Lecture 4: Data-driven business models

Management in the digital age

Chair of Business Informatics
Processes and Systems
University of Potsdam

Univ.-Prof. Dr.–Ing. habil. Norbert Gronau
Chairholder

Mail August-Bebel-Str. 89 I 14482 Potsdam I Germany
Visitors Digitalvilla am Hedy-Lamarr-Platz, 14482 Potsdam
Tel +49 331 977 3322

E-Mail ngronau@lswi.de
Web lswi.de

EDUCating for Positive Management

Co-funded by the Erasmus+ Programme of the European Union

Data-based Business Models

Learning Content

- The role of information and data
- Typology of data-based business models: Selling data, Selling analysis, Selling data-based services
- Value creation and capture in data-based business models
- Examples for each of this business model types

Skill-related Targets

- Analysis of existing business models
- Understanding value streams in data-based business models
- Design of a data-based business model
- Development und realization of data-based service models

The role of information and data

Typology of data-based business models

Value creation and capture in data-based business models

Development of data-based business models

From Data-based business models to sustainable business models

Case Study

EDUCating for Positive Management

The role of information and data

Typology of data-based business models

Value creation and capture in data-based business models

Development of data-based business models

From Data-based business models to sustainable business models

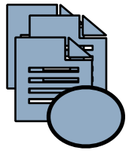
Case Study

EDUCating for Positive Management

General information on data

Data

- A **set of symbols** that represents **events** and **object properties** [1]
- Are **facts** or **raw numbers**, that need to be processed and interpreted [2]
- **Unrefined** and **unfiltered** information or a set of **discrete objective facts** about events [3]



Information

- Are **processed** and **interpreted** data

Knowledge

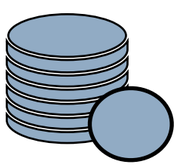
- Is **actionable information** or **meaningful links** between the information and its application

Data, information and knowledge represent distinct concepts.

EDUCating for Positive Management

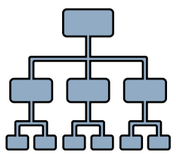
Source: Parvinen 2020, [1] Ackoff 1989, [2] Alavi and Leidner 2001, [3] Liew 2007

Data characteristics



The value of data

- Is only realizable when used
- Depends on the context, situations and time
- Decreases rapidly after revelation
- Varies by the way one uses it and how it is combined
- Data is a non-rivalrous experience good



Organizational perspective

- Internal source:
  - Concerns natural persons (CRM data, service user data)
  - Or business operations (ERP data, sensor data)
- External Source:
  - Bought data from third parties
  - Open data

Data can be sourced from various sources. The value depends on the data processing.

Source: Parvinen 2020

EDUCating for Positive Management

Definitions

Type	Data role	Key concept	Business Model
Data-based	Assist, enhance, complement	▪ **Data-based:** „a service or product wich is enhanced by data in a particular way.“ e.g. price, distribution channels, best selling paints for cars	▪ **Data-based business model:** „is a business model where the decision process is supported by data, but data isn’t necessarily a part of their business“
Data-driven	Key resource	▪ **Data-driven:** „a service or product that uses data as the key resource.“	▪ **Data-driven business model:** „is a business model that relies on data as the main resource and where data is necessarily required for the value proposition“

Data-based and data-driven aspects vary by their importance of data as a resource.

EDUCating for Positive Management

Source: Parvinen 2020

Quiz Session

EDUCating for Positive Management

The role of information and data

Typology of data-based business models

Value creation and capture in data-based business models

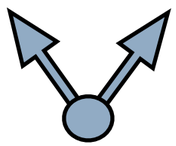
Development of data-based business models

From Data-based business models to sustainable business models

Case Study

EDUCating for Positive Management

Monetization of data



Options to monetize data

- *Internal* use of data to improve existing processes and products
- *External* use of data to create new offerings

Business Models

- *Selling Data:* direct selling of raw or aggregated data and granting its ownership
- *Selling Analysis:* selling data based analyses with restricted access to the original data
- *Selling Data-based Services:* create services to scale how they deliver data using multi-sided business models. Data comes from services' users

Monetization of data refers to capturing data's value. Companies can monetarily benefit from data by selling, trading, optimizing their operation and reducing their costs with it.

EDUCating for Positive Management

Source: Parvinen 2020

Examples for monetization of data

Selling data

- The value of data depends on the use case
- Mobile network operator have data on movement behavior
- Vodafone sells anonymized data
- TomTom uses data for optimizing navigation

Selling analyses

- Reference information may be useful for benchmarks
- Barclays provides a service for SME companies that provides them with information about their finances and transactions.
- Customer can compare their own data with similar businesses in similar locations.

Selling data-based services

- Integrated services help to provide feedback loops
- Google smart thermostat Nest provides data on users' energy consumption to electricity utilities.
- Aggregated data allows for balancing the user's energy grid.

Data monetization is already practiced by companies. Depending on the form of the data and the companies willingness to process and analyze the data before selling, the offerings differ.

Source: Parvinen 2020

Business model variations

Customer type \ offering type	Example	Current customers	Actors in current value chain	Anyone
Example		Existing customers	Existing supplier	Potential clients
Selling data	Selling anonymized aggregated data on customer demand	Selling *data* on to current customers	Selling *data on customer demand* to current suppliers	Selling data to data-brokers or data integrators
Selling analyses	Selling analyses that provide clients with useful information	Selling *analyses* of the business environment to current customers	Selling analyses on *customer preferences* to suppliers	Selling analyses on the business environment to market research agencies
Selling data-based services	Selling data-based services that provide signals on active notice	Selling a *service* that provides relevant signals on the business environment	Selling a service that provides suppliers with early information on *future product demand*	Selling a service to new customers with relevant signals on the business environment

The sales strategies differ depending on the target group and the type of data available.

Source: Parvinen 2020

EDUCating for Positive Management

Business model refinement for data monetization
Typical paths for business model refinements

Customer type/ offering type	Current customers	Actors in current value chain	Anyone
Selling data	1st path		3rd path
Selling analyses			
Selling data-based services	2nd path		

Extension of data-based business models

- Simplest way to start monetizing data is selling fairly unrefined data to one's current customers
- Typical ways to extend data-based business models involve two dimensions, i.e. offering and customer
- Selling more advanced forms of data (data —> analyses —> services)
- Provide the offering to a broader market (customers —> value chain —> anyone)

Different paths for the refinement of data-based business models exist. Companies may extend the group of customers or the offering type gradually.

Source: Parvinen 2020

EDUCating for Positive Management

Remote energizer – count to ten!

EDUCating for Positive Management

The role of information and data

Typology of data-based business models

Value creation and capture in data-based business models

Development of data-based business models

From Data-based business models to sustainable business models

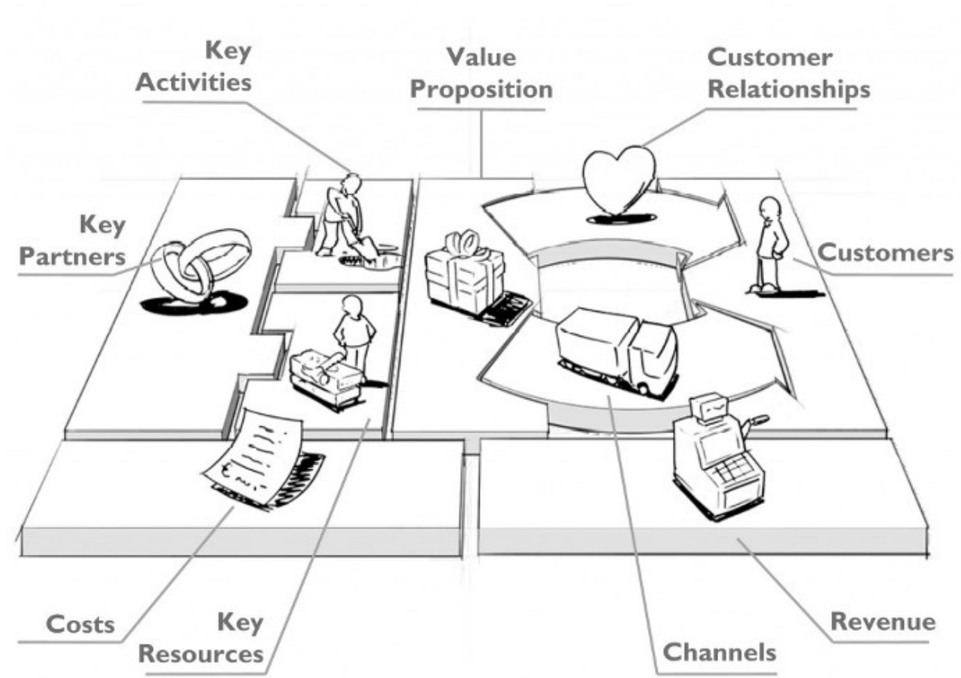
Case Study

EDUCating for Positive Management

From general business model to data-based business model

General business model by Osterwalder

1. Value Creation
2. Value Capturing
3. Value Proposition



Data-based business model

- Extension of the business model canvas by **incorporating the importance of data**
- Data is a key resource is involved frequently
- Businesses are data-based and data-driven
- The general components are now **data-infused**

Data-based business models are an extension of the general business model by enriching it with data.

Source: Schuritz 2016, Osterwalder 2010, Graphic Sammer 2021

Dimensions of data-infused business models

Value Creation

Value Capture

Value Proposition

Definition

- Describes how resources in the organization are orchestrated to produce and deliver a defined value proposition
- Describes how the value proposition is turned into (monetary) remuneration for the company.
- Describes what can be offered to other parties.

Examples

- Process of data analysis to transform raw data in useful analysis for customers
- Dynamic pricing using information on customers willingness to pay
- Real-time provision of traffic information for navigation

The Impact of Data-Infusion varies depending on the specific part to which it is applied

Source: Schuritz 2016

Data Infusion

Data Infusion

- Data Infusion describes the act of enhancing specific components of the business model with data and analysis.
- Data Infusion may occur for single components (type I and II) or for multiple components (type III to V)
- The first three types occur most frequently

Types of Data-Infusion Patterns

Name	Infused component(s)		
	Value Creation	Value Capturing	Value Proposition
I. Data-Infused Value Creation	✓		
II. Data-Infused Value Capturing		✓	
III. Data-Infused Value Proposition via	✓		✓
IV. Data-Infused Proposition via		✓	✓
V. New Data-Infused Business Model	✓	✓	✓

Data Infusion opens many ways to innovate and improve business.

Source: Schuritz 2016

EDUCating for Positive Management

Examples for data-infusion patterns

Value Creation

- The scrape rate in the steel industry is roughly 32%
- Saarstahl AG one of the leading steel producers in Germany uses a network of sensors to optimize process by recognizing defect material in real-time and visualizing the data for *quality checks* in order to make *faster and better decision* if to scrap the material or not.

Value Capture

- Staples, a large office supply chain store, *individualizes* the *prices* in its online stores based on the location of the customer identified via the IP-address. The location gives estimates on a variety of *factors* such as the *average income* of the customer and the general cost of doing business in that area.

Value Proposition via Creation

- Rolls Royce offer „power-by-the-hour“ arrangements - *performance-based* contracts for their *jet engines*.
- They are using different types of analysis to identify issues very early and improve driving for engine maintenance.
- Customers of Rolls Royce can use VisiumFUEL to monitor their aircraft fuel consumption and identify opportunities for efficiency improvements.

Source: Schuritz 2016

Quiz Session

EDUCating for Positive Management

The role of information and data

Typology of data-based business models

Value creation and capture in data-based business models

Development of data-based business models

From Data-based business models to sustainable business models

Case Study

EDUCating for Positive Management

Development of data-based business models

Development of novel data-based business models

- Listing unique product qualities
- Identifying inimitable properties
- Finding the (most) suitable monetization
- Starting of monetizing
- Evolving the product, using other paths

Extension of existing data-based business models

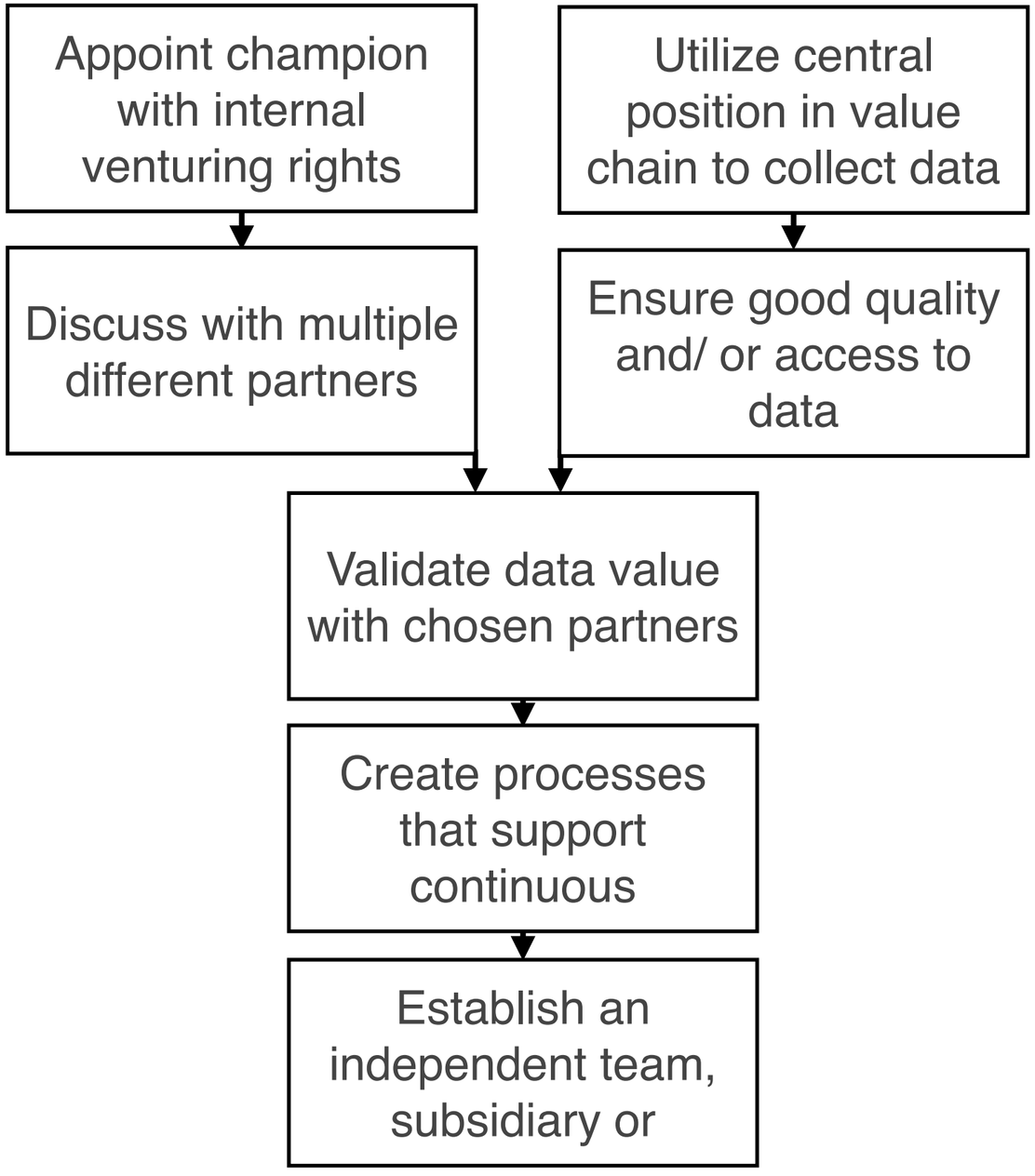
- Identifying potential (additional) stakeholders
- Identifying target-specific data of interest
- Selling target-specific data to stakeholders
- Evolving the business relationship through up-selling and cross-selling

The development of data-based business models typically appears in a step-wise manner regarding the dimensions offering type and customer type.

Source: Sorescu 2017

EDUCating for Positive Management

Recommended steps on the path to data monetization



Source: Parvinen 2020

- Discussing data use with other companies can help understanding the terms of business opportunities
- Validating the data value is a key step before starting a comprehensive monetization plan e.g. with a pilot project

Points to consider

- Companies can not simply integrate data monetization into their current offerings
- How to monetize data depends on the strategy they choose
- The data offering should always be suitable and appropriate to the customer
- Otherwise it can have an harmful impact on the company e.g. Facebook - Cambridge Analytica

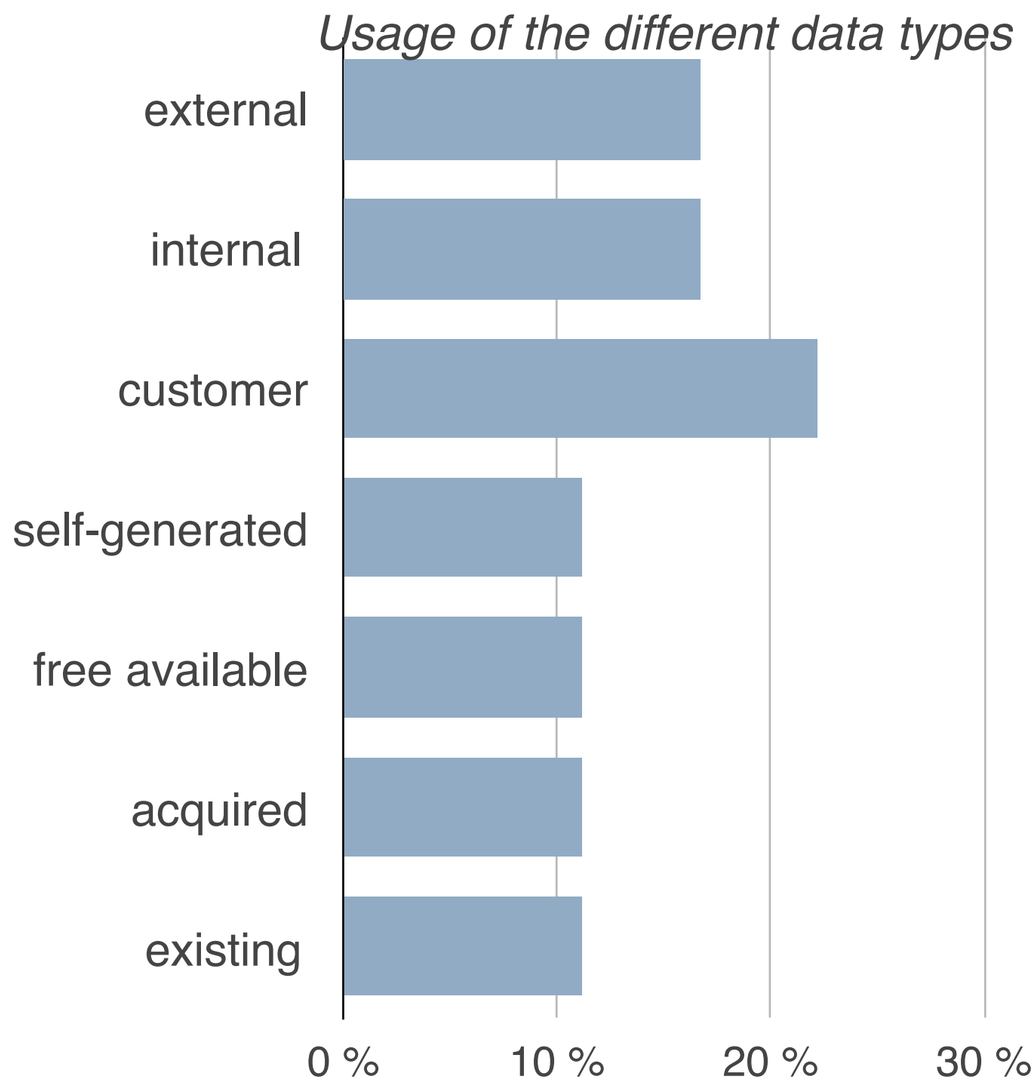
EDUCating for Positive Management

Implications for data-driven business models

Representing data types is a **foundation** of data-driven business models.

As data is the main resource, the aspect of **quality and security** should be covered by the representation: confidentiality, integrity and availability.
Key activities should be **deeply connected** to the main resource data since they are the core of the data value chain.

Key activities field should include at least the following activities: how **to acquire**, **structure** and **analyze** the required data.

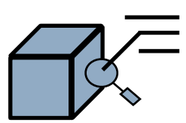


Data-driven business models use different data sources. The use of internal and external data is rather balanced. Data on customers is most frequently involved.

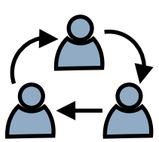
Source: Kühne 2018

EDUCating for Positive Management

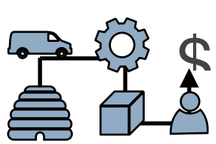
Constraints on developing data-based business models



- **Data Characteristics:** Quality is an initial issue for companies when starting a data-based offering. Accessibility, timeliness, and consistency are a few other problems.



- **Organization Type:** Organisations need to be properly aligned, be ready to innovate. data-related projects need to have a strategic importance, room for experimentation and risk taking.



- **Position in the Value Network:** Those with the best access to data can most successfully monetize and sell it along or outside the value chain most successfully.

- **Data Privacy:** privacy concerns need to considered when data includes personal information. Private users rarely internalize privacy agreements thus companies risk of loosing customers' trust by selling data rises.

- **Data Security:** The ability to protect data from thefts, errors and accidental destruction defines which business-model can be monetized and which customers can be sold to.

The ability to build a data-driven business is determined by the ability to access, process, secure, manage and sell data.

Source: Parvinen 2020

EDUCating for Positive Management

The role of information and data

Typology of data-based business models

Value creation and capture in data-based business models

Development of data-based business models

From Data-based business models to sustainable business models

Case Study

EDUCating for Positive Management

Data and sustainability

Why does it matter?

Risks

- High power consumption
- Rising demand for data-centers and their resources
- The demand for cooling for servers in data centers results in a high electricity and water demand (Jones 2018)

Opportunities

- Power consumption can be mitigated through the design of the algorithms used (Sedlmeir 2021) and renewable energy sources
- Integration of sustainable practices to reduce emissions (e.g., energy-efficiency improvements: smart heating and cooling, hooked up to building sensors and weather reports) (Jones 2018)
- Creating transparency to enable environmental tracking e.g., via blockchain (Chohan 2019)

Source: Sedlmeir 2021, Chohan 2019, Jones 2018

Data-driven Business Models

Archetype	Value Creation	Value Offer	Value capture
Platform-based business models	Data collection and analysis across entire value chains or ecosystems, serving multiple customers.	Sharing data allows multiple stakeholders to optimize existing or uncover unknown potentials.	License, model, Subscription model, Pay-per- use
Use-based business models	Data collection and analysis is conducted constantly, but presentation and evaluation is specific.	Optimization and insights regarding existing processes when needed for customers.	Pay-per-use, Pay-per-feature
Outcome-based business models	Data collection and analysis that is combined with specific, individual services and knowledge.	Services targeted for specific purposes, such as reducing downtime or improving quality, combined with services.	Pay-per-output, Pay for guaranteed results

Source: Müller 2020

Data-driven sustainable Business Models

Archetype	Value Creation	Value Offer	Value capture
Platform-based sustainable business models	Comparable to platform- based business models, but also including environmental or social certifications or institutions.	Traceability, compliance with ethical, environmental, or social standards, transparency of certifications for all stakeholders	Subscription fee, License, Public funding for platform or sustainability features
Use-based sustainable business models	Certifications or environmental standards are collected and monitored consistently, but only charged if needed (e.g., regulations, recycling specifications)	Availability of certifications, environmental standards or optimization when needed, that would be too costly to monitor constantly, e.g., for SMEs.	Pay-per-use, Pay-per-feature, Public funding for platform or sustainability features
Outcome-based sustainable business models	Collection of data that is available for optimization for all customers, but only charged when improvements are made.	Reduction of CO2 emissions, load and energy balancing across the supply chain. Product input resource and logistics process reductions.	Pay for improvements, State subsidies (e.g., CO2 pricing)

The integration of sustainable aspects in the business model perspective accounts for another perspective on resources.

Source: Müller 2020

Integrating sustainable aspects in the business model

The Triple bottom line perspective (TBL)

People
Social Dimension

- Strives to establish equity for all human beings and their opportunities in gaining access to resources with regard to basic needs such as water, food, and development through improved living conditions such as health care and education their

Planet
Environmental dimension

- Reductions of human-created footprints and ecological imbalances in terms of e.g., pollution, the ozone layer, greenhouse gases, non-biodegradable waste, deforestation, overfishing

Profit
Profit dimension

- Emphasizes that the production of goods and services is a prerequisite to improving the living conditions globally

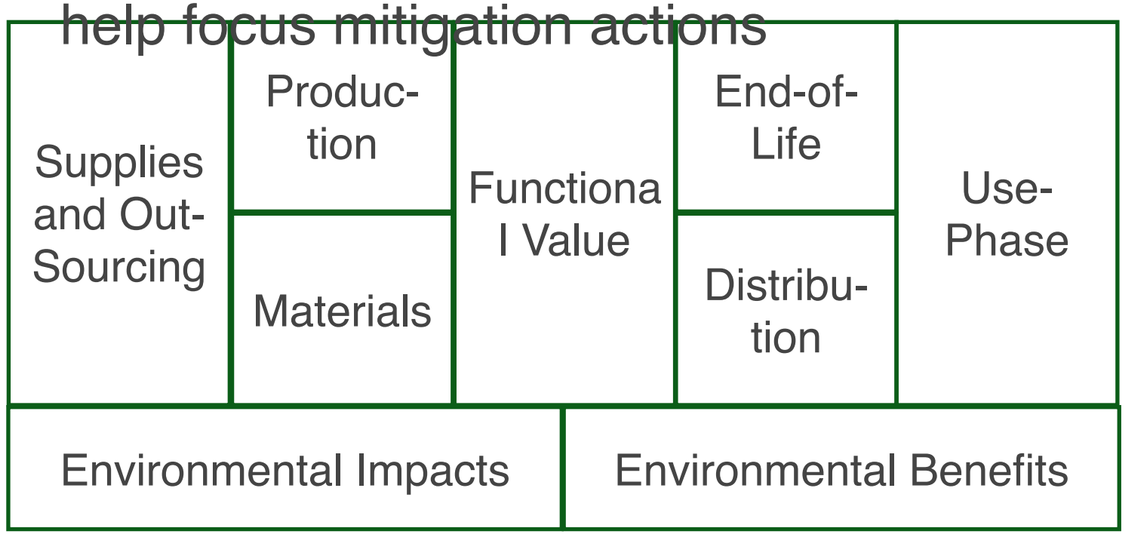
The TBL-approach is well established and widely applied in Corporate Social Responsibility (CSR) and global reporting initiative (GRI) reporting.

Source: Bansal 2005, Aagaard 2019

Triple-Layered Business Model Canvas

Environmental layer business model canvas

- Integration of Life Cycle Assessment (LCA) approach to business model considerations
- Analysis of how companies can generate more environmental benefits than harm and identify negative impact-hot-spots to help focus mitigation actions



Example Nespresso

Supplies and Out-Sourcing	Produc-tion	Functiona l Value	End-of-Life	Use-Phase
Cup and machine production *Energy & water for processes*	*Capsule production* *Production center* Materials *Coffee supply* *Aluminium for capsules*	*40ml of expresso coffee once daily multi-plied by the amount of consumers over the period of one year*	*Capsule packaging, machine end-of-life* Distribu-tion *Favoring Trains* *Packaging*	*Cup washing (and production)* *Coffee preparation water and energy* *Machine use (and*
Environmental Impacts *46.6% of carbon footprint from use phase*			Environmental Benefits *20.7% carbon footprint savings fromm 2008 to 2012 with machine redesign*	

The Triple-Layered Business Model Canvas adds an environmental and social layer to the existing model to integrate sustainability

Source: Joyce and Paquin 2016; Hope 2018

Triple-Layered Business Model Canvas

Social layer of the business model canvas

- Integration of the stakeholder management approach, that seeks to balance stakeholder's interests (not just profit maximization)
- Reflects the mutual interactions between the organization and its stakeholders to capture the social impacts

Local Communi-ties	Gover-nance	Social Value	Societal Culture	End-User
	Emplo-yees		Scale of Outreach	
Social Impacts		Social Benefits		

Example Nespresso

Local Communi-ties	Gover-nance	Social Value	Societal Culture	End-User
84% of farmers in production participate in the AAA Sustainable farming program development in partnership with the Rainforest	*Autonomous business unit, Transparency in*	*Enhance the quality of consumers lives offering tastier and healthier food and beverage choices*	*Culture of individuality with single servings*	*Caffeine boost* *Warmth* *Taste*
	Emplo-yees *Positive workplace with high diversity*		Scale of Outreach *60 countries across the world Education services for*	
Social Impacts *Potential Caffeine dependency Potential displacement of traditional farming practices and*		Social Benefits *Community engagement leading to improving the quality of life of stakeholders*		

The Triple-Layered Business Model Canvas adds an environmental and social layer to the existing model to integrate sustainability

Source: Joyce and Paquin 2016; Hope 2018

The role of information and data

Typology of data-based business models

Value creation and capture in data-based business models

Development of data-based business models

From Data-based business models to sustainable business models

Case Study

EDUCating for Positive Management

Case Study Part

Chair of Business Informatics
Processes and Systems
University of Potsdam

EDUCating for Positive Management

Co-funded by the Erasmus+ Programme of the European Union

Univ.-Prof. Dr.–Ing. habil. Norbert Gronau
Chairholder

Mail August-Bebel-Str. 89 I 14482 Potsdam I Germany
Visitors Digitalvilla am Hedy-Lamarr-Platz, 14482 Potsdam
Tel +49 331 977 3322

E-Mail ngronau@lswi.de
Web lswi.de

Case Study on data-driven business models

Assignment

- You are the Chief Technology Officer (CTO) of Mida Brush. For the upcoming management offsite, you were asked to present additional options for the current business model. While the established business model is based on product distribution, the owners are highly interested to add new forms of business models to **increase profitability**. More specifically, they are interested in possibilities regarding **data-driven business models**.
- You are in close contact with the product design department and heard that the new product line will be equipped with **RFID tags**. Those tags can allow for the identification of an individual brush. In this regard, you and your team were thinking about potential applications for data-driven business models.
- For the upcoming presentation, you were asked to present **three different possibilities**, rate them (using a utility matrix with three self-defined criteria), and present a concept for the **most promising business model** and potential (value creation, proposition, and capture) to increase profitability. Please present your results in a pptx- presentation (saved as a pdf document) with a maximum of 5 slides. You are welcome to use illustrations, tables or pictures.

Please refer to the general case study description for potential applications and the design of your suggestions.

EDUCating for Positive Management

Literature

Aagaard, A. (2019). Identifying Sustainable Business Models Through Sustainable Value Creation: Innovation, Implementation and Success. 10.1007/978-3-319-93275-0_1.

Ackoff, R. L. (1989). From data to wisdom. Journal of Applied Systems Analysis, 16(1), 3-9.

Alavi, M., & Leidner, D. E. (2001). Knowledge management and knowledge management systems: Conceptual foundations and research issues. MIS Quarterly, 25(1), 107-136.

Chohan, U. W. (2019). Blockchain and Environmental Sustainability: Case of IBM's Blockchain Water Management (February 11, 2019). Notes on the 21st Century (CBRI), Available at SSRN: https://ssrn.com/abstract=3334154 or http://dx.doi.org/10.2139/ssrn.3334154

Hope, A. (2018). Sustainable Business Model Design: A review of tools for developing Responsible Business Models. 10.1007/978-3-319-73503-0.

Icons made by https://www.flaticon.com/authors/ddara

Jones N., (2018). How to stop data centres from gobbling up the world's electricity. Nature. 561. 163-166. 10.1038/d41586-018-06610-y. Osterwalder, A., & Pigneur, Y. (2010). Business model canvas. Self published. Last.

Joyce A., Paquin R.L. (2016). The triple layered business model canvas: A tool to design more sustainable business model, in Journal of Cleaner Production 135 (2016) 1474e1486.

Kühne, Babett, und Tilo Böhmann. „Requirements for Representing Data-Driven Business Models - Towards Extending the Business Model Canvas“, o. J., 10., 2018.

Liew, A. (2007). Understanding data, information, knowledge and their inter-relationships. Journal of Knowledge Management Practice, 8(2), 1-16.

Müller, J. M., (2020). Data-based sustainable business models in the context of Industry 4.0" (2020). *International Conference on Information Systems 2020 Special Interest Group on Big Data Proceedings*. 5.

Petri Parvinen, Essi Pöyry, University of Helsinki, Robin Gustafsson, Aalto University, Miikka Laitila, Futurice, Matti Rossi, und Aalto University. „Advancing Data Monetization and the Creation of Data-Based Business Models“. *Communications of the Association for Information Systems* 47, Nr. 1 (1. Oktober 2020): 25–49.

Schuritz, Ronny, und Gerhard Satzger. „Patterns of Data-Infused Business Model Innovation“. In *2016 IEEE 18th Conference on Business Informatics (CBI)*, 133–42. Paris, France: IEEE, 2016.

Sedlmeir et al. (2020). The Energy Consumption of Blockchain Technology, Bus Inf Syst Eng 62(6):599–608.

Sorescu, Alina. „Data-Driven Business Model Innovation: BUSINESS MODEL INNOVATION“. *Journal of Product Innovation Management* 34, Nr. 5 (September 2017): 691–96.

Sammer, Werner „Der Business Model Canvas: Dein Geschäftsmodell kompakt“. ut11.net; letzter Aufruf: 22.03.2020

EDUCating for Positive Management