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Business models rethought: applying the heuristic methods of Altshuller and Osborn to improve an organization's fitness in a variable environment

Reinwencja modelu biznesowego: zastosowanie metod heurystycznych Altshullera i Osborna dla poprawy sprawności organizacji

Abstract:

Business model (BM) is a universally applicable framework for analyzing an organization's entire spectrum of activities, from cost structure, revenue streams, to human resources and organizational culture, client networks, collaborators and the essence of what the organization offers, i.e. the customer value proposition. To facilitate an efficient process of re-inventing or re-conceptualizing the BM, we have applied two heuristic tools: Altshuller's 40 inventive principles and Osborn's seven SCAMPER questions, which were developed initially for applications in engineering and marketing, respectively. We show examples of how each module of a BM can be modified in a creative and, sometimes, counterintuitive way, thus leading to the improvement of the organization's functioning in an uncertain and fluctuating business environment.

Key words:

business model, creativity, heuristic methods, innovation, SCAMPER, TRIZ

Streszczenie:

Model biznesowy (BM) jest powszechnie stosowanym schematem służącym do analizy pełnego spektrum działań organizacji, od struktury kosztów, źródeł dochodów, poprzez zasoby ludzkie i kulturę organizacyjną, sieci i relacje z klientami i partnerami biznesowymi, do sedna tego, co oferuje organizacja, czyli wartości oferowanej klientowi. Aby ułatwić proces efektywnej reinwencji lub re-konceptualizacji BM, stosujemy dwa narzędzia heurystyczne: 40 zasad wynalazczych Altshullera oraz 7 pytań Osborna (SCAMPER), które pierwotnie zostały opracowane dla zastosowań, odpowiednio, w inżynierii i marketingu. Pokazujemy przykłady, jak każdy moduł BM może być modyfikowany w sposób twórczy, a czasami wręcz nieoczekiwanie odkrywczy, prowadząc tym samym do poprawy funkcjonowania organizacji w niepewnym i zmieniającym się otoczeniu biznesowym.

Słowa kluczowe:

kreatywność, innowacja, metody heurystyczne, model biznesowy, SCAMPER, TRIZ

Introduction

Variability of the business environment creates the need for constant reinvention of the way firms and institutions operate. Those which are not able to cope with this variability, by not responding in sufficiently creative ways to the macro- and micro-economic challenges, disappear. The term “fitness”, borrowed from evolutionary biology, is meant to express an organization’s ability to survive under competition or in hostile socio-economic conditions, to withstand time pressures and scarcity of resources, and to increase its share of the market.

The purpose of this paper is to show that two well-known methods for stimulating creative thinking, one originating in the world of advertising¹ and the other developed by and for engineers² may also be applied to business and management. The framework we use is that of business models (BMs) whose several components encompass the entire spectrum of issue relevant to the functioning of a modern organization. We believe that reinvention of BMs through application of heuristic methods should become the everyday reality of sophisticated managers and business leaders^{3,4}.

Tools for reinvention

The methodology known by the acronym TRIZ (from its Russian name, meaning „theory of inventive problem solving“) was developed in the context of engineering by Genrich S. Altshuller^{5,6} and it is based on an analysis of a very large collection of patent applications. One of his goals was to review the methods used by inventors when overcoming various technological obstacles and categorize them into well-defined „inventive principles“. Mann & Domb’s⁷ attempted to provide explicit translation of such engineering-derived heuristic principles into terms related to business and management; see also Moehrle⁸ who explored how various TRIZ methods may be used in organizations.

SCAMPER is a heuristic method, created in the world of advertising. At first the list of 83 questions was developed by Alex Osborn⁹, the father of brainstorming¹⁰, and then refined by Eberle¹¹ who decided to make the list short and simple to help teachers in triggering children’s natural creativity. He used the mnemonic tool of an acronym of the names of seven potentially useful procedures: (S)ubstitute, (C)ombine, (A)dapt, (M)odify, (P)ut to another use, (E)liminate and (R)everse; his goal was to make it easier to learn and remember, and then put it into action during

¹ Osborn A. F., *Applied Imagination: Principles and Procedures of Creative Thinking*, Charles Scribner's Sons, New York 1953.

² Altshuller G., *Creativity as an Exact Science*, Gordon & Breach, New York 1979.

³ Jasiński M., *Edukacja menedżerów w Polsce: więcej heurystyki i jakości*, W: „Edukacja ekonomiczna wobec przemian otoczenia społeczno-gospodarczego” (J. Dietl, Z. Sapijaszka, red.), Fundacja Edukacyjna Przedsiębiorczości, Łódź 2012, pp. 63-68.

⁴ Jasiński M., Rzeźnik M., *Innovatics – a new toolbox of skills for innovative production managers*. In: „Innovations in Management and Production Engineering” (ed. R. Knosala), Oficyna Wydawnicza Polskiego Towarzystwa Zarządzania Produkcją, Opole 2012, pp. 63-71.

⁵ Altshuller G., *op. cit.*

⁶ Altshuller G., *40 Principles: Extended Edition*, Technical Innovation Center, Worcester, MA 2005.

⁷ Mann D., Domb E., *40 Principles for business, with examples*, The TRIZ Journal, www.triz-journal.com, September 1999.

⁸ Moehrle M. G., *How combinations of TRIZ tools are used in companies - results of a cluster analysis*, R & D Management, 2005, vol. 35, pp. 285-296.

⁹ Osborn A. F., *op. cit.*

¹⁰ Osborn J., *Biography: Alex F. Osborn*, Journal of Creative Behavior, 2004, vol. 38, pp. 70-72.

¹¹ Eberle R. F., *Developing imagination through Scamper*, Journal of Creative Behavior, 1972, vol. 6, pp. 199-203.

brainstorming. Additional feature of the method is that it is based on the meaning of the word “to scamper”. This helps associate the name of the method with the seven principles that may help “to run playfully about in one’s mind in search of ideas”^{12,13}.

The set of simple questions offers a systematic and practical way to stimulate creativity by suggesting counterintuitive ideas, thinking outside the box, and destroying mental blocks which can prevent finding solutions. Brainstorming was found to work particularly well in solving cross-functional problems, because it could exploit the intellectual diversity of the participant group¹⁴, although SCAMPER itself may be more effective in improving verbal rather than figural creative thinking¹⁵. SCAMPER can be helpful when aiming to generate an idea about a product, service, or a process, or also how the existing BMs can be improved by changing some or all of their components.

Business models

Business model is understood as a conceptualization of the way a firm does its business^{16,17,18,19}. Osterwalder and Pigneur²⁰ explain that a BM is like a guideline, by describing its key aspects of functioning, and specifying what the company does and how it operates in order to create value for the customers²¹. One may say that BM provides a big picture of an organization and aids in communicating and implementing new market opportunities. Although specific components comprising the BMs vary according to different authors, creating and delivering value is the element they all share; see Baden-Fuller & Morgan²² for a useful summary of various definitions of BMs.

Osterwalder and Pigneur²³ define nine building blocks that are critical to design a successful BM. “Value proposition” is the array of products or services that satisfy the customers’ needs or help solve their problems. “Channels” are the way of communicating and reaching the customer segments in order to provide them a value proposition. “Customer segments” are clearly defined groups of people which the company aims to serve and which it plans to omit. It is crucial to have a deep understanding of particular needs of the customers which a company tends to reach.

¹² Eberle B., *Help! In Solving Problems Creatively at Home and School*, Good Apple, Inc., Carthage 1984.

¹³ Michalko M., *Thinker Toys. A Handbook of Creative Thinking Techniques*, Ten Speed Press, Berkeley, CA 2006.

¹⁴ Kavadias S., Sommer S. C., *The effects of problem structure and team diversity on brainstorming effectiveness*, Management Science, 2009, vol. 55, pp. 1899-1913.

¹⁵ Mijares-Colmenares B. E., Masten W. G., Underwood J. R., *Effects of trait anxiety and the Scamper technique on creative-thinking of intellectually gifted students*, Psychological Reports, 1993, vol. 72, pp. 907-912.

¹⁶ Shafer S. M., Smith H. J., Linder J. C., *The power of business models*, Business Horizons, vol. 48, 199-207, 2005.

¹⁷ Johnson M. W., Christensen C. M., Kagermann H., *Reinventing your business model*, Harvard Business Review, 2008, vol. 86, no. 12, pp. 50-59.

¹⁸ Zott C., Amit R., Massa L., *The business model: recent developments and future research*, Journal of Management, 2011, vol. 37, pp. 1019-1042.

¹⁹ Jasiński M., Rzeźnik M., Candi M., *Understanding and innovating business models: some basic methodological issues*, In: “Innovations in Management and Production Engineering” (ed. R. Knosala), Oficyna Wydawnicza Polskiego Towarzystwa Zarządzania Produkcją, Opole 2013, pp. 51-58.

²⁰ Osterwalder A., Pigneur Y., *Business Model Generation. A Handbook for Visionaries, Game Changers, and Challengers*, Wiley, John Wiley & Sons, Hoboken, New Jersey 2010.

²¹ Magretta J., *Why business models matter*, Harvard Business Review, 2002, vol. 80, no. 5, pp. 86-92.

²² Baden-Fuller C., Morgan M. S., *Business models as models*, Long Range Planning, 2010, vol. 43, pp. 156-171.

²³ Osterwalder A., Pigneur Y., *op. cit.*

“Customer relationships” are types of interaction that a company wants to establish and maintain with the customer segments for long time. “Key partners” are the established network of partners and suppliers that the company maintains (for many reasons i.e. risk reduction, reliable access to resources or outsourcing etc.). “Key resources” (physical, financial, intellectual or human) enable the organization to create and deliver value to its customers. “Key activities” are the most important actions which make possible creating and delivering a value proposition, maintaining relationships with customers and generating profits for the company. Finally, two components concern the financial aspects of business activity. “Cost structure” describes all the costs the company incurs to create and deliver value, maintain relationships with the customers and earn revenue. “Revenue streams” are generated when the company successfully (i.e. profitably) creates and delivers value proposition to its customers.

How TRIZ and SCAMPER may be applied to business model components

Each of these methods has already found application in various areas of business and management^{24,25,26,27}. For example, various TRIZ methods were used in human resource management aspects of manufacturing²⁸, product design²⁹, product service systems³⁰, marketing and sales³¹, customer service³² and quality management^{33,34}. Chen et al.³⁵ combined both SCAMPER and TRIZ methods in a creativity-based Kano model (C-Kano model) that was aimed at discovering customer needs and helping practitioners focus on the most important dimensions of product quality.

Examples of how each of the seven SCAMPER questions and each of forty TRIZ Inventive Principles can be used are shown below. The latter are always given with their numbers (from 1 to 40), since the numbering system, proposed originally in 1960s by Altshuller and modified in early 1970s³⁶, has been kept by the practitioners of the TRIZ approach. While the SCAMPER questions are phrased in a general way that may easily be applied to any field, the TRIZ Inventive Principles are

²⁴ Mann D., Domb E., *op. cit.*

²⁵ Isaksen S. G., Treffinger D. J., *Celebrating 50 years of reflective practice: Versions of creative problem solving*, Journal of Creative Behavior, 2004, vol. 38, pp. 75-101.

²⁶ Moehrl M. G., *op. cit.*

²⁷ Ilevbare I. M., Probert D., Phaal R., *A review of TRIZ, and its benefits and challenges in practice*, Technovation, 2013, vol. 33, pp. 30-37.

²⁸ Akay D., Demiray A., Kurt M., *Collaborative tool for solving human factors problems in the manufacturing environment: the Theory of Inventive Problem Solving Technique (TRIZ) method*, International Journal of Production Research, 2010, vol. 46, pp. 2913-2925.

²⁹ Gonzalez-Cruz M. C., Aguilar-Zambrano J. A., Aguilar-Zambrano J. J., Colombel M. G., *TRIZ, the systematic creativity strategy used in multidisciplinary product design teams*, Dyna, 2008, vol. 83, pp. 337-350.

³⁰ Kim S., Yoon B., *Developing a process of concept generation for new product-service systems: a QFD and TRIZ-based approach*, Service Business, 2012, vol. 6, pp. 323-348.

³¹ Retseptor G., *40 Inventive Principles in Marketing, Sales and Advertising*, The TRIZ Journal, www.triz-journal.com, April 2005.

³² Retseptor G., *40 Inventive Principles in Customer Satisfaction Enhancement*, The TRIZ Journal, www.triz-journal.com, January 2007.

³³ Retseptor G., *40 Inventive Principles in Quality Management*, The TRIZ Journal, www.triz-journal.com, March 2003.

³⁴ Su C. T., Lin C. S., Chiang T. L., *Systematic improvement in service quality through TRIZ methodology: an exploratory study*, Total Quality Management & Business Excellence, 2008, vol. 19, pp. 223-243.

³⁵ Chen L. S., Liu C. H., Hsu C. C., Lin C. S., *C-Kano model: a novel approach for discovering attractive quality elements*, Total Quality Management & Business Excellence, 2010, vol. 21, pp. 1189-1214.

³⁶ Altshuller G., *40 Principles...*, *op. cit.*

in some cases very technical and their application outside of engineering requires some imagination. They should be considered not literally (e.g. Principle 18. Mechanical vibrations, Principle 37. Thermal expansion), but metaphorically, when “vibrations” or “temperature” may be understood also in terms of e.g. “emotional resonance” or “excitement”.

Value proposition

SCAMPER - Modify?

A value proposition can be modified through product range extension or by increased frequency of proposed offerings. By changing inventory weekly, a particular product will not be available in a few days, so the client must buy it now or never. For example Tchibo³⁷, which produces and supplies coffee, has expanded its offering beyond coffee and related products, with a wide range of carefully selected products which make up its changing weekly offering of clothing, shoes, household and office articles, electronics, etc. Zara uses a similar approach in its stores.

TRIZ

Extracting functionalities from hardware to software transformed expensive workstations into cheap desktop computers (e.g. Indigo graphic workstation by Silicon Graphics) (Principle 2. Extraction - Taking out). Bundling less popular services or products with more popular, helps moving inventory (Principle 8. Counterweight). Allocation of resources to marketing efforts should be adjusted to the customers' perception of product's „temperature“ (Principle 37. Thermal expansion). In general, practically all principles may be applied to the improvement of products or, more generally, of value proposition.

Channels

SCAMPER – Combine?

Channels can be combined and used together to reach customers in new ways. For example, Tchibo combined its traditional channels for reaching customers, i.e. brand stores, with an on-line store offering the same products³⁸.

SCAMPER - Reverse?

Some package-delivery companies offer automated package pick-up locations, where the customers themselves can go to pick up their mail, i.e. the traditional roles have been reversed: the customer becomes active and the delivery service company becomes passive during the final stage of delivery.

TRIZ

Applying circularity in logistics may mean that there are no load-free routes (Principle 14. Spheroidal or curved). Applying modular designs (IKEA-style) means that methods of shipping very different products may be unified and simplified (Principle 5. Consolidation-Merging). Also, shipping and storage of pellets is much easier than of the powdered fertilizer (Principle 35. Change of parameters). Delivery of products to customers may be moved to virtual domain (e.g. as ebooks, software updates, and apps) (Principle 17. Another Dimension).

³⁷ Karliński K., *Odporny na konkurencję model biznesu*, essentis.pl/czytelnia/controling-marketingowy/242-odporny-na-konkurencje-model-biznesu (date of access 2014-04-14).

³⁸ *Ibidem*.

Customer segments

SCAMPER - Substitute?

When current customers do not show sufficient interest in a company's products, the customer segment can be substituted. Assumptions about a product and its uses can be changed. For example, Segway³⁹ originally assumed that their product would revolutionize the way people move. However, its innovative solutions such as electric drive and control using gyroscope did not meet with interest from customers. The substitution of the target audience and offering the product to security companies and the police was successful and currently many shopping malls and exhibition halls are patrolled by people on Segways.

TRIZ

Conduct market research with attention to detail, since it will allow you to define your customer segments with precision; each of them should be homogeneous with respect to various criteria relevant to you e.g. age, gender, ethnicity, or musical taste (Principle 33. Homogeneity). Find heterogeneity (demographic sub-groups) in what was previously assumed to be a homogeneous group of customers, e.g. teenagers (Principle 1. Segmentation). Isolate customer segments with the use of invisible barriers, thus making them feel special and unique (separate web sites, separate stores) (Principle 30. Flexible shells and thin films). Look for a class of objects (e.g. customers or concepts) nested within a broader category and this forces us to define them more precisely (Principle 7. Nesting). Find mission statements about your organization that will resonate with specific customer segments (Principle 18. Mechanical Vibrations).

Customer relationships

SCAMPER - Combine? Adapt? Put to another use?

Customer relationships may be strengthened through multiplying the benefits delivered to customers. A strong message that the company cares for customers and that it will try to meet its needs and be available when convenient for them can work wonders. A club-cafeteria "Rodzinka" (Folks) from Nowy Sacz is a good example of such a company. This is a cozy and friendly place for both seniors and for parents with children where the owners combine professionalism with passion and commitment. They support comprehensive development of children aged 0-12 years through creative and constructive play and workshops under the supervision of specialists. A cafeteria is adapted to support the building of social bonds, assists in establishing contacts with peers, integrates generations and gives the parents a meeting place to exchange their parenting experiences. At the same time it helps the company to maintain and strengthen the relationships with clients.

TRIZ

Use „limited-time offers“ as a marketing tool (Principle 19. Periodic Action). Data gathering about customer behavior should be continuous, with the use of various IT tools (Principle 20. Continuity of useful action). Some business decisions that may lead to erosion of customer trust, such as mergers, should be carried out quickly (Principle 21. Skipping). Negative commentaries from customers may serve as valuable feedback (Principle 22. Blessing in disguise). Change sensitivity to customer evaluation results depending on the previous history of interactions with

³⁹ Karliński K., *op. cit.*

that customer (Principle 23. Feedback). Replace face-to-face interactions with video conferences (Principle 28. Substitute mechanical interaction).

Key partners

SCAMPER - Substitute? Eliminate?

Substituting key partners can lead to an improvement of the entire business model. The key questions here are whether someone else could do things better and even whether some partners are simply redundant. For instance, a consulting company could substitute cooperation with a partner in the field of information technology services by its own team of software developers. As a consequence, software development can further enhance the company's value proposition and enrich its range of services.

TRIZ

Payoffs from interactions may be of „asymmetric“ nature, i.e. may involve not only money, but also prestige (Principle 4. Asymmetry). Before announcing to the business partners the necessary changes, educate them about new economic realities which necessitate lower profit margins from partnerships (Principle 9. Preliminary Counteraction). Publish clear rules of partnership, describing up front partners' mutual obligations (Principle 10. Preliminary Action). Use mediators for solving company's internal problems arising among employees (Principle 24. Intermediary). Partners' internal code names may refer to gold or silver, depending on their value for the company (Principle 32. Changing color or clarity).

Key resources

SCAMPER - Substitute?

Enhancing diversity in the employee group can be an effective way to introduce a new spirit. Heterogeneity in the team may have a positive impact on its creative potential: to build a creative team, its composition could be diversified and consist of people with a broad array of personalities and talents (even including employees not trained in a given area) which complement each other, leading to new opportunities.

TRIZ

Hire employees who have broad spectrum of skills (Principle 6. Universality). Restructure the organization: dissolve university departments and replace them with project-oriented teams (Principle 15. Dynamics). Use cheap offices, rented by the hour, as copies of permanent locations (Principle 26. Copying). Make „organizational“ holes in the „glass ceiling“ which prevents women from advancement in the corporate hierarchy (Principle 31. Porous materials). Recruit team members who have heterogeneous educational profiles and the profile of the entire team becomes a composite of various competencies (Principle 40. Composite materials).

Key activities

SCAMPER - Combine?

Apart from traditional activities a company could offer more to its customers by combining a product with a service. For example, a Polish brand Irena Eris, in addition to producing a wide range of cosmetics, offers its customers a network of spas that provide wellness services based on its own products.

TRIZ

Apply carefully thought-through rules for document flow to avoid unnecessary loops in the document's path (Principle 12. Equipotentiality). Organize quality circles among employees ⁴⁰ (Principle 25. Self-service). Seasonal employees leave the company after the harvest season and apply again the following year (Principle 34. Discarding and recovering). Bring charismatic motivational speakers to energize the staff (Principle 38. Strong oxidants). Organize mock presentations before academic conferences in front of a noncompetitive audience of friends (Principle 39. Inert atmosphere).

Cost structure

SCAMPER - Modify? Eliminate?

One way to reduce costs is to replace traditional forms of employment with outsourcing. This is an attractive option for companies to not do everything by themselves and can expand the scope of business and at the same time reduce employment costs for the employer.

TRIZ

Purchase insurance protecting against the clients' potential bankruptcy (Principle 11. Beforehand Compensation). Reduce costs of cleaning by using disposable cups and utensils (Principle 27. Cheap disposables). Liquid or flexible, rather than fixed-schedule salary, may be more effective in motivating employees (Principle 29. Pneumatics and hydraulics). Reduce shipping costs by packaging products in a thin shrink-wrap foil (Principle 30. Flexible shells and thin films).

Revenue streams

SCAMPER - Modify? Eliminate?

Reducing prices or promotional pricing are potential ways to espouse to the philosophy of "less is more". In the long term this can lead to increased profits since the increased appeal of lower prices and resultant higher sales could more than compensate for the lower revenue per item. For example, a complex of geothermal pools in southern Poland attracts visitors by offering, in addition to traditional family discounts, free use of the swimming pools on selected days for every fifth visitor.

TRIZ

Customize the payment structure, so that it addresses the needs of the clients (Principle 3. Local Quality). To stimulate sales of luxury goods, increase the prices instead of lowering them (Principle 13. Do it in reverse). Simplify the process of paying by accepting credit card transactions of low value without any authorization (Principle 16. Partial or Excessive Action). Prepare the company's accounting system to transitions between „bull“ and „bear“ market periods when cash flow may fluctuate (Principle 36. Phase transitions).

Discussion

Briggs and Reinig ⁴¹ suggested that more emphasis should be placed on the quality of proposed solutions during the ideation phase, and not only on the number

⁴⁰ Mann D., Domb E., *op. cit.*

⁴¹ Briggs R. O., Reinig B. A., *Bounded ideation theory*, Journal of Management Information Systems, 2010, vol. 27, pp. 123-144.

of generated ideas, as postulated by Osborn⁴². Addressing this issue, Chulvi et al.⁴³ compared effectiveness of SCAMPER and TRIZ as idea-generating tools in an engineering area, using an experiment in which each method was used by seven teams. Novelty and utility of the proposed solutions were compared and the solutions generated by TRIZ were found to be more novel than solutions based on the SCAMPER, while both methods yielded solutions similar in their level of utility. Furthermore, Ogot and Okudan⁴⁴ concluded that various learning styles of students of engineering were more compatible with TRIZ procedures than offering them only brainstorming as a creative thinking method.

However, it was not our intention to compare in this paper the levels of innovativeness of ideas generated by either method, but only to encourage practitioners to open their minds to heuristic methods in general. Especially difficult for traditional engineers and managers is to accept a certain level of metaphorical thinking inherent to both of these methods. As the examples given in this paper show, even the algorithmic approach of Altshuller may require some imaginative improvisation to adapt engineering-derived principles of invention to the areas of business and management.

Finally, the degree to which either of the described methods may be found useful to entrepreneurs or managers seeking the way to effectively re-invent the business models of their companies depends on several factors. It is important to have in mind that heuristic methods cannot operate in organizational vacuum: there must first exist in the organization an environment conducive to innovativeness^{45,46}. It should have a constellation of features of organizational culture of which probably the most important is a lack of stiff and hierarchical relationships among employees. Once such environment is in place, innovative thinking flows easily, improving the chances of the organization to succeed.

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References

- Akay D., Demiray A., Kurt M., *Collaborative tool for solving human factors problems in the manufacturing environment: the Theory of Inventive Problem Solving Technique (TRIZ) method*, International Journal of Production Research, 2010, vol. 46, pp. 2913-2925.
- Altshuller G., *Creativity as an Exact Science*, Gordon & Breach, New York 1979.

⁴² Osborn A. F., *op. cit.*

⁴³ Chulvi V., Gonzalez-Cruz M. C., Mulet E., Aguilar-Zambrano J., *Influence of the type of idea-generation method on the creativity of solutions*, Research in Engineering Design, 2013, vol. 24, pp. 33-41.

⁴⁴ Ogot M., Okudan G. E., *Systematic creativity methods in engineering education: A learning styles perspective*, International Journal of Engineering Education, 2006, vol. 22, pp. 566-576.

⁴⁵ Jasiński M., Rzeźnik M., *op. cit.*

⁴⁶ Jasiński M., *Features of an e-learning environment which promote critical and creative thinking: choice, feedback, anonymity, and assessment*, International Journal of Continuing Engineering Education and Life-Long Learning, 2014, vol. 24 (in press).

- Altshuller G., *40 Principles: Extended Edition*, Technical Innovation Center, Worcester, MA 2005.
- Baden-Fuller C., Morgan M. S., *Business models as models*, Long Range Planning, 2010, vol. 43, pp. 156-171.
- Briggs R. O., Reinig B. A., *Bounded ideation theory*, Journal of Management Information Systems, 2010, vol. 27, pp. 123-144.
- Chen L. S., Liu C. H., Hsu C. C., Lin C. S., *C-Kano model: a novel approach for discovering attractive quality elements*, Total Quality Management & Business Excellence, 2010, vol. 21, pp. 1189-1214.
- Chulvi V., Gonzalez-Cruz M. C., Mulet E., Aguilar-Zambrano J., *Influence of the type of idea-generation method on the creativity of solutions*, Research in Engineering Design, 2013, vol. 24, pp. 33-41.
- Eberle B., *Help! In Solving Problems Creatively at Home and School*, Good Apple, Inc., Carthage 1984.
- Eberle R. F., *Developing imagination through Scamper*, Journal of Creative Behavior, 1972, vol. 6, pp. 199-203.
- Gonzalez-Cruz M. C., Aguilar-Zambrano J. A., Aguilar-Zambrano J. J., Colombel M. G., *TRIZ, the systematic creativity strategy used in multidisciplinary product design teams*, Dyna, 2008, vol. 83, pp. 337-350.
- Ilevbare I. M., Probert D., Phaal R., *A review of TRIZ, and its benefits and challenges in practice*, Technovation, 2013, vol. 33, pp. 30-37.
- Isaksen S. G., Treffinger D. J., *Celebrating 50 years or reflective practice: Versions of creative problem solving*, Journal of Creative Behavior, 2004, vol. 38, pp. 75-101.
- Jasieński M., *Edukacja menedżerów w Polsce: więcej heurystyki i jakości*, W: "Edukacja ekonomiczna wobec przemian otoczenia społeczno-gospodarczego" (J. Dietl, Z. Sapijaska, red.), Fundacja Edukacyjna Przedsiębiorczości, Łódź 2012, pp. 63-68.
- Jasieński M., *Features of an e-learning environment which promote critical and creative thinking: choice, feedback, anonymity, and assessment*, International Journal of Continuing Engineering Education and Life-Long Learning 2014, vol. 24 (in press).
- Jasieński M., Rzeźnik M., Candi M., *Understanding and innovating business models: some basic methodological issues*, In: "Innovations in Management and Production Engineering" (ed. R. Knosala), Oficyna Wydawnicza Polskiego Towarzystwa Zarządzania Produkcją, Opole 2013, pp. 51-58.
- Jasieński M., Rzeźnik M., *Innovatics – a new toolbox of skills for innovative production managers*, In: "Innovations in Management and Production Engineering" (ed. R. Knosala), Oficyna Wydawnicza Polskiego Towarzystwa Zarządzania Produkcją, Opole 2012, pp. 63-71.
- Johnson M. W., Christensen C. M., Kagermann H., *Reinventing your business model*, Harvard Business Review, 2008, vol. 86, no. 12, pp. 50-59.
- Karliński K., *Odporny na konkurencję model biznesu*, essentis.pl/czytelnia/controling-marketingowy/242-odporny-na-konkurencje-model-biznesu (date of access 2014-04-14)
- Kavadias S., Sommer S. C., *The effects of problem structure and team diversity on brainstorming effectiveness*, Management Science, 2009, vol. 55, pp. 1899-1913.
- Kim S., Yoon B., *Developing a process of concept generation for new product-service systems: a QFD and TRIZ-based approach*, Service Business, 2012, vol. 6, pp. 323-348.

- Magretta J., *Why business models matter*, Harvard Business Review, 2002, vol. 80, no. 5, pp. 86-92.
- Mann D., Domb E., *40 Principles for business, with examples*, The TRIZ Journal, www.triz-journal.com, September 1999.
- Michalko M., *Thinker Toys. A Handbook of Creative Thinking Techniques*, Ten Speed Press, Berkeley, CA 2006.
- Mijares-Colmenares B. E., Masten W. G., Underwood J. R., *Effects of trait anxiety and the Scamper technique on creative-thinking of intellectually gifted students*, Psychological Reports, 1993, vol. 72, pp. 907-912.
- Moehrle M. G., *How combinations of TRIZ tools are used in companies - results of a cluster analysis*, R & D Management, 2005, vol. 35, pp. 285-296.
- Ogot M., Okudan G. E., *Systematic creativity methods in engineering education: A learning styles perspective*, International Journal of Engineering Education, 2006, vol. 22, pp. 566-576.
- Osborn A. F., *Applied Imagination: Principles and Procedures of Creative Thinking*, Charles Scribner's Sons, New York 1953.
- Osborn J., *Biography: Alex F. Osborn*, Journal of Creative Behavior, 2004, vol. 38, pp. 70-72.
- Osterwalder A., Pigneur Y., *Business Model Generation. A Handbook for Visionaries, Game Changers, and Challengers*, Wiley, John Wiley & Sons, Hoboken, New Jersey 2010.
- Retseptor G., *40 Inventive Principles in Customer Satisfaction Enhancement*, The TRIZ Journal, www.triz-journal.com, January 2007.
- Retseptor G., *40 Inventive Principles in Marketing, Sales and Advertising*, The TRIZ Journal, www.triz-journal.com, April 2005.
- Retseptor G., *40 Inventive Principles in Quality Management*, The TRIZ Journal, www.triz-journal.com, March 2003.
- Shafer S. M., Smith H. J., Linder J. C., *The power of business models*, Business Horizons, vol. 48, 199-207, 2005.
- Su C. T., Lin C. S., Chiang T. L., *Systematic improvement in service quality through TRIZ methodology: an exploratory study*, Total Quality Management & Business Excellence, 2008, vol. 19, pp. 223-243.
- Zott C., Amit R., Massa L., *The business model: recent developments and future research*, Journal of Management, 2011, vol. 37, pp. 1019-1042.