



# Prof. Dr. Frank Piller

**Not Invented Here:  
Warum wir oft externes Wissen ablehnen,  
und was wir dagegen machen können**

# Kommende Events Januar 2021

19.01.2021 – 18:00



Exklusiv für unsere Studierenden

Anmeldung  
notwendig

## Microsoft Data & AI

Florian Kidman | Moritz Winzig | Pia Jenderek  
*Impulsvortrag zum Thema Data & AI  
mit anschließender Diskussionsrunde und  
Informationen zum Einstieg bei Microsoft*



Alle Details auf unserer Webseite  
[www.wiwi-network.rwth-aachen.de](http://www.wiwi-network.rwth-aachen.de)



# Kommende Events Januar 2021

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**27.01.2021 – 18:30**



## **Nobel Prize** LECTURE

**Prof. Dr. Britta Preis**

Lehrstuhl für Management Science

Wirtschaftsnobelpreisträger 2012 - Roth & Shapley

*Nierentransplantationen, Kindertagesstätten und stabile Partnerschaften  
Ansätze und Anwendungen der Matching-Theorie*

**Prof. Dr. Thomas Kittsteiner**

Lehrstuhl für Volkswirtschaftslehre insb. Mikroökonomie

Wirtschaftsnobelpreisträger 2020 - Milgrom & Wilson

*Jenseits von eBay und Sotheby's – Die Suche nach der  
perfekten Auktion*





# Not Invented Here

**Warum wir oft externes Wissen ablehnen  
und was wir dagegen machen können**

Frank Piller (@masscustom) based on joint work with David Antons | Jan. 2021



WiWi  
NETWORK

RWTHAACHEN  
UNIVERSITY



Co-Director, Institute for **Technology & Innovation Management (TIM)** and **Professor of Management** at RWTH Aachen University

Academic Director, **Institute for Management Cybernetics (ifu e.V.)**, Affiliated institute of RWTH Aachen and Member of RWTH Cybernetics Lab

Member of the **Scientific Advisory Board**, German National Platforms Industrie 4.0 & Lernende Systeme



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Twitter: [@masscustom](https://twitter.com/masscustom)

Connect in <https://linkedin.com/in/frankpiller>



## Research Interests and Expertise

### Strategies for Customer-Centric Value Creation

Mass customization, innovation co-creation, additive manufacturing, managing the frontend of innovation

### Open Innovation

Technology transfer, R&D partnership models, crowdsourcing

### AI-Augmented Innovation

AI and ML augmenting the innovation process, (hybrid) managerial decision making in times of AI&ML

### Managing Change & Business Model Innovation in Established Organizations (in context of Industry 4.0)



## Entrepreneurial Activities

### Co-Founder, Investor, and/or Member of Board of Directors

**ThinkConsult** (process management and concept testing), **Dialego AG** (innovative online market research), **Corpus-e AG** ("best fit" solutions for eCommerce), **Carpus AG** (buildings for innovation), **Combeentation** (product configurators as a service), and **DOOB AG** (3D printing and 3D modelling)

### Real life achievements

Only German in "Top50 Profs on Twitter" list;  
**Google Scholar Citations** ~17600; **H-index** >58

In the **Institute for Technology & Innovation Management at RWTH Aachen**, an interdisciplinary **team of seven professors and post-docs**, about **25 research associates** and doctoral researchers, many **student researchers**, and a great network of **engaged guest professors and visiting scholars** investigate the latest issues in strategic technology management, behavioral innovation, and computational innovation. The Institute is a proud part of the **TIME Research Area**, a department at RWTH's School of Business & Economics with more than 120 researchers focusing on technology, innovation, marketing, and entrepreneurship.

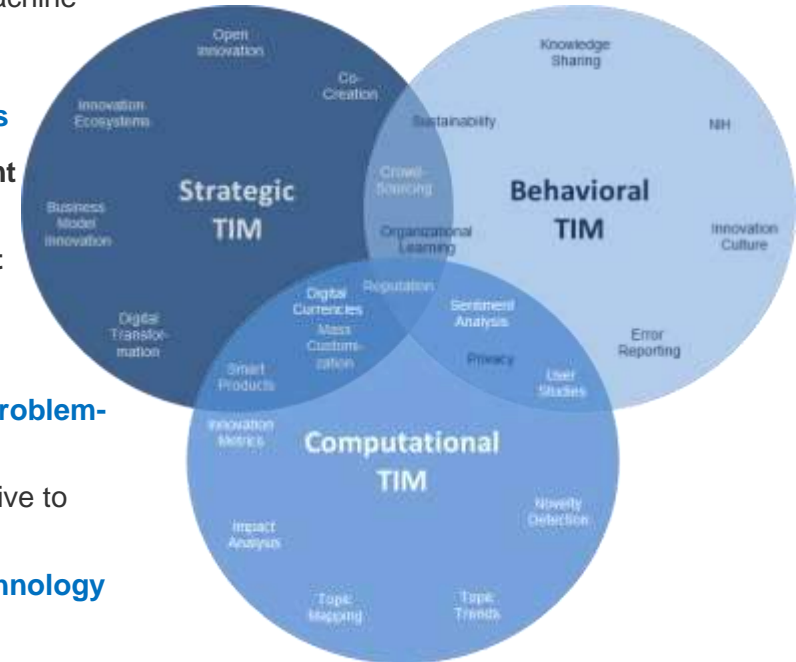
Connect with us [time.rwth-aachen.de/tim](https://time.rwth-aachen.de/tim) and [linkedin.com/company/rwth-tim/](https://linkedin.com/company/rwth-tim/)



[time.rwth-aachen.de/tim](https://time.rwth-aachen.de/tim)

## Thematic priorities of our current work are...

- the **transformation of established organizations** in the face of **disruptive technological innovation**, such as Industry 4.0, Artificial Intelligence/Machine Learning, Smart Products & Services, Mass Customization, or Additive Manufacturing
- the **systematic development and evaluation of new business models**
- the integration of **external partners into the research and development process (open innovation and customer co-creation)**
- the promotion of **corporate sustainability and economic development through technological innovations** as well as research on the broader societal challenges associated with new technologies (**Responsible Innovation**)
- the practices of **organizational learning, organizational search, and problem-solving**
- the development and maintenance of an **organizational culture** conducive to innovation
- the development and improvement of tools and metrics for **effective technology management and policy**
- how **Artificial Intelligence & Machine Learning** augment the R&D process



For a deep dive into our research projects, head to <https://prezi.com/view/NbxNrWQOnYuWdwiscz2W/>

# A starting example





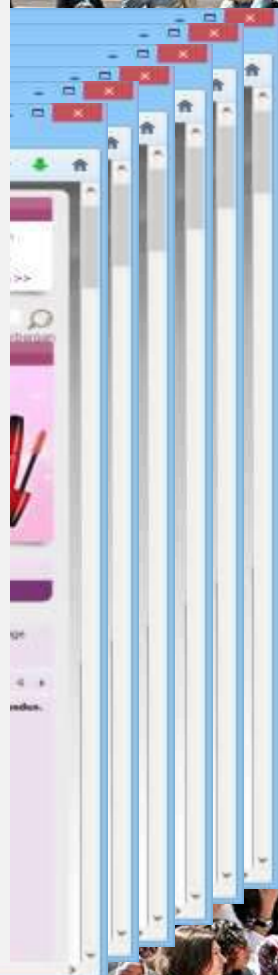
BDF  
Beiersdorf

The following case has been abstracted and slightly modified for teaching purposes.

# Deodorant- and Anti-perspirant Stains

moneysavingexpert.com Saving  
bargainbanter.co.uk cosplay.com splitcoaststampers.com  
holidaytruths.co.uk gon.com angrychicken.typepad.com  
atheistnetwork.com Travel doityourself.com DIY islandmix.com  
madsci.org madsci.org creativehomemaking.com taste.com.au  
neowin.net Hobbies & Interests forums.nasioc.com veggieboards.com  
neogaf.com chins-n-quills.com my350z.com Automotive  
tribalwar.com theknot.com spotsoftime.net  
gspayers.com weddingcentral.com.au Wedding  
healthboards.com community.i-do.com.au  
medical-health-fitness.blogspot.com Health & medicine  
fitnessmagazine.com t-nation.com  
skatingforums.com Body-Buidling  
bayarearidersforum.com elitefitness.com  
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dance-forums.com Horse Riding  
tt.tennis-warehouse.com ultimatedressage.com  
associatedcontent.com google.groups.com  
Product Reviews wisegeek.com  
thenest.com General & Advice lifetips.com  
flickr.com somethingawful.com forumosa.com thriftyfun.com  
terismessageboard.com ehow.com  
getidofthings.com ebay.com Q & A answers.google.com  
yedda.com  
Household & Cleaning howtogetidofstuff.com  
ths.gardenweb.com cleaning.tips.net  
mrscleanmw.com cleaning123.wordpress.com

garmentguard.com  
thefashionspot.com ribbedtee.com T-Shirts  
styleforum.net undershirtguy.com  
thefedoralounge.com Style men.style.com askandyaboutclothes.com  
Fashion & Beauty thefedoralounge.com  
cosmogirl.com beautyiseasy.com  
basenotes.net Cosmetics beauty.about.com  
essentialdayspa.com malaysianbabes.net  
makeuptalk.com  
badgerandblade.com  
divine.ca seventeen.com Men askmen.com  
shefinds.com Women femalefirst.co.uk  
mothering.com Target Groups  
spiffymoms.com ukparentsounge.com  
bubhub.com.au Parents thenestbaby.com  
dfwareamoms.com canadianparents.com  
windsorpeak.com  
laospirit.com asianfanatics.net  
soompi.com escafe.com govteen.com  
pinoyexchange.com Asia onelove.com.au  
trendhunter.com Lifestyle inthe00s.com  
discovalante.wordpress.com ebaumsworld.com lokapriya.com postpla.net  
treehugger.com my811adventure.wordpress.com  
Nature forums.thestranger.com  
itsnoteasybeinggreen.org



# What do consumers expect from deodorants?

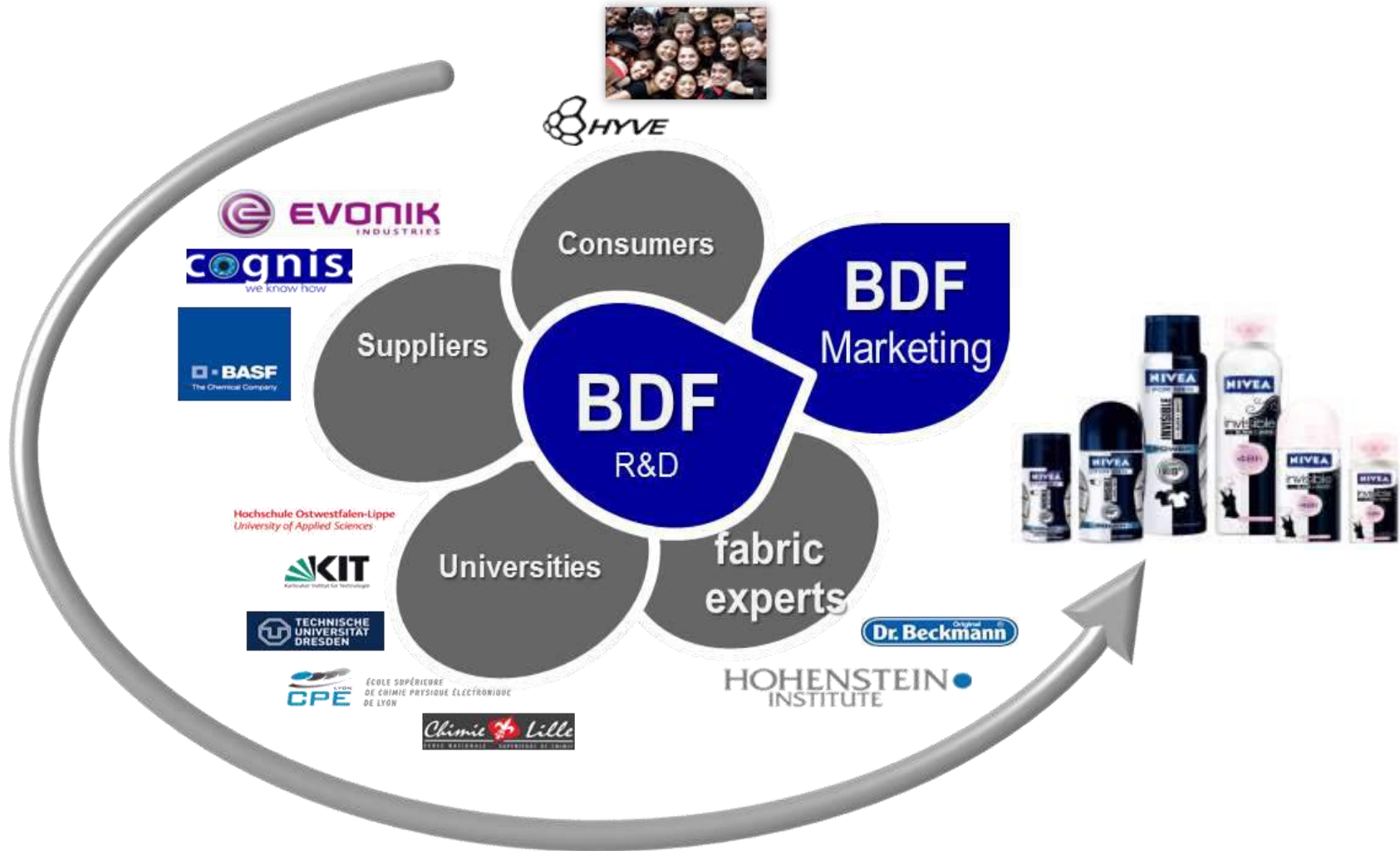


... as revealed by classical market research...

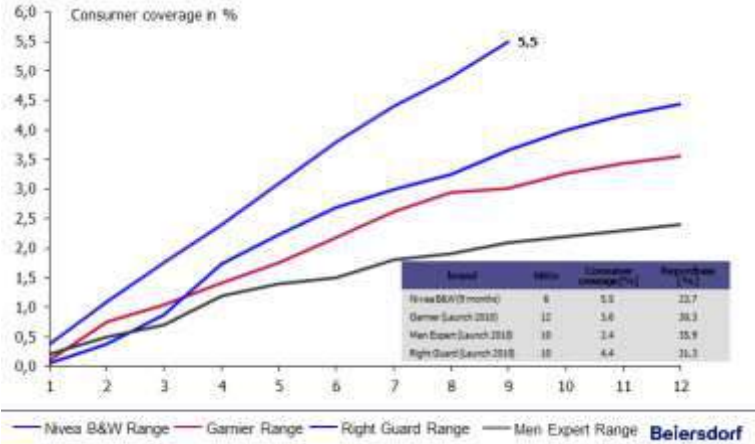


... as revealed by listening to what they say...

**Great insights ... but how can  
we develop a product  
that provides this feature?**



# Nivea Black & White reached almost twice as many consumers after 9 months than the previously most successful launches in the entire deo market after 12 months!



Source: GfK Consumer Scan Individual / Einzelmonate nach Launch

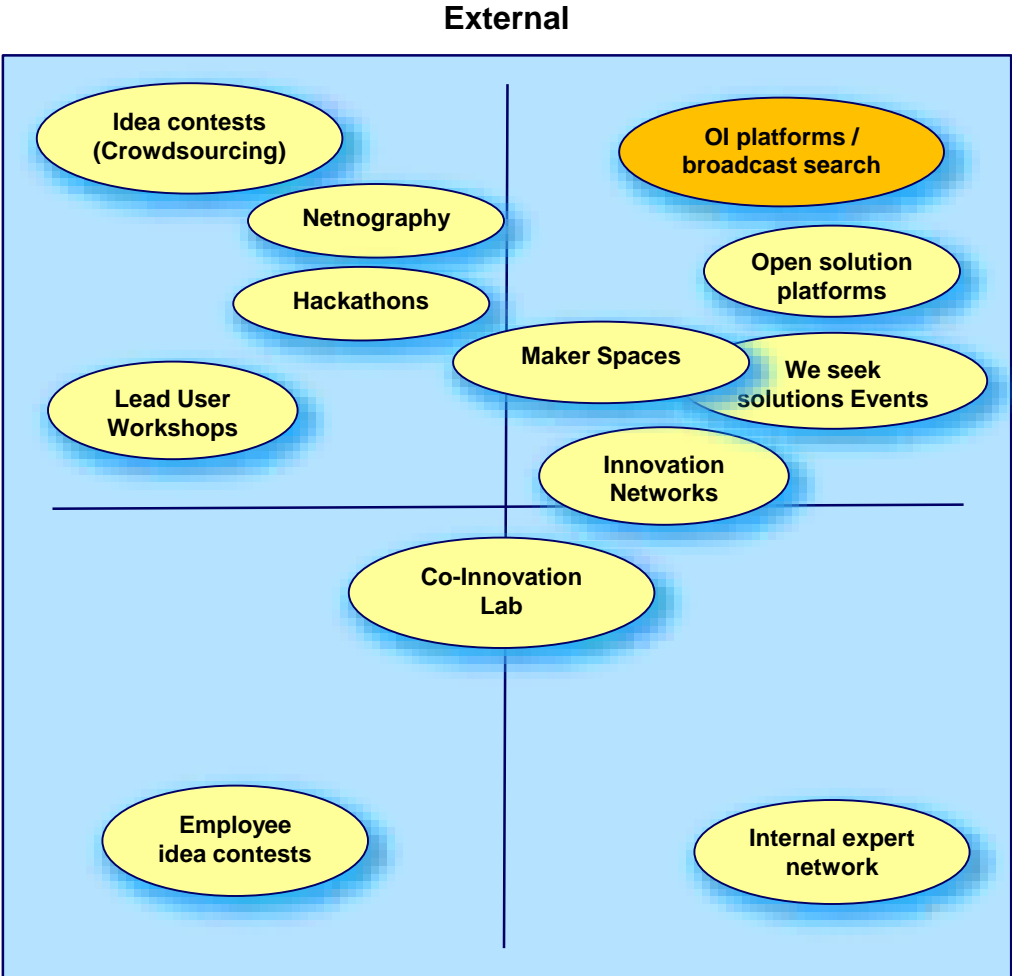


## Nivea: A typical story of co-creation and open innovation

- Extending innovation into the **periphery of the organization**.
- **Utilizing existing knowledge** and inputs **from “unconventional” (non representative) and unobvious sources**.
- Seeking out to **lead users** and **user communities** and integrating them into the innovation process.
- Building a **network of partners** for problem solving, and **“broadcasting” a problem** to identify new partners.
- Combining a **variety of methods and tools** along all stages of the innovation process.
- Not substituting internal R&D and market research, but **complementing it**.

# Methods for Open Innovation

Needs & Ideas / Concepts



Solutions / Technologies

Internal



Kathleen Diener and Frank T. Piller

# THE THIRD RWTH OPEN INNOVATION ACCELERATOR SURVEY

The Market for Open Innovation:  
Collaborating in Open Ecosystems  
for Innovation



**RWTHAACHEN**  
**UNIVERSITY**

**Recently published from RWTH TIM**

The Third RWTH Open Innovation Accelerator Survey: **The Market for Open Innovation: Collaborating in Open Ecosystems for Innovation,**

*by Kathleen Diener & Frank Piller, RWTH Aachen University.*

For **free open access** to the full market report, head to <http://oia.open-innovation.com>

**But ...**

## Challenges of open innovation in large organizations

"Imagine to present the idea of broadcast search to a very conservative **innovation board that has failed to deliver a solution** to [the technical problem] in the past. **Tough!**"

"**Often you are facing "Not Invented Here"**. R&D employees ask themselves: 'Why should I ask other people to solve my problems when I am capable of solving them on my own? Doing so would just prove that I'm too stupid.'"

"It was surprising to me **that people inside our company built up such strong barriers against openness**. It was disillusioning to discover such a closed mind set amongst our employees."

"(...) I expected our business unit managers to get the word out about the opportunity of open innovation. But, of course, **they did not share the information**."

# Three Levels of Open Innovation F

Level of analysis

Open Innovation facet

Firm

Portfolio and diversity of knowledge search and acquisition

Project

Decision to Make-Buy-Cooperate when absorbing extern. tech. knowledge

Individual

Internal knowledge search and knowledge networks

J Bus Econ (2014) 84:339–374  
DOI 10.1007/s11573-014-0723-7

ORIGINAL PAPER

## Wisdom of the crowd and capabilities of a few: internal success factors of crowdsourcing for innovation

Dirk Lüttgens · Patrick Pollok · David Antonis · Frank Piller

Published online: 21 March 2014  
© Springer-Verlag Berlin Heidelberg 2014

**Abstract** Crowdsourcing has been demonstrated to be an effective strategy to enhance the efficiency of a firm's innovation process. In this paper, we focus on tournament-based crowdsourcing (also referred to as "broadcast search"), a method to solve technical problems in form of an open call for solutions to a large network of experts. Based on a longitudinal study of six companies piloting this application of crowdsourcing, we identify barriers and sources of resistance that hinder its implementation in firms. Our paper contributes to the state of research by analyzing crowdsourcing on the level of pilot projects, hence providing a workflow perspective that considers the creation of dedicated processes and operations of crowdsourcing. This project level analysis enables the identification of specific challenges managers face when implementing crowdsourcing within an established R&D organization. Following a design science approach, we derive suggestions for organizational interventions to overcome these barriers. We find that dedicated promoter roles strongly contribute to a successful implementation of crowdsourcing, turning pilot projects into an organizational routine.

**Keywords** Tournament-based crowdsourcing · Broadcast search · Open innovation · Barriers to innovation · Promoter roles

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# Three Levels of Open Innovation Readiness

Level of analysis	Open Innovation facet	Factor / contingency influencing readiness
Firm	Portfolio and diversity of knowledge search and acquisition	Sufficient internal organizational and management practices
Project	Decision to Make-Buy-Cooperate when absorbing extern. tech. knowledge	Sufficient project (problem) characteristics
<b>Individual</b>	<b>Internal knowledge search and knowledge networks</b>	<b>Sufficient decision styles and overcoming decision biases</b>

# THE NOT-INVENTED-HERE SYNDROME

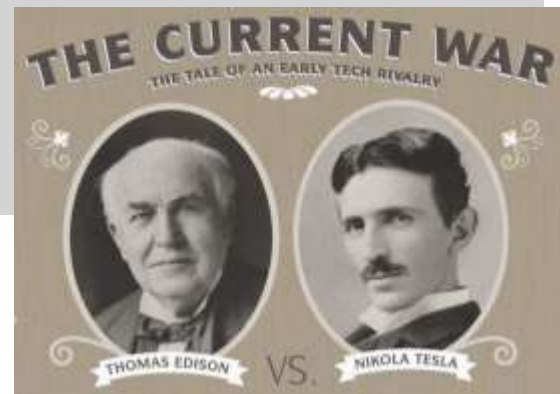
...and the struggle of famous inventors

NIH



Building on joint work with Prof. David Antons, RWTH TIME

## The Not-Invented-Here Syndrome is nothing new



### More historical examples of NIH

- **Galileo rejecting Kepler**  
Moon creating tidal motion
- **Huygens & Leibniz rejecting Newton**  
Concept of universal gravity
- **Davy rejecting Dalton**  
Atomic structure of matter
- **William Thomson Lord Kelvin rejecting Joseph Thomson**  
Concept of electrons & idea that atoms are decomposable into smaller elements



Dan Ariely, Professor of Psychology and Behavioral Economics at Duke University

**What is the NIH syndrome in your view?**

**Have you ever experienced the NIH syndrome in practice? Have you or your ideas been affected?**

**Poll: Was sind für Sie die ZWEI Haupt-Ursache hinter NIH?**



# NOT-INVENTED-HERE | Definition

Defining the concept

We define NIH as a **bias** triggered by the **negatively-shaped attitude** of an **individual towards knowledge** that has to cross a **disciplinary, spatial or functional boundary**, resulting in either its **sub-optimal utilization** or its **rejection** as behavioral consequences of this attitude bias.



Academy of Management Perspectives  
 Vol. 14, No. 2, 2015  
<http://dx.doi.org/10.54053/amp.2015.0181>

## ARTICLES

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### OPENING THE BLACK BOX OF “NOT INVENTED HERE”: ATTITUDES, DECISION BIASES, AND BEHAVIORAL CONSEQUENCES

DAVID ANTONS  
RWTH Aachen University

FRANK T. PILLER  
RWTH Aachen University

The not-invented-here syndrome (NIH) describes a negative attitude toward knowledge (ideas, technologies) derived from an external source. Even though it is one of the most cited constructs in the literature on knowledge transfer, previous research has not provided a clear understanding of the antecedents, underlying attitudes, and behavioral consequences of NIH. The objective of our paper is to open the black box of NIH by providing an in-depth analysis of this frequently mentioned yet rarely understood phenomenon. Building on recent research in psychology and an extensive review of the management literature on NIH, we first develop a framework of different sources classifying knowledge as “external.” We then discuss how a perception as “external” may trigger the rejection of this knowledge, even if it is useful for the organization. Differentiating various functions of an attitude, we hereby identify possible trajectories linking NIH with such biased individual behavior and decision making. We apply this understanding to develop an extensive agenda for future research.

Staying innovative over time is a major challenge for organizations and individuals alike. Since March’s (1991) seminal work, management literature has discussed the managerial trade-off of exploiting routines and core capabilities while simultaneously exploring innovative products and business opportunities. However, core capabilities are frequently a major source of rigidities when it comes to innovation and change (Benzer & Tushman, 2002; Leonard-Barton, 1992). To become better at exploration, studies unanimously emphasize the need for an organization to successfully transfer and absorb outside knowledge as a potent driver of innovative output, firm performance, and economic welfare (e.g., Laurson & Sahier, 2006; Lichtenthaler, 2011).

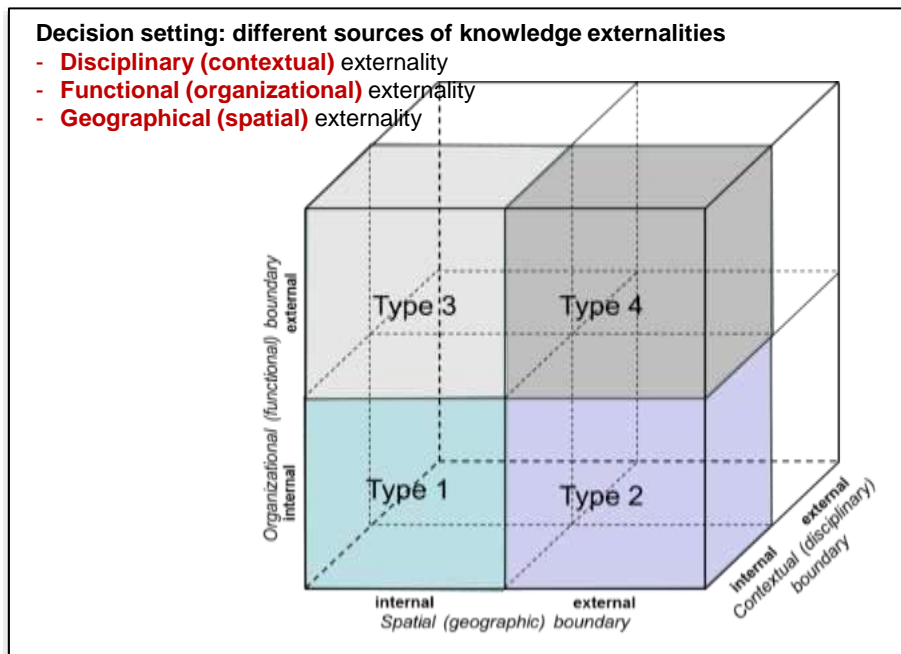
Previous research has demonstrated that this is not an easy task. Organizational inertia and structural rigidities challenge the transfer and use of outside knowledge on the level of the organization (Lane, Koka, & Pathak, 2006; Zahra & George, 2002). In most instances, however, knowledge is actually transferred, absorbed, and put into practice on an individual level (Lichtenthaler, 2011; Reagans & McEvily, 2003; Rogan & Mox, 2014). Here, previous research has identified multiple heuristic concepts influencing and biasing knowledge use and decision making on the individual level, including representativeness, anchoring, and availability (Kahneman & Tversky, 1979), escalating commitment

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# NOT-INVENTED-HERE | Conceptual Model

## What are sources of knowledge externalities?



Let's build a  
model of NIH

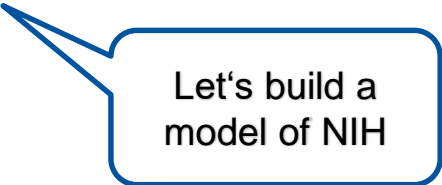
# NOT-INVENTED-HERE | Conceptual Model

## Building a model of NIH

**Decision setting: different sources of knowledge externalities**

- Disciplinary (contextual) externality
- Functional (organizational) externality
- Geographical (spatial) externality

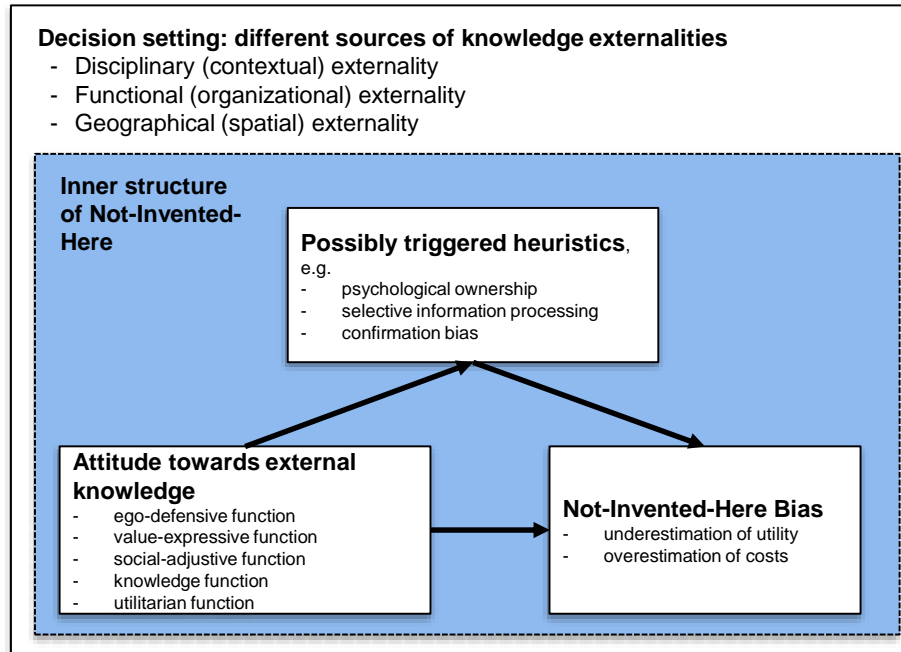
**Inner structure  
of Not-Invented-  
Here**



Let's build a  
model of NIH

# NOT-INVENTED-HERE | Conceptual Model

## Building a model of NIH



We define NIH as a **bias** triggered by the **negatively-shaped attitude** of an **individual towards knowledge** that has to cross a **disciplinary, spatial or functional boundary**, resulting in either its **sub-optimal utilization or its rejection** as behavioral consequences of this attitude bias.

# NOT-INVENTED-HERE | Conceptual Model

NIH is a bias triggered by an attitude. But what is an attitude (“Einstellung”)?

*An attitude is **an individual's predisposed state of mind regarding a value** and it is precipitated through a **responsive expression towards a person, place, thing, or event** which in turn **influences the individual's thoughts and actions**. Attitudes are acquired **through experiences**.*

## Attitude towards external knowledge

- ego-defensive function
- value-expressive function
- social-adjustive function
- knowledge function
- utilitarian function

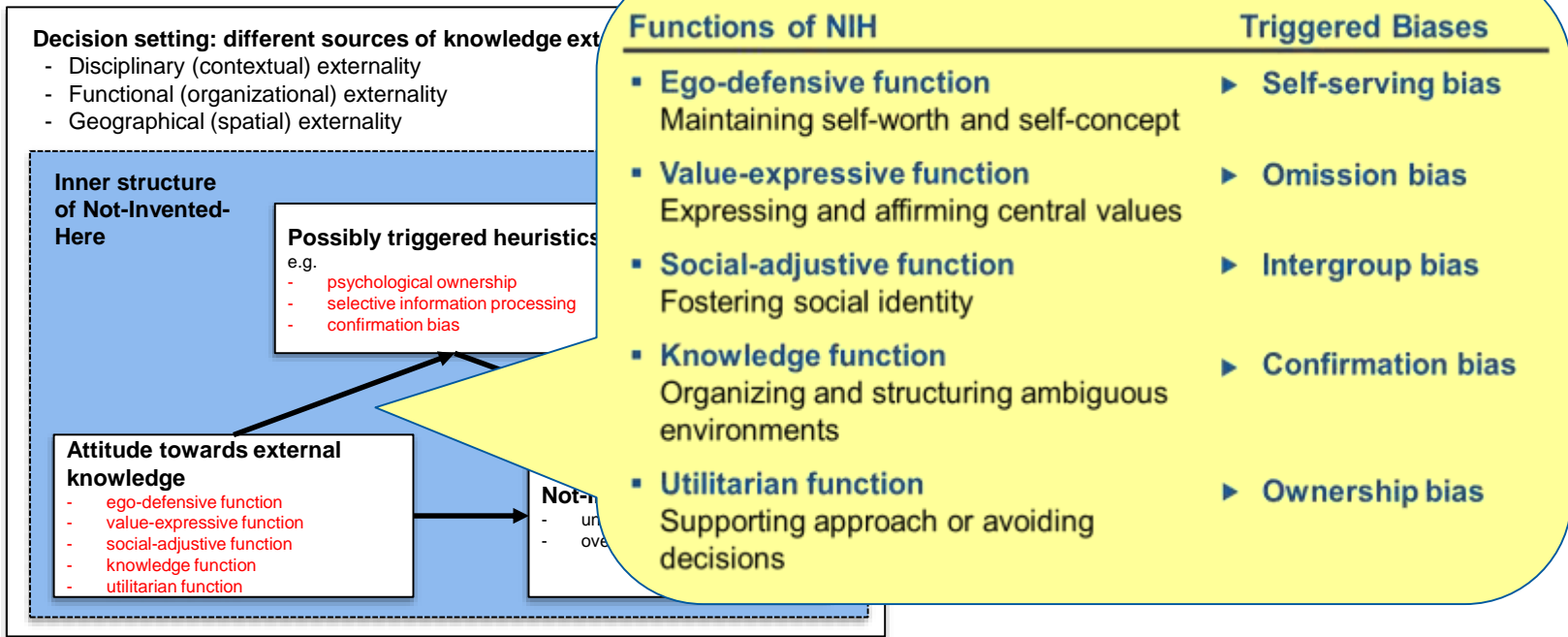
## Not-Invented-Here Bias

- underestimation of utility
- overestimation of costs

We define NIH as a **bias** triggered by the **negatively-shaped attitude** of an **individual** towards **knowledge** that has to cross a **disciplinary, spatial** or **functional boundary**, resulting in either its **sub-optimal utilization** or its **rejection** as behavioral consequences of this attitude bias.

# NOT-INVENTED-HERE | Conceptual Model

Depicting different behavioural trajectories of attitudinal functions



# NOT-INVENTED-HERE | Conceptual Model

How does the NIH attitude translate into specific beliefs and behaviors?

## Function of NIH

- **Ego-defensive function**  
Maintaining self-worth and self-concept

## Triggered Bias

- ▶ **Self-serving bias**

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### ▪ **Self-serving bias**

- Attribution of success to own effort and abilities - attribution of failure to external, situational factors
- Personal effort (“own” ideas) is expected to be successful
- Increased under conditions of self-threat (“external ideas”)

---

**Illusion that own ideas should be more successful than external ideas**

# NOT-INVENTED-HERE | Conceptual Model

How does the NIH attitude translate into specific beliefs and behaviors?

## Function of NIH

- **Utilitarian function**

Supporting approach or avoiding decisions

## Triggered Bias

- ▶ **Ownership bias**

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- **Ownership bias**

- Tendency to value owned things higher than similar things that are not owned
- Even prevalent if ownership was just recently established or no other reason for attachment is apparent

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**Investing more resources to retain “own” idea  
instead of investing less in a comparable “foreign” idea**



# NOT-INVENTED-HERE | Conceptual Model

How does the NIH attitude translate into specific beliefs and behaviors?

## Function of NIH

- **Social-adjustive function**  
Fostering social identity

## Triggered Bias

- ▶ **Intergroup bias**

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### ▪ **Intergroup bias**

- Tendency to evaluate one's own membership group (in-group) more favorably than a non-membership group (out-group)
- Encompassed by prejudice, stereotyping, and discriminations
- Continuum from in-group favoritism to out-group derogation
- Influenced by group size, status, power, and potential threat

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**In-group ideas are supported, out-group ideas are rejected**

# NOT-INVENTED-HERE | Conceptual Model

How does the NIH attitude translate into specific beliefs and behaviors?

## Function of NIH

- **Value-expressive function**  
Expressing and affirming central values

## Triggered Bias

- ▶ **Omission bias**
- Action bias**

## ▪ **Omission bias**

- Tendency to prefer inaction to action, especially if consequences are potentially negative or ambiguous
- Omissions are less obvious than active commissions, leading to the perception that omissions are more favorable than commissions

**External initiatives slowly “peter out”**

# NOT-INVENTED-HERE | Conceptual Model

How does the NIH attitude translate into specific beliefs and behaviors?

## Function of NIH

- **Knowledge function**

Organizing and structuring ambiguous environments

## Triggered Bias

- ▶ **Confirmation bias**

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- **Confirmation bias**

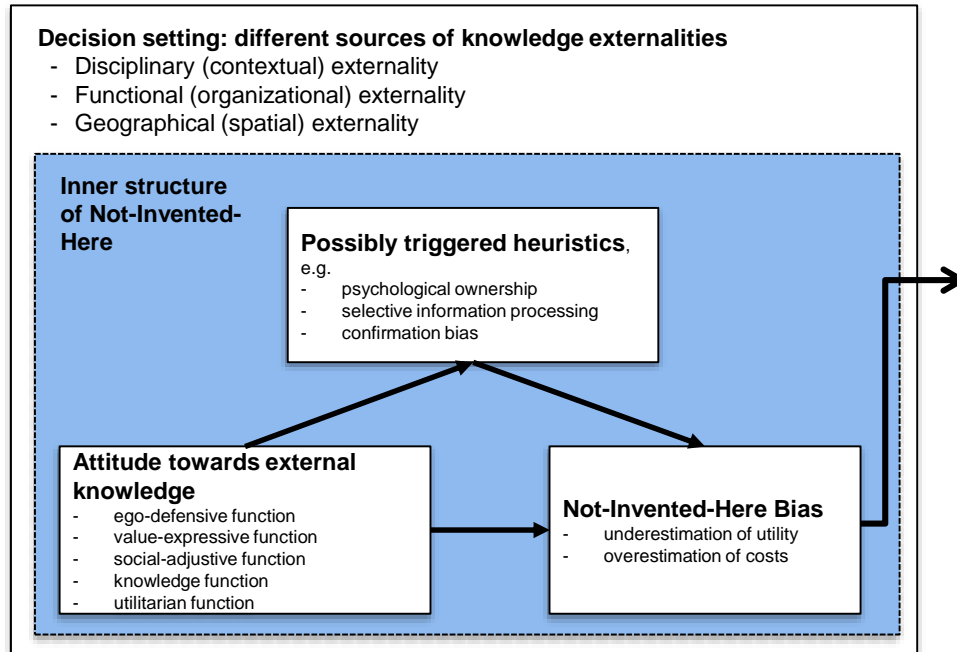
- Tendency to interpret, and search for information that is in-line with own assumptions, attitudes and preconceptions
- Selective information processing leads to under-elaboration of relevant information
- Leads to overconfidence

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**Information processing to support own ideas and reject external ideas**

# NOT-INVENTED-HERE | Conceptual Model

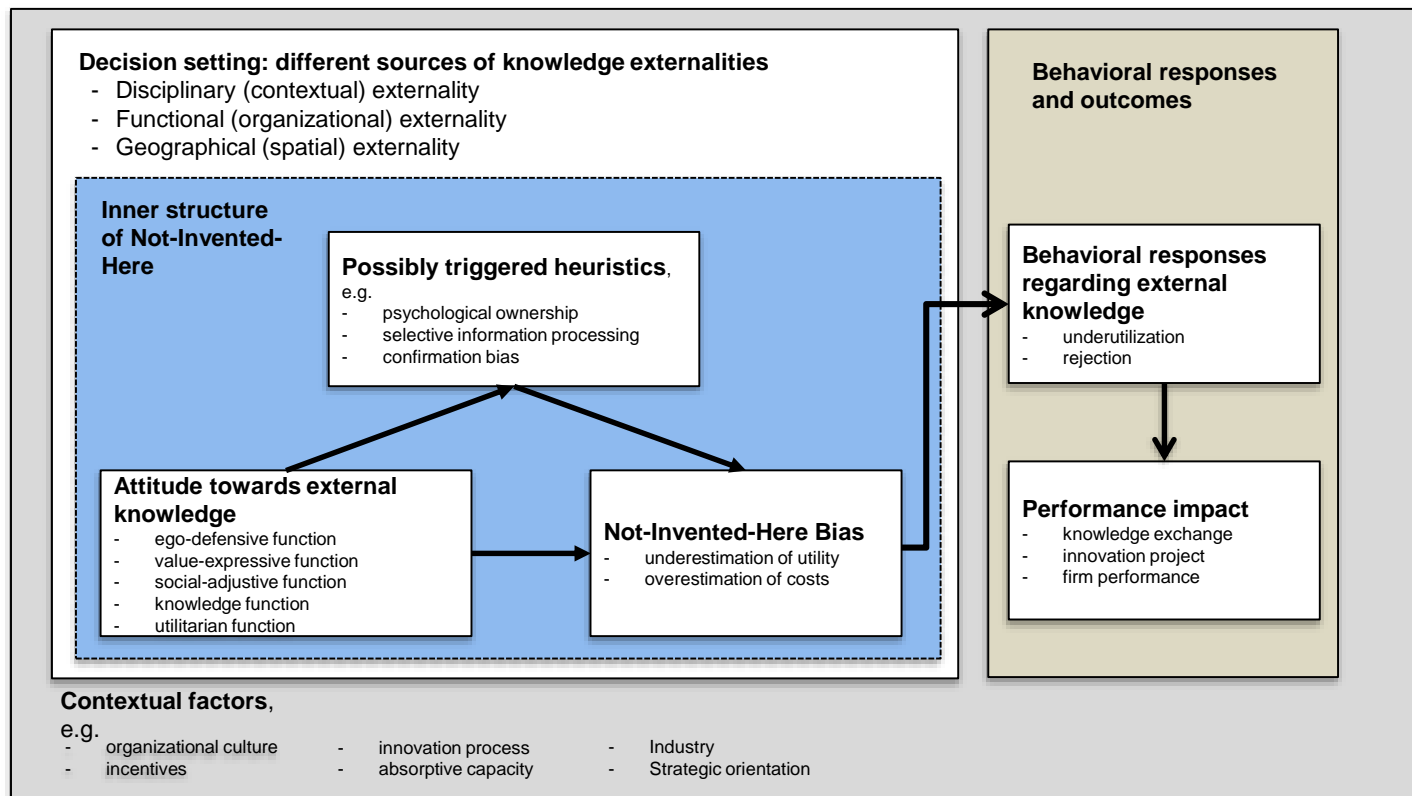
## Building a model of NIH



**What are the consequences?**


# NOT-INVENTED-HERE | Conceptual Model

What are the consequences of NIH?



# NOT-INVENTED-HERE | Remedies

What can we do against NIH?



**So what  
can we do  
against  
this?**

**And please do not respond  
“Innovation culture”.**

# NOT-INVENTED-HERE | Remedies

What can we do against NIH?

<p><b>Organizational</b></p>	<ul style="list-style-type: none"> <li>• <b>Rotate staff</b> between different teams and functions</li> <li>• <b>Establish boundary-spanners</b> &amp; social learning from <b>promoters</b> of new ideas</li> <li>• <b>Create a climate of openness</b>: Provide information on value of external knowledge; share success stories of working with external knowledge</li> </ul>
<p><b>Procedural</b></p>	<ul style="list-style-type: none"> <li>• <b>Formalize the scanning and review</b> of the external environment</li> <li>• <b>Provide information</b> about external partners <b>in an unbiased way</b></li> <li>• <b>Use clear checklists</b> and ranking schemes to evaluate ideas; consider crowd assessments</li> </ul>
<p><b>Training &amp; Exchange</b></p>	<ul style="list-style-type: none"> <li>• <b>Provide training</b> on the symptoms, consequences, and therapies for NIH</li> <li>• <b>Hold regular meetings</b> among project participants</li> <li>• <b>Host social events</b> for project participants (establishing informal communities of practice)</li> </ul>
<p><b>Performance Management</b></p>	<ul style="list-style-type: none"> <li>• Formulate clear <b>responsibilities</b></li> <li>• Use <b>incentives and awards</b> ("proudly stolen elsewhere" award)</li> <li>• <b>Sanction</b> NIH behavior</li> </ul>

Another large stream of our (*David with Iring Koch & Kathleen Diener*) research has been on measuring NIH: **How to detect an attitude that people either don't know they have or don't want to admit to suffer from**



# Self Assessment: How significant is your organization’s NIH challenge?

Which of the following statements describe your organization?

Rate each statement on a 5-point scale, where 1 = **strongly disagree** and 5 = **strongly agree**.

Statement	Score 1..5
We primarily promote from within.	
We have a homogeneous culture.	
We have a strong culture.	
Our employees have long tenure in the company.	
Other than entry-level positions, we rarely hire from the outside.	
Even when we hire outsiders, we have strong socialization mechanisms.	
We have a long track record of success.	
Our dominant logic is: don't mess with success.	
Our top management team has long tenure in the company.	
Our top management team has worked primarily in the industry in which we compete.	
We rarely recruit from the outside into our top management team.	
We have a strong performance focus that places a premium on meeting short-term financial goals.	

Source: Govindarajan (2018) The Three Bix Solution

**If your total score is 36 or above on these 12 statements, your company has a significant bias towards your current status-quo to overcome. How will you lead change within this environment?**

# Measuring NIH

TABLE 1 IAT design utilized for Study 1

		Block				
		1	2	3	4	5
		Task description				
		Practice of target concept discrimination	Practice of attribute concept discrimination	Combined test block	Practice of reversed combination	Combined test block of reversed combination
Mapping (example)	Left	Mechanical engineering	Positive	Mechanical engineering + positive	Mechanical engineering + negative	Mechanical engineering + negative
	Right	Electrical engineering	Negative	Electrical engineering + negative	Electrical engineering + positive	Electrical engineering + positive

Note. IAT, implicit-association test.

TABLE 2 Study 2: Final version of the explicit NIH scale and factor loadings

Item		
Affective subscale		
A1	I like to work with nonrelated or less related subject areas.	
A2	I have sympathies for other knowledge domains.	
A3	I look forward to talks and speeches from other knowledge domains.	
Cognitive subscale		
C1	Collaborating with other knowledge domains generates more overhead than benefit.	
C2	I think that different knowledge backgrounds may be helpful for the progress of a project.	
C3	I doubt that I could achieve significant results applying methods taken from other knowledge domains.	
Behavioral subscale		
B1	I network across different knowledge domains.	
B2	I look for opportunities to exchange with persons having a different knowledge background.	
B3	In addition to the challenges of my own discipline, I seek new ones at the interfaces to other disciplines.	

Note. Measured with a slider on a metric scale ranging from 0 (strongly disagree) to 100 (strongly agree).

RESEARCH ARTICLE

## Assessing the not-invented-here syndrome: Development and validation of implicit and explicit measurements

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<sup>3</sup>Technology and Innovation Management Group, TIM Research Area, School of Business and Economics, RWTH Aachen University, Aachen, Germany

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**Funding information:** DFG German Research Foundation

Summary

The not-invented-here (NIH) syndrome has been called one of the largest obstacles in innovation management, preventing effective knowledge transfer between organizational units and individuals. NIH is defined as a negatively biased attitude towards knowledge that has to cross a disciplinary, spatial, or organizational boundary, resulting in either its suboptimal utilization or its rejection. Our goal is to equip scholars with appropriate measurement instruments for the phenomenon. On the basis of 4 studies with 1,238 subjects overall, we developed an implicit measure based on the implicit-association test as well as an explicit (survey) measure of NIH, taking into account theoretical insights on attitude structure. We provide evidence for reliability as well as construct and criterion validity. We want to facilitate further research on NIH and knowledge transfer (a) by providing a better theoretical framework for NIH on the basis of the tripartite component model of attitudes, (b) by demonstrating the application of association-based implicit measures for management research, and (c) by providing a validated multidimensional survey scale to measure NIH explicitly. We also provide recommendations on how managers can utilize the NIH measurement instruments to investigate NIH and potential countermeasures in detail and they can test the behavioral outcomes predicted by previous research.

KEYWORDS

attitude, explicit-association test (IAT), scale development, knowledge transfer, not-invented-here

1 | INTRODUCTION

In 1986, Northrop Corporation, a U.S. defense company, terminated its Titan program developing the military fighter F-20 without having sold a single plane. The F-20's entire research and development (R&D) investment of over \$1.2 billion was privately funded by Northrop and a few subcontractors, a unique situation compared to the usual flow of R&D expenditures between a contractor and the U.S. military. Au Martin and Schmidt (1987) examine one of the reasons for the program's failure was the strong negative attitude of the U.S. military, who did not consider the program as one of their own, but instead as the initiative of an outside corporation. For example, the "Stars and Bars" insignia was removed from an F-20 prototype at the 1984 Paris Air Show because the plane was not a part of the U.S. inventory. Similarly, Northrop was not permitted to land the F-20 at restricted air bases. Northrop management also alleged that the F-20 was not given equal briefing to foreign nations interested in purchasing U.S. fighter aircraft (Martin & Schmidt, 1987).

The rejection of the F-20 as a technological innovation is an excellent example of a phenomenon called the "not-invented-here" (NIH) syndrome, and many managers will recall a similar story from their own experience. Although literature on innovation frequently highlights the importance of incorporating different perspectives, ideas, and technologies into the R&D process (Blegen, Aduki, & Bantam, 2010; Cavusgil & Vengler, 2006; Laursen & Salter, 2006; Wassner, 2008) innovation as well as knowledge exchange and transfer is often impeded at an individual level (Hesse-Siber, Palocz, & Liu, 2015). This individual barrier, which is referred to as NIH, has been called one of the largest obstacles in innovation management. It is accused of leading to incorrect evaluations and delayed and distorted transfer of ideas and technologies (Agrawal, Cockburn, & Bozler, 2010; Barkans & Schjerve, 2008; de Borchart, Kivimäki, & Sandegård, 2014), slowed implementation and expanded development costs (Lichtenthaler & Ernst, 2006), project failure (Hessig & Linsen, 2010; Kautzler & Lohse, 2012), and diminishing firm performance (Katz & Allen, 1992; King, Corley, & Hegarty, 2008). NIH describes "the

**An alternative approach complementing  
these dedicated methods and measures:**

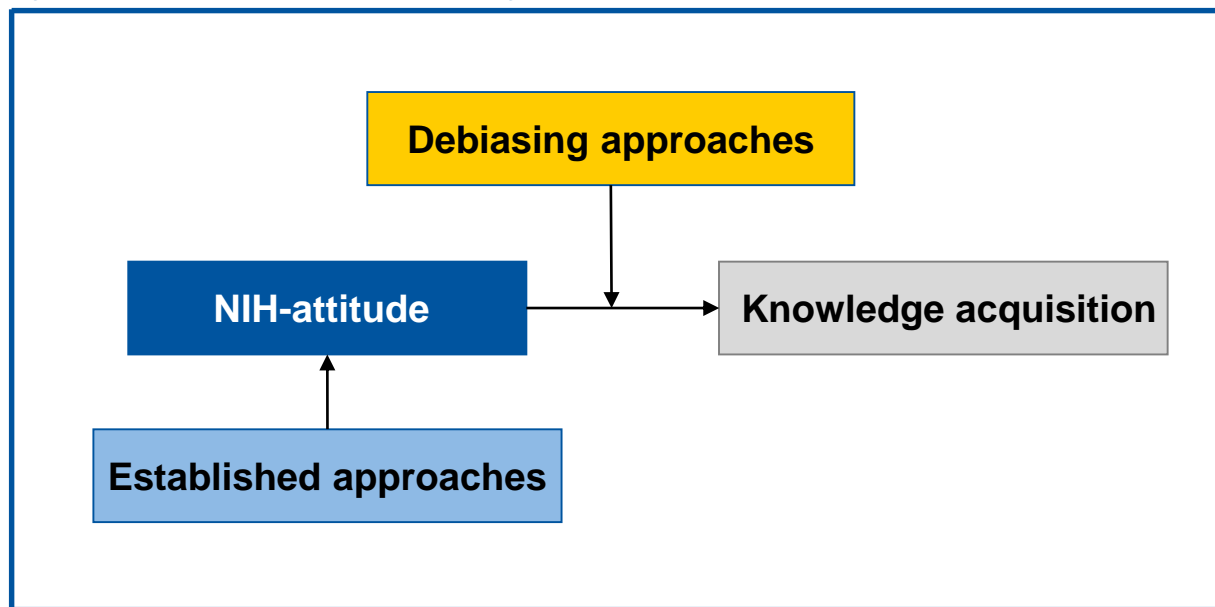
**Using de-biasing strategies**

# NOT-INVENTED-HERE | Behavioral Remedies

Introducing alternative behavioral remedies



## Types of methods to remedy NIH



# NOT-INVENTED-HERE | Consequences

## How severe is NIH in practice?

### Our recent study to test the consequences of NIH

- Large (N=583) international sample from a diverse set of industries
- Participants from companies working in open innovation projects: **Very conservative sample**, as participants already decided to work with externals(!)
- Participants judged a recent project in which they worked together with an external project partner (e.g., external to own department or organization)

The screenshot shows the front page of a research article in the journal *Research Policy*. The article title is "Containing the Not-Invented-Here Syndrome in external knowledge absorption and open innovation: The role of indirect countermeasures" by Julian Hansen, David Antoni, Frank Piller, Torsten Oliver Sölge, Tim Colman, and Timothy M. Devinney. The abstract discusses the Not-Invented-Here Syndrome (NIHS) and its impact on organizational learning and innovation. It mentions that the study uses a mixed-methods approach, combining a survey of 583 participants with focus group discussions. The article is available for open access.

Download of paper (open access): <https://doi.org/10.1016/j.respol.2019.103822>

# NOT-INVENTED-HERE | Behavioral Remedies

Overcoming NIH by utilizing two de-biasing techniques



	Considering the Opposite	Perspective Taking
Description	<ul style="list-style-type: none"> <li>■ <b>Generate alternatives to preferred course of action</b></li> <li>■ Increases search for <b>disconfirmatory information</b></li> <li>■ Reduces <b>selective information processing</b></li> </ul>	<ul style="list-style-type: none"> <li>■ Adopt perspective of other party</li> <li>■ Decreases <b>egocentrism</b></li> <li>■ Decreases <b>in-group favoritism</b></li> <li>■ Encourages <b>more balanced</b> evaluation of external knowledge</li> </ul>
Effect on NIH	<ul style="list-style-type: none"> <li>■ Examine <b>alternative</b> to sole use of internal knowledge (e.g. user ideas)</li> <li>■ Reflect upon <b>potential merits</b> of using external knowledge</li> <li>■ Helps <b>debias</b> external knowledge acquisition</li> </ul>	<ul style="list-style-type: none"> <li>■ View project through <b>eyes of external partners</b> (e.g. users)</li> <li>■ Understand their <b>unique viewpoints</b></li> <li>■ Facilitates external <b>knowledge acquisition</b></li> </ul>

# NOT-INVENTED-HERE | Remedy 1

## Considering the Opposite

### One central question:

- How to facilitate decision making?

### Kray & Galinsky (2003):

- Study on how to debias decision-making in challenger scenario
- 2 Groups: control vs. debiasing group
- Debiasing was primed
- Scenario to induce counterfactual thinking:  
„**Consider the opposite**“: What would have been?  
What if?



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Organizational Behavior and Human Decision Processes 91 (2003) 69–81

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DECISION PROCESSES[www.elsevier.com/locate/jhdp](http://www.elsevier.com/locate/jhdp)

The debiasing effect of counterfactual mind-sets: Increasing the search for disconfirmatory information in group decisions

Laura J. Kray<sup>a,\*</sup> and Adam D. Galinsky<sup>b</sup>

<sup>a</sup> Haas School of Business, University of California, USA

<sup>b</sup> Kellogg Graduate School of Management, Northwestern University, USA

#### Abstract

We hypothesized that the activation of a counterfactual mind-set minimizes decision errors resulting from the failure of groups to seek disconfirming information to test an initial hypothesis. To test this hypothesis, we conducted two experiments examining the decision making processes of groups. The task for both experiments was modeled after the Space Shuttle Challenger disaster, and groups had to actively seek disconfirmatory information to make a correct decision. Prior to beginning the group decision making task, groups were exposed to one of two pre-task scenarios in which the salience of counterfactual thoughts was manipulated. In Experiment 1, groups in the counterfactual prime condition were significantly more likely to make the correct decision than groups in the non-counterfactual prime condition. In Experiment 2, we replicated the effect of counterfactual primes on decision accuracy and demonstrated that groups in the counterfactual prime condition were more likely to seek disconfirmatory information than groups in the non-counterfactual prime condition. We also conducted mediation analyses that clarify the decision making process. Implications for group decision making are discussed.

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# NOT-INVENTED-HERE | Remedy 1

## Considering the Opposite

**Considering the Opposite:** Prior to making a decision, individuals search for arguments supporting and contradicting each possible alternative.

- This form of „**mental simulation**“ prevents from selective information processing, as the decision focus is enlarged
- It directly **counteracts association-based biases** – relying on a too narrow information base
- It **reduces confirmation biases** by also considering contradictory information
- Counterfactual thinking is a **trainable mind-set**



# NOT-INVENTED-HERE | Remedy 1

## Considering the Opposite

### Typical exemplars of Considering the Opposite:

*At work, I...*

- *tend to be the 'devil's advocate'.*
- *tend to question my first intuitive answers.*
- *concentrate on possible negative consequences of my decisions.*
- *try to explore why my decisions might be wrong.*
- *try to think about all possible scenarios before making a decision.*
- *try to consider alternative options before making a decision.*

# NOT-INVENTED-HERE | Behavioral Remedies

Overcoming NIH by utilizing two de-biasing techniques



	Considering the Opposite	Perspective Taking
Description	<ul style="list-style-type: none"> <li>Generate alternatives to preferred course of action</li> <li>Increases search for <b>disconfirmatory information</b></li> <li>Reduces <b>selective information processing</b></li> </ul>	<ul style="list-style-type: none"> <li><b>Adopt perspective of other party</b></li> <li>Decreases <b>egocentrism</b></li> <li>Decreases <b>in-group favoritism</b></li> <li>Encourages <b>more balanced</b> evaluation of external knowledge</li> </ul>
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# NOT-INVENTED-HERE | Remedy 2

## Perspective Taking

### Hoever, van Knippenberg, van Ginkel, and Barkema (2012)

- Study on multidisciplinary work groups
- Research question: How to unlock the full potential of diverse work groups
- **Perspective Taking as “Debiasing”:** the simple process of taking another team-member’s perspective. To imagine what she/he might know, might be thinking, and feeling.

Journal of Applied Psychology  
2012, Vol. 97, No. 3, 302–316

© 2012 American Psychological Association  
1073-4269/12/\$12.00 DOI: 10.1037/a0028296

#### Fostering Team Creativity: Perspective Taking as Key to Unlocking Diversity’s Potential

Inga J. Hoever, Daan van Knippenberg, and  
Wendy P. van Ginkel  
Erasmus University Rotterdam

Hary G. Barkema  
Erasmus University Rotterdam and London School of  
Economics and Political Science

Despite the clear importance of team creativity for organizations, the conditions that foster it are not very well understood. Even though diversity, especially diversity of perspectives and knowledge, is frequently argued to stimulate higher creativity in teams, empirical findings on this relationship remain inconsistent. We have developed a theoretical model in which the effect of a team’s diversity on its creativity is moderated by the degree to which team members engage in perspective taking. We propose that perspective taking helps realize the creative benefits of diversity of perspectives by fostering information elaboration. Results of a laboratory experiment support the hypothesized interaction between diversity and perspective taking on team creativity. Diverse teams performed more creatively than homogeneous teams when they engaged in perspective taking, but not when they were not instructed to take their team members’ perspectives. Team information elaboration was found to mediate this moderated effect and was associated with a stronger indirect effect than mere information sharing in task conflict. Our results point to perspective taking as an important mechanism to unlock diversity’s potential for team creativity.

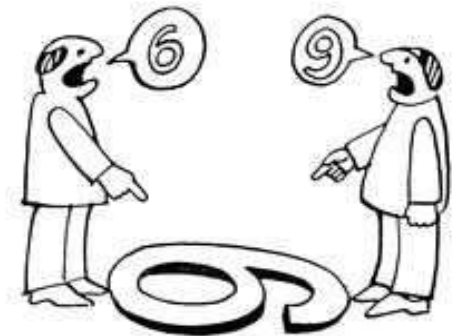
*Keywords:* team creativity, diversity, perspective taking

# NOT-INVENTED-HERE | Remedy 2

## Perspective Taking

**Perspective Taking: the simple process of taking another's perspective: imagine what she/he might know, might think, and feeling.**

- Decreases feelings of group-membership
- Decreases stereotyping and negative attitudes towards „out-group“
- Leads to consideration of more information
- Knowledge from external sources is perceived as more familiar and results in higher willingness to acquire it
- Increases negotiation success through higher combined value creation
- Increases collaboration



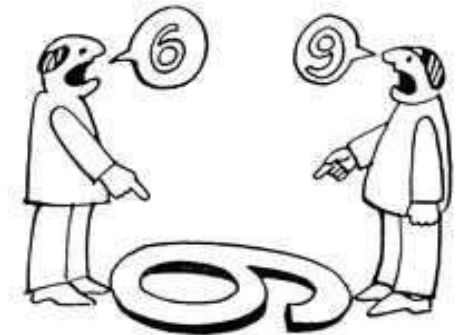
# NOT-INVENTED-HERE | Remedy 2

## Perspective Taking

### Typical exemplars of Perspective Taking:

*At work, I...*

- *I frequently try to take the my coworker's perspective.*
- *I often imagine how other people are feeling".*
- *I make an effort to see the world through other people's eyes.*
- *I regularly seek to understand other people's viewpoints.*



# NOT-INVENTED-HERE | Behavioral Remedies

Overcoming NIH by utilizing two de-biasing techniques



## Considering the Opposite

### Methods to stimulate Considering the Opposite:

- Use case studies to demonstrate general benefits of the technique
- Devil's advocate
- War-gaming exercise
- Provocative Operation (de Bono)
- SWOT
- Lateral thinking

## Perspective Taking

### Methods to stimulate Perspective Taking:

- (Team building) workshops to increase perspective taking skills – also as a skill beyond NIH context
- Six Thinking Hats
- War-gaming exercise
- Developing Perspective Taking routines by asking a set of specific questions

**A CEO who personally  
took care of NIH (*just by intuition*)**



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### Responsible Investor Interview with Alexander Schindler



Union Investment is looking to double the assets invested in its sustainable funds and greatly expand its proxy business for institutional clients by the end of this decade.

[More information](#)

### Union Investment given A+ rating by PRI



The United Nations Principles for Responsible Investment (PRI) initiative has awarded Union Investment its top mark of A+ in recognition of the company's overarching approach to responsible investment.

[More information](#)

Union Investment is a German active asset manager based in Frankfurt/Main providing a comprehensive range of investment solutions across asset classes and regions. Founded in 1956, it now has more than **2,500 employees** and manages **€252bn** of assets (as of 30 June 2015, when we did the project).

Greenwich Associates has awarded Union Investment the accolade of Quality Leader in the institutional business. This is the result of a survey that the US-based consultancy has conducted this

When China sneezes the global economy catches a cold, or so they say. Economic growth in China was one of the main topics discussed at the Union Investment Committee's regular meeting in July.



**Our assignment:**

**Build a co-creation  
platform for service  
innovation targeting input  
from sales associates in  
partner (retail) banks**

## **It seemed like a very easy project:**

**>> CEO sponsorship**

**>> Real need**

**>> Fit with strategy**

**>> Project ownership**

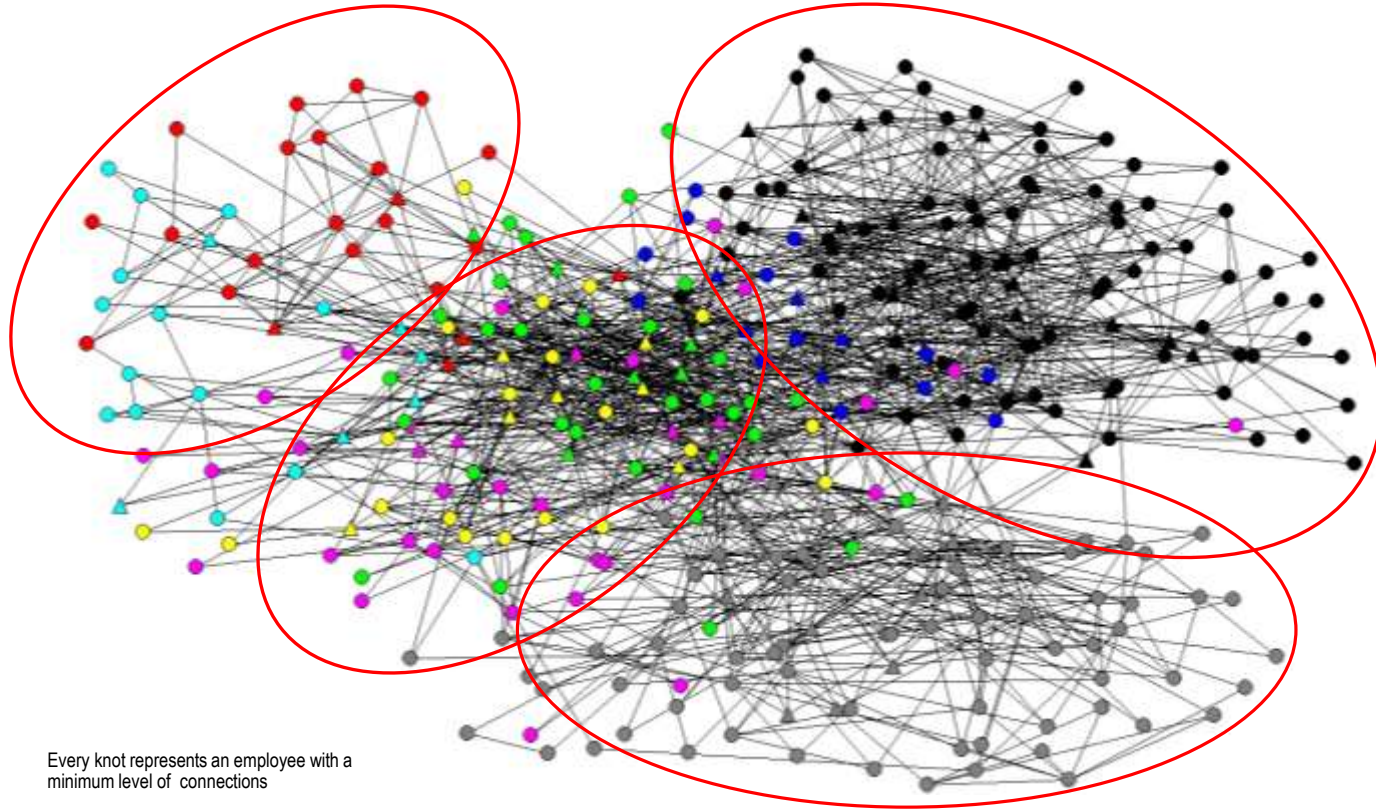
(“service innovation” implemented  
as new function)

**>> Competition doing it as well**

***In a broad employee survey,  
we asked everyone two questions:***

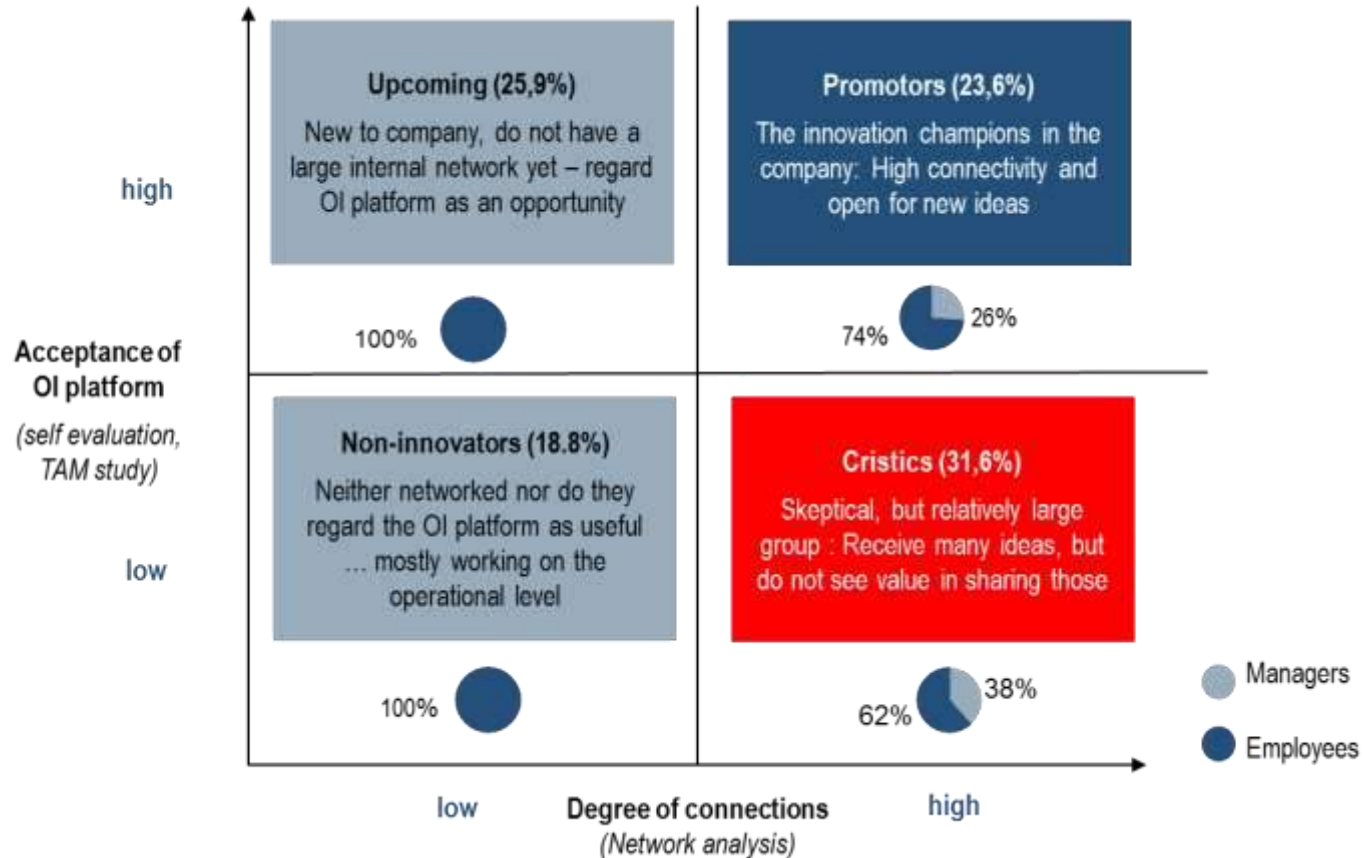
- (1) “To whom do you refer (internally) when you have an innovative idea?”**
- (2) “How do you like the co-creation scenario [...]?”**

From Q1, we could generate this social network of innovation connections within the company with Christoph Ihl)



Every knot represents an employee with a minimum level of connections

# Together with Q2, this matrix evolved: Acceptance of co-creation on the individual level



## ***What we did:***

Stopped the rollout

Facilitated an internal community of practice

Internal education and communication  
(corporate TV)

Creating a promotor structure

Making board member (critic!) head of initiative

Announcing executive board as idea selection  
committee (*next to crowdsourcing evaluations  
of ideas broadly*)

# *Achievements*

Large success

30% reach of potential target group

>250 elaborated ideas submitted

Implementation of internal Service/Product  
Development Process

Implementation of innovation management role

Identification of new relationship  
opportunities for sales team

Two more external contests, three internal ones

**NIH can be diagnosed and managed!**



# Conclusions

# Departing questions

- **Collaboration is the new normal** – and current technological trends greatly enhance our collaboration productivity (as are platform-based business ecosystems)
- **The strategy perspective:** What could we give into the periphery of our organization and still make money?
- **How do we create collaborative capabilities?** (We do not educate people for collaboration – we still create “solvers”, but not “seekers”)
- We need to create **incentives for collaboration** – too many of our current individual performance criteria still reward individual **solutions**
- **What are other corresponding capabilities?** How can we overcome the “local search bias” and “not invented here”?

**Offers for further interaction**  
**(and to develop your organization's capabilities)**

# The RWTH Aachen Executive MBA: Our flagship program freshly relaunched in 2021. Academic Director: Prof. Frank Piller

Unser Executive MBA bietet Ihnen Ideen und Konzepte, Wissen und Fähigkeiten sowie Inspiration und Mut, um Ihre berufliche Zukunft aktiv zu gestalten. Mit einem für die RWTH Aachen University typischen Technologiefokus bietet das Programm eine abwechslungsreiche und moderne Learning Journey bestehend aus Selbstlernphasen, interaktiven Tagen an der RWTH Business School und internationalen Modulen. Lernen Sie bisher gewohntes Verhalten infrage zu stellen und mit neuen Betrachtungsweisen den eigenen Horizont zu erweitern, um über sich selbst hinaus zu wachsen und einen entscheidenden Beitrag zum Unternehmenserfolg zu leisten.



## Blended Learning

Unsere Lehr- und Lernphilosophie basiert auf neuesten Blended-Learning-Methoden, die das Beste aus der digitalen und der klassischen Lehre kombinieren, um eine optimale Lernerfahrung zu ermöglichen.



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Die RWTH Aachen ist ein Ort, an dem die Zukunft unserer industrialisierten Welt gedacht wird. Mehr als 320 Technologieunternehmen forschen und arbeiten auf dem RWTH Aachen Campus.



## International Innovation Ecosystems

Sie besuchen vier global führende „Innovation Ecosystems“ in Aachen, Berlin, Buenos Aires und Cambridge und gewinnen dabei intensive Einblicke in aktuelle technologische Entwicklungen.



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# Back to school ... Our (free) innovation management online programs

In case you are interested in studying innovation management, you can get a deep dive in the content with our free innovation MOOCs at edx.org:

The screenshot shows the edX website interface. At the top, there is a navigation bar with 'Courses', 'Programs', 'Schools & Partners', and 'About'. A search bar and 'Sign In' / 'Register' buttons are also present. The main content area features a video player for the course 'Managing Technology & Innovation: How to deal with disruptive change'. The video player includes the RWTH Aachen University logo and a play button. Below the video player, there is a red banner with the text 'First German edX Micromaster'. The course description states: 'A free MicroMaster by RWTH – study online and at your own pace. Earn ECTS and course credits. Learn how to lead an organization to success by anticipating and leveraging disruptive change brought about by...'. The URL <https://www.edx.org/micromasters/managing-technology-innovation-how-deal> is displayed below the video player.

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'This MicroMaster examines solutions to the most... in deal with disruptive change in the...

Average Length:	6 weeks per course
Effort:	8-10 hours per week per course
Number Of Courses:	4 Courses in Program

<https://www.edx.org/micromasters/managing-technology-innovation-how-deal>

Deep Dive: The RWTH Aachen Streetscooter Case on edX.org  
A (free) MOOC on entrepreneurship and innovation management, explained at the case of Streetscooter (<https://www.edx.org/course/innovation-strategies-for-electric-mobility-the-streetscooter-case>)

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The screenshot shows the edX website interface for the course 'Innovation Strategies for Electric Mobility: The StreetScooter Case'. The navigation bar includes 'Courses', 'Programs & Degrees', 'Schools & Partners', and 'edX for Business'. A search bar and 'Sign In' / 'Register' buttons are also present. The main content area features a video player for the course. The course description states: 'Help your organization develop the strategies needed to become a front-runner of innovation in electric mobility and beyond.' Below the video player, there is a green banner with the text 'Enroll Now'. The course is self-paced. A checkbox option is available: 'I would like to receive email from RWTH Aachen University and learn about other offerings related to Innovation Strategies for Electric Mobility: The StreetScooter Case.' Below the video player, there is a table with course details: 'Length: 6 weeks', 'Effort: 2 to 4 hours per week', 'Price: FREE. Add a Verified Certificate for \$99 USD', and 'Instructors: RWTH Aachen University'. The 'About this course' section states: 'Learn about the tools and methods that can be employed to understand and identify customer needs as well as the processes that companies can set in place to foster and launch successful technological innovations. A special emphasis will be placed on analyzing how companies can benefit from entrepreneurial thinking to innovate more successfully and on understanding how they can build entire ecosystems around their products and services. The theoretical knowledge will be transferred and applied to a recent, highly successful technological innovation from Germany: The StreetScooter, an electric delivery vehicle of Deutsche Post DHL.'

<https://www.edx.org/course/innovation-strategies-for-electric-mobility-the-streetscooter-case>

**Note: Deep-dive into these topics and join the conversation in our Top Executive Seminars with *The Leadership Network*, London**  
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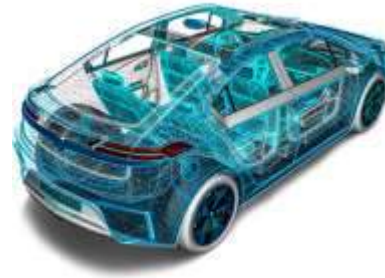


"Great step for us; it confirmed our strategy and gave us ideas to implement."

Schneider  
Electric

**Dates and locations for 2021:**  
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# Our community of senior R&D and innovation managers



## TIM-Expertenkreis (TIMEX) Technologie- und Innovationsmanagement in der Praxis



### Herausforderung

- Im Tätigkeitsfeld des Technologie- und Innovationsmanagements kursieren ständig neue Trends und „Buzzwords“
- Viele davon sind theoretisch-wissenschaftlich bereits gut erforscht bzw. finden in Nischen bereits Anwendung
- Die praktische Implementierung in etablierten Unternehmen ist jedoch oft herausfordernd und lässt sich häufig erst durch gezielten, moderierten Austausch mit externen Experten realisieren

### Der Expertenkreis

- Im TIM-Expertenkreis treffen sich Innovations- und F&E-Manager aus etablierten Unternehmen, um im gegenseitigen Austausch untereinander und mit Forschern der RWTH Aachen unter der Leitung von Prof. Frank Piller aktuelle Themen aus ihren Tätigkeitsbereichen zu diskutieren
- Fokusthemen werden gemeinsam mit den teilnehmenden Partnern gesammelt und ausgewählt
- In offener Atmosphäre erfolgt ein intensiver Austausch und Networking, interaktives Erlernen neuer Innovationsmethoden und bis hin zu gemeinsamen Projekten
- Bisherige und zukünftige Themen: Innovationskultur, Geschäftsmodellinnovation, Ideenselektion, TRIZ, Zukunftsforschung, uvm.

### Vorgehensweise

- Drei ganztägige Treffen (entweder in Aachen oder auf Einladung bei einem der Partner) sowie Teilnahme an einer der Konferenzen des TIM Instituts
- Fachvorträge ausgewählter Dozenten aus Wissenschaft und Industrie, offene Diskussion und Austausch bis hin zur Vorbereitung der praktischen Umsetzung in Workshops
- Dokumentation und Aufbereitung der Ergebnisse für alle Partner

### Termine 2020:

- Dienstag, 04. Februar 2020
  - Dienstag, 21. April 2020
  - Dienstag, 06. Oktober 2020
- sowie Teilnahme an der *Internationalen Open and User Innovation Konferenz (OUI)* am 06./07. Juli 2020 in Aachen

**Interested?**

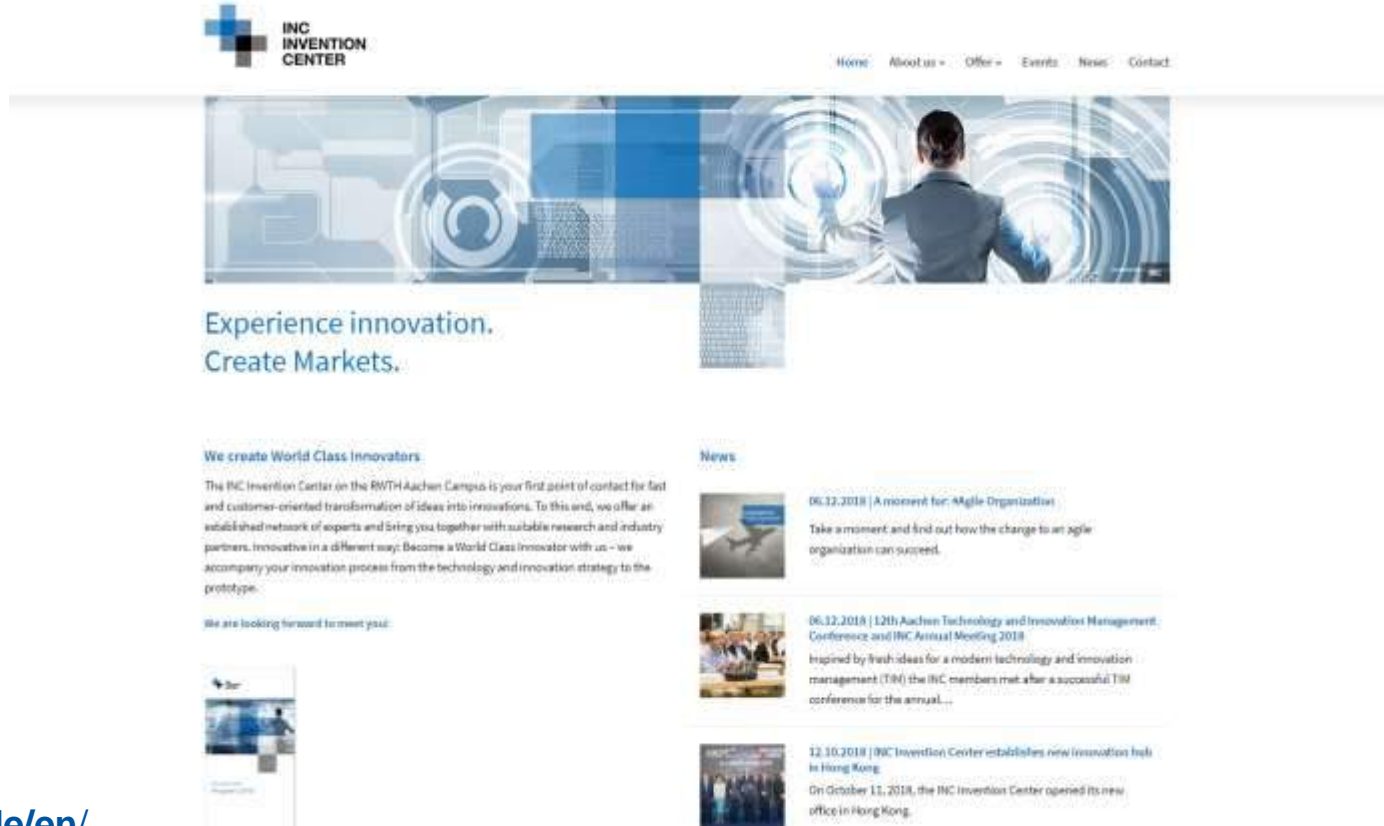
**Contact**

**Christian Gülden,**  
Head of Industry  
Relations at  
RWTH TIME

+49 (0)241 809-6660

guelpen@

time.rwth-aachen.de



The screenshot shows the homepage of the RWTH Innovation Center. At the top left is the logo for the INC INVENTION CENTER, which consists of a blue cross-like shape made of squares. To the right of the logo is a navigation menu with links for Home, About us, Offer, Events, News, and Contact. Below the navigation is a large banner image showing a person in a suit interacting with a futuristic, glowing digital interface. Underneath the banner is the main headline: "Experience innovation. Create Markets." Below this headline is a section titled "We create World Class Innovators." which contains a paragraph of text and a small image of a person. To the right of this section is a "News" section with three news items, each featuring a small thumbnail image and a title followed by a short summary.

INC INVENTION CENTER

Home About us Offer Events News Contact

## Experience innovation. Create Markets.

### We create World Class Innovators.

The INC Invention Center on the RWTH Aachen Campus is your first point of contact for fast and customer-oriented transformation of ideas into innovations. To this end, we offer an established network of experts and bring you together with suitable research and industry partners. Innovative in a different way: Become a World Class Innovator with us - we accompany your innovation process from the technology and innovation strategy to the prototype.

We are looking forward to meet you!

### News

06.12.2018 | A moment for Agile Organization  
Take a moment and find out how the change to an agile organization can succeed.

06.12.2018 | 12th Aachen Technology and Innovation Management Conference and INC Annual Meeting 2018  
Inspired by fresh ideas for a modern technology and innovation management (TIM) the INC members met after a successful TIM conference for the annual...

12.10.2018 | INC Invention Center establishes new innovation hub in Hong Kong  
On October 11, 2018, the INC Invention Center opened its new office in Hong Kong.





# Innovative Tuesday

Our monthly free innovation talk  
at RWTH Business School.

Currently online! Every 2nd  
Tuesdays per month, 18:00 CET

[www.innovativetuesday.de](http://www.innovativetuesday.de)

## An Interactive Innovation Talk

„Innovative Tuesday“ is a networking format between the local economy, researchers and students in the field of innovation. On a Tuesday evening a month we welcome all those interested in innovation and innovation management at the **INC Invention Center** at the **RWTH Aachen Campus**. We are looking for exciting discussions with speakers from business and science as well as other participants from the region of Aachen on various aspects of the topic of technology and innovation management. All events will be held in English to promote the exchange even beyond the national border and involve the students of RWTH Business School.

**BUSINESS  
SCHOOL**

**RWTHAACHEN  
UNIVERSITY**

Industrie- und Handelskammer  
Aachen



**RWTHAACHEN  
UNIVERSITY**

**Co-create the future of innovation with us by engaging in one of our networking formats and professional education offerings:**

- **Innovative Tuesday:** A monthly free evening event connecting corporate innovators, students, and the Aachen innovation community on the RWTH Campus ([innovativetuesday.de](https://www.innovativetuesday.de))
- **TIM Expert Circle (TIMEX):** Our community of practice for R&D and innovation managers
- **INC Invention Center on the RWTH Campus:** Turn your concepts into successful products with agile methodologies ([invention-center.de](https://www.invention-center.de))
- **The Aachen Technology Management Conference**, co-hosted with Fraunhofer IPT ([TM-tagung.de](https://www.tm-tagung.de))
- **VDI Committees on Business Model Innovation** for Industrie 4.0 under our scientific advisory
- **RWTH Executive MBA** for upcoming leaders in technology companies ([emba.rwth-aachen.de](https://www.emba.rwth-aachen.de))
- **A wide variety of executive certificates:** e.g., Chief Digital Officer (CDO), Business Model Innovation (BMI), TIM Mini-MBA (via [campusforum.de](https://www.campusforum.de) and [business-school.rwth-aachen.de](https://www.business-school.rwth-aachen.de))
- **edX/RWTH TIME MicroMaster** on Managing Disruptive Change (via [edx.org](https://www.edx.org))

# Open for interaction



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