

Investigating the capabilities of TRIZ to realize organizational ambidexterity

Johannes Hofweber¹, Armin Lau², Oana Buliga¹ and Julian M. Müller¹

¹ Friedrich-Alexander Universität Erlangen-Nürnberg, Chair of Industrial Management,
School of Business and Economics, Lange Gasse 20, 90403 Nürnberg

² Schaeffler Technologies AG & Co. KG, Industriestr. 1-3, 91074 Herzogenaurach, Germany
{johannes.hofweber, oana.buliga, julian.mueller}@fau.de,
armin.lau@schaeffler.com

Abstract. This paper investigates the application of TRIZ tools for systematically addressing the management problem to achieve organizational ambidexterity. Organizational ambidexterity refers to the capability of an organization to exploit the existing business while simultaneously exploring new business opportunities. Handling this contradiction of exploitation and exploration represents a major challenge for established companies, especially in currently ongoing transformation processes with rapidly changing business environments. This study assesses the potentials of TRIZ tools, e.g. the contradiction matrix, the 40 inventive principles or the separation principles. Thereupon, new and evaluating existing solutions for conflicting objectives regarding exploitation and exploration are developed. The results are based on qualitative-empirical data. The paper extends current research on the application of TRIZ in a non-technical context as well as on organizational ambidexterity. In sum the study provides valuable insights into the practicability of using contradiction-based problem solving in managerial practice.

Keywords: TRIZ, contradiction, organizational ambidexterity.

1 Problem Statement

The fast-changing business world of today is characterized by volatility, uncertainty, complexity and ambiguity (VUCA) (Bennett, Lemoine 2014). Surviving in this VUCA environment is a major challenge especially for established companies (Ali et al. 2018). There are many examples of corporates which struggle with this challenge and at last fail like Nokia or Kodak (Heimburg 2017). To survive in this new world, organizations have to exploit their existing competencies while simultaneously explore future capabilities (Christensen 1997). Combining exploitation and exploration within a company is a complex managerial task because of their opposing nature. Both activities compete for the same limited resources of a company (O'Reilly, Tushman 2016).

Organizations with the ability to manage exploitation and exploration at the same time are called ambidextrous and are – as empirical data shows – more successful in the long run (Gibson, Birkinshaw 2004; Raisch et al. 2009; He, Wong 2004). Due to

the fact that exploitation and exploration are seen as contradictory (March 1991), realizing ambidexterity is in many cases a long process, embossed by trial and error.

TRIZ, known as the theory of inventive problem solving, was originally developed to systematically solve technical problems (Altshuller 2000). In this respect, it focuses on solving the underlying contradictions and provides methods and tools that help to identify, formulate and solve these contradictions. However, satisfying the contradictions by finding a compromise does not lead to an inventive solution according to TRIZ (Ilevbare et al. 2013).

Engaging in exploitation and exploration at the same time seems to be a hardly solvable contradiction for organizations, which is in practice often approached by realizing compromises. However, as the growing attention for ambidexterity in research and practice shows, this managerial complex problem requires innovative solutions, which go beyond trade-offs.

While TRIZ has been transferred to business and management in the past (Mann 2005), its practicability in this field is still mostly unproven in research. In this paper, we apply and test the practicability of TRIZ in an organizational context within the concept of ambidexterity. Therefore, we conduct a qualitative-empirical study with experts in the field of innovation management to identify and formulate concrete manifestations of contradictions, and with TRIZ experts to resolve these contradictions.

The study provides several insights in the practicability of TRIZ in an organizational context. Furthermore, the solutions obtained extend research in the field of organizational ambidexterity. In the course of this paper, we outline the concept of organizational ambidexterity, followed by a short overview of TRIZ in the management and business environment. We then explain the qualitative-empirical results used in this paper, followed by a discussion of their implications.

2 Origins of organizational ambidexterity

According to its Latin origin, “ambidexterity” means to be right-handed with both hands. Duncan (1976) firstly transferred the idea of ambidexterity to organizations. In his definition, organizational ambidexterity describes the ability of organizations to focus on incremental as well as on radical innovation.

March (1991) introduced two fundamentally different forms of organizational behavior: exploitation and exploration. In his work, exploitation is defined as refinement, choice, production, efficiency, selection, implementation and execution. Exploration is defined as search, variation, risk taking, experimentation, play, flexibility, discovery and innovation (March 1991, p. 71). Therefore, activities towards exploitation refer to short-term productivity whereas exploration refers to long-term innovation. Several studies find that engagement in both kinds of activities is necessary for long time success (Gibson, Birkinshaw 2004; Raisch et al. 2009; He, Wong 2004). To manage the tensions resulting from exploitation and exploration, March (1991) suggested an appropriate balance between both kinds of activities.

In managerial practice, established companies often favor activities supporting exploitation because the rewards are more secure and lead directly to short-term success.

This success leads to further engagement in exploitation activities (Uotila et al. 2009). Especially in established companies, the ratio between exploitation and exploration is often out of balance and, as pointed out earlier, threatens the long-term viability of these companies. This phenomenon is known as so-called success trap: success out of activities towards exploitation leads to amplification while more and more structural and cultural barriers against exploring new business opportunities are built up within a company (March 1991; Levinthal, March 1993). To escape this trap, research on organizational ambidexterity distinguishes between a trade-off and an orthogonal view on exploitation and exploration (Gupta et al. 2006):

First, the trade-off perspective considers exploitation and exploration as fundamentally different activities. From this perspective, two concepts emerge to realize an appropriate balance: sequential and structural ambidexterity. On the one hand, sequential ambidexterity proposes a temporal separation of exploitation and exploration. In times of stability, organizations should focus on exploitation and in times of change, organizations should focus on exploration. Sequential ambidexterity therefore stands for a periodic switching between phases of exploitation and exploration to avoid possible tensions when performing both activities simultaneously (Brown, Eisenhardt 1997). On the other hand, structural ambidexterity advises separation in space of exploitation and exploration. Hereby, business units should consequently focus on either exploitation or exploration, not on both. This separation leads to a shift of possible tensions from the business unit level to the level of top-management, as the latter is in charge of both units and therefore has to deal with conflicts resulting out of exploitation and exploration (O'Reilly, Tushman 1996; O'Reilly, Tushman 2004).

More recent research suggests engagement in exploration and exploitation at the same time is not necessarily a contradiction (Cao et al. 2009). Out of this orthogonal perspective on exploitation and exploration, the concept of contextual ambidexterity evolved. Contextual ambidexterity is defined as “[...] the behavioral capacity to simultaneously demonstrate alignment and adaptability [...]” (Gibson, Birkinshaw 2004, S. 209). This behavioral capacity emerges through the establishment of the cultural values stretch, discipline, support and trust. By building up this supportive organizational context, individuals should be encouraged to decide on their own between exploitation and exploration. In contrast to the above-mentioned concepts, it proposes a shift of resolving such contradictions from business unit to an individual level (Gibson, Birkinshaw 2004).

The overarching goal of TRIZ is to completely resolve existing contradictions. In sequential and structural ambidexterity, exploitation and exploration are described as completely dependent variables, and the resulting conflict is therefore closely resembling a physical contradiction. Temporal or spatial separation of exploitation and exploration represent solutions, which can be supported by using the TRIZ principles of separation.

The orthogonal perspective regards exploitation and exploration as independent variables and therefore represents rather an engineering contradiction in the sense of TRIZ, which again should allow for applying TRIZ principles for its solution. Unfortunately, in both cases, the concept of contextual ambidexterity is vague and difficult to understand, on the level of problem description as well as on the solution level.

Our research supports the orthogonal perspective on ambidexterity by dissolving supposed contradictions with TRIZ. Therefore, this research leaves the meta-level of exploitation and exploration and approaches a more specific representation of ambidexterity. An example is the need of structured, formal processes which support efficiency (exploitation) as well as flexible, dynamic processes to address new business opportunities (exploration). We apply TRIZ to formulate and resolve such contradictions from tensions resulting out of exploitation and exploration in daily business.

3 TRIZ – Relevant tools and application overview in business and management

The theory of inventive problem solving (TRIZ) is a knowledge-based systematic methodology of inventive problem solving. TRIZ was developed to solve technical problems by using analogies to inventions in other fields. The fundamental idea of TRIZ is to provide operators with easy access to knowledge of former innovative solutions. Among others, the best solutions according to TRIZ evolve through seeking out and resolving conflicts and trade-offs. Therefore TRIZ offers a broad set of tools which cover all aspects of problem analysis and solving (Altshuller 2000; Mann 2001b; Ilevbare et al. 2013). Our research focuses on the contradiction matrix and the 40 inventive principles to resolve concrete contradictions out of exploitation and exploration. These tools are known as basic TRIZ tools and help to follow the common approach of the TRIZ method to solve problems which is illustrated in figure 1 (Mann 2001b).

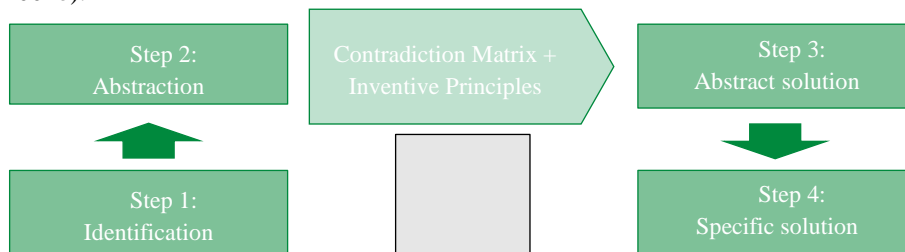


Fig. 1. General TRIZ approach (based on Mann 2001b)

The original contradiction matrix consists of 39 rows and 39 columns to represent parameters of a technical system. The rows of the matrix contain the improving parameters of a system whereas the columns contain deteriorating parameters. To appropriately use the contradiction matrix, it is necessary to analyze the specific problem and formulate concrete contradictions which describe the effect of a change to the system by an improving aspect, whereas a different aspect is simultaneously getting worse. In this first step of abstraction the contradiction is formulated in own words. In a second step of abstraction this contradiction is transferred to parameters in the matrix. At the intersection of row and column, the contradiction matrix refers to several of 40 inventive principles, which are recommended for resolving the contradiction. (Moehrle 2005; Mann 2001b).

This small number of generally valid inventive principles was deduced from patent analysis, and it is one of the best known TRIZ tools. When inventive principles have been identified from the contradiction matrix as abstract solution, it is necessary to translate them to a concrete solution. Therefore, the inventive principles offer a description as a supporting measure. (Moehrle 2005; Mann 2001b).

As pointed out earlier, TRIZ was originally developed to solve technical problems. The main application area where TRIZ is successfully used is in product development. As there are not only technical problems in isolation to be solved, the application area expanded over the years (Mann 2005; Chechurin, Borgianni 2016). Different studies applied TRIZ e. g. in quality management (Yamashina et al. 2002), innovation management (Mann 2003), sustainability management (Kobayashi 2006) and human factor problems (Akay et al. 2008).

Mann (2002) adapted the TRIZ tools for problems occurring in a business and management environment. While the validity of the inventive principles in a business environment can be confirmed, the parameters of the classical matrix do not fit to issues of relevance in a management and business environment. Similar to the original contradiction matrix, the adapted contradiction matrix offers access to the best of other business solutions. The new matrix consists of 31 different improving and worsening parameters divided into five main areas: R&D, Production, Supply, Support and a large set of variables relating to Customer. The identification of suitable parameters was conducted through an analysis of several hundred win-win cases of business and management problems (Mann 2001a, 2009).

So far, TRIZ is not an established problem-solving tool in a business and management environment and there is little evidence about its practicability. In this study, we use TRIZ to the organizational problem to simultaneously exploit and explore by using Mann's adapted contradiction matrix and the 40 inventive principles. With this approach, we evaluate the practicability of TRIZ in an organizational context and generally gain more implications for the application in the business & management area.

4 Method

The research design in this paper is of explorative nature (Blumberg et al. 2014). TRIZ is applied in an organizational context to the concept of ambidexterity. Therefore, this research extends the body of knowledge on TRIZ in a non-technical context to a management problem.

The approach in this paper is action research. It was introduced by Lewin in 1943 to explain social change (Lewin 1946). Basically, this research method deals with practical problems and focuses on the interplay between action and research to achieve the desired outcome. The acceptance and distribution of action research is rising because there is a big gap between business research and practice (Blumberg et al. 2014; Eden, Huxham 1996).

Action research has been selected because at the initial point, this paper deals with everyday problems large companies are facing and work actively on a solution to these concrete problems. By applying TRIZ, concrete solutions to concrete problems of

management are developed. Additionally, the results provide information about the practicability of TRIZ in an organizational context. In this context, a qualitative-empirical approach to collect the relevant data is best suited (Blumberg et al. 2014; Krippendorff 2009).

The general process of this qualitative-empirical approach is in accordance with the four steps of the common TRIZ approach, which is illustrated in figure 1. Within two group discussions organized as workshops, these four steps have been conducted. The first workshop took place with about 15 experts in the field of innovation and innovation culture from various companies and different industry sectors and focuses on the identification of concrete contradictions out of exploitation and exploration. The second workshop has been carried out together with about 15 experts familiar with the TRIZ methodology and focuses on the application of the adapted TRIZ tools to the identified contradictions. Both workshops have been structured similarly. After a short introduction to the concept of ambidexterity, the participants started to identify concrete contradictions from everyday work referring to exploitation and exploration.

As a frame of reference for those contradictions we use the St. Galler Management Model (Rüegg-Stürm 2005). We introduced the four main categories (culture, strategy, structure and processes) both as help for workshop participants to provide stimulus for creativity and to create a holistic view.

In action research, the line between researcher and participant is increasingly blurring (Blumberg et al. 2014). In this paper, the researchers were partly involved in the different steps of problem solving.

Within the following chapter, the main results, described by using an example of the four steps from identification to a solution with the help of TRIZ, are presented. With this practical approach, we obtain insights how far TRIZ – especially the adapted contradiction matrix from Mann (Mann 2002, 2005, 2009) and the inventive principles – are practicable in a business and management environment to the concrete problem of organizational ambidexterity.

5 Results & Discussion

First of all, applying TRIZ in a business and management environment to solve problems resulting from exploitation and exploration was considered possible and successful. As an overall result, 104 concrete contradictions referring to exploitation and exploration were identified in the two workshops. 24 of those contradictions were related to category “Strategy”, 20 contradictions to category “Structure”, 33 contradictions to category “Culture” and 27 contradictions to “Processes”. In both workshops, most of the identified contradictions belonged to the category “Culture”. This implicates most of the involved experts see the cultural level of a company as very important when considering ambidexterity. Out of the identified contradictions, eight contradictions – two from each category – were prioritized and formulated as nine engineering and two physical contradictions. In sum 19 different inventive principles were used to develop several solutions for the eight prioritized contradictions.

By using an example, the way from the identification of a contradiction resulting from exploitation and exploration to the development of an inventive solution with the help of TRIZ is illustrated. This process follows the standard TRIZ approach, which is represented in figure 1.

One possible contradiction which was identified in one of the workshops belonging to the category “Processes” is “Standardized Processes vs. Flexible Processes”. Both types of processes are required in a company. Standardized processes support efficiency and therefore relate to exploitation. A company also needs flexible processes to handle new, radical themes, especially in the R&D department, and therefore flexible processes are regarded as exploration. The identification of this concrete contradiction represents step one of the standard TRIZ approach.

The contradiction was formulated by the participants in TRIZ syntax as follows to make clear which parameter is improving and which parameter is worsening: “IF processes in a company are highly standardized, THEN a high degree of efficiency can be achieved, BUT it is difficult to represent new and radical progresses”. This formulation is important to get a deeper understanding of the concrete problem and helps to find the right parameters in the contradiction matrix. Formulating the contradiction symbolizes the way from step one to step two in the standard TRIZ approach.

From step two to step three the contradiction matrix was applied. In this example improving the efficiency with standardized processes can be represented as improving parameter 29, control complexity. Worsening the handling with radical themes through standardized processes can be represented as parameter 1, R&D capability. The matching intersection in the contradiction matrix yields four inventive principles:

- 25 Self-service
- 2 Taking Out/Separation
- 15 Dynamization
- 36 Paradigm Shift

These proposed principles are the abstract solutions to the given example. To translate the abstract solution to a specific solution, one has to consider the initial problem and what the abstract solution means for this problem. The following passage demonstrates this last step from the abstract problem to the specific solution by using inventive principle 25, Self-service. Self-service is described as “Make a system or object serve itself by [...] helpful functions” (Mann 2009, p. 283). For the explained problem, the participants thought of the following solution: If standardized processes of a company don’t fit, omit them and serve yourself with the needed resources. When comparing this solution to the managerial practice, this is comparable to the approach of maverick buying. Maverick buying describes when a department buys materials and services without incorporating the purchasing department. Omitting the highly standardized procurement processes can lead to negative effects but can be used selectively to support flexibility, e. g. in R&D departments (Rothkopf, Pibernik 2016).

With the help of this example, the practicability of TRIZ to the problem of organizational ambidexterity can be proven. The developed solution enables engagement in highly standardized processes while simultaneously omitting these processes when needed without compromise. Therefore, this case confirms the possibility of an

orthogonal view on ambidexterity by creating an innovative solution with TRIZ. This has been affirmed by further examples from the workshop.

In all of the cases from the workshop, it was possible to transform the contradictions to the parameters of the adapted contradiction matrix from Mann. With the matched inventive principles, there was always a minimum of two solutions found. For applying the principles of separation to problems formulated as physical contradictions, this overall impression was also confirmed. The fact that there are more solutions than processed contradictions proves that working with TRIZ was successful. There is no visible relation between the contradictions of one category and certain parameters of the contradiction matrix. As pointed out, 19 different inventive principles were used to develop solutions. That indicates that both parameters and inventive principles are broadly applicable for our problem. Thus, considering all findings, the applicability of TRIZ in sum can be confirmed.

By reviewing the four steps from the specific problem to the specific solution by applying TRIZ the following findings can be observed: From step one to step two - after identifying a concrete problem from exploitation and exploration - it is important to precisely understand the exact trade-offs and what is worsening when improving one side. The common syntax for formulating engineering and physical contradictions showed to be helpful to formulate these organizational contradictions. The process of translating the formulated contradictions into suitable parameters of the contradiction matrix has been found difficult, because the adapted matrix for business and management was completely unknown to the participants. However, the participants were also missing parameters like R&D quality or sustainability and had to identify other ways to express their contradiction. When the appropriate parameters were identified, the suggested inventive principles helped to guide the solving process. Step three to step four represents the translation of the abstract solution to the specific solution. The development of a specific solution by using the identified principles worked well and there was always more than one solution deduced. Still, it was a challenge to interpret the identified inventive principles to problems of business and management, even with the extensive descriptions provided in Mann (2002).

Naturally, the results from this practice-oriented empirical research are not claiming completeness but the overall result is positive and encourages to elaborate on using TRIZ for other contradiction-based problems in management.

6 Conclusion

The approach to use TRIZ to solve concrete contradictions from exploitation and exploration was a success. It showed the practicability of TRIZ methods and tools in an organizational context. Therefore, we suggest to continue research on TRIZ in the business and management environment. The application of TRIZ tools specifically adapted to business and management problems is hereby recommended. Still, an adaption phase has to be considered to get used to the adapted tools.

Some of the participants suggested that more seminal breakthroughs are possible by applying TRIZ in a technical context. Indeed, the solution space in the business and

management area is completely different to the technical area. Real inventions like in the technical area are difficult to reach in a business and management context. The authors suggest to further elaborate on this matter in order to get a better understanding how the different levels of invention, as described by Altshuller for patented solutions (Altshuller 1995; Altshuller 2000), might match the field of business and management.

We suppose by applying TRIZ new and radical solutions for managerial problems can be developed, presumably even faster than working with conventional problem-solving tools. The approach presented leads to innovative solutions, which either validate existing solutions in organizational theory or propose completely new approaches. Furthermore, TRIZ stimulates discussions about the core of a problem and supports the problem analysis.

For future research, we encourage further studies and practical applications of TRIZ to managerial problems. In particular in this field, compromises are often sought and accepted as the standard solution. With TRIZ, going beyond trade-offs and striving for real solutions could become a standard practice for challenges in business and management.

References

1. Akay, D.; Demıray, A.; Kurt, M. (2008): Collaborative tool for solving human factors problems in the manufacturing environment. The Theory of Inventive Problem Solving Technique (TRIZ) method. In *International Journal of Production Research* 46 (11), pp. 2913–2925. DOI: 10.1080/00207540600969774.
2. Ali, Abdul; Mancha, Ruben; Pachamanova, Dessislava (2018): Correcting analytics maturity myopia. In *Business Horizons* 61 (2), pp. 211–219. DOI: 10.1016/j.bushor.2017.11.003.
3. Altshuller, Genrich (Ed.) (2000): The innovation algorithm. TRIZ, systematic innovation and technical creativity. 1. ed., 2. print. Worcester, Mass.: Technical Innovation Center.
4. Altshuller, Genrich S. (1995): Creativity as an exact science. The theory of the solution of inventive problems. New York: Gordon and Breach (Studies in cybernetics, 5).
5. Bennett, Nathan; Lemoine, G. James (2014): What a difference a word makes. Understanding threats to performance in a VUCA world. In *Business Horizons* 57 (3), pp. 311–317. DOI: 10.1016/j.bushor.2014.01.001.
6. Blumberg, Boris; Cooper, Donald R.; Schindler, Pamela S. (2014): Business research methods. 4. ed. Maidenhead u.a.: McGraw-Hill Education.
7. Brown, Shona L.; Eisenhardt, Kathleen M. (1997): The Art of Continuous Change. Linking Complexity Theory and Time-Paced Evolution in Relentlessly Shifting Organizations. In *Administrative Science Quarterly* 42 (1), pp. 1–34. DOI: 10.2307/2393807.
8. Cao, Qing; Gedajlovic, Eric; Zhang, Hongping (2009): Unpacking Organizational Ambidexterity. Dimensions, Contingencies, and Synergistic Effects. In *Organization Science* 20 (4), pp. 781–796. DOI: 10.1287/orsc.1090.0426.
9. Chechurin, Leonid; Borgianni, Yuri (2016): Understanding TRIZ through the review of top cited publications. In *Computers in Industry* 82, pp. 119–134. DOI: 10.1016/j.compind.2016.06.002.
10. Christensen, Clayton M. (1997): The innovator's dilemma. When new technologies cause great firms to fail. Boston MA: Harvard Business School Press (The management of innovation and change series).

11. Duncan, Robert B. (1976): The ambidextrous organization: Designing dual structures for innovation. In *The Management of Organization* 1, pp. 167–188.
12. Eden, Colin; Huxham, Chris (1996): Action Research for Management Research. In *Br J Management* 7 (1), pp. 75–86. DOI: 10.1111/j.1467-8551.1996.tb00107.x.
13. Gibson, C. B.; Birkinshaw, J. (2004): The Antecedents, Consequences, and Mediating Role of Organizational Ambidexterity. In *Academy of Management Journal* 47 (2), pp. 209–226. DOI: 10.2307/20159573.
14. Gupta, A. K.; Smith, K. G.; Shalley, C. E. (2006): The Interplay between Exploration and Exploitation. In *Academy of Management Journal* 49 (4), pp. 693–706. DOI: 10.5465/AMJ.2006.22083026.
15. He, Zi-Lin; Wong, Poh-Kam (2004): Exploration vs. Exploitation. An Empirical Test of the Ambidexterity Hypothesis. In *Organization Science* 15 (4), pp. 481–494. DOI: 10.1287/orsc.1040.0078.
16. Heimburg, Joachim von (2017): Thriving on VUCA, or the secret to surviving in a fast-changing world. Available online at <http://perspectives.infraserv.com/megatrends/thriving-on-vuca-or-the-secret-to-surviving-in-a-fast-changing-world-2219/>, checked on 3/27/2018.
17. Ilevbare, Imoh M.; Probert, David; Phaal, Robert (2013): A review of TRIZ, and its benefits and challenges in practice. In *Technovation* 33 (2-3), pp. 30–37. DOI: 10.1016/j.technovation.2012.11.003.
18. Kobayashi, Hideki (2006): A systematic approach to eco-innovative product design based on life cycle planning. In *Advanced Engineering Informatics* 20 (2), pp. 113–125. DOI: 10.1016/j.aei.2005.11.002.
19. Krippendorff, Klaus (2009): Content analysis. An introduction to its methodology. 2. ed., [Nachdr.]. Thousand Oaks, Calif.: Sage Publ.
20. Levinthal, Daniel A.; March, James G. (1993): The myopia of learning. In *Strat. Mgmt. J.* 14 (S2), pp. 95–112. DOI: 10.1002/smj.4250141009.
21. Lewin, Kurt (1946): Action Research and Minority Problems. In *Journal of Social Issues* 2 (4), pp. 34–46. DOI: 10.1111/j.1540-4560.1946.tb02295.x.
22. Mann, Darrell (2001a): 'A or B' to 'A and B'. In *Creativity & Inn Man* 10 (2), pp. 134–138. DOI: 10.1111/1467-8691.00214.
23. Mann, Darrell (2001b): An Introduction to TRIZ. The Theory of Inventive Problem Solving. In *Creativity & Inn Man* 10 (2), pp. 123–125. DOI: 10.1111/1467-8691.00212.
24. Mann, Darrell (2002): Systematic Win-Win Problem Solving In A Business Environment. Available online at <http://www.systematic-innovation.com/assets/200205-systematicwin-winproblemsolvinginabusinessenvironment.pdf>.
25. Mann, Darrell (2005): New and Emerging Contradiction Elimination Tools. In *Creativity & Inn Man* 14 (1), pp. 14–21. DOI: 10.1111/j.1467-8691.2005.00321.x.
26. Mann, Darrell (2009): Hands-on systematic innovation for business and management. 2. ed., reprinted. Clevedon: IFR Consultants Ltd.
27. Mann, Darrell L. (2003): Better technology forecasting using systematic innovation methods. In *Technological Forecasting and Social Change* 70 (8), pp. 779–795. DOI: 10.1016/S0040-1625(02)00357-8.
28. March, James G. (1991): Exploration and Exploitation in Organizational Learning. In *Organization Science* 2 (1), pp. 71–87.
29. Mayring, Philipp (2016): Einführung in die qualitative Sozialforschung. Eine Anleitung zu qualitativem Denken. 6., überarbeitete Auflage. Weinheim, Basel: Beltz.
30. Moehrle, Martin G. (2005): What is TRIZ? From Conceptual Basics to a Framework for Research. In *Creativity & Inn Man* 14 (1), pp. 3–13. DOI: 10.1111/j.1476-8691.2005.00320.x.

31. O'Reilly, Ch.; Tushman, M. L. (2004): The Ambidextrous Organization. In *Harvard Business Review*.
32. O'Reilly, Charles A.; Tushman, Michael L. (1996): Ambidextrous Organizations: Managing Evolutionary And Revolutionary Change. In *California Management Review* 38 (4), pp. 8–30.
33. O'Reilly, Charles A.; Tushman, Michael (2016): Lead and disrupt. How to solve the innovator's dilemma. Stanford, California: Stanford Business Books an imprint of Stanford University Press. Available online at <http://search.ebscohost.com/login.aspx?direct=true&scope=site&db=nlebk&AN=1201645>.
34. Raisch, Sebastian; Birkinshaw, Julian; Probst, Gilbert; Tushman, Michael L. (2009): Organizational Ambidexterity. Balancing Exploitation and Exploration for Sustained Performance. In *Organization Science* 20 (4), pp. 685–695. DOI: 10.1287/orsc.1090.0428.
35. Rothkopf, Alexander; Pibernik, Richard (2016): Maverick buying. Eliminate, participate, leverage? In *International Journal of Production Economics* 179, pp. 77–89. DOI: 10.1016/j.ijpe.2016.05.020.
36. Rüegg-Stürm, Johannes (2005): The new St. Gallen management model. Basic categories of an approach to integrated management. 1. engl. ed. Houndmills: Palgrave Macmillan. Available online at <http://www.palgraveconnect.com/pc/doi/finder/10.1057/9780230505162>.
37. Uotila, Juha; Maula, Markku; Keil, Thomas; Zahra, Shaker A. (2009): Exploration, exploitation, and financial performance. Analysis of S&P 500 corporations. In *Strat. Mgmt. J.* 30 (2), pp. 221–231. DOI: 10.1002/smj.738.
38. Yamashina, Hajime; Ito, Takaaki; Kawada, Hiroshi (2002): Innovative product development process by integrating QFD and TRIZ. In *International Journal of Production Research* 40 (5), pp. 1031–1050. DOI: 10.1080/00207540110098490.