Meet TIME
An Introduction to the Research Area TIME
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Fraunhofer Institute for Production Technology IPT (p. 25)
Private (p. 12 top, p. 26)
Dear readers,

Since the establishment of the Research Area TIME (Technology, Innovation, Marketing and Entrepreneurship) in 2012, we have grown together as colleagues, researchers and friends.

In this report, we want to introduce our colleagues, our partners in research and practice and our students to our diverse research activities. After a short overview of the Research Area, we present you the highlights of the recent years in the fields of research and teaching.

We have published a number of articles in prestigious scientific journals and launched new research projects, which are located at the interface between economics, engineering and natural sciences. In the area of teaching, we succeeded in launching and implementing a TIME specialization in our M. Sc. programs.

Also, our team has grown: Since October 2014, Professor Dr. Stefanie Paluch and her team strengthen our activities in the areas of B2B, technology and service marketing. We will present these and further activities on the following pages in detail.

We hope to have aroused your interest and invite you to contact us.

Malte Brettel, Christian Hopp, Stefanie Paluch, Frank Piller, Torsten-Oliver Salge, Daniel Wentzel
Table of contents

Meet TIME

The Research Area TIME

The Research Area TIME ................................................................. page 5
The School of Business and Economics ........................................ page 7
Meet the professors ........................................................................ page 9
Appointments ................................................................................ page 12

Research activities

Our research philosophy ............................................................... page 14
Our publications .......................................................................... page 15
The Research Area TIME presents its activities ......................... page 17
Interdisciplinary research projects .............................................. page 23
Foundation of the Invention Center ............................................ page 25
Case Study Competition ............................................................... page 26

Contact

Contact ................................................................................................ page 28
The Research Area TIME

Facts & Figures

- Professors: 6
- Associated professors: 5
- Post-Docs: 7
- Student assistants: 19
- Team assistants: 6
- External PhD students: 7
- Scientific staff members: 79

Number of theses in 2014

<table>
<thead>
<tr>
<th>TIME</th>
<th>School in total</th>
<th>35%</th>
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<tr>
<td>128</td>
<td>363</td>
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External funds in 2013

- 2.15 Million €

More numbers

- 40 Distinct courses
- 14 FT-45-Publications
- 9,858 Accumulated citations in Google Scholar
The Research Area TIME

In a few words

The Research Area "Technology, Innovation, Marketing & Entrepreneurship", briefly TIME, was founded in 2012. The initiative arose from the Excellence Initiative at RWTH Aachen University, which has also led to a reorientation of the School of Business and Economics. The Research Area consists of the chairs and professorships of Professor Brettel, Professor Hopp, Professor Paluch, Professor Piller, Professor Salge and Professor Wentzel.

The TIME Research Area is at the center of the vision of an integrated, technical university and offers many opportunities for interdisciplinary cooperation. Together, the members of the Research Area are pursuing an ambitious research and teaching program with a clear focus on the conception, development and commercialization of technological innovations.

The aim is to provide students, scientists and practitioners with valuable evidence-based insights into the conception, development, design, commercialization and continuous improvement of new products, services and business models within established organizations and new ventures.

Thanks to an inspiring work and learning environment new answers and solutions to the most important challenges in research and society as a whole can be found.

The Research Area TIME maintains close links with leading research institutes and companies and conducts joint research projects.
The School of Business and Economics
Facts & Figures

Students WS 2013/2014

<table>
<thead>
<tr>
<th>School</th>
<th>RWTH</th>
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<tr>
<td>5,847</td>
<td>40,375</td>
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<table>
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<tr>
<th>thereof BA</th>
<th>thereof Industrial Engineering</th>
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<td>1,559</td>
<td>4,288</td>
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External funding in 2013

| 5 Million € |

Rankings

**TOP 10**

*2014 - Handelsblatt-Ranking Business Administration*

The School of Business and Economics ranks among the Top 10 research orientated management schools in Germany.

**Top position**

*2014/15 - Ranking Centre for Higher Education (CHE)*

The School was ranked as "excellent" with regards to the overall study situation, the international orientation and external research funding and is part of the "top" group.

**1st Place**

*2013 - University-Ranking Wirtschaftswoche*

RWTH Aachen University was ranked first in Germany in the category "Business Administration and Engineering" in 2013.
The School of Business and Economics

In a few words

The Research Area TIME is part of the School of Business and Economics at RWTH Aachen University.

Since its inception, business and economics have played an important role at RWTH Aachen University. In the year of its foundation in 1870, the university established an extraordinary chair for national economics and business management. The independent School of Business and Economics was founded in 1986 and has been growing ever since.

Research questions of global relevance can only be solved through interdisciplinary cooperation. Therefore, the School of Business and Economics focuses on interdisciplinary topics which are positioned at the interface between management, engineering and natural sciences.

As part of this effort, four Research Areas have been established, which reflect the strong internal centers of excellence deeply integrated into the wider university. Research Areas and the interdisciplinary networks enable students to approach problems from different angles at an early stage. As a result, the School has built an international reputation for excellence in research and teaching at the intersection of management and technology.

In April 2011, the School received the accreditation of the Association to Advance Collegiate Schools of Business (AACSB). In Germany, only eight business schools or schools of economics carry the accreditation of AACSB. This accreditation was renewed in March 2016.
Meet the professors

Malte Brettel
Innovation and Entrepreneurship (WIN)

Malte Brettel was born in 1967. He holds a degree in engineering and business administration from the Technical University of Darmstadt. In 1996, he received a doctoral degree and, in 2003, a post-doctoral Habilitation degree from the WHU Koblenz. Since 2003, Malte Brettel has been Professor of Business Administration and Entrepreneurship at RWTH Aachen University. He is co-founder of a successful e-commerce start-up, where he also acted as managing director. In addition to founding several businesses, he has extensive practical experience as a consultant, both for start-up firms and for established companies like Porsche AG and Deutsche Post AG.

Research Interests: General entrepreneurship; corporate entrepreneurship; entrepreneurial finance and controlling; entrepreneurial marketing

Christian Hopp
Technology Entrepreneurship (TEN)

Christian Hopp studied business administration at universities in Germany, the Netherlands, and the United States. He holds a Doctoral degree (Dr. rer. Pol.) in Quantitative Economics and Finance from the University of Konstanz, a Master in Business Administration from the University of Pittsburgh, USA, and a Master in Financial Management from the Rotterdam School of Management, the Netherlands. Prior to joining RWTH Aachen University in August 2013, he was an Assistant Professor at the University of Vienna, Austria. His research encompasses various areas ranging from venture capital financing, human resource management, to entrepreneurship.

Research Interests: Entrepreneurship and new venture emergence; entrepreneurial founding processes; business planning and entrepreneurial financing; venture capital financing and syndication
Stefanie Paluch
Service and Technology Marketing (STM)

Stefanie Paluch studied business administration at the University of Dortmund and at the Ceram Business School in France. For her dissertation at TU Dortmund University entitled ‘Customer Perception of Remote Service Technologies’ Stefanie Paluch received the dissertation award in 2011 by TU Dortmund University. Prior to joining RWTH Aachen University, Stefanie Paluch was an interim professor for innovation and technology management, 2013 to 2014 and an assistant professor for service and technology management, 2012 to 2014, both at the Faculty of Economics, Business Administration and Social Sciences at TU Dortmund University. Stefanie Paluch received the Rudolf-Chaudoire Award for outstanding research achievements.

*Research Interests:* Acceptance of technology-based services (remote services/smart technologies); marketing of innovative services and new technologies

Frank Piller
Technology and Innovation Management (TIM)

Frank Piller graduated with a Ph.D. in operations management from the University of Würzburg in 1999 and habilitated at the TUM Business School in 2004. He has headed the TIM Group at RWTH Aachen University since 2007. Earlier, he worked at the MIT Sloan School of Management and was an assistant professor of management at the TUM Business School (1999-2004). Frank Piller has worked as a consultant for many international companies, including several DAX30 and Fortune 500 corporations. As a member of their board of scientific advisors, he works with a number of innovative technology companies to bring his research into practice. He also is a co-founder of the MIT Smart Customization Group, Massachusetts Institute of Technology, USA.

*Research Interests:* Innovation interfaces (open innovation and co-creation); strategies for managing disruptive innovation, technology transfer and technology acquisition
Meet the professors

Torsten-Oliver Salge
Innovation, Strategy and Organisation (ISO)

Torsten-Oliver Salge studied business administration at universities in Germany, France, Italy and England. He holds a Ph.D. and an M.Phil. degree, both from the University of Cambridge. Prior to joining RWTH Aachen University in April 2013, he was an interim professor at the University of Duisburg-Essen, 2012 to 2013, a junior professor at the University of Bochum, 2009 to 2012, and a post-doctoral research associate at the University of Cambridge, 2009. He has held visiting scholar appointments at universities in Auckland, Buenos Aires, Cambridge, Oxford and Philadelphia. As part of his research program, he has collaborated with a number of organizations from sectors such as healthcare, public services and financial services.

Research Interests: Collaboration across organisational and institutional boundaries; strategic HRM and employee well-being; technology legitimation; adoption and payoff

Daniel Wentzel
Marketing (MAR)

Daniel Wentzel was born in Bonn in 1978. He has held the Chair of Marketing in the School of Business and Economics at RWTH Aachen University since spring 2011. Daniel Wentzel studied business administration at the University of Cologne and the University of Auckland, New Zealand. In 2008, he received his doctoral degree from the University of St. Gallen, Switzerland. From 2008 to 2011, he worked as an assistant professor at that university and received his post-doctoral Habilitation degree in 2010. As part of his research program, he has worked together with many companies from the automobile, retailing and financial services industries.

Research Interests: Consumer behavior; consumer acceptance and adoption of innovations; product design; service and brand management
Appointments
Post-docs accept new professorships in Dortmund and Hamburg

In January 2014 two post-doctoral students of the Research Area TIME, Tessa Flatten and Christoph Ihl, were appointed as full professors by Universities in Dortmund and Hamburg. We would like to congratulate them on this achievement and wish them much luck establishing their research groups!

Tessa Flatten
Tessa Flatten was appointed to a professorship at TU Dortmund at the Chair of Business Technology Management and declined offers from Justus Liebig University Giessen and University of Lübeck. Previously, since 2011, she was a post-doctoral researcher at the Chair of Innovation and Entrepreneurship (WIN). Her research focuses on innovation and knowledge creation as well as entrepreneurship. Tessa Flatten obtained her doctorate between 2007 and 2011 on the subject of organizational absorption capacity at RWTH Aachen University, where she also studied business administration.

Christoph Ihl
Christoph Ihl heads the Institute of Entrepreneurship and the STARTUPDOCK of Hamburg University of Technology since April 2014. Previously, since Juli 2009, he was employed as assistant professor and research group leader at the chair of Technology and Innovation Management (TIM). His research focused on technology transfer, open innovation and methodological work regarding surveys on preferences of consumers and managers. Christoph Ihl studied industrial engineering with a focus on mechanical engineering at the Technical University of Berlin and completed an MBA program at the University of British Columbia in Vancouver. He obtained his doctorate at the Technical University of Munich with a focus on the topics of mass customization and consumer behavior.
Research within the Research Area TIME

Our research philosophy

Research activities within the Research Area TIME pursue the common objective of generating new evidence-based findings on fundamental research questions in the areas of technology and innovation management, marketing and entrepreneurship. We adopt an integrative methodical approach (mixed methods). This allows us to benefit from the complementary nature of quantitative, qualitative and experimental methods to obtain a holistic assessment of our research questions.

Application-orientated, third-party funded research complements our basic research activities that seek to push the knowledge frontier in our discipline and regularly lead to publications in leading international journals. Furthermore, our special concern is to ensure that the results of our research are transferred into practice. Therefore, the members of the Research Area TIME are involved in research cooperations with companies and other research institutes. The entrepreneurship center, headed by Professor Brettel, also constitutes an important vehicle for knowledge transfer within the Research Area TIME and RWTH Aachen University more generally. Its main objective is to make the prospect of founding a technology-based start-up more attractive among students and scientists at RWTH Aachen University and support them on their way from the initial idea to the successful business launch.

Highlights

- **Our publications** .............................................................. page 15
  In the last years, we published articles in journals like Entrepreneurship: Theory and Practice, Journal of Applied Psychology, Journal of Marketing and Journal of Service Research.

- **Interdisciplinary research projects** ................................ page 23
  Research projects within the Research Area TIME examine the rejection of external knowledge and the individualization of consumer electronics and are promoted by well-known institutions.

- **Founding the Invention Center** ....................................... page 25
  In June 2014 the Invention Center was founded, a cooperation between the KEX AG, the Fraunhofer Institute for Production Technology IPT and the Research Area TIME.

- **Case Study Competition** ................................................. page 26
  Members of the Research Area TIME established the Medical Adhesive Revolution GmbH, a manufacturer of products for wound care, and won the largest business plan competition in the world.
Our publications

Recent publications

Members of TIME publish in leading international journals in the field of technology and innovation management, marketing and entrepreneurship.

**Category A+**

**Category A**

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1 Note: Based on JOURQUAL 3 Journal Ranking

**Category B**

A study by Professor Wentzel examines the role of product design

The design of a product has a significant influence on consumers’ purchasing decisions and can represent an important competitive advantage. A study by Professor Wentzel carried out together with his colleagues Professor Jan Landwehr (Goethe University Frankfurt) and Professor Andreas Herrmann (University of St. Gallen) examines how consumers respond to typical and atypical designs in the automotive sector.

"The design of an automobile has a significant impact on its market success."

The results show that consumers process typical designs more easily and prefer these types of designs when they see them only a few times. However, when they are exposed to each product several times, they perceive typical designs as boring, whereas atypical and innovative designs are seen as substantially more aesthetic. In addition, the design of an automobile has a significant impact on its market success. An analysis using sales data of 28 models in the German market showed that cars with a more typical design exhibited higher sales at the beginning of their life cycle compared to cars with an atypical, innovative design. However, in the long run, atypical designs proved to be much more successful. In year three, atypically designed cars outsold their counterparts with a typical design. After five years, their cumulative sales exceeded those of cars with a typical design. These results demonstrate that companies with a higher focus on unusual product designs are more successful in the long run.

Mr. Wentzel: Defend your research
Three questions to Professor Daniel Wentzel about the role of design

1 Your study focuses on the role of product design in the automotive industry. From your point of view, why do you look at product design? We know a lot about traditional marketing tools like pricing or communication. Compared to this, we know little about the role of product design in purchasing decisions. This was surprising to us, because the design is the first eye-catching product feature a consumer is exposed to. Insofar product design should be a core area of marketing.

2 What does a good product design seen from a marketing perspective look like? This question cannot be answered easily. Our results show that aesthetic preferences can change over time. In case consumers see a car only a few times, they prefer simple and typical designs. On the other hand, in case they see them several times and thus have more time to decide, they favor innovative and atypical designs. Eventually, these perceptual changes are reflected in actual sales figures.

3 What kind of advice would you give companies based on the results of your study? I would advise companies to be more courageous and innovative when designing their products. In many categories such as cars, electronic and home appliances products look quite similar and boring. Our study shows that products with innovative and exceptional designs sell better in the long term – even though it takes time until consumers get used to these new designs.
A study by Professor Paluch examines the acceptance of technology-based services

Specific technology-based services – so-called remote services – rely on IT infrastructure without personal contact between provider and user to conduct diagnosis, maintenance and repair tasks remotely especially in the fields of IT, medical technology and mechanical engineering.

However, the results also uncover paradoxical behavior among users. On the one hand, users wish to participate actively in providing the service to maintain control over key processes. On the other hand, they reject a full integration due to personal and contractual reasons.

The empirical study shows that the desire for integration depends on how the service was initiated. To avoid unsatisfied users, companies should integrate them into their processes if the provider initiated the intervention. In contrast, when users trigger the service, the provider might opt not to integrate them any further into the actual problem-solving process.

"These innovative services provide tangible benefits to both providers and users. Acceptance in actual practice, however, is still low."

Three empirical studies conducted by Professor Paluch in collaboration with Markus Blut (Newcastle University) show that customer satisfaction of remote services consist of eight different factors, e.g. safety, reliability, process integration and individualization.

Mrs. Paluch: Defend your research
Three questions to Professor Stefanie Paluch about technology-based services

1 Your study examines the role of remote services within medical technology industries. Why especially consider technology-based services? Nowadays, digitalization of services plays an important role and is supposed to generate time and cost benefits for companies and customers alike. Despite these advantages, using technology-based services poses new challenges. From a marketing perspective, there is considerable need for further research into the commercialization and usage of digital services.

2 Which aspects of commercialization of remote services are important for companies? First of all, providers should clearly communicate that these technologies are not supposed to fully substitute personal contact with users. Personal interaction is still important for users and influences their level of satisfaction. Furthermore, it is important to offer control options to consumers. Our study shows that different dimensions can determine the level of satisfaction.

3 With respect to your results, what can providers of innovative services learn? Companies must introduce innovations as part of a continuous dialogue and should keep in mind that some users wish to interact and be a part of the service process. This is especially the case if remote maintenance has been initiated by the provider. In case of customer-initiated services on the other hand, providers are recommended to avoid an integration in the service provision process, since it might be interpreted as a lack of competence.

Professor Dr. Stefanie Paluch, Chair STM
Our publications
The Research Area TIME presents its activities

A study by Professor Hopp examines the provision of risk capital

With regards to the provision of risk capital for young enterprises, we observe an increasing tendency towards joint project funding by a multitude of investors.

The collaborative work by Professor Hopp and Professor Christian Lukas (University of Jena) entitled "A Signaling Perspective on Partner Selection in Venture Capital Syndicates" examines, in light of this background, which factors play a role in selecting a suitable financing partner. The article was published in May 2014 in the leading international journal Entrepreneurship: Theory & Practice.

The results show that prior investment experience of a potential partner is a significant predictor of cooperation only if previous collaborative projects were funded or if both potential partners have an overlapping social network. Moreover, the strength of the signals depends on the frequency of joint bilateral cooperations. Reciprocal invitations are observed frequently, where lead investors respond to invitations of former partners.

"Selecting a suitable partner by the leading venture capital provider is a decisive factor for the later success of a transaction."

The shared deal flow will be strengthened by this fact and will be made accessible to the partner. Overall, the results show that successful transactions are strongly concentrated on a small number of venture capital firms, who often fund jointly.

Mr. Hopp: Defend your research
Three questions to Professor Christian Hopp about venture capital transactions

1 Your study examines the venture capital transactions especially in Germany. Which features can be ascertained? The German market is generally characterized by business-unfriendly conditions like rigid employment contracts, little incentives for academic entrepreneurship, and high capital gain taxes. Due to these factors, it is harder for venture capital companies to promote interesting enterprises and technologies. As a result, it is of great importance that different venture capital companies work together in order to jointly fund these projects. Consequently, the same big players can be found when it comes to successful transactions. Furthermore, shared transactions allow them to analyze the market and offer the possibility of a subsequent initial public offering.

2 In which areas do you identify pent-up demand regarding venture capital financing in Germany? Over time, we can show that German entrepreneurs and funders react very strongly to external business models and financial instruments, for example from the USA. During the period of investigation, we also observed numerous public initiatives for entrepreneurship. Mostly, we find incremental innovations rather than radical ones. Most patents for example originate from established industries. To that extent, a lack of ideas cannot always be compensated by an increase in capital.

3 Which advice would you give to potential investors based on your results? Our results demonstrate that successful venture capital alliances mainly depend on whether sufficient industry experience can be generated by own transactions and whether you can find openness regarding collaborative funding. Additionally it is very important that persistent and reciprocal connections are formed, which allows the partner to benefit from their own deal flow.
Interdisciplinary research projects
Current research projects funded by prestigious institutions

Ideas, tooth brushes and the Not-Invented-Here (NIH)-syndrome

Ideas are like toothbrushes, according to the psychologist Dan Ariely. Everyone wants one, everyone needs one, everyone has one, but no one would like to use the toothbrush of someone else. This is exactly the case with the ideas and the knowledge of others, which often, despite obvious advantages, meet with refusal. This resistance to the adoption of external knowledge is referred to in the literature as the Not-Invented-Here syndrome (NIH).

Within the framework of a biennial research project sponsored by the "Otto von Guericke" e.V. association, concrete measures are being developed to overcome this problem in business practice. Under the direction of Dr. David Antons, this project goal is pursued together with employees of the TIM and ISO chairs as well as other research facilities of RWTH Aachen University together with well-known companies. The following questions are in the focus of the research interest: How can a company determine whether and to what extent their own research and development employees are open to external knowledge? How can the NIH syndrome with its negative consequences be avoided as effectively as possible? On the basis of the research results, an SME-compatible and scientifically validated test instrument is developed to determine the extent of the NIH syndrome as well as solutions for the associated challenges. Three specific approaches are being studied to avoid and reduce the phenomenon: change of attitude, debiasing and nudging. The last two approaches relate to the use of techniques that systematically improve the distorted decisions and ways of thinking of a decision-maker. The aim is to create a method pool for the prevention of the NIH syndrome.

"Ideas are like toothbrushes, everyone wants one, everyone needs one, everyone has one, but no one would like to use the toothbrush of someone else."
Can watching TV protect the environment?

This hypothesis is somewhat daring, but at least the device, with which we spend up to four hours a day as an average German, has a high impact on environmental sustainability.

The SMC-EXCEL (Sustainable Mass Customization for TVs) project, funded by the EU and the BMBF, is therefore looking for product and behavioral innovations to make TVs (representing other entertainment electronics) more sustainable. "TVs have become a disposable product by now. Once, they were used 12 or more years. Nowadays, it is often necessary to purchase a new device every two to three years", says Stephan Hankammer of the Research Area TIME and manager of the project. "Our hypothesis is that above all a massive individualization (mass customization) of the devices promotes sustainability here".

Modularization of the product architecture thus allows e.g. simple upgrades or repairs. The vision is also that consumers can configure their new TV at the time of purchase. Perhaps "eco-components" from sustainable raw materials are more likely to be chosen. Consumers also often have a higher emotional connection to individual products and use them longer. But the ideas even go further: Why not immediately bundle an eco-electricity contract with the TV or the price of the television to the recycling of the old device?

"TVs have become a disposable product by now. Once, they were used 12 or more years. Nowadays, it is often necessary to purchase a new device every two to three years."

The aim of the project is, on the one hand, to broadly test the acceptance of these sustainability options among European consumers. On the other hand, close cooperation with Vestel, the second-largest television producer in the world, will also be used to test the feasibility of the hypothesis in the form of prototypes and design studies. Other project partners will review the aggregated effects of the scenarios in sustainability analyses.
Founding the Invention Center

On the RWTH Aachen University Campus, a playing field for explorers and inventors has been created.

On June 24, 2014, the inauguration of the Invention Center took place at the cluster of logistics on the RWTH Aachen University Campus. A new world of experience for technological trends and innovations is being built on around 1,000 square meters.

"The Invention Center is to become a place where technology and innovation management companies can further qualify and develop solutions for special challenges."

The Invention Center was initiated by KEX AG, Fraunhofer Institute for Production Technology IPT and the Research Area TIME. The Scientific Board of the Invention Center is composed of the RWTH professors Malte Brettel, Frank Piller, Günther Schuh and Daniel Wentzel.

The purpose of the Invention Center is to facilitate access to technology and to qualify and educate excellent technology and innovation managers. Also, the aim is to conduct research together with industry partners and to strengthen the connections between partners and experts from the technology and innovation management community.

The environment is intended to create a creative framework for joint innovation projects for the partners of the Invention Center, in order to convert ideas into market-ready products in less time and with lower costs than before. 3M, Daimler, Hilti, Johnson Controls and Thyssen-Krupp have already joined as premium industry partners for the Invention Center. In addition, there are 13 other companies as business and basic partners. In the medium term, ten premium partners and 30 to 40 additional partners will be part of the Invention Center.
The Medical Adhesive Revolution GmbH develops and markets wound care products. The two core products are a biocompatible wound adhesive to apply on the skin and a biodegradable wound adhesive to use inside the body.

The products are based on a proprietary polyurethane technology and can be applied using a two-component syringe. When used, the two components mix in the static mixer of the 2K syringe and cure within about 30 seconds. For both products, customers are primarily hospitals, plastic surgeons, rescue services, as well as the military.

Since 2007, the technology has been developed by Bayer MaterialScience (BMS) and has been tested since 2008 in the laboratories of the University Hospital of RWTH Aachen University. After a strategic decision of the BMS management, the technology was put on sale in 2012. In November 2013, the shareholders Dr. Heike Heckroth (authoritative inventor of the technology), Professor René Tolba (Head of RWTH Aachen Institute of Laboratory Animal Science), Professor Malte Brettel (Rector of RWTH Aachen University for Industry and Head of the Founding Center), and Marius Rosenberg (Ph.D. student at RWTH Aachen University), founded the Medical Adhesive Revolution GmbH.

Following a capital increase in January 2014, the patent portfolio related to the polyurethane tissue adhesives technology has been taken over completely in February 2014. In April 2014, the team won the Rice Business Plan Competition in Houston, Texas, which is commonly known as the biggest business-plan-competition worldwide, and received prize money exceeding $500,000.

Since then, the company has expanded to the US and founded Adhesys Medical Inc., located in the Texas Medical Center, which is in charge of bringing the products to the US market.
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