

# The Application of Lean Management Tools in Management of Sustainable Development of the Enterprise

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**Abstract**— In the paper, the concept of sustainable development in relation to enterprise management as well as the idea of sustainable enterprise against the background of the concept of sustainable development have been presented. In the subsequent part of the study, the selected tools of the lean management concept have been depicted. In the last part, the efficiency of the implementation of lean management tools in the context of the implementation of assumptions of sustainable development has been assessed. In the paper, the following research question has been formulated: how does the implementation of lean management tools in the enterprise translate into the efficiency of the implementation of assumptions of sustainable development? On the other hand, the objective of the study has been to assess the efficiency of the implementation of lean management tools in reduction in operating costs and to analyze the effects of this implementation on the implementation of assumptions of sustainable development. In order to achieve the objective of the study, the relationship between the level of costs of the implementation of lean management tools and the costs of the implementation of assumptions of sustainable development has been analyzed, which has indicated the impact of an increase in the listed costs on an increase in return on sales in years 2009-2017. The research clearly shows that continuous improvement in the implementation of activities and processes, including the implementation of assumptions of sustainable development allows for achieving success in the analyzed area. The applied research methods are: literature studies, case study, trend analysis of the costs of the implementation of lean management tools.

**Keywords**— *lean management tool; management; sustainable development.*

## 1. Introduction

The dynamics of changes of the economic space brought about that, in the recent subject literature, an increase in the interest in the topic of sustainable development has been observed. This interest in the idea of sustainable development is the result of the discussion held by theoreticians and practitioners of not only management science on the development of solutions combining environmental, social and economic needs. However, combining environmental and social objectives by enterprises oriented mostly to the implementation of economic objectives requires the development of detailed guidelines, both external (legal acts) and internal ones. Moreover, the recognition of social and environmental objectives should take place taking into account justice and solidarity between people equally with economic

objectives through the implementation of the postulates of sustainable development [1], [2]. Therefore, in this paper, the attention will be drawn to the implementation of the concept of sustainable development based on an improvement in economic results of the enterprise, achieved due to cost reduction or an increase in sales. In the study, the research question has been formulated: how does the implementation of lean management tools in the enterprise translate into the efficiency of the implementation of assumptions of sustainable development? As a consequence of this question, the objective of the study has been to assess the efficiency of the implementation of lean management tools in reduction in operating costs and to analyze the effects of this implementation on the implementation of assumptions of sustainable development. The research methods applied to achieve the assumed objective are literature studies, case study, trend analysis of the costs of the implementation of lean management tools.

## 2. Materials and methods

### 2.1. The concept of sustainable management and enterprise management

An increase in the interest in the idea of sustainable development caused that it has become one of the objectives of modern enterprise management. The basis for the implementation of the concept of sustainable development is the Report of the World Commission on Environment and Development: Our Common Future (Web-1), which defines sustainable development. In the report, the attention is drawn to the need to search for paths of sustainable development [3], [4]. The aim of this searching is to find multilateral solutions which allow for combining economic, environmental and social benefits. This means that the objective of sustainable development is to meet the current needs of the society, however, the fulfillment of these needs cannot reduce the development opportunities of future generations [5], [6].

The problem of reconciling economic objectives with environmental and social ones in the enterprise has contributed to the evolution of the approach to the concept of sustainable development. The center of gravity has moved to the issues of the analysis of systems: economic, social and environmental in order to enable simultaneous implementation of economic, social and environmental objectives [7], [8]. At the same time, sustainable development has become not only the ability of material

development in order to maintain the long-term existence of people on Earth [9], [10], but also the concept of balancing environmental needs with the needs for development [11], [12].

Summing up the theoretical review of the approaches to the concept of sustainable development, it should be pinpointed that it is a multidimensional term and not fully defined. For this reason, management of sustainable development, on the one hand, should ensure the integration of social, environmental and economic objectives. On the other, it should pay attention to the needs of future generations taking into account the technological and ethical dimension. An increase in the awareness of sustainable development in the enterprise should also be reflected in an improvement in living conditions, an increase in innovative capacity or an increase in customer satisfaction.

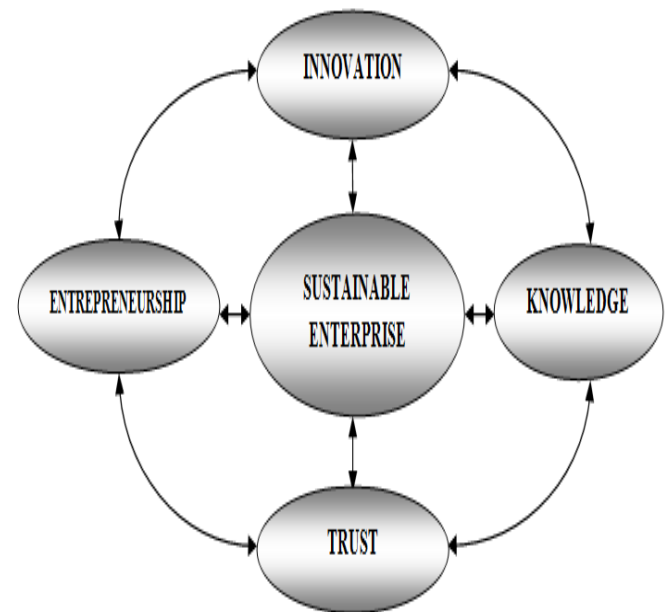
## 2.2. The idea of sustainable enterprise against the background of sustainable development

The concept of sustainable development is subjected to constant evolution. The enterprises which focus their attention on the implementation of assumptions of sustainable development, fulfill business objectives combining them with the implementation of environmental and social ones. Such an approach has brought about the emergence of the idea of sustainable enterprise, which combines management oriented to sustainable development with the implementation of economic objectives.

In the subject literature, it is assumed that the characteristics which mostly construct sustainable enterprise are: innovation, knowledge, trust and entrepreneurship. These sustainable enterprise features, according to the authors of this concept, are mutually dependent, as shown in Figure 1. Moreover, the listed characteristics not only construct sustainable enterprise but they also reconstruct business.

Innovation in the model of sustainable enterprise is to enable the implementation of new ideas which create value [13]. This means that innovativeness is becoming the basic mechanism for gaining competitiveness of the enterprise [14]. Combining innovation with utility, price and cost proposals into a whole creates the innovation of value [15] which arises in areas having impact both on the structure and level of costs and the proposal of customer value. Knowledge in the model of sustainable enterprise is seamless connection of experience, value, selected information and expert insight into the quality of the issue, which provides the framework for assessment and implementation of new experiences and information [16]. Trust in the model of sustainable enterprise is a component enabling sustainable competitive advantage [14]. At the same time, trust becomes the key organizational adhesive in modern business [17]. Entrepreneurship in the model of sustainable enterprise relates not only to setting up and developing new ventures [18] but, most of all, includes the reorganization of business and the ability of its renewal [14]. The process of entrepreneurship should take into account the ability to

see opportunities and create the organization to follow them [19].



**Figure 1.** Paradigms of the model of sustainable enterprise, source: [14], p. 36.

Summing up, it should be pinpointed that the featured characteristics of the model of sustainable enterprise, i.e. innovation, knowledge, trust and entrepreneurship are the key characteristics of sustainable success. However, it ought to be highlighted that, in order to achieve sustainable success, there is the need for management staff, being open to changes and visionary, who will be able to develop the position of the enterprise in the competitive market [14]. Therefore, it should be underlined that the approach of sustainable enterprise is a young, only developing area of knowledge [20], [21] which is a turning point on the way to sustainable development of the enterprise.

## 2.3. The implementation of selected lean management tools in management of sustainable development of the enterprise

The research problem considered in the study is the improvement of activities and processes aimed at achieving the assumptions of sustainable development using lean management instruments. Due to the fact that the concept of sustainable development aims at creating the general structure, which is to develop the solutions combining environmental, social and economic needs, in this study, the attention has been drawn to the combination of environmental and social issues in the context of lean management of the enterprise. The concept of lean management came into being in the 1960s in a Japanese Toyota company as a set of activities introduced in order to improve a difficult financial

situation. Lean management is a way of thinking of the company employees oriented to cost minimization, waste elimination and continuous improvement in the implemented processes. The discussed concept includes many methods and techniques which, when implemented in the enterprise, can be reflected in the company cost reduction. The tools of the lean concept, among others, include: continuous improvement (CI), 5S, MUDA, KPIs, the analysis of cause-effect relations and many others. Due to the amount of lean tools, the economic practice and literature [22] shows that enterprises implement such tools of the lean concept which seem to be effective to managers and the way of implementation depends on the team launching the tools in the enterprise.

In the study, the attention has been focused on the two selected tools of the lean concept: continuous improvement and the analysis of cause-effect relations. The selection of the discussed tools has been made intentionally since these tools have been implemented in the enterprise as a suggested way of solving growing problems associated with a large number of returns of finished products and semi-finished products and high costs of failure in process lines.

The first tool of the lean concept analyzed in the study is the process of continuous improvement, which is defined by the technological standard as “recurrent actions aimed at increasing the ability to meet requirements” [23]. The requirements set to organizations in the field of continuous improvement can refer to internal needs of the enterprise, problem situations faced by the organization, creativity of individual employees and also the conduct compliant with the changing environment of the enterprise [24]. Continuous improvement is nothing but constant improvement and streamlining of processes and activities occurring in the company.

Another tool of the lean concept is the analysis of the Ishikawa cause-effect relations, which allows the identification of the reasons for arising a specific event. The Ishikawa method was first applied in Japan in Sumitomo Electric, and its name comes from the name of its author [25]. The form of the conducted analyses in the discussed method is a fishbone-like diagram, although “the essence of Ishikawa diagrams is the graphic presentation of interactions between the effects and a variety of reasons that may cause them” [26]. While conducting the method of problem solving using the Ishikawa diagram the problem is identified, which is recorded on the main axis of the diagram. Subsequently, the main reasons for the problem identified are recognized, which is marked on the axes reaching the main axis of the diagram. In the subsequent step, specific reasons relating to the groups of reasons identified earlier are searched for, which is marked on the axes reaching the

axis of the group of reasons. The reasons indicated in the last step of creating the Ishikawa diagram can be the final solution of the problem analyzed. The discussed method can be developed or modified depending on the needs resulting from the activity of the enterprise.

The presented characteristics of the tools of the lean concept do not cover the analyzed contents and are only the review determined by the implementation of mostly the tools which have been implemented in the analyzed company in response to the problems occurring in it, which is to constitute the supplement of social and environmental activities within the framework of management of sustainable development of the enterprise.

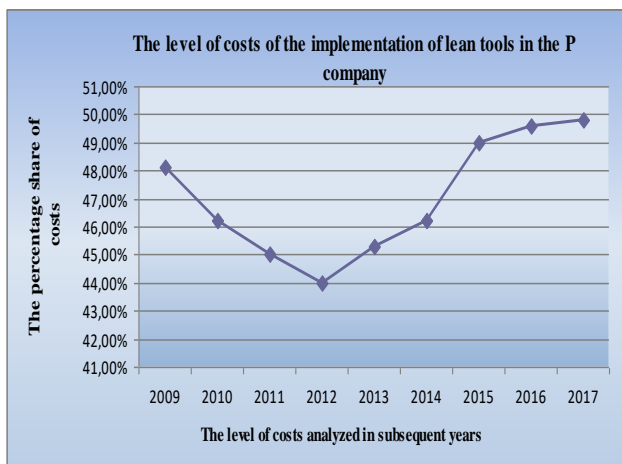
#### **2.4. The assessment of the efficiency of the implementation of lean management tools in the context of the implementation of assumptions of sustainable development – the research procedure**

The research procedure in the paper was conducted on the basis of the case study [27]. The application of the case study in the empirical research enables the presentation of a more accurate image of the phenomena analyzed. However, the case study is a method of the probabilistic possibility of scientific cognition. The constraints of the case study are: intuitiveness and subjectivity of judgements and low representativeness of the results. However, it should be pinpointed that, apart from the constraints, a significant advantage of the case study is the presentation of the in-depth image of the analyzed relationships.

The empirical research was carried out on the basis of the financial data shared by the cement industry company conducting its business activity in Poland. The company was selected on the basis of purposive sampling, determined by the availability of data necessary for carrying out the empirical research since the surveyed company implements the lean tools and the implementation of assumptions of sustainable development is one of its objectives. The scope of the empirical data included the years 2007-2017.

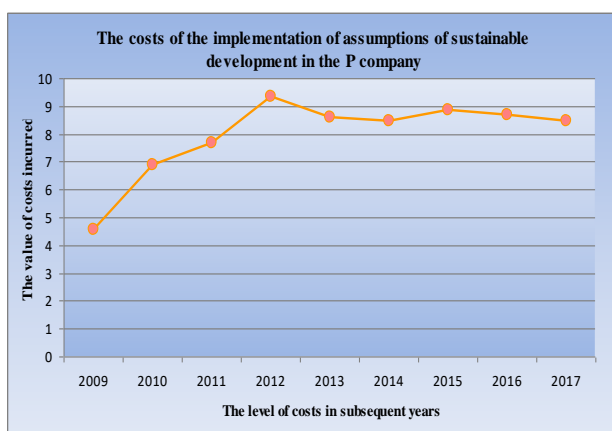
The pursuance of the research objective, i.e. the assessment of the efficiency of the implementation of lean management tools in reduction in operating costs and the analysis of the effects of this implementation on the implementation of assumptions of sustainable development, began with the analysis of cost data based on the simulation data developed for the surveyed entity. Cost simulation of the lean tools in the analyzed company was carried out on the basis of the actual information on costs incurred on their implementation. In the analysis, two types of costs were referred to. The costs of the

implementation of lean tools and the costs of the implementation of assumptions of sustainable development as well as return on sales were subjected to analysis. The development of the level of costs of the implementation of lean tools in the total amount of the operational budget of the *P* company is presented in Figure 2. The conducted research indicates that, in years 2009 – 2012, there was a decrease in the share of costs incurred on the implementation of lean tools in the general structure of costs of the operational budget. From 2013 the share of costs incurred on the implementation of lean tools grew steadily in the total amount of the operational budget of the *P* company.



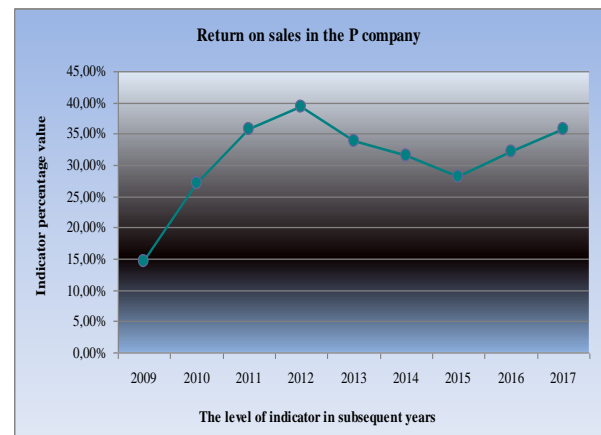
**Figure 2.** The level of costs of the implementation of lean tools in the P Company, Source: Own study

The implementation of lean management tools translated into reduction in operating costs in the form of lowering the level of returns of finished products and semi-finished products by 63% in the whole research period. Moreover, there was observed reduction in the costs of failure in process lines in the areas in which lean management tools were implemented by 47% in the research period.



**Figure 3.** The level of costs of the implementation of assumptions of sustainable development of the P Company in the research period, Source: Own study

While analyzing the development of costs of the implementation of assumptions of sustainable development in the *P* company (Figure 3) one can observe their intensive growth from 2009 to 2012. From 2013 there was a decrease in the level of costs of the implementation of assumptions of sustainable development. The level of costs of the implementation of assumptions of sustainable development over the years 2015 - 2017 indicated an upward trend.



**Figure 4.** The development of the level of return on sales in the P company

Source: Own study.

In the *P* company, in years 2009 - 2012 there was recorded a dynamic increase in return on sales (Figure 4). In 2013 there was a clear decline in the level of the indicator value to the level similar to 2011. A downward trend remained until 2015. This may mean that the *P* company is not successful in the market of products offered to customers, which suggests that the decisions in the field of the pricing policy were incorrect. An increase in sales was disrupted by the downturn in the market but a downward trend was halted in 2015. From that moment the company has been successfully rebuilding its market position.

### 3. Result and discussion

The conducted empirical research indicates that an increase in the amount of costs incurred on the implementation of lean management tools and the costs of the implementation of assumptions of sustainable development in the surveyed company is accompanied by an increase in the level of return on sales. The conducted research indicates the relationship occurring in all three analyzed areas. In the case of an increase in costs incurred on the implementation of lean management tools, one can also observe reduction in costs associated with the handling of returns of finished products and semi-finished products and reduction in costs of failure in process lines. In the area of costs of the implementation of assumptions of sustainable development, there were taken actions associated with providing customers with high quality products, paying customers' attention to their environmentally friendly production, which translated into an increase in return on sales, in spite of an unfavorable economic situation in the specific market segment. It

follows that the current control of the operating costs related to the implementation of lean management tools and the costs of the implementation of assumptions of sustainable development allows for taking right managerial decisions in the field of management of the operational efficiency of the company, which is reflected in results from sales.

In order to detail the obtained results, the strength and direction of the linear relationship between the level of costs of the implementation of lean management tools and the costs of the implementation of assumptions of sustainable development and return on sales were analyzed. On the basis of the value of the Pearson correlation coefficient calculated for the P company, one can observe strong relationships between the analyzed variables (Table 1).

**Table 1.** The correlation between the level of costs of the implementation of lean management tools and the costs of the implementation of assumptions of sustainable development and return on sales in years 2009-2017

The Pearson correlation coefficient between	Return on sales
The costs of the implementation of lean management tools	0.71
The costs of the implementation of assumptions of sustainable development	0.68

Source: Own study

A positive correlation informs that along with an increase in the costs of the implementation of lean management tools and the costs of the implementation of assumptions of sustainable development there is an increase in return on sales. The correlation is statistically significant for all the analyzed comparisons ( $\alpha = 0.05$ ). It follows that both the costs of the implementation of lean management tools and the costs of the implementation of assumptions of sustainable development are related to the level of return on sales in the P company, which confirms the research results obtained using trend analysis.

#### 4. Conclusion

In the study, the issues related to the implementation of lean management tools in the context of management of sustainable development of the enterprise have been discussed. The paper related to current issues which modern enterprises cope with. Sustainable development of the enterprise and constant search for the ways to reduce costs, which can be realized through the implementation of the concept of lean management, is a challenge for modern entrepreneurs.

The paper contains the research question, which is the following: how does the implementation of lean management tools in the enterprise translate into the efficiency of the implementation of assumptions of sustainable development? In the context of the formulated

research question, it has been shown that continuous improvement in the implementation of activities and processes, including the implementation of assumptions of sustainable development allows for achieving success in the analyzed area. Continuous improvement implemented in the enterprise obliged employees to continuous implementation of assumptions resulting from the binding policy of sustainable development in the company.

In relation to the formulated question, the objective of the paper has been to assess the efficiency of the implementation of lean management tools in reduction in operating costs and to analyze the effects of this implementation on the implementation of assumptions of sustainable development. In order to accomplish the objective of the study, the Pearson correlation coefficient was used, which allows for the analysis of the relationship between the level of costs of the implementation of lean management tools and the costs of the implementation of assumptions of sustainable development and return on sales. The conducted analyses proved that along with an increase in the costs of the implementation of lean management tools and the costs of the implementation of assumptions of sustainable development there is an increase in return on sales. Therefore, the implication from the conducted research is the validity of the implementation of lean management tools along with current implementation of assumptions of sustainable development, which is reflected in an increase in return on sales.

The paper indicates the possibilities to demonstrate the relationship between the concept of lean management of the enterprise and the implementation of assumptions of sustainable development in the enterprise, which constitutes its value added. However, it should be pinpointed that, due to the limited volume of this study, the presented contents do not fully cover the topic discussed, while constituting the basis for further considerations.

#### References

- [1] Szablewski, A.; (ed.) (2000), *"Strategie wzrostu wartości firmy"*, Poltext, Warszawa, p. 15.
- [2] Dudycz, T.; (2005), *"Zarządzanie wartością przedsiębiorstwa"*, PWE, Warszawa, p. 17.
- [3] Williams, CC.; Millington, AC.; (2004), *"The diverse and contested meanings of sustainable development"*, *Geographical Journal* 170 (2), p. 99-104 (6 pages).
- [4] McWilliams, A.; Siegel, D.; (2000), *"Corporate Social Responsibility and Financial Performance: Correlation or Misspecification?"* *Strategic Management Journal*, No. 21. pp. 603-609 (7 pages).
- [5] Reis, T.H.; (2011). *"Compensation for Environmental Damages under International Law"*. Netherlands: Wolters Kluwer. p. 4.
- [6] Starik, M.; Kanashiro, P.; (2013), *"Toward a Theory of Sustainability Management: Uncovering and"*

- Integrating the Nearly Obvious*", "Organization & Environment", Vol. 26, p. 7-30 (24 pages).
- [7] Larson, B.A.; (2007). "Sustainable Development Research Advances. Nova Science Publishers", p. 11.
- [8] Schaltegger, S.; Lüdeke-Freund, F.; Hansen, E.; (2012), "Business Cases for Sustainability: The Role of Business Model Innovation for Corporate Sustainability", "International Journal of Innovation & Sustainable Development", Vol. 6, pp. 95-119 (25 pages).
- [9] Rossa, S.A.; (2008). "Sustainable Development Handbook. London: The Fairmont", 700 Indian Trail, p. 44.
- [10] Porter, T.; Derry, R.; (2012), "Sustainability and Business in a Complex World", "Business and Society Review", Vol. 117, p. 33-53 (21 pages).
- [11] Tladi, D.; (2007). "Sustainable Development in International Law: An Analysis of Key Environmental Instruments". Pretoria University Law Press, p. 74.
- [12] Gong, M.; Wall, G.; (2001), "On exergy and sustainable development - Part 2: Indicators and methods, Exergy". International Journal 1(4). pp. 217-233 (16 pages).
- [13] Linder, J.C.; Jarvenpaa, S.; Davenport, T.H.; (2003), "Toward an Innovation Sourcing Strategy", Harvard Business Review, 44 (4), pp. 43-49 (7 pages).
- [14] Grudzewski, W.M.; Hejduk, I.K.; Sankowska, A.; Wańtuchowicz, M.; (2010), "Sustainability w biznesie, czyli przedsiębiorstwo przyszłości. Zmiany paradygmatów i koncepcji zarządzania", Poltext, Warszawa, p. 36-37 (2 pages), 68, 116.
- [15] Chan Kim, W.; Mauborgne, R.; (2006), "Strategia błękitnego oceanu", Wydawnictwo MT Biznes, p. 31.
- [16] Davenport, T.H.; Prusak, L.; (2000), "Working Knowledge: how Organizations Manage What They Know", Harvard Business School Press, Boston-Massachusetts, p. 46.
- [17] Evans, C.; (2005), "Zarządzanie wiedzą", PWE, Warszawa, p. 59.
- [18] Bratnicki, M.; (2008), "Zarys kontekstualnej teorii przedsiębiorczości organizacyjnej. Organizacja i Kierowanie", No. 2 (132), p. 7.
- [19] Bygrave, W.; Zacharakis, A.; (2008), "Entrepreneurship", Wiley, Hoboken, p. 49.
- [20] Pabian, A.; (2017), "Planowanie strategiczne z perspektywy sustainability", Handel Wewnętrzny, No. 3, Vol. 1, pp. 341-350 (10 pages).
- [21] Koźuch, B.; Koźuch, A.; Sienkiewicz-Małyjurek, K.; (2016), "Contemporary Faces of Public Management", Przegląd Organizacji, No. 3, pp. 56-63 (8 pages).
- [22] Imai, M.; (2012). *Gamba Kazein*, "A Commonsense Approach to a Continuous Improvement Strategy", McGraw-Hill, New York, p. 36.
- [23] PN-EN ISO 9000:2006, "Systemy zarządzania jakością. Podstawy i terminologia", Polski Komitet Normalizacyjny, Warszawa, p. 29.
- [24] Ejdyś, J.; (2011), "Model doskonalenia znormalizowanych systemów zarządzania oparty na wiedzy", Oficyna Wydawnicza Politechniki Białostockiej, Białystok, p. 11, 187.
- [25] Krzemień, E.; (2004), "Zintegrowane zarządzanie – aspekty towaroznawcze: jakość, środowisko, technologia, bezpieczeństwo", Wydawnictwo Śląsk, Katowice-Warszawa.
- [26] Szczęśniak, B., Zasadzień, M.; Wapiennik, Ł.; (2012), "Zastosowanie analizy pareto oraz diagramu Ishikawy do analizy przyczyn odrzutów w procesie produkcji silników elektrycznych", Zeszyty Naukowe. Organizacja i Zarządzanie / Politechnika Śląska, z. 63a, pp. 125-147 (23 pages).
- [27] Czakon, W.; (ed.), (2015), "Podstawy metodologii badań w naukach o zarządzaniu", Oficyna Wydawnicza, Wolters Kluwer Business, Warszawa, p. 189-208 (20 pages).

#### Web sites:

Web-1: <http://www.un-documents.net/our-common-future.pdf>, consulted 13 September 2018.