The 1st Asian Energy Conference: Smart Grids, Sustainability Transition, and Innovation in Governance

Factors Enhancing Smart Grid Consumer Engagement

2015.11.

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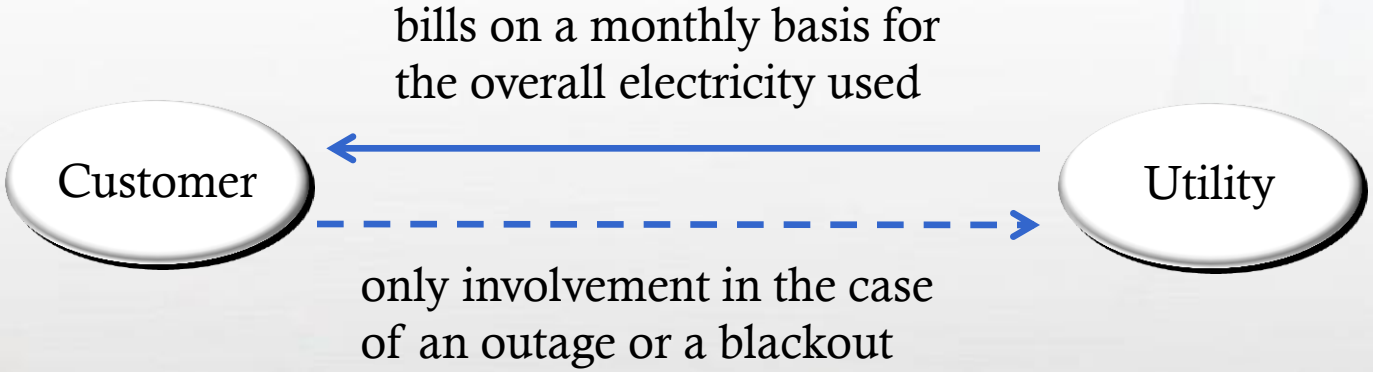
1 Consumer in Smart Grid

As-Is (in a conventional grid)

→ Dormant stakeholder with no major role to play in the grid

☞ previously provides no information on how the power usage habits of consumers influence their monthly bills

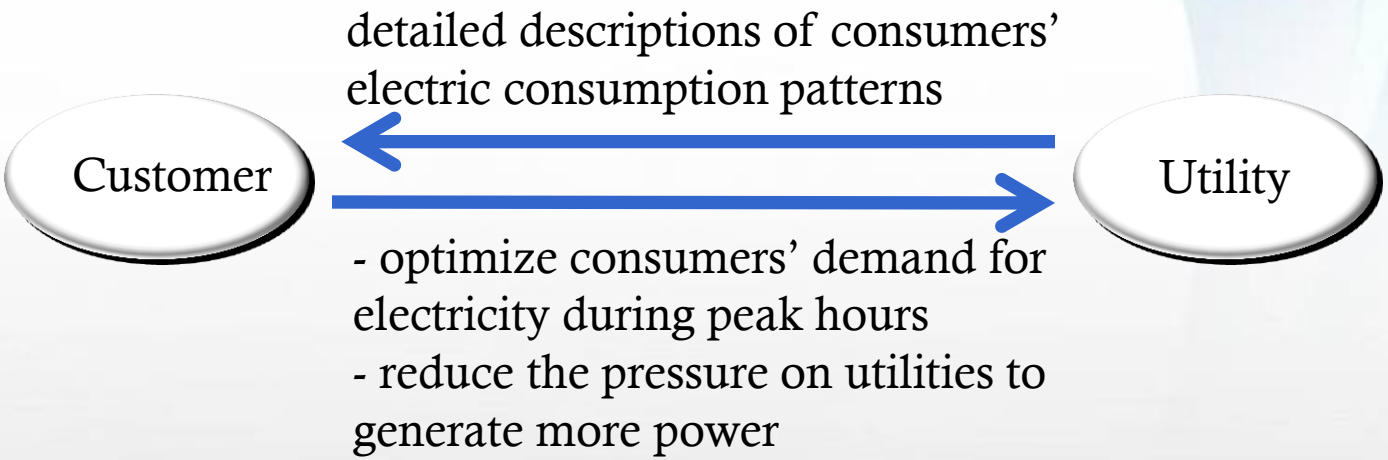


☞ required to call up the utility to provide information about a power loss in the case of an outage or a blackout

1 Consumer in Smart Grid

To-Be (in smart grid)

→ Key stakeholder in energy activities

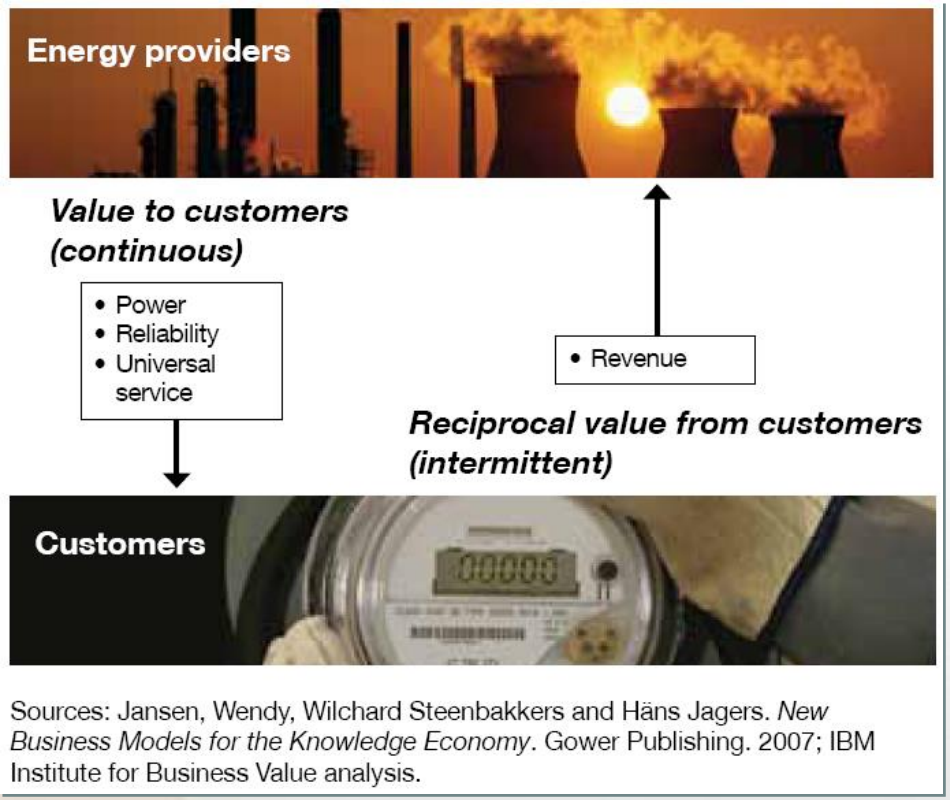


☞ Customer engagement is an important **prerequisite** for the successful implementation of **smart grid technologies**

(smart meters, demand response, net metering, outage management systems, electric vehicles, vehicle to grid, power generation from distributed energy resources, etc.)

1 Consumer in Smart Grid

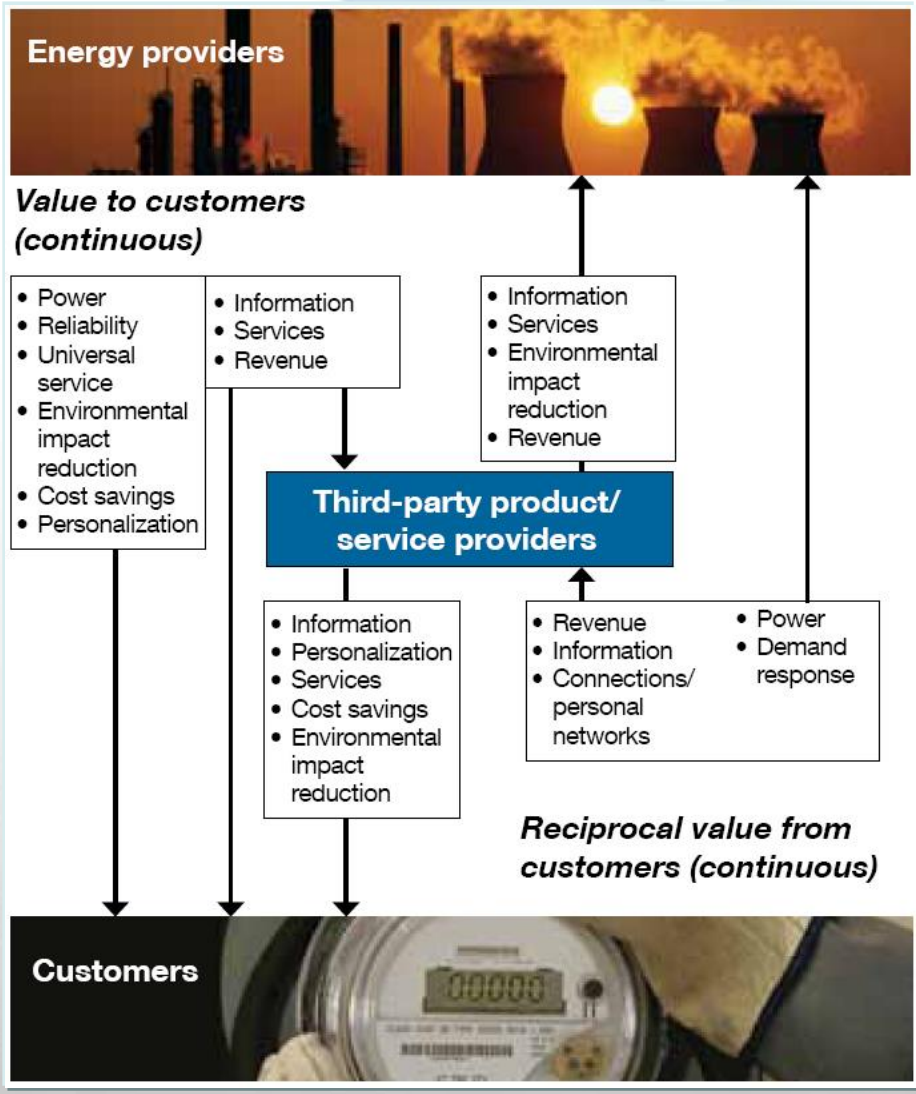
Traditional Industry Value Model



Sources: Jansen, Wendy, Wilchard Steenbakkers and Häns Jagers. *New Business Models for the Knowledge Economy*. Gower Publishing. 2007; IBM Institute for Business Value analysis.

자료: IBM, 2010.3

Emerging Industry Value Model



1 Consumer in Smart Grid

Since 2009, many countries have been installing advanced metering infrastructure including smart meters,

which are considered as primary infrastructure for a smart grid,
at the residential buildings as well as commercial and industrial ones.

As for residential consumers, however, the infrastructure is something unfamiliar, possessing acceptance restraints

such as *cyber security threats*, *the possibility of electricity rate increase*, and *reluctance among targets in using a new kind of technology.*

2 Research Objectives

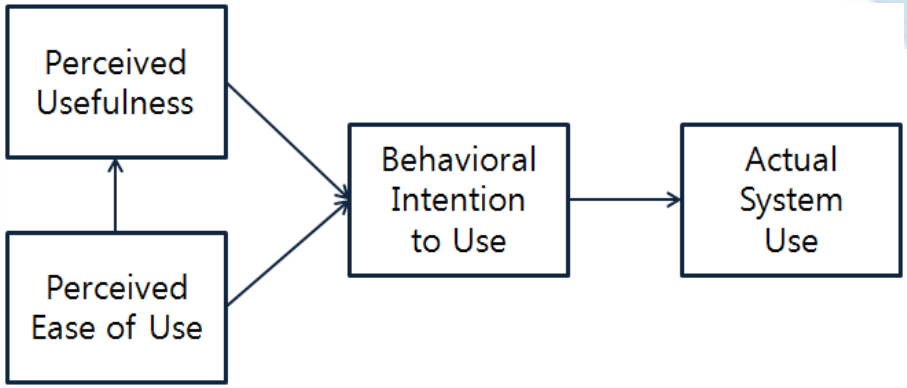
To examine how residential consumers perceive the smart grid and what factors influence their acceptance of the smart grid.

We assume that the advanced metering infrastructure including smart meters is considered as the main smart grid technology to residential electricity consumers.

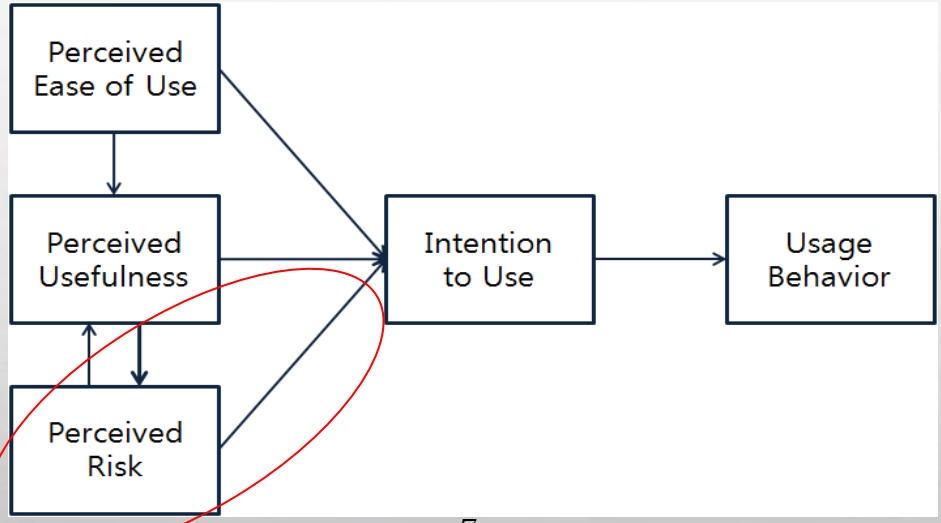
To comprehensively analyze the systematic process which smart grid technology is accepted on the basis of the results of the existing studies and to provide implications for the smart grid acceptance.

3 Research Model

Simplified TAM(Technology Acceptance Model) of Davis(1989)



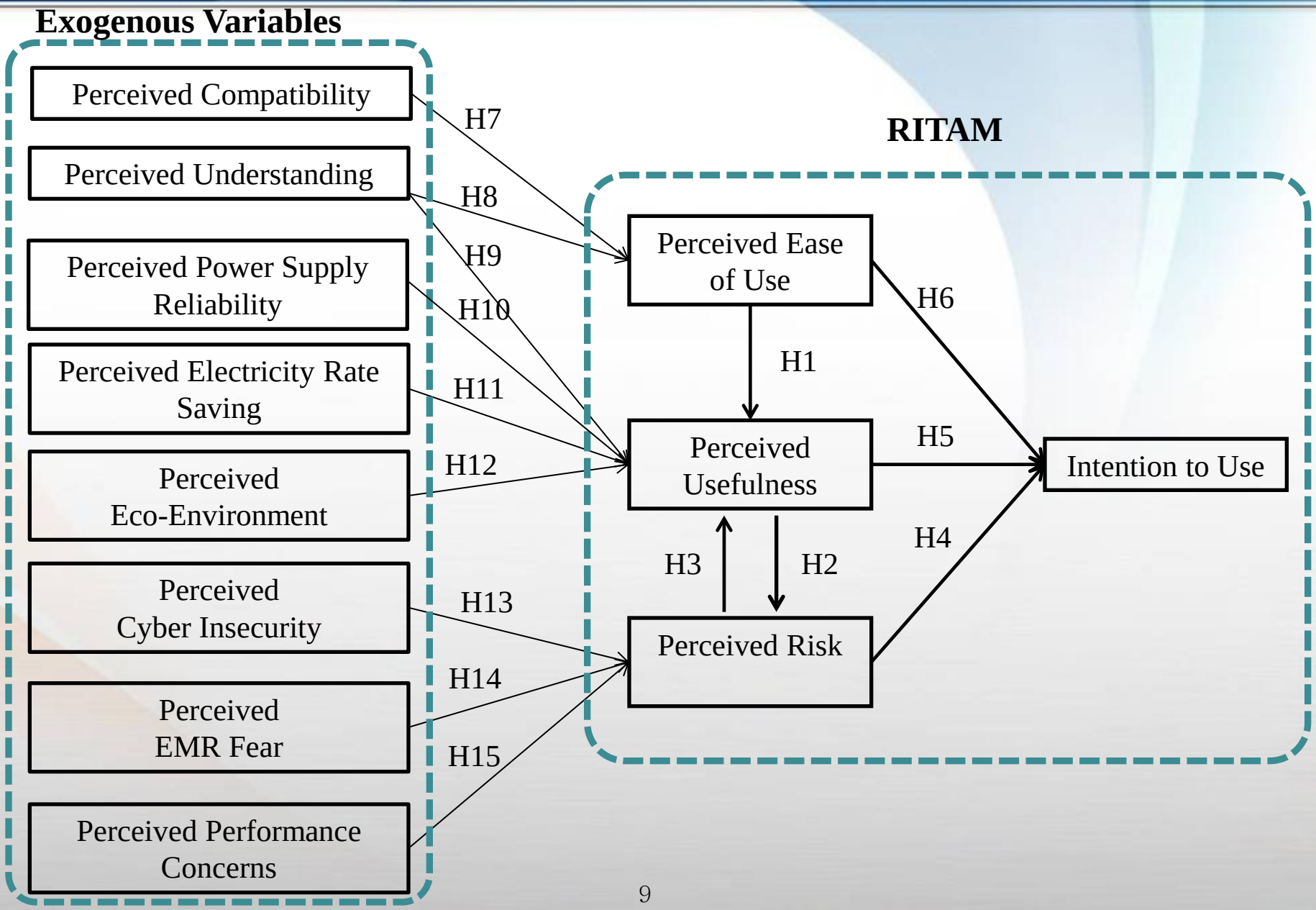
Risk Integrated TAM(Technology Acceptance Model)



3 Research Model

Authors	Technology	Focus
Wu and Wang (2005)	mobile commerce	perceived risk → intention to use
Lee (2009)	Internet banking acceptance	
Sanayei and Bahmani (2012)	Internet banking	
Yoon, Y.B. et al. (2011)	Smart phone applications	
Siegrist et al. (2007)	Nano technology	perceived usefulness → perceived risk
Shim, J.S. (2009)	Nuclear related technology	
Featherman and Pavlou (2002)	e-Services	perceived risk → perceived usefulness
Li et al. (2009)	online shopping channel	

3 Research Model



3 Research Model

Variables	References
Perceived ease to use	Davis(1989), Davis et al.(1989), Venkatesh and Davis(1996), Venkatesh and Davis(2000)
Perceived usefulness	
Intention to use	
Perceived risk	Siegrist et al.(2007), Li et al.(2009)
Perceived compatibility	Wu and Wang(2005)
Perceived understanding	Accenture(2010), Best Buy(2010), Parks Associates(2010), IBM(2011), Zpryme(2011)
Perceived eco-environment	Accenture(2011), IBM(2011), Oracle(2009)
Perceived electricity rate saving	IBM(2011), EconAlign(2011), Accenture(2011)
Perceived cyber insecurity	GlobalData(2010); IEA(2011), Greentech Media(2011), Harris Interactive(2010), Zpryme(2011)
Perceived EMR fear	Zpryme(2011)
Perceived performance concern	Zpryme(2011), BCG(2010)

4 Methodology

Respondent Selection and Data Collection

The survey is conducted to potential smart grid users in South Korea, and 300 questionnaires were analyzed. (period: from 4th to 21st of June, 2012)

The questions are based on previous studies, using a 7 point Likert scale as the criteria.

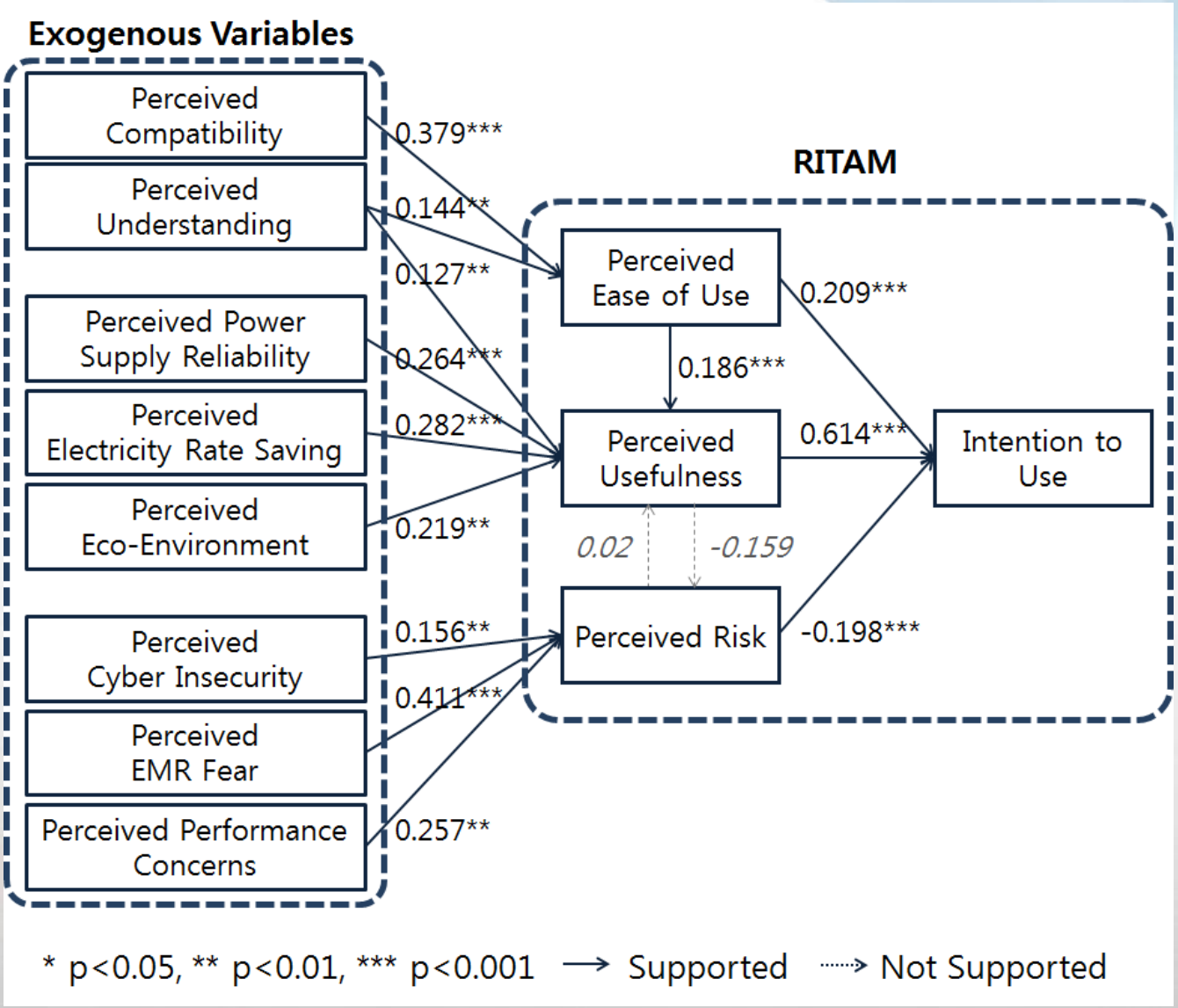
As for the method of data collection for empirical analysis, a personal interview method is used.

A pilot test (60 people) is performed prior to the actual survey in order to increase the reliability and validity of the research.

Data Analysis Method

Factor Analysis, Structural Equation Modeling

5 SEM Result


Exogenous Variables
Perceived Compatibility
Perceived Understanding
Perceived Power Supply Reliability
Perceived Electricity Rate Saving
Perceived Eco-Environment
Perceived Cyber Insecurity
Perceived EMR Fear
Perceived Performance Concerns
0.379***
0.144**
0.127**
0.264***
0.282***
0.219**
0.156**
0.411***
0.257**
RITAM
Perceived Ease of Use
Perceived Usefulness
Perceived Risk
0.186***
0.209***
0.614***
-0.198***
0.02
-0.159
Intention to Use
* p<0.05, ** p<0.01, *** p<0.001
Supported
Not Supported

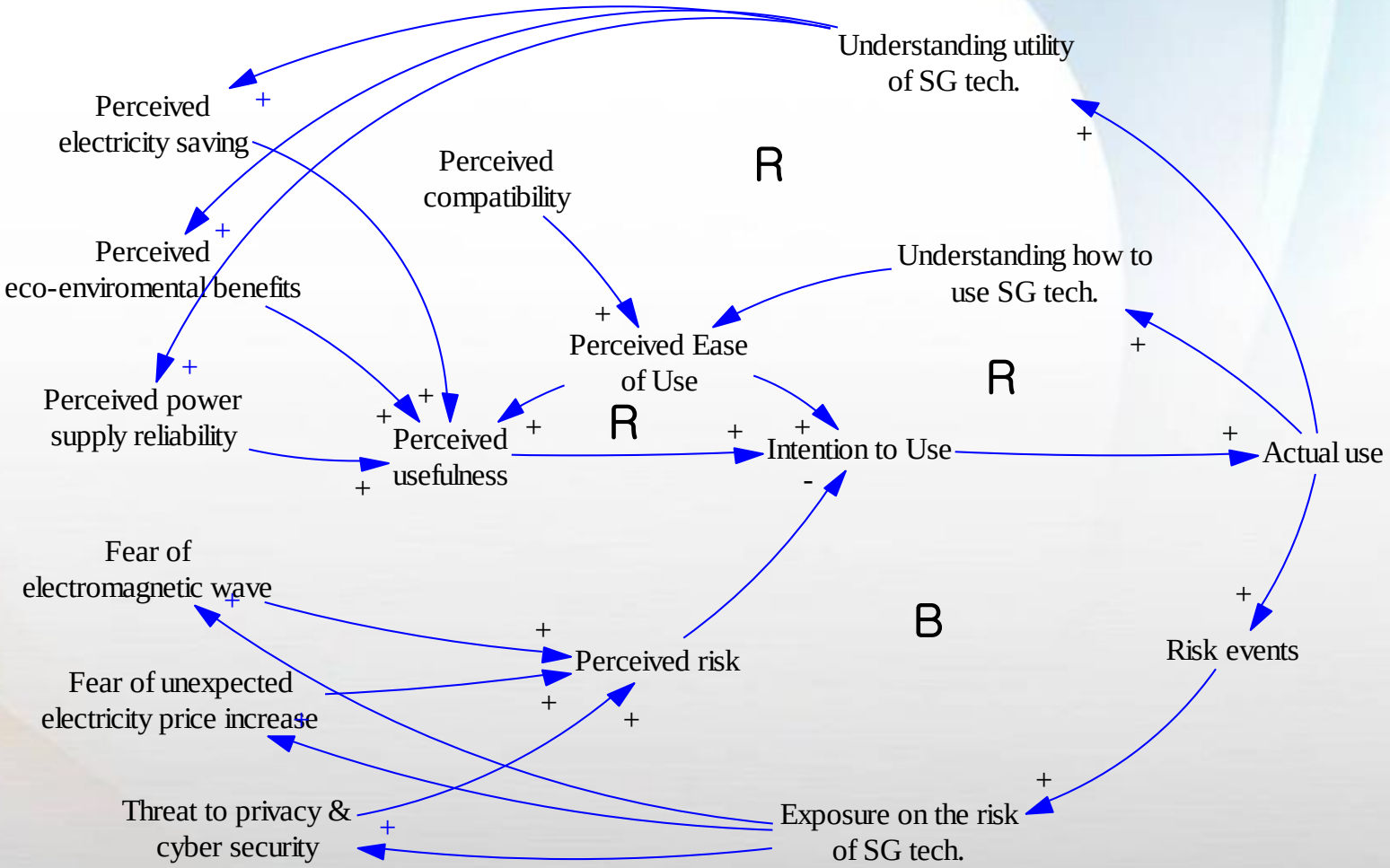
6 Dynamics in User Acceptance of SGT

In study described before, “Perceived Risk” was newly added to endogenous variables, and diversified exogenous variables were used.

However, the former study did not analyze feedback structures among the variable factors and fail to employ dynamic approaches.

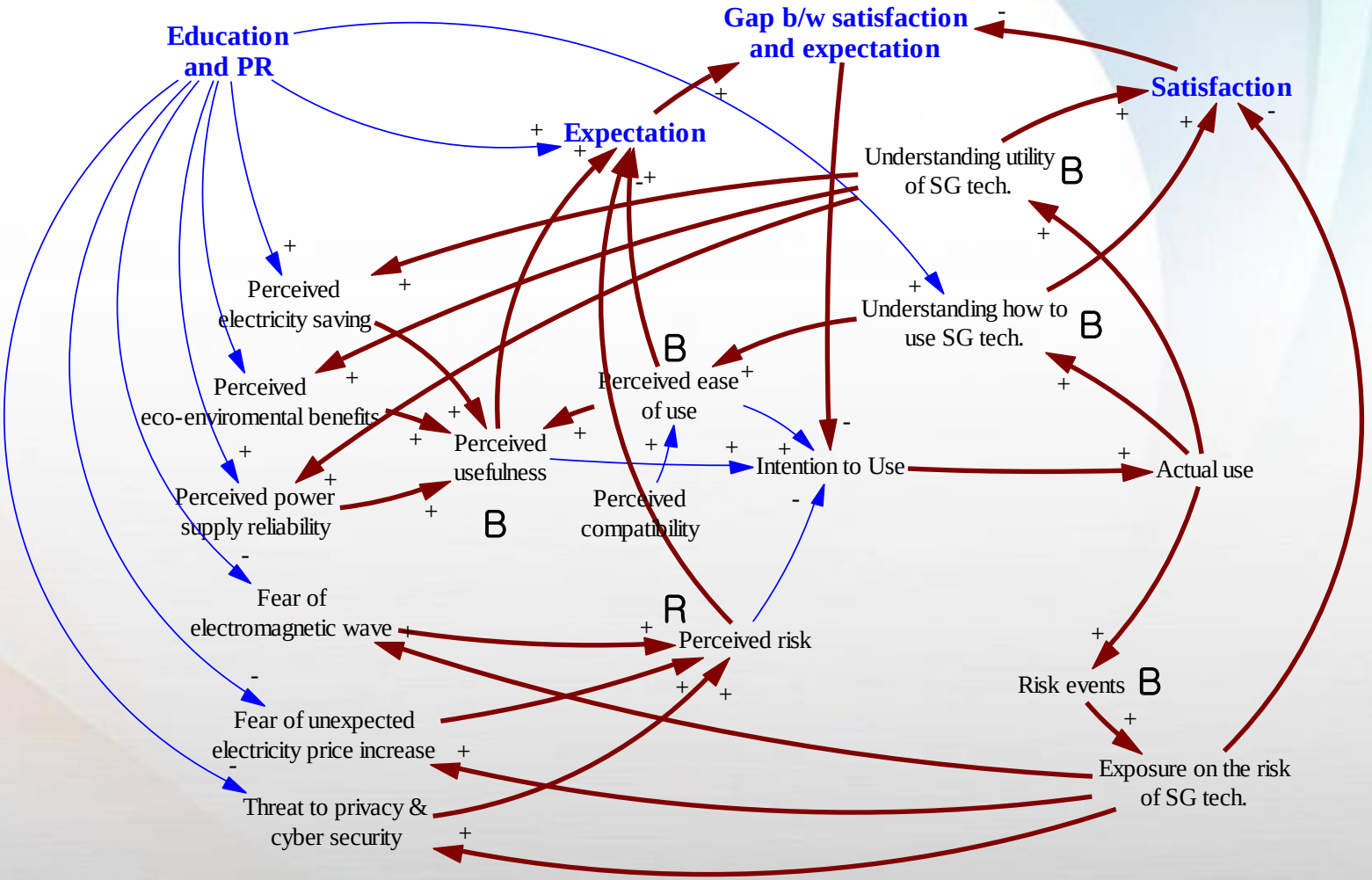
6 Dynamics in User Acceptance of SGT

<Main Feedback Structure of the Smart Grid Technology Acceptance>



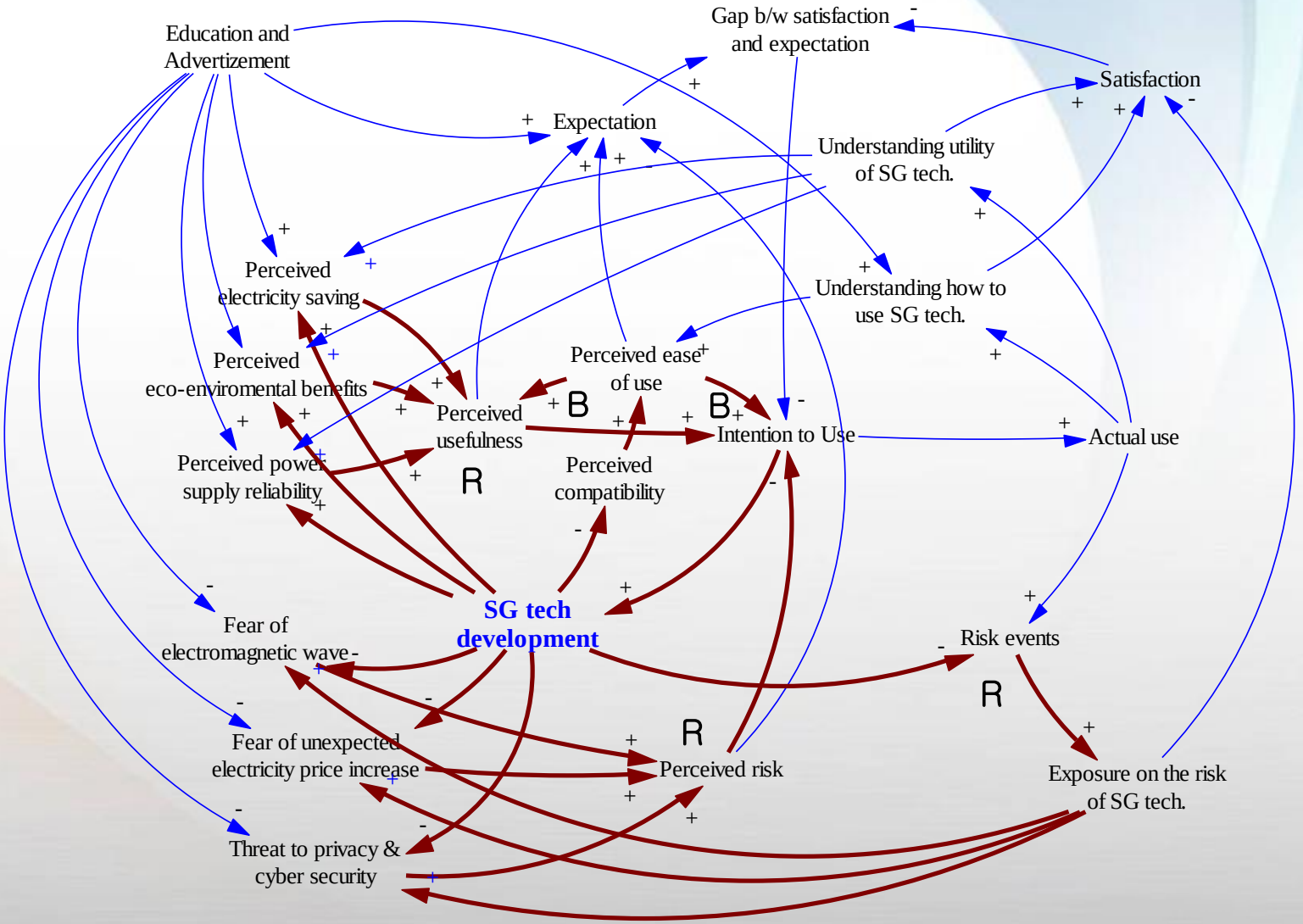
6 Dynamics in User Acceptance of SGT

<Consideration to expectation, satisfaction and public relations>



6 Dynamics in User Acceptance of SGT

<Consideration to direction of technology development>



7 Conclusion

First, it is important to manage the awareness of risks on smart grids.

- Consumers are aware of not only benefits but also risks. Social/psychological risk, functional/economic risk, and physical risk are included in the risks that reduce the Intention to Use of smart grids.

Second, we need to try to minimize the Gap between Expectation and Satisfaction.

- In other words, we are requested efforts to make consumer satisfaction after experiencing smart grids equivalent to the expectations on benefits of smart grids.
- At the same time, overemphasized information should not be disseminated during Education and PR.

Third, we should keep the balance between the expansion of benefits and reduction of risks to develop smart grid technologies.

Lastly, in order to improve Perceived Ease of Use of smart grids, we should enhance the Perceived Compatibility with the existing technology and design the intuitive user-friendly interfaces.


Thank You