Cross Industry Innovation –
How to develop innovative digital ideas in the automotive industry

Edited by: Muhamed Aziz, Laurenz von Eickstedt, Christian Fischer and Julia Kristina Mecheels
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Supervisor: Prof. Ellen Enkel
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Abstract

There are numerous ways of designing and conducting workshops approaching the development of innovative and breakthrough ideas. This paper includes an example of how a workshop with a cross-industry approach could be designed, and explains how it results in an innovative digital distribution model within the automotive industry.

The cross-industry approach is based on the five phases of Gassmann and Zeschky’s A4 - Innovation Process Model and, furthermore, is supported by the use of Biomimicry and Wishing as ideation methods.

A group of eight students of Zeppelin University ran through this specific workshop format. Based on these insights, it indicates the development of product or service innovations by means of the respective workshop setup.
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1. Introduction

Throughout previous years, the factor digitalization has intruded into nearly all industries, which, in turn, have to draw necessary conclusions for the future. Such that products offer novel functions, with remarkably improved price/performance ratios that transform their design, production, distribution and use, with embedded digital capability (Yoo et al., 2010). New strategies have to be developed to cope with the emerging market dynamics by competing head-to-head on the one hand and collaborating on the other (Yoo et al., 2010).

This paper concentrates on the example of the automotive industry, as a car has become a computing platform where other firms outside of the specific industry can develop and integrate new devices, networks, services and content (Henfridsson and Lindgren 2010).

In form of a market analysis, the following section of the paper gives a detailed insight of the future challenges the automotive industry faces. With this as a fundamental basis, the authors developed a conceptual workshop with the A⁴-Process Innovation Modell of Gassmann and Zeschky (2008) as a theoretical framework, and used the methods “Biomimicry” and “Wishing” at different stages of the workshop as structural approaches to come up with innovative ideas. In the end, the practical applicability of the workshop and its target orientation towards the automotive industry, correlating with the factor of digitalization, is shown by executing the workshop, resulting in an innovative distribution service.

1.1 Distribution

Regarding the automotive industry, different impacts can be identified, e.g. the growing competition through the increasing globalization, modified user behavior like car sharing or climate change (Heismann & Maul, 2012; Giesa & Schiller Clausen, 2014; Widuckel, 2015). Especially urban mobility is one of the greatest challenges (Lerner, 2011). By 2050, the worldwide population of urban areas will increase by 2.6 billion to 6.3 million people (United Nations, 2011). However, the current infrastructure cannot deal with these pressures (Störmer et al., 2009). City centers are poorly accessible, the road networks are suffering
from traffic volume and the environmental impact is already too high in urban areas (Kuhnimhof et al., 2012; Van Nes & Bovy, 2004; McKinnon et al., 2009). Moreover, the changing mobility patterns of people and the demographic changes are challenges for citizens, governments and companies (Spickermann, 2014). Therefore, solutions have to be found to deal with these impacts and to modernize the current mobility system from an economical, environmental and institutional point of view (Spickermann, 2014).

Besides the growth of urban civilization, a worldwide increase of the population and expanding trade can be identified. Therefore, the logistics industry has to find a way to transport an increasing freight volume through a system stressed by traffic and infrastructure (Stillman & Welch, 2015). At least the logistic industry is heading to meet the challenge. Driverless trucks, controlled by onboard computers, aerial drones and unmanned ships are new technological approaches. The vehicles are linked to each other and to central computer systems that analyze and calculate routes to optimize delivery time, fuel efficiency and profits (Stillman & Welch, 2015).

### 1.2 Digitalization

Focusing on product manufactures, a growing service orientation can be identified. This trend can be described as servitization (Lerch & Gotsch, 2015). Companies are moving from simply selling products to offering supportive services (Baines et al., 2009). These services can be traditional and product-related such as maintenance or even advanced customer-oriented services (Lay, 2014). The shift to move toward developing new services has coincided with the trend towards digitalization (Lerch & Gotsch, 2015). Thus, products are able to operate without human intervention (Lerch & Gotsch, 2015). As a result of these trends, the number of manufacturers using digital systems to support their services has increased (Münster & Meiren, 2011). As a logical consequence, manufacturers have to recognize these emerging impacts, otherwise they could be threatened with extinction in the near future (Lerch & Gotsch, 2015).

However, the merging trend of digitalization is a largely unexplored potential for manufacturing companies (Lerch & Gotsch, 2015). There are new capabilities to
simplify, accelerate and optimize existing processes and to develop new forms of customer integration (Schuh & Fabry, 2014). Therefore, new services based on digitalization may have far-reaching consequences for companies and the entire manufacturing industry (Lerch & Gotsch, 2015). To deal with this shift, companies have to identify their potential to develop digital services. Moreover, customer needs and market potentials have to be detected (Lerch & Gotsch, 2015).

In the following, one method of how to approach this industry challenges for the automotive industry will be explained in detail.

2. A⁴ - Innovation Process

2.1 Description of the theoretical framework

Firstly, a theoretical framework for the workshop setting will be introduced. In this context, the concept of analogical thinking has to be mentioned, which uses information from one domain in order to solve a problem in another. Analogical thinking is a method to transfer existing and available knowledge from different areas to create new ideas (Dahl & Moreau, 2002), which makes the method specifically suitable for cross-industry innovation. Gassmann and Zeschky (2008) have found that using this cross-industry solution process reduces the usage of resources and decreases the risk and time that are normally involved in finding an adequate result.

After conducting research on the usage of the analogical thinking, Gassman and Zeschky (2008) came up with the A⁴ – Innovation Process. The purpose of this process is to provide a structured approach in analogical solution finding for interested firms, encouraging the application of analogical thinking. The usage of such an approach supports knowledge exchange between industries, assisted through the increased dependency in the internet, which documents research and technological progress. If we were to look for an innovative solution of distribution in the automotive industry, the A⁴ – Innovation Process may be used to assess possible results through comparing distribution methods with those of other sectors.
After having analyzed the A\textsuperscript{4} – Innovation Process, which typically consists of five phases, as shown in Figure 1, it was decided to only work with the three most relevant ones for the workshop setting, in which the goal is to develop cross-industry analogies for idea generation in the area of mobility and innovative distribution. In this context, the A\textsuperscript{4} – Innovation Process is intended as a framework for the workshop setting, which will guide the workshop through the different stages, from problem identification to ideation. Thus, we have assessed the relevant phases to be Abstraction, Analogy and Adaptation, as without these three steps it is impossible to find an adequate solution through analogy.

Abstraction describes the process of analyzing the internal problem and defining the key terms that need to be enhanced. Once these points have been identified, analogies may be investigated in the different sectors. This is what defines the Analogy process. When such analogies have been found, it is important that the information is transferred and adjusted to the particular problem, as analogies only serve for inspiration and need to be adapted to one’s own situation.

The first step that we do not focus on in depth is Strategic Intent, meaning that a firm needs to have an open mindset towards outside technologies. Within a workshop setting, this open mindset would be achieved by providing input about general trends in the mobility industry, as introduced in chapter 2. Also left aside is the Assessment phase, which analyzes and evaluates found knowledge and its target source using technical equipment. Since the workshop setting can neither provide the necessary access to computers or similar research equipment nor provide the necessary time frame to conduct this research phase in depth, the Assessment phase will be understood as part of the Adaptation phase for our purposes. Nevertheless, it is important to mention that within the

**Figure 1:** The A\textsuperscript{4} – Innovation Process, own representation based on Gassmann & Zeschky (2008)
A4– Innovation Process, the Assessment phase is a crucial step to ensure the acquisition of relevant knowledge, which will enable a substantiated assessment of the analogies that have been developed before.

### 2.2 Abstraction and Analogy

#### 2.2.1 Definition

As explained before, Abstraction and Analogy are the second and third phase of the A4– Innovation Process. Whereas in the Abstraction phase, the focus lies on identifying the context of the relevant problem and defining search terms connected to the problem, the Analogy phase intends to conduct the search for any similarities that can be put into context with the defined problem (Gassmann & Zeschky, 2008).

A specific method of analogical thinking will be used to guide through the Abstraction and Analogy phase in a workshop context, which is called “Biomimicry” and elaborated on in the following paragraphs.

#### 2.2.2 Biomimicry

**What is “Biomimicry”?**

“Biomimicry” is a term that combines the two greek words *bios* (life) and *mimesis* (imitate) to define a new discipline used for innovation (Verbrugge, 2011). The concept of Biomimicry was firstly introduced by Janine Benyus in 1997, when she defined a new form of innovation based on nature and its life cycles with the aim of encouraging the development of more sustainable innovations within the industrial world (Benyus, 1997). Benyus defines Biomimicry as “a new science that studies nature’s models and then imitates or takes inspiration from these designs and processes to solve human problems, e.g. a solar cell inspired by a leaf” (Benyus, 2002, front pages). In her understanding, nature has already solved numerous problems that our industrial world is dealing with, and all observable processes in nature can be clustered into a limited amount of patterns. These patterns can serve to find inspiration for problem solving approaches and for new technological inventions (Benyus, 2002). To put it in a nutshell, Biomimicry is *learning from nature* (Ratnieks, 2008).
How and when to use it?

The basic principle of Biomimicry in the analogy process is to recognize that it is not intended to replicate nature’s processes in the exact way, but to find parallel principles that can be used as a basis for future ideation (Kennedy et al., 2015). Biomimicry thinking can be used for various purposes, however, Baumeister (2014) developed a method specifically for entrepreneurial purposes and innovation, which is called “Biology to Thinking”. The path is appropriate if a process is to start with an inspirational insight into nature’s processes to find analogies that can be used later on. As shown in figure 2, the first steps can be placed within the Abstraction phase of the A^4 – Innovation Process. Firstly, the path starts with discovering problem-solving strategies that nature provides by observing the environment. In the second and third step, those observations are abstracted to define underlying strategies and to identify the resulting functions of those processes. Those steps provide the means to define relevant search terms that can be used to find analogies in the next step. After that, the path dives into the Analogy phase of the A^4 – Innovation Process by defining the technological context which the observations can be embedded into, to develop ideas for suitable analogies (Baumeister, 2014).

![Figure 2: The Biomimicry Biology to Design Path, own representation based on Baumeister, 2014.](image)

While the actual biomimicry process also provides further steps for the ideation process, this workshop design only concentrates on the steps that are relevant for the Abstraction and Analogy phase of the A^4 – Innovation Process.

**Examples of successful innovations with Biomimicry**

A well-known example of innovation based on Biomimicry thinking is the development of the Japanese train *Shinkansen 500 series*. The company’s engineers managed to increase the speed of the train by applying traditional engineering practices, but were faced with the problem of the noise that a train
at such a high speed would produce. Especially when entering and exiting tunnels, the pressure change would produce an exceeding amount of noise. Thus, the engineers searched for possible solutions by applying Biomimicry thinking and found a solution to their problem with the discovery of the kingfisher, which is a bird that minimizes energy loss and splashing when it enters the water by the shape of its beak. The pressure change in the process of entering water from air is similar to the problem that the Shinkansen train faced when exiting tunnels. The engineers found the solution to their problem by replicating the kingfisher’s beak and by constructing the nose of the train in the exact same way as the beak. As a result, the train was faster, quieter, and more energy efficient, which made it a successful innovation in the mobility industry (Verbrugge, 2011).

2.3 Adaption

2.3.1 Definition

Adaption, as the fifth and last phase of the A4 - Innovation Process, concentrates on the generated ideas of the previous four phases and how to apply these in practice. Most likely there is not the one and only area of adaptation for the idea generated and there can be many creative ways of bringing them into use. There are different approaches of ideation techniques that can help to come up with a set of ideas, from which the most suitable ones are picked. Such an approach would be “Analogical Thinking” and “Biomimicry” as stated in section 3.1 of this paper (Mattimore, 2012).

The following section concentrates on “Wishing” as another ideation technique, showing how it can have an accelerating effect on the process to come up with creative, useful and adaptable applications for the topic of innovative distribution with focus on digitalization.

2.3.2 Wishing

What is “Wishing”? 

Wishing is an ideation technique, which starts of with the setting “anything is possible”. In other words, there are neither restrictions on time, money, energy,
nor on legal issues. This approach promises a fresh starting point as well as an open mind-set and makes it easier to think outside the box (Mattimore, 2012).

**How and when to use it?**

In general, the method takes place in a group setting to bring in as much creativity as possible and to come up with entirely new solutions, products or competencies to tackle existing challenges.

Wishing is carried out in two main steps. Usually, it starts off by encouraging the people involved to think of the “impossible” in context with their topic. By doing so, it helps a team to challenge perceived limitations around any creative opportunity (Mattimore, 2012).

As soon as roughly twenty to twenty-five wishes have been expressed and noted, the team enters the second phase and works its way through several of the more unrealistic wishes, to use these as stimuli for more realistic and implementable ideas. The group keeps on preceding the second step over and over again until a preferable number of innovative, exciting and practical ideas have been generated (Mattimore, 2012).

**Advice to facilitator:**

Not everyone is comfortable with an approach like Wishing, which seems a little childish to some participants. The mature attitude adults have been trained to stay “realistic” and “practical” in the job, therefore, it could be a hurdle that needs to be cleared. At this point, the facilitator has the very important role to encourage the participants, by modelling the behavior he wants the participants to show. This can be achieved by asking questions like: “Anybody here wish they could exist in two dimensions at once?” “How about a machine that would record your potential customers’ every thought?!” (Mattimore, 2012).

Finally, it is critically important to separate the Wishing stage from the “Turn the wishes into reality” stage, to assure the practical relevance of the final results (Mattimore, 2012).
3. Results and Discussion

3.1 Workshop Outline and Methodology

Section three of the paper tries to bring the theoretical input of the previous sections into practice, by executing a workshop based on the steps of the A4–Innovation Process, with a focus on the three phases Abstraction, Analogy and Adaption. Concerning the latter two, Biomimicry and Wishing are the methods used to come up with innovative, break-through ideas in context of innovative distribution in relation to the automotive industry. Since the phase Abstraction focuses on the analysis of problems in the market and how specific customer needs can be tackled, there was a perfect fit with the market analysis in the first section of the paper, to clarify the challenges that Analogy and Adaption should come up with concrete solutions for.

The workshop was carried out by the members of Group 4, as part of the Knowledge Management Course held at Zeppelin University in Friedrichshafen (Spring Semester 2016). The group consisted of eight group members, whereas one operated as facilitator throughout the workshop. The workshop was carried out the same way as to read in this section.

Strategic Intent:

As explained earlier, the workshop focused on the phases Abstraction, Analogy and Adaption, because they allow a practical feasibility in a workshop setting. Still, the workshop constructors had to look at the phase Strategic Intent in advance to offer a theoretical base on which the participants could build on with the creative ideas that they should come up with in relation to innovative distribution throughout the workshop. This was done in form of a market analysis of the automotive industry in combination with the aspects of digitalization as it was the field of the workshop, which was determined in advance. The result of the analysis was also used as the introduction of the paper.

Abstraction & Analogy:

In the Abstraction and Analogy phase, the participants first looked for characteristics their idea should fulfil at the end of the workshop. They were
discussing the business analysis as well as the main targets and trends their idea should tackle in the area of digital distribution, automotive industry and digitalization. Finally, the team agreed that the main problems to be solved at the moment are the lack of connectivity, efficiency, flexibility and digital access in the automotive and distribution industry.

From there on, Biomimicry comes into play. The facilitator asked the participants to look for any problem-solving strategies that nature provides, which could be used to solve the challenges that were elaborated in the previous phase in context to the respective topic. After a long discussion, one of the group members came up with the analogy of ants and how they manage to transport leaves and other material along a distance very efficiently. Although the total biomass of ants is bigger than the total biomass of humans, ants are much more efficient in their distribution and transportation activities resulting in relatively much less pollution (Mathews, 2011). Why not use that procedure and apply it to our challenge? The group decided to proceed with the idea of ant-distribution-chains and so the Analogy phase was completed successfully and the workshop proceeded.

**Assessment:**

As well as Strategic Intent, phase four Assessment is not very feasible in a workshop setting, which led us to the conclusion not to put too much focus on it. It is rather a slot in which every participant gets some time to find out more about the topic specified in the previous phase individually. Therefore, the group continued directly with the final phase “Adaption”.

**Adaption:**

Throughout the previous phases, the participants came up with characteristics their idea needs to fulfil, such as connectivity and flexibility, as well as with an analogy from nature, which was the idea of taking the ant-transportation-system and transfer it towards the factors automotive, innovative distribution and digitalization. This was the starting point for the final phase of the workshop, which was conducted using the Whishing method.
The participants were encouraged to think of the impossible, how the ant-transportation-system could interlink with the terms automotive, innovative distribution and digitalization. Numerous ideas were brought up, with some being very abstract. However, the intent was to create ideas without the limitation to consider the current feasibility.

In a next step, the group assessed all ideas and discussed which of them were most applicable in reality. Finally, the group agreed on the idea of intelligent car distribution, which we will further elaborate on now.

**3.2. Result of Workshop**

The final idea is tackling the postal industry with an innovative distribution idea for package transportation. To realize this idea, cars of the future should be wirelessly connected with each other and communicate their location as well as their future routes. While this interconnection of cars could firstly be applied to more efficient use of transportation by using it as a car sharing method, the workshop idea expands this idea even further. A car that plans to travel from location A to location B could not only take people but also packages along this route. Even if the package has location C as its final destination, the car could communicate with another car which is travelling to location C. At any intersection of the two cars the package could be passed on from one to the other. This transportation chain could be continued endlessly, as long as efficient communication between cars is ensured. The process could be organized without direct human interaction and, thus, tackle the trend of digitalization. Furthermore, the previously identified problems could be solved, since the intelligent car distribution is not only interconnected and digitally accessible, but also flexible and efficient. Therefore, it is providing clear advantages for both the automotive industry and the postal services.

**4. Conclusion**

Since the automotive industry is currently dealing with problems that could lead to a change in the industry landscape (Störmer et al., 2009), there is a need for innovative ideas to tackle those challenges. Especially digital approaches minimizing human intervention could shape the future of transportation and
distribution (Lerch & Gotsch, 2015). One approach to those trends is cross-industry innovation (Gassmann et al., 2010), which implies the development of innovative business models by accessing resources and partners in other industries.

This paper introduced the A⁴ – Innovation Process (Gassmann & Zeschky, 2008) as a theoretical framework of a cross-industry innovation process, using analogical thinking as a basis to create new ideas in the context of digitalization. By introducing the creativity and ideation methods Biomimicry and Wishing, two approaches were introduced that could support the practical application of the theoretical model in a workshop context. The paper developed the methodological approach to conduct a workshop following the A⁴ – Innovation Process and described the process and results of a conducted workshop in a closed environment. Finally, the workshop resulted in the idea of innovative distribution cars, which introduces a new way of transporting packages and, thus, offers an applicable cross-industry innovation example for the automotive and postal industry. The paper shows that cross-industry innovation is a functioning approach to new industry trends and to the omnipresent challenge of developing new ideas in the digital era.

However, a limitation of the practical approach is that the workshop was conducted in a closed environment with students only. To be able to assess the applicability of this workshop setting, future research should conduct the workshop again in a real industry case with a partner company to ensure realistic results. Furthermore, this paper does not consider the phase “Analysis”, which enables a deeper understanding of the analogies that were identified during the A⁴ - Innovation Process (Gassmann & Zeschky, 2008). Future research could elaborate on the importance of this phase for the development of innovative ideas in a workshop context.
References


Ehrenwörtliche Erklärung

Wir erklären hiermit ehrenwörtlich, dass wir die vorliegende Hausarbeit mit dem Thema:

„Cross Industry Innovation – How to develop innovative digital ideas in the automotive industry“

selbstständig und ohne fremde Hilfe angefertigt haben.

Die Übernahme wörtlicher Zitate sowie die Verwendung der Gedanken anderer Autoren haben wir an den entsprechenden Stellen der Arbeit kenntlich gemacht.

Wir sind uns bewusst, dass eine falsche Erklärung rechtliche Folgen haben wird.

Friedrichshafen, den 10. Mai 2016

Muhamed Aziz

Laurenz von Eickstedt

Christian Fischer

Julia Mecheels