A Quantitative Model for Using Open Innovation in Mobile Service Development
Motivation

Importance of Mobile Services

- Substantial economic impact and possibilities through mobile services
- High competition possibly leaves non-innovative players behind
- Risk of developing mobile services that do not meet customers’ expectations

Open Innovation

A concept brought up by Henry Chesbrough (2003):

- “[…] the use of purposive inflows and outflows of knowledge to accelerate internal innovation […]”
- “[…] firms can and should use external ideas […] to advance their technology.”

Find ideas for successful mobile services by including customers in the innovation process

Open Innovation in Mobile Service development in practice?

- Companies like HTC, Google, Ericsson, CocaCola, Hilti or Elsevier have called the customer to submit ideas for Mobile Services → but what about the economic benefit?
- In a running industry project, the question on “how much to invest in open innovation measures for mobile service idea generation” raised
- **Challenge**: Virtually no approaches in research and practice to evaluate the decision-making concerning investments in open innovation activities (regarding mobile service development)
Research Questions & Goals of the paper

1. What is the economic effect of investments in open innovation activities on a company’s revenue regarding mobile service development?

2. What is the optimal investment amount in open innovation activities for mobile service development?

Goals

- Formalizing the whole effect chain between investments in OI activities and the generated economic profit and putting special emphasis on the specifics of mobile services
- Developing a mathematical model to theoretically determine the optimal investment amount in OI activities for mobile service development
- Illustrate our findings with an example on the basis of real-world data
### Literature (selection)

#### Effects of customer integration in product development
- Lead users can provide more accurate data on future needs of customers *(von Hippel 1986)*
- Customers can contribute to the concept, design, performance testing or validation in the development of e.g. new services *(Gruner and Homburg (2000); Kleinschmidt and Cooper (1991); Lengnick-Hall (1996))*
- Customer integration in product/service development leads to more effectiveness and benefits in form of more customer-oriented products *(e.g., Atuahene-Gima (1995); Fuchs and Schreier (2011); Matthing et al. (2004); Reichwald et al. (2002))*
- Risks of customer integration *(e.g. Enkel et al. (2005))*

#### Open Innovation
- New IT allows for broader integration of external innovation sources *(Gassmann (2006))*
- Companies are better off by integrating external sources in the innovation process *(Chesbrough (2003))*
- Open innovation as major innovation process in the next decades *(Gassmann et al. (2010); Howells (2008))*
- Open innovation activities positively influence the possibility to create auspicious products and services *(Enkel et al. (2005); Bruce and Biemans (1995))*
- Open innovation activities increase customer satisfaction and partly support cost reduction *(Faems et al. (2010))*

#### Open Innovation in Mobile Service development
- High importance and relevance of open innovation approaches for mobile service development *(Bouwman et al. (2008); Reichwald et al. (2002))*
- First positive experience for user integration in terms of a learning environment for mobile app development *(Platzer (2011))*
- First technical approaches for open innovation activities regarding mobile service development *(Aalto et al. (2004))*

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### Research Gap
- Previous literature focusses on Open innovation case studies, best practices or qualitative analysis
- Economic valuation or formal analysis of open innovation investments and customer satisfaction and company revenues are still missing
- No mobile service specific analysis
Hints for the basic impact of Open Innovation can be found in existing literature

- The basic impact of OI investments on revenue is a causal chain with four links.
- The impact of investments in OI activities on customer satisfaction and revenue is not analyzed, yet.

**Conclusions**

Enkel et al. (2005)
Bruce and Biemans (1995)
Kohli and Jaworski (1990)
Kano et al. (1984)
Buhl et al. (2007)
Gneiser (2010)
Ittner and Larcker (1998)
The confirmation/disconfirmation paradigm in the sense of Kano

- **Must-be attributes** are considered fundamental by the customer and are perceived only implicitly.
- **One-dimensional attributes** generate dissatisfaction or satisfaction. Customers are aware of one-dimensional attributes and explicitly demand them.
- **Attractive attributes** are service features that are not expected by customers and lead to a disproportional increase of customer satisfaction.

![Diagram of the confirmation/disconfirmation paradigm](image)
The subsiding effect of Open Innovation

- The positive contribution of OI to customer satisfaction **usually slows down** throughout its use.
- A service’s attractive attributes can become one-dimensional attributes and one-dimensional attributes can become must-be attributes.
Research Question 2: Problem formalization

Formalization with the classic earnings function

\[ cs(l) = -a \cdot l^3 + b \cdot l^2 + c \cdot l + cs_0 \]

with \( a, b, c, cs_0 > 0 \)

For simplification, we use the conversion factor \( d > 0 \) to link customer satisfaction to revenue \( r \):

\[ r = cs(l) \cdot d \]

The ultimate objective function is the profit function \( P(l) \), comparing revenue to investment amount

\[ P(l) = cs(l) \cdot d - I = (-a \cdot l^3 + b \cdot l^2 + c \cdot l + cs_0) \cdot d - I \rightarrow \text{max!} \]

Underlying assumptions:

- Available OI activities are equal, divisible and can be executed separately and independently
- Investments in OI activities influence customer satisfaction in the discussed ways which can be formulated with a classic earnings function
- All parameters are assumed to be deterministic and the time value of money is neglected
Practical example

- Large manufacturing company of a past industry (research-in-progress) project in the context of mobile app innovations.
- The company has already performed OI activities and now wants to decide on the investment amount to be spent on an OI activity for its next mobile app projects.
- Input data of five already completed OI activities from the past mobile app projects.*

<table>
<thead>
<tr>
<th>OI activity</th>
<th>description</th>
<th>payouts l</th>
<th>estimated profits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Lead user interviews 1</td>
<td>45 thousand (T)€</td>
<td>0.5 T€</td>
</tr>
<tr>
<td>2nd</td>
<td>Lead user interviews 2</td>
<td>20 T€</td>
<td>8 T€</td>
</tr>
<tr>
<td>3rd</td>
<td>Field observation</td>
<td>25 T€</td>
<td>49.25 T€</td>
</tr>
<tr>
<td>4th</td>
<td>Online survey</td>
<td>60 T€</td>
<td>168.25 T€</td>
</tr>
<tr>
<td>5th</td>
<td>Idea competition</td>
<td>100 T€</td>
<td>290 T€</td>
</tr>
</tbody>
</table>

* Due to the confidential character of the data, all values were transformed.

Conclusions from the practical example

- By using the input data in the profit function, the company is able to determine the values for the objective function.
- The overall optimum investment amount is 312 T€ resulting in a maximized profit of 605 T€.
- Above this amount of money, it is not reasonable to invest more in OI activities.
- In this example, investing more than the economic optimum will lead to worse results than investing an equal amount less.
Conclusions & Limitations

1. What is the economic effect of investments in open innovation activities on a company’s revenue regarding mobile service development?

2. What is the optimal investment amount in open innovation activities for mobile service development?

The economic impact of OI activities can be formalized with the help of a classic earnings function. An optimal investment amount can be determined through mathematical optimization.

Limitations

- Model requires calibration with further data
- No consideration of differences between OI activities
- No consideration of risk
- No empirical validation of assumptions
Thank you for your attention and your feedback!

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