

Customer Acceptance of Smart Grid Products and Services: The role of incentives, psychological interventions, market segmentation and customer value

*Dissertation – Karoline Kuenzel, Good Energies Chair for Management of
Renewable Energies, University of St.Gallen*

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12. November 2013

Agenda

The critical role of customer acceptance of smart grid products and services

Overview of my Dissertation

A Model for Customer Acceptance of Smart Grid Products and Services

Increasing Customers Acceptance of Demand Response Programs

First Results: Generic Business Models & Customer Value of Smart Metering

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The critical role of customer acceptance of smart grid products and services

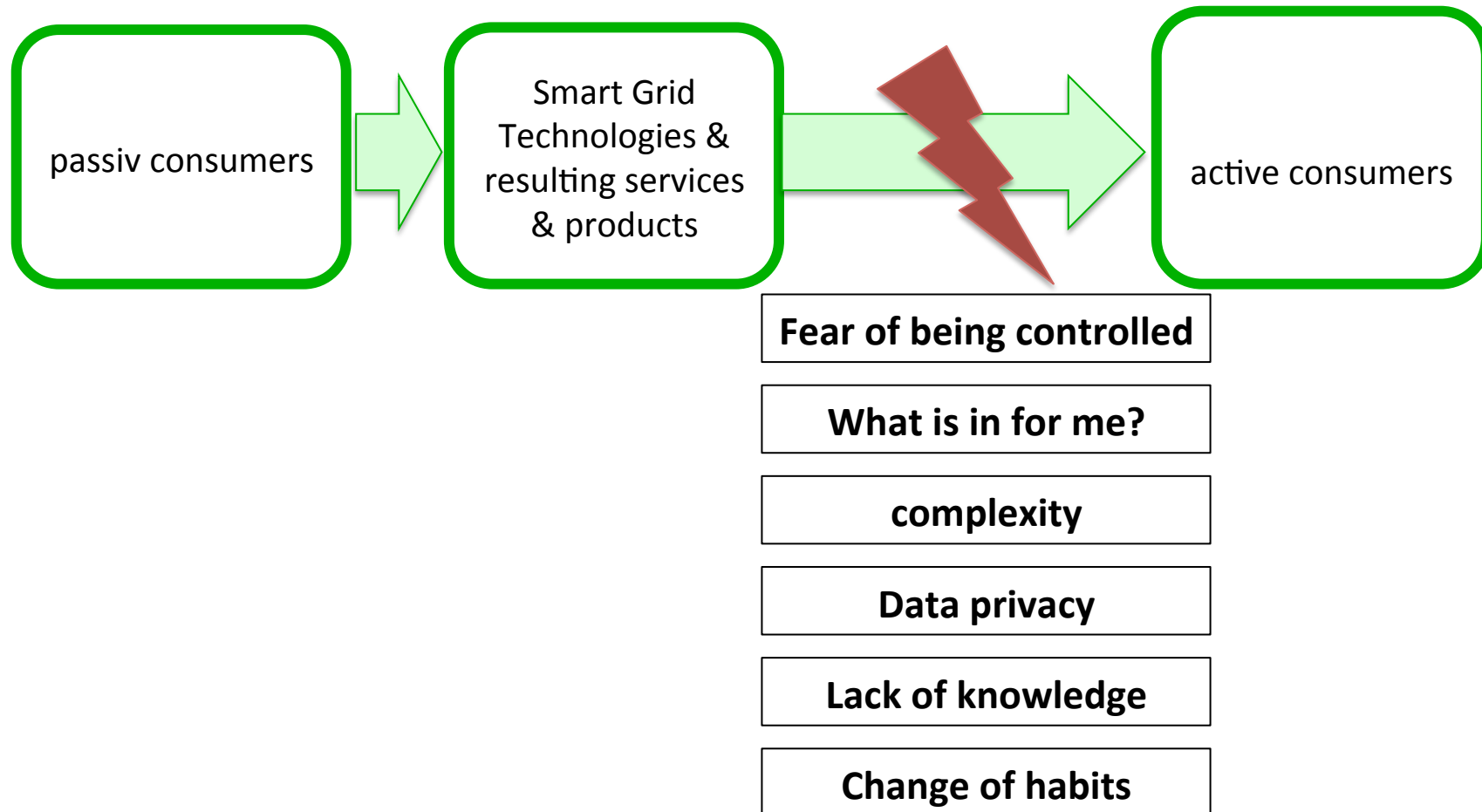
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A Model for Customer Acceptance of Smart Grid Products and Services

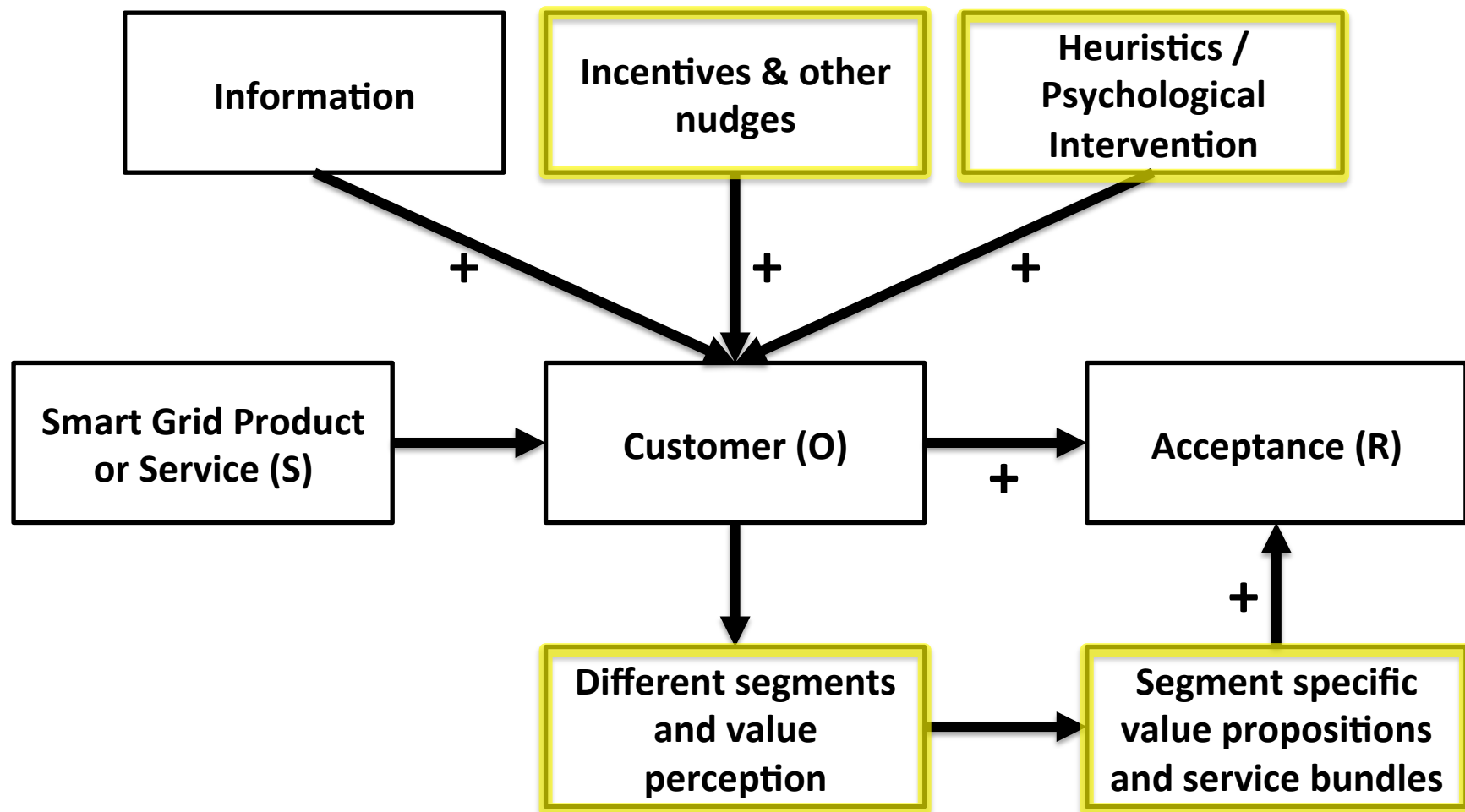
Increasing Customers Acceptance of Demand Response Programs

First Results: Generic Business Models & Customer Value of Smart Metering

The critical role of customer acceptance



Increasing Customer Acceptance of Smart Grid Products & Services



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Overview of my Ph.D. thesis

Framework Paper: Development of a generic framework for increasing customer acceptance of smart grid products and services				
- Review and research agenda on how to increase customer acceptance of smart grid products and services - Based on Kollmann's Acceptance Model (which relies on innovation research and attitude research + a new component of usage)				
Incentives	Incentives & psychological intervention	Psychological Intervention	Customer value and market segmentation	
Paper 1 Reward vs. Punishments	Paper 3 Endowment effect & reward type	Paper 2 Hypocrisy & construal level	Paper 4 Customer Value of Smart Metering	Paper 5 Generic customer segments and business models for smart grid
K.Kuenzel, M. Loock, C. Cometta	K.Kuenzel	K.Kuenzel, M. Loock, M. Delmas ?	S.Kaufmann, K.Kuenzel, M. Loock	H. Curtius, K.Kuenzel, M. Loock
- 1st laboratory experiment currently running - 2nd experiment with customers of Swiss utility planned in early 2014	- Pretest planned for March 2014 - Study with customers of an energy efficiency portal planned for May 2014	- Pretest for manipulation check Dec. 2013 - First study early 2014	<i>Published</i>	<i>Published</i>

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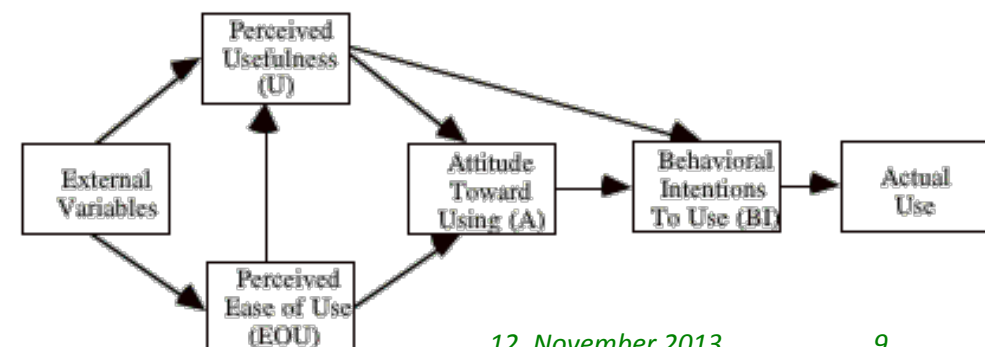
First Results: Generic Business Models & Customer Value of Smart Metering

What is acceptance?

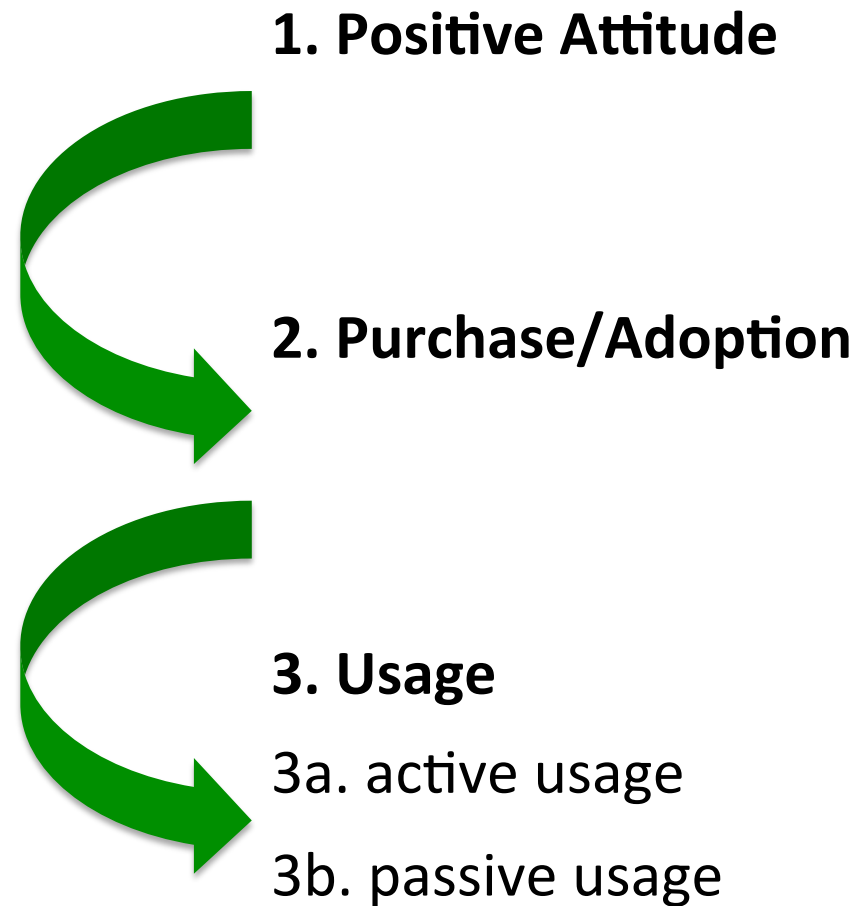
- Ubiquitous use of the word **acceptance**
- Different contexts of acceptance, e.g.:
 - In society: social acceptance: general opinion of society
 - In economic environment: market environment, organizational environment, consumer environment
- Different dimensions, such as
 - Cognitive
 - Affective
 - Normative-evaluative
 - Conative
- Different models
 - Technology Acceptance Model
 - Innovation Diffusion



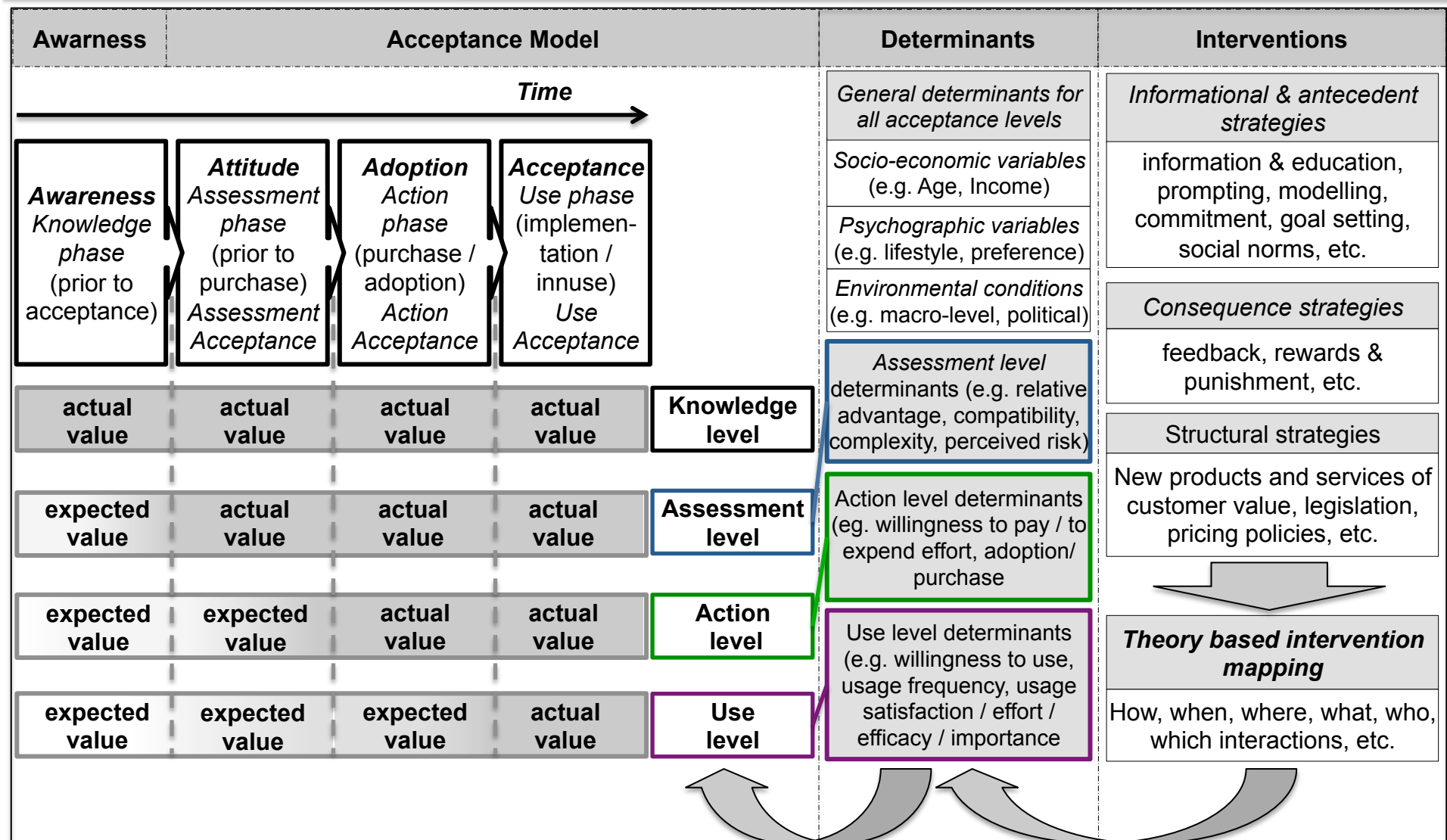
Fig. 1. The triangle of social acceptance of renewable energy innovation.



Acceptance of smart grid products and services



A Model for Increasing Customer Acceptance of Smart Grid Products & Services



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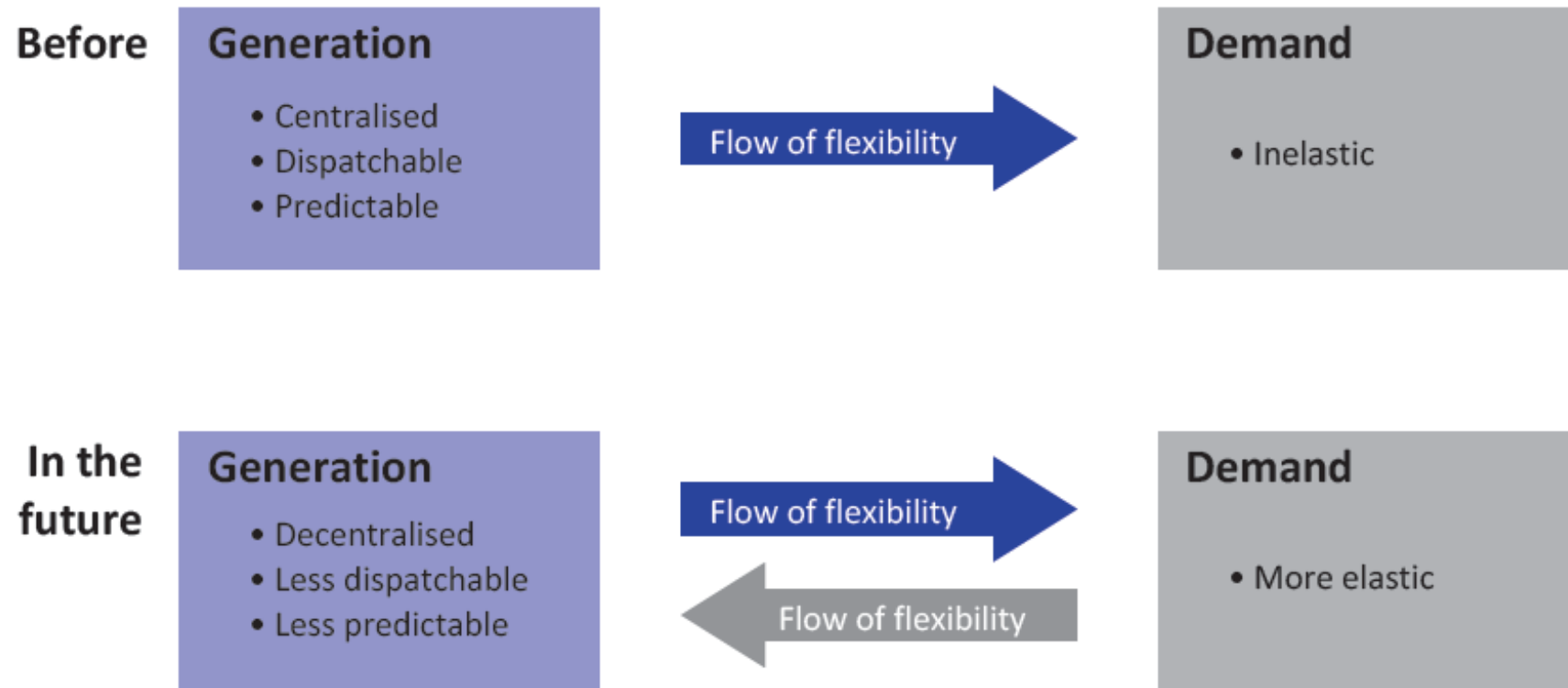
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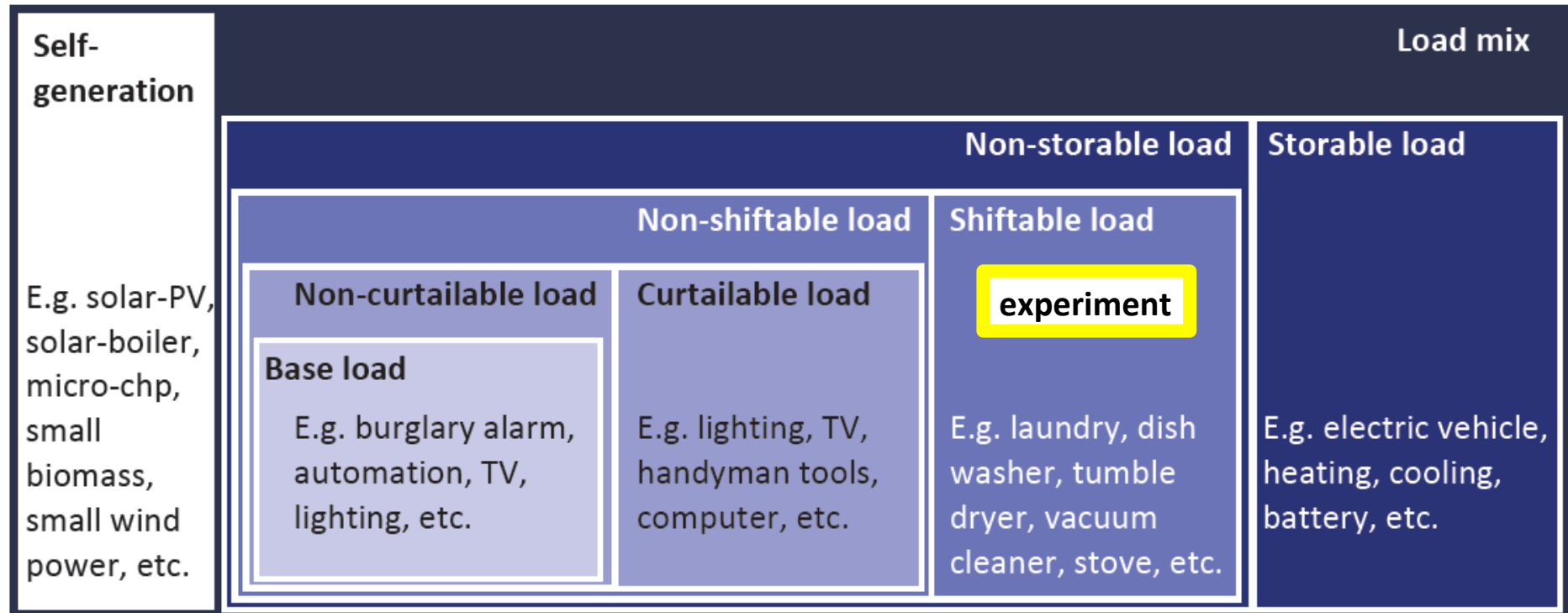
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Importance of Demand Response Programs



Source: Hancher et. al. 2013

Application Field



Source: Hancher et. al. 2013

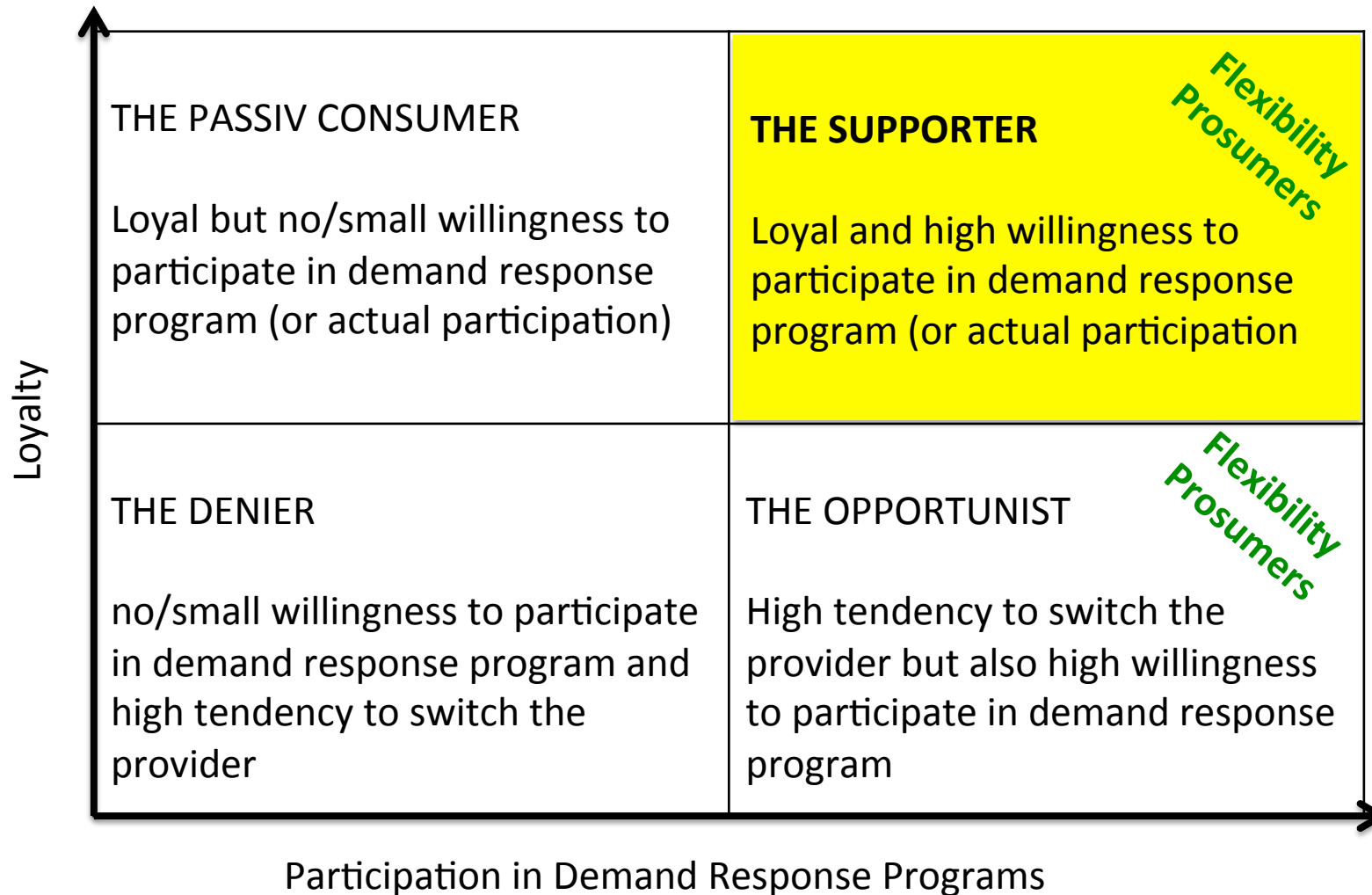
Kind of contract

Table 1: Range of contract types: technical features and high-level terms imposed on customers

Contract type	Signal form	Signal volatility	Price risk	Volume risk	Complexity	Autonomy/ Privacy loss	Financial compensation
Time of Use pricing	Price based	Static	Low	None	Low	None	Limited
Dynamic pricing	Price based	Dynamic	High	None	High	None	High potential
Fixed load capping	Volume based	Static	None	Low	High	Limited	Limited
Dynamic load capping	Volume based	Dynamic	None	High	High	Limited	High potential
Direct load control	Control based	Predefined	None	None	None	High	Limited/ High potential

Source: Hancher et. al. 2013

Increasing Customer Participation in Demand Response Programs

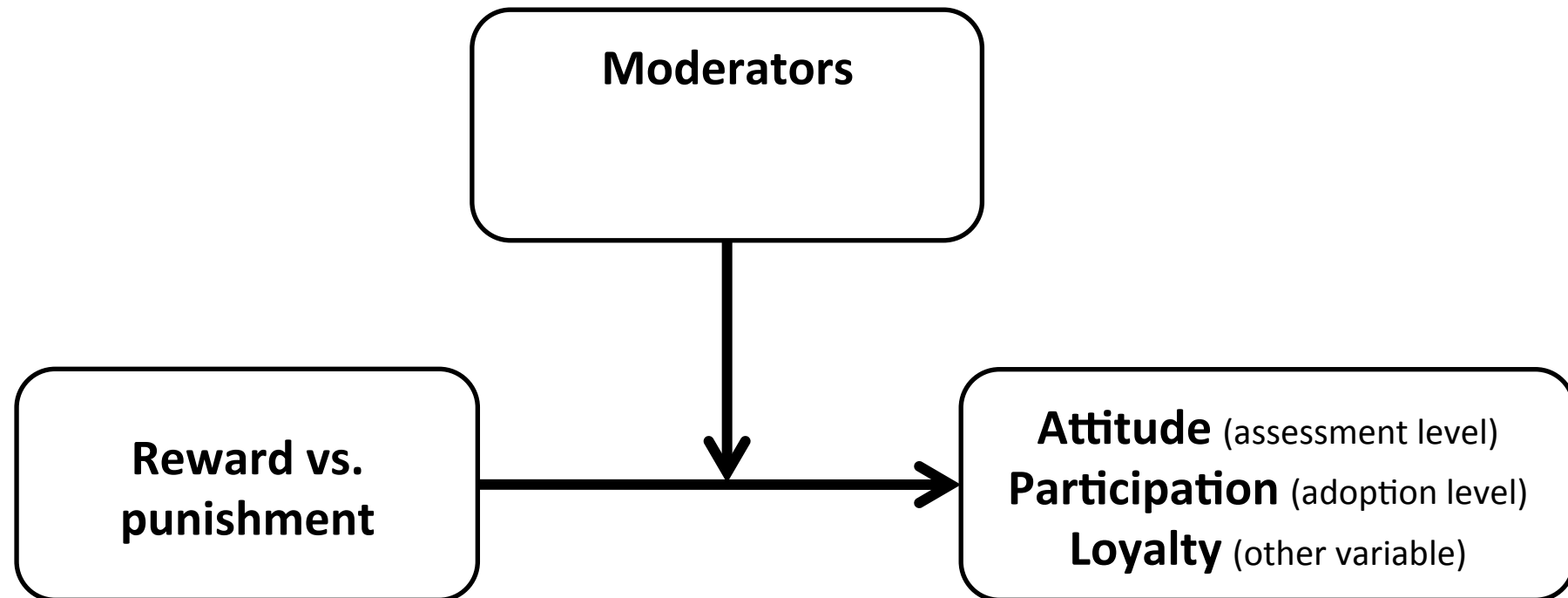


Research Questions Paper I

THE CARROT OR THE STICK OR NOTHING AT ALL? - *UNDER WHICH CONDITIONS CAN PUNISHMENT AND/OR REWARDS INCREASE CUSTOMER ACCEPTANCE OF DEMAND RESPONSE PROGRAMS*

- *(1) Are rewards and/or punishments an effective market instrument to increase customer acceptance of demand response programs?*
- *(2) Are rewards or punishments better for increasing customer acceptance of demand response programs?*
- *(3) How does one have to design and frame punishments in order to mitigate their potential negative side effects?*

The role of rewards and punishments



Description of Demand Response Program - Dishwasher

1. Sie starten den Geschirrspüler der ein Signal über den Smart Meter an den Energieversorger sendet



2. Der Energieversorger sendet ein Signal über den Smart Meter an den Geschirrspüler um diesen zu starten
- in Abhängigkeit, ob genügend Strom aus erneuerbaren Energien vorhanden ist.

a) Mehr Strom verfügbar als gebraucht



b) weniger Strom verfügbar als gebraucht



3. Ihr Geschirr ist nach spätestens 8 Stunden sauber

8 Stunden →



Sie können die automatische Steuerung des Starts des Waschgangs verhindern und durch eine mobile App, einen Schalter am Geschirrspüler oder ein Onlineportal den Spülvorgang sofort starten.

Manipulation – Independent Variable

Reward: If you join the FLEX-Program and let your devices automatically be controlled by your energy provider, you will be **rewarded** with a **discount** of 50 CHF per month on your electricity bill. This will only happen if you do not prevent the automatic steering through the mobile app, the online portal or the button on your device more than twice a month.

Punishment: If you join the FLEX-Program and let your devices automatically be controlled by the signal of your energy provider, you **will not** be charged with an **additional fee** of 50 CHF per month on your electricity bill. This will only happen if you do not prevent the automatic steering through the mobile app, the online portal or the button on your device more than twice a month.

Manipulation Moderator

No Reason vs. Reasons

- **Reward:** participation in FLEX-Program → efficient use of electricity from renewable sources in the region → less investment (and/or postponement) for grid enforcement + no need for additional and expensive power plants → distribute the resulting savings fairly among customers: customers who participate will receive a discount and those who do not will not receive a discount
- **Punishment:** no participation in FLEX-Program → no efficient use of electricity from renewable sources in the region → high investment (immediat/soon) for grid enforcement necessary + need for additional and expensive power plants → distribute the resulting costs fairly among customers: customers who do not participate will have to pay an additional fee, customers who participate will not have to pay an additional fee

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Generic Business Models for Smart Grid

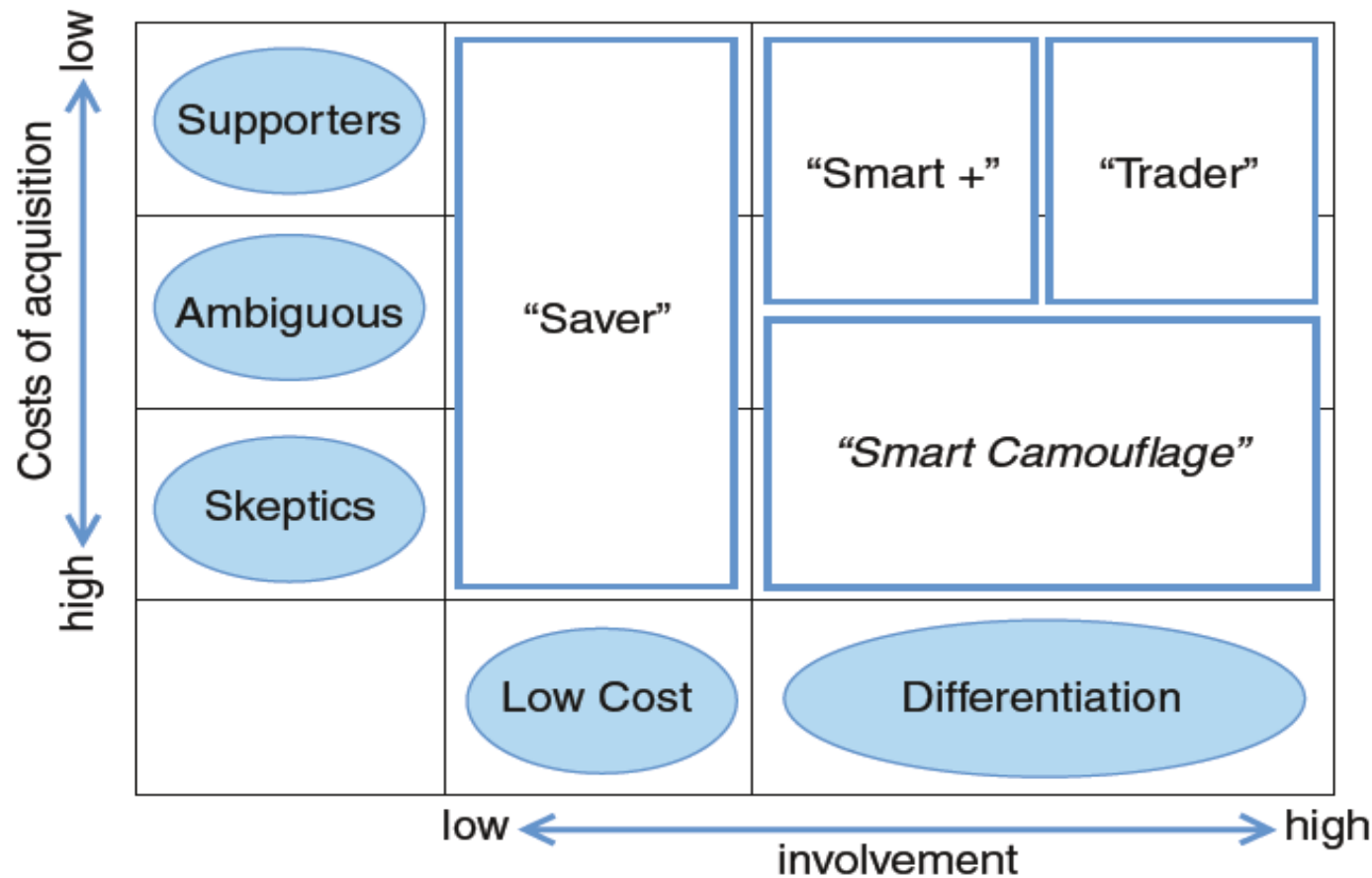


Fig. 3 Generic clusters and generic business models for smart grids

Curtius, H. C.; Kuenzel, K. & Loock, M. (2012). "Generic customer segments and business models for smart grids." *der markt, International Journal of Marketing*, Volume 51, Issue 2-3, pp 63-74

Customer Value of Smart Metering

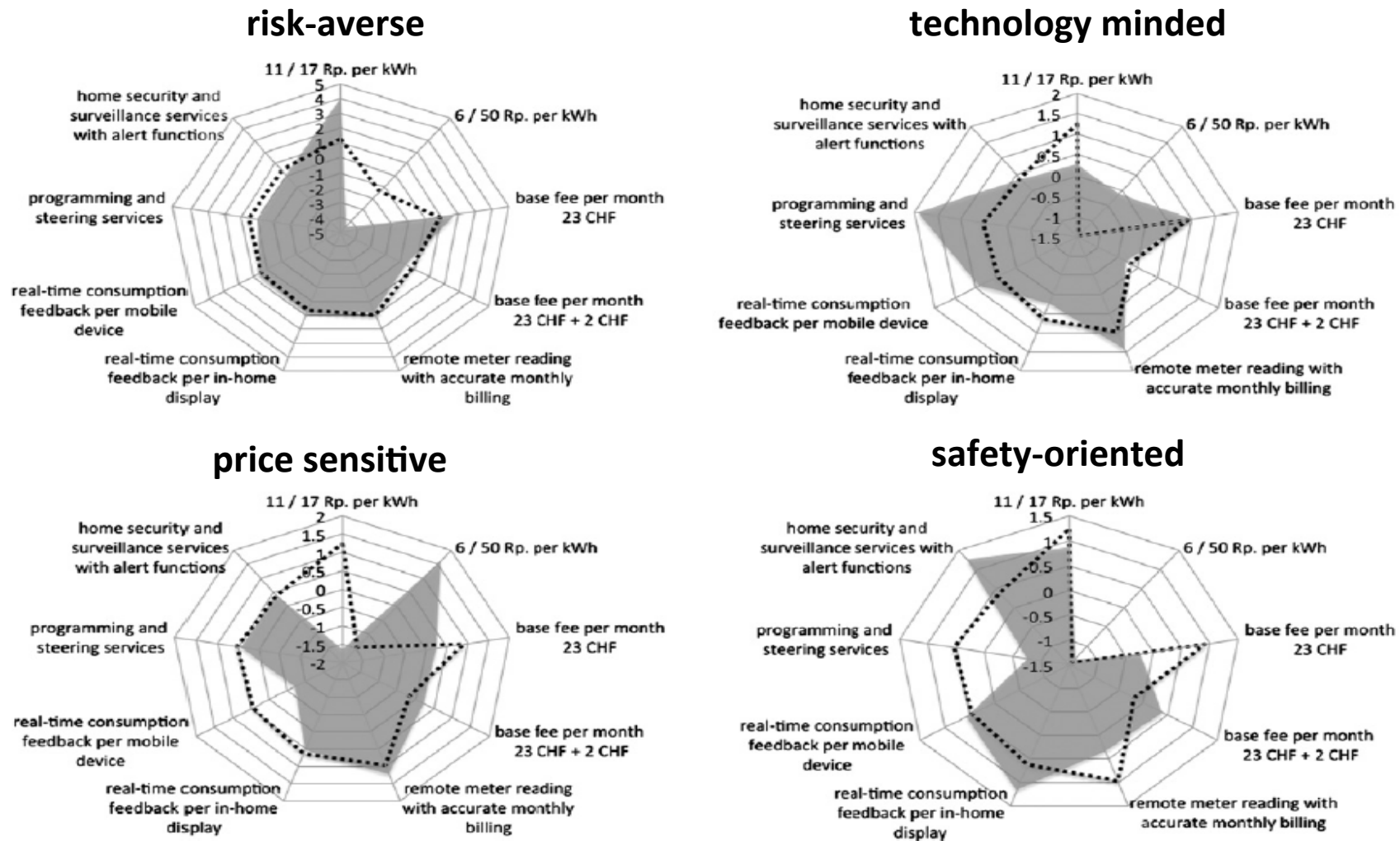


Fig. 4. Customer segments for smart metering.

Kaufmann, S.; Künzel, K. & Loock, M. (2013). Customer value of smart metering: Explorative evidence from a choice-based conjoint study in Switzerland. *Energy Policy*, Volume 53, Pages 229–239

Thank you for your attention!

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