes in costs	8,11	6,56	53,20
Product market price change	8,11	6,33	51,34
Technological disruption	7,00	7,22	50,54
Life cycle cost/value becoming customer decision criteria	7,56	6,67	50,43
Customer business strategy change	7,67	6,56	50,32
Changing customer expectations	7,67	6,44	49,39
Change in OBC related regulations and financial policies	6,78	6,33	42,92
Component supply problems	7,44	5,67	42,18
Sustainability goals driving modernization of equipment	6,89	6,11	42,10
Change in interest rates	8,22	5,11	42,00
Country/region incentives for local production and sourcing	7,33	5,67	41,56
Supplier's competitors adopting OBC business models	7,11	5,67	40,31
Scarcity of skilled labor	6,56	5,89	38,64
Wild card events (e.g. war)	5,89	6,56	38,64
Customer's production line related problems	6,67	5,56	37,09
Increase in OBM financing opportunities	7,11	5,00	35,55
Energy and material shortage	6,33	5,56	35,19
Shortening of product life cycles	5,33	6,00	31,98
Changes to Import/Export Rules	5,89	5,22	30,75
Restrictions on usage of natural resources	5,89	5,22	30,75
Digital platforms emergence	6,89	4,11	28,32
Changing customer IT needs	6,78	4,11	27,87
Political situation impacting the equipment and data flows	5,22	5,11	26,67
Digitalization leads to centralization of maintenance	6,44	4,00	25,76
Customers wanting to insource equipment competence	5,22	4,89	25,53
Cyber security affecting remote monitoring	5,11	4,78	24,43
Changes in safe data sharing (e.g. blockchain)	5,33	4,33	23,08
Change of ownership of companies	5,78	3,89	22,48
Social unrest creating uncertainty	5,33	4,11	21,91
Change in union rules	4,22	4,89	20,64
Personal relationship change	5,44	3,11	16,92

Kuismanen, O., Menon, K., Kärkkäinen, H. (2024). Drivers of Change Impacting Outcome-Based Business Models in Industrial Production Equipment. In: Danjou, C., Harik, R., Nyffenegger, F., Rivest, L., Bouras, A. (eds) Product Lifecycle Management. Leveraging Digital Twins, Circular Economy, and Knowledge Management for Sustainable Innovation. PLM 2023. IFIP Advances in Information and Communication Technology, vol 701. Springer, Cham. https://doi.org/10.1007/978-3-031-62578-7_13

Scenarios & Characteristics of feasible OBC in scenario

Global Modernization BOOM! | Multipolarily uneven | Separate Niche | The end of individual asset OBC

PESTLE		Global Modernization BOOM!	Multipolarily uneven	Separate niche	The End of individual asset OBC
P	Political stability	World is united in the fight to resolve the grand challenges. Globalization 2.0.	**Multipolar world with several politically, ideologically and societally different internally uniform regions.**	Stability, at least inside geographical regions, free flow of equipment within regions.	The world is relatively stable, with regional conflicts occurring with increasing multipolarization.
E	Economic activity	**Strong growth in economic activity across industries. Record pace of modernizations.**	**Geographically uneven levels of economic activity; some regions flourish while others struggle.**	Moderate.	Predictable, although companies measured through new KPIs with longer time frames.
E	Environmental sustainability	**Consumers conscious of products' environmental impact, choosing brands based on sustainability. Industry sustainability pledges (and reporting).**	Consumers conscious of products' environmental impact, choosing brands based on sustainability. Industry sustainability pledges (and reporting).	n.a.	n.a.
E	Availability of OBC financing	**Sustainability-driven customer behavior drives investment funds to sustainable technologies.**	Availability of financing depends on region.	Financing exists but is limited, both for traditional CAPEX investments as well as OBC assets.	Financing is available on a production line level and for companies operating Manufacturing-as-a-Service.
E	Inflation and financial stability	High financial stability globally. Inflation stable but high.	**Financial stability depends on region.** Emerging markets have volatile interest rates and inflation.	Financial stability depends on region. Emerging markets have high interest rates and inflation.	High financial stability and predictable inflation rates.
S	Industry outsourcing trend	Producers outsource much of their non-core production assets and services to suppliers.	Dependent on region. Certain regions ownership is considered vital, firms operate large parts of supply chain. In some regions outsourcing and networked economy thrive.	Core production assets purchased in traditional way, with increased spare part inventories and commitments from suppliers.	**Producers maintain control of larger parts of their supply, including individual production equipment. Production-lines-as-a-Service trend. Suppliers offer full responsibility life cycle service contracts, removing asset related uncertainties.**
S	Decision making strategy	Decision making on production equipment has been standardized to corporate level.	Global corporations adopt a hybrid approach; within a region decision making is harmonized, but between regions differs. Decision making timeline depends heavily on company ownership (public/private).	Relatively short investment evaluation timelines and complexity of OBCs limits their usage to independent and easily movable assets. **Central governance on production process and technical setup, local organizations have freedom to choose suppliers and business models.**	**Customers and integrators embrace full life cycle cost evaluation as the primary decision-making criteria for investments, powered by big data and predictive models. Plant output vs. market need is forecasted, making investment decisions predictable.**
T	Production technologies	Asset interoperability and connectivity has greatly increased due to standardization. Assets of different suppliers are widely interchangeable. Industrial automation has increased. 3D printing of spare parts. Blockchain widely used for data protection.	Complexity and automation in equipment has increased, but through standardization the interfaces remain intact. 3D printing of parts helps the availability of spare parts, but only for big vendors due to IPR considerations.	**Increasing technological complexity of production lines makes purchasing assets and standardizing interfaces the primary option for producers. Limiting technological risks by insourcing needed knowledge to design, operate and maintain complex lines but outsourcing less dependent assets.**	**Production assets enjoy high automation levels. Big data powered AI, predictive algorithms and materials science improvements have improved asset reliability, maintainability and life cycle costs to a very predictable level.** Industrial scale 3D printing technologies provide instantaneous spare parts for equipment, on the spot.
L	Legislation and regulation	Sustainability-related regulation has been standardized, circularity is considered in accounting, taxation, import/export legislation	Large regional differences. Western markets legislate circularity and provide uniform regulation. Inside regions less barriers than between regions.	No significant changes.	No significant changes.

Market/geography	Product	Service	Other
Available globally/ wide geographical availability.	Equipment that aligns with sustainability goals	Globally remotely monitored, locally maintainable	Easily integrated to production lines, connectivity, automation
Standardized across industries	Easily transported		Financeable
Alignment of market regulation (e.g. energy efficiency), product and operation energy and material efficiency	Multi-market capabilities (e.g. electronics ratings)		

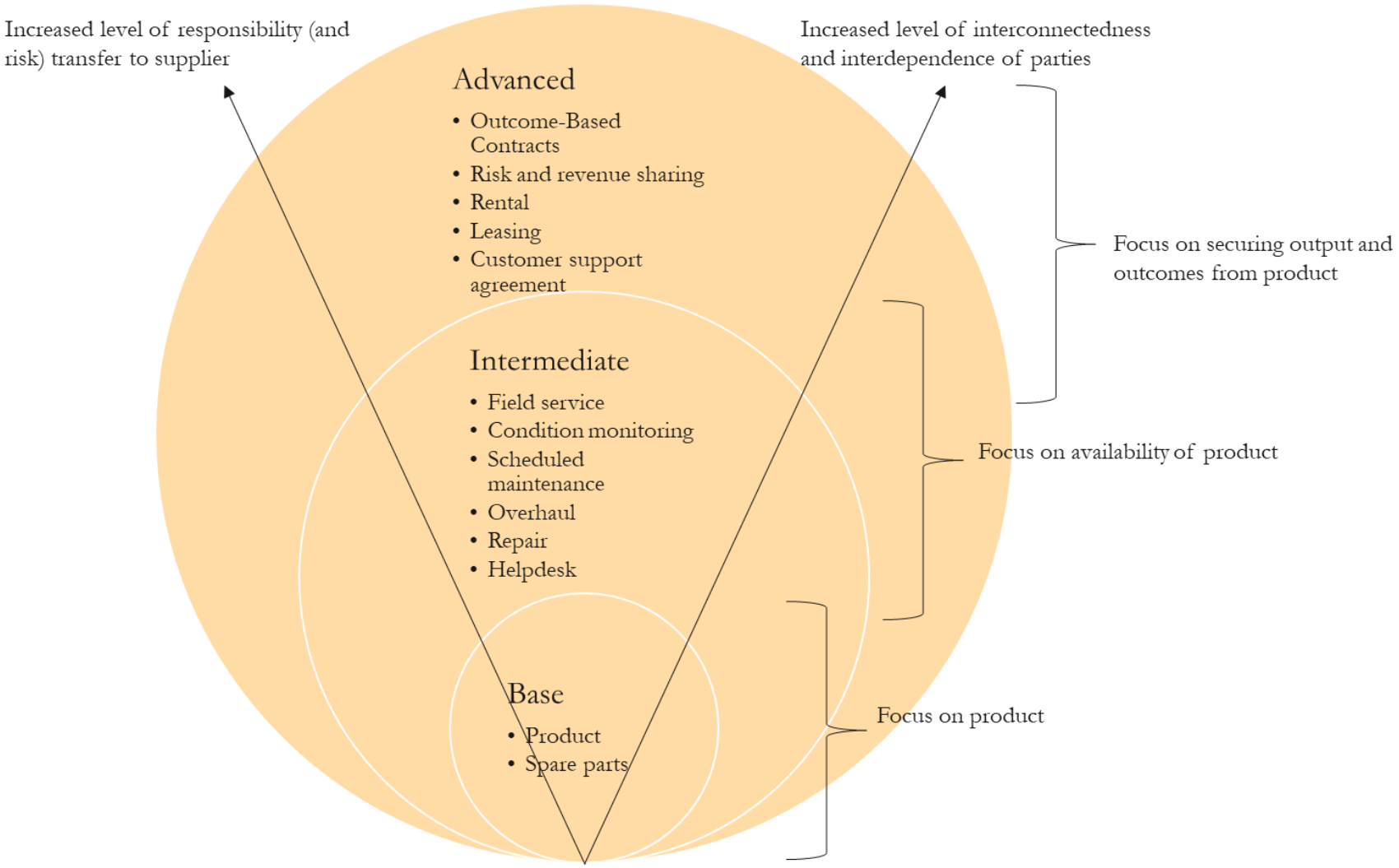
Market/geography	Product	Service	Other
Different value mechanisms for different markets depending on market characteristics (energy cost, availability, low cost of asset	Equipment that aligns with regional needs -Energy efficiency in markets with high energy cost or sustainability targets -Material efficiency in markets with scarcity -Automated in markets with high labor cost, manual in low-cost markets -Low material and spare part consumption.	Either remotely or regionally monitored online, locally maintainable	Contracting models dependent on regional regulation (e.g. accounting regulation vs. contract term)
Ability to provide different OBCs (use, output, outcome), based on local customers' needs (also decision making style)	Potentially different technical configuration for different markets (e.g. low-cost version for cost sensitive markets vs. high spec version for energy efficiency seeking markets))	Regionally or locally available spare parts and consumables -3D-printing	Financeable by local financers
Regionally large market	Standardized within region strong industry (e.g. oil and gas in Middle East)	Service presence regionally strong	Purchase clauses in certain regions
	Easily integrated to production lines, connectivity, automation capabilities		

Market/geography	Product	Service	Other
Market can be global, regional or even local, depending on scale	Independent assets, limited but easy integration to other assets, limiting the impact of changes in e.g. technologies	Globally or regionally remotely monitored, locally maintainable	Financeable -Majority of costs in assets with low technical depreciation/high value retention
Ability to provide different OBCs (use, output, outcome), but mostly use-based contracts	Movable, easily transported assets, standardized within industry	Regionally or locally available spare parts and consumables	
	Multi-market capabilities	Service presence regionally strong	

Market/geography	Product	Service	Other
Large scale manufacturing of standard products	High capacity, high efficiency, integrated equipment working in an automated production line	Integrators keep the responsibility of service and maintenance of assets in the production line	Key OBC suppliers can elevate their position to become integrators
Multiple potential end customers for production lines maximize utilization	Standardized interfaces to maintain interchangeability between (and power over) equipment providers	Full responsibility service contracts where supplier keeps responsibility for mechanical functioning are possible.	
	High level of automation, remote/local centralized control and monitoring		

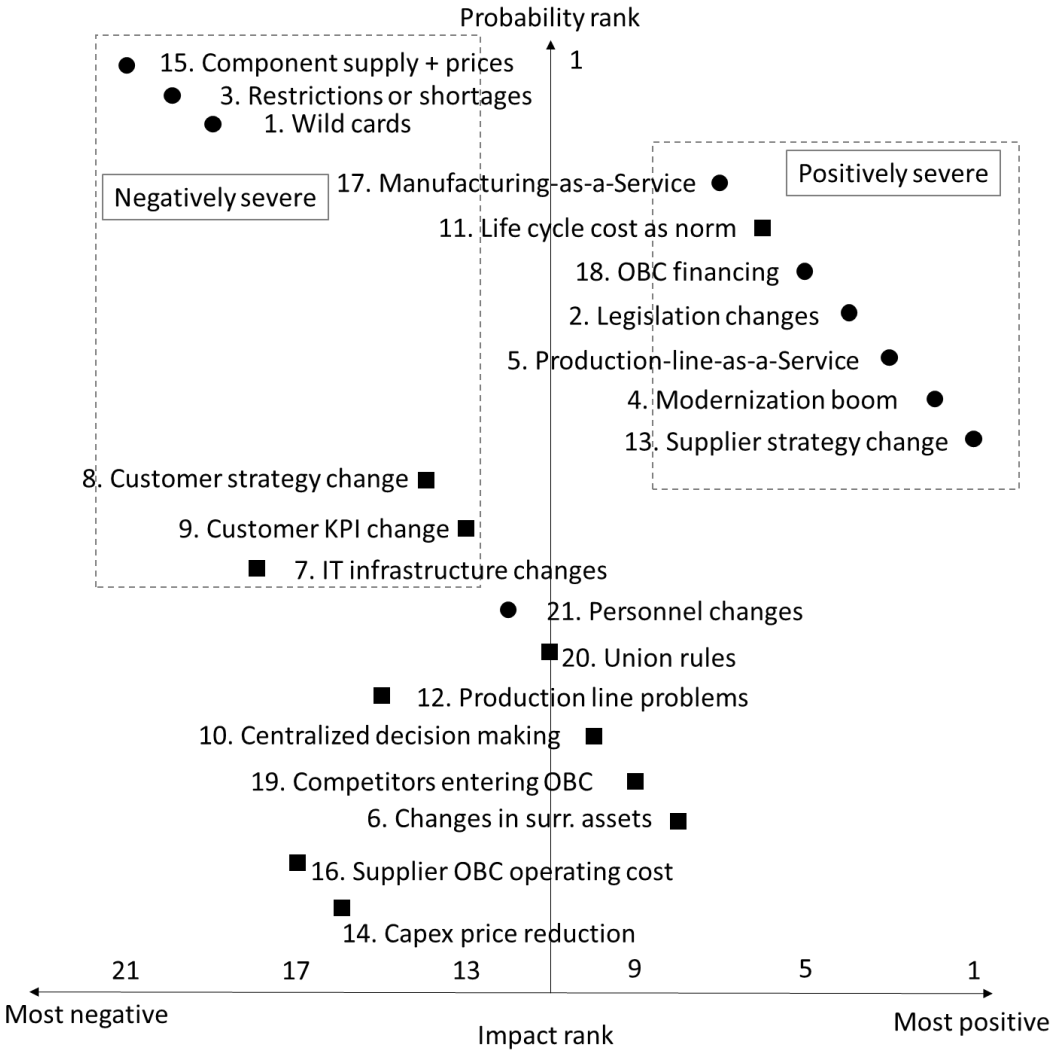
Kuismanen, O., Menon, K., Kärkkäinen, H. (2024). Four Scenarios for Future of Outcome-Based Contracts. In: West, S., Meierhofer, J., Buecheler, T. (eds) Smart Services Summit. SMSESU 2023. Progress in IS. Springer, Cham. https://doi.org/10.1007/978-3-031-60313-6_10

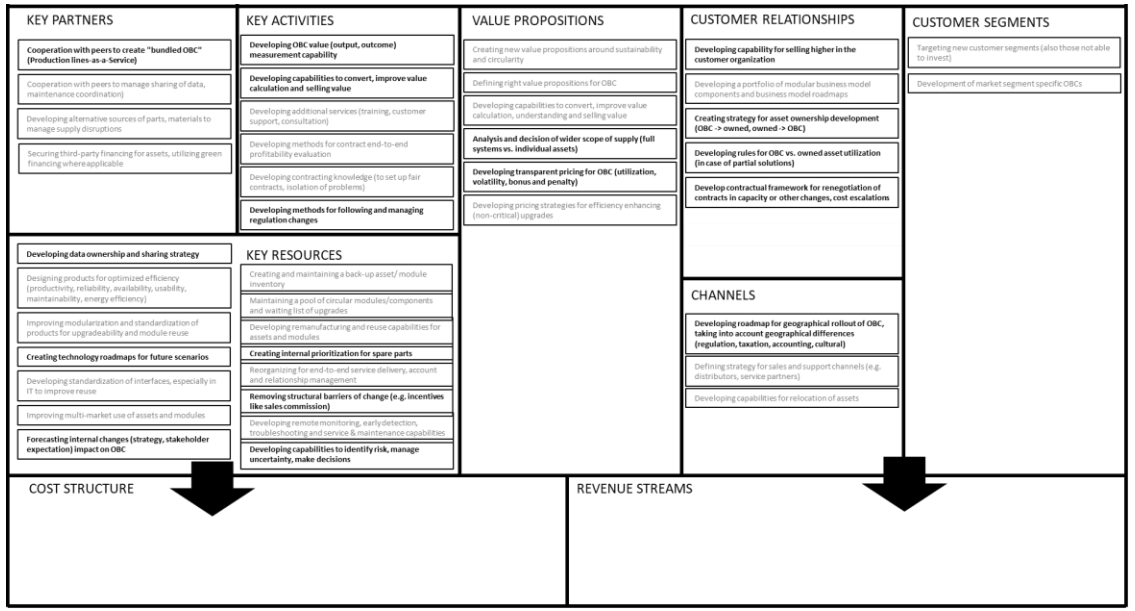
“Risk and reward sharing business models”

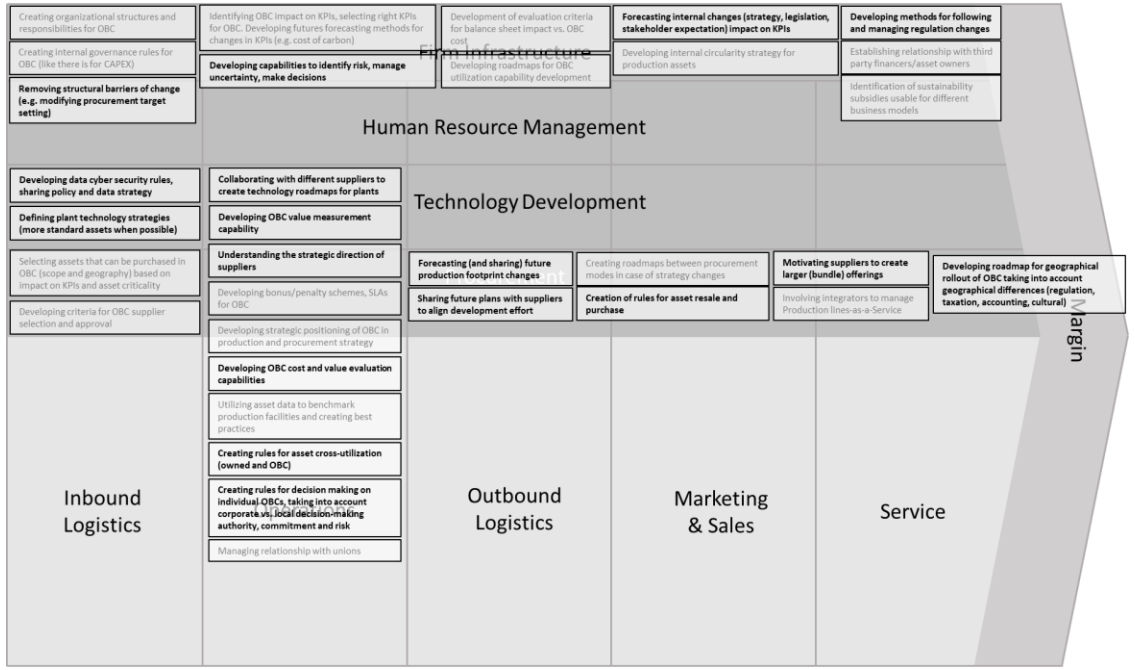


Adapted from Baines and Lightfoot (2013) and Uski (2023)

Paradox: change is negative and positive for PaaS supplier







Final thought:
Who can best manage product obsolence risk?

Thank you!

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