

Vlačić, Ernest

Conference Paper

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Provided in Cooperation with:

Governance Research and Development Centre (CIRU), Zagreb

Suggested Citation: Vlačić, Ernest (2018) : Disruption Disrupted through the Meta-Analysis, In: Tipurić, Darko Labaš, Davor (Ed.): 6th International OFEL Conference on Governance, Management and Entrepreneurship. New Business Models and Institutional Entrepreneurs: Leading Disruptive Change. April 13th - 14th, 2018, Dubrovnik, Croatia, Governance Research and Development Centre (CIRU), Zagreb, pp. 225-237

This Version is available at:

<http://hdl.handle.net/10419/179994>

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Disruption Disrupted Through the Meta-Analysis

Ernest Vlačić

University of Applied Sciences Baltazar, Zaprešić

NOVAMINA CIT, Zagreb, Croatia

ernest.vlacic@novamina.hr

Abstract

Innovation, particularly when realized through structured innovation process strategically contributes to firms' mission to achieve and maintaining a long-term and sustainable competitive advantage. Recently, over half of the Fortune 500 companies have disappeared since 2000 by being merged, acquired, or gone bankrupt. Many of them because they did not properly react on uncertain and dynamic global market dynamisms where the innovative strategic positioning present on of the most driving critical success factor. This is notable particularly when it comes to the field of disruptive innovations which presents one of the challenging phenomenon that corporations have to face to. Due to its nature and genesis the emergence of disruptive innovation tents to slip under the radars of incumbents thus causing plausible or sometimes significant damages by disrupting their comfortable market positioning. Thus, the research challenge and the goal of this paper arises which is to examine the theoretical background of the disruptive innovation field to get deeper insights on the attractiveness of the research area. Consequently, a comprehensive overview of the existing knowledge base related to the theory of disruptive innovations in influencing firms' business practices lies in focus of this research. Based on a ProKnow-C methodology and the WoS Core Collection base, this paper presents a bibliometric analysis of relevant publications on disruptive innovation field. In terms of methodology, by conducting exploratory secondary research the available bibliographic data related to the field of disruptive innovation studies have been analyzed in detail. As the instrument for determining the relevance and influence of the impact of disruptive innovation, a meta-analysis of published papers was performed. It is hoped that the results obtained will contribute to a better understanding of disruptive innovation and its areas of influence, as well as guide and focus potential future research efforts particularly in the economies where it wasn't evaluated sufficiently.

Keywords: *disruptive innovation, corporations, meta-analysis, strategic positioning*

Track: *Management & Leadership*

Word count: 5.274

1. Introduction

In a highly dynamic environment of constant changes, the organisation which does not encourage and promote organisational learning and innovation as a systemic and continuous practice cannot expect to be capable of realising a higher sustainable performance (Drucker, 1993). This is particularly valid for the turbulent times which are characterized as a down of the new industrial revolution, colloquially called the Industry 4.0. Just in a recent time, over half of the Fortune 500 companies have disappeared since year 2000 by being merged, acquired, or gone bankrupt. Many of them because they did not properly react on uncertain

and dynamic global market dynamisms where the innovative strategic positioning present on of the most driving critical success factor. This is notable particularly when it comes to the field of disruptive innovations which presents one of the challenging issues that corporations have to deal with. Due to its nature and genesis the emergence of disruptive innovation tends to slip under the radars of incumbents and causing plausible or sometimes significant damages by disrupting their comfortable market positioning. That phenomenon represents the fundamentals in the 'innovators dilemma' discourse (Christiansen, 1997).

Disruptive innovation may be encountered in almost all segments of private and public sectors. For example in recent publication Jönsson (2017) is examining the impacts of the disruption related to European Union (EU) health industry.

The rapid spread of digital technologies, such as the internet, internet of things, IoT, WEB2.0, cloud technologies and big-data analytics and has disrupted the business models of numerous industries, such as telecommunications, education, postal services, music, media, banking, retail and insurance (Bughin and Van Zeebroeck, 2017; Greenstein, Goldfarb, and Tucker, 2013). These changes are usually influenced by new players that use digital technologies to shape and introduce business models that business models of market incumbents make frequently obsolete. As a response to such digitization, recent empirical evidence suggests that incumbents which adapt by developing or acquiring new products or services do successfully maintain or even manage to grow their position in the market (Bughin and Van Zeebroeck, 2017).

Several scholars have attempted to deal with disruption, but the field still remains widely uncovered. As a consequence there's limited quantity of the available scientific theory that supports the nature of the disruption and how it influences the incumbents strategic positioning and what are their reactions in protecting the market position through resisting or overcoming the disruption. The question arises which are the heterogeneity and diversification drivers in incumbents' responses to digital disruption?

Accordingly, deeper insights through production of the comprehensive overview on the existing knowledge base related to the theory of disruptive innovations in influencing firms' business practices lies in the focus of this paper's authors. Thus, the goal of this paper is to examine the theoretical background of the disruptive innovation field in order to get deeper insights on the attractiveness of the research area. Besides analyzing the topic coverage at the global level, author also concurrently provides a rather limited analysis of the local/regional situation, thus additionally providing evidence in order to influence and catalyze future decisions on production of research papers to be focused on national or regional scope.

This research has been performed by conducting exploratory secondary research, and it methodologically presents a bibliometric analysis of relevant publications in the field of disruptive innovation theory and studies. As the instrument to achieve our defined research objectives we have selected a commonly used methodological systematic review of the available bibliography in a form of a simplified meta-analysis (Dabić et al. 2014, 2015, author(s) 2016, 2017). The meta-analysis is complemented by ProKnow-C methodology instrument which was applied on published papers available in WoS Core Collection data base. The results were systematized in a form of quantitative bibliographic review supporting the main goal of this paper which is to provide deeper insight in terms of relevance for the impact of disruptive innovation in contexts of corporate business practices.

It is hoped that the results from this paper will contribute in better understanding of disruptive innovation and its fields and intensity of influence, as well as guide and focus potential future research efforts particularly in the economies where it wasn't evaluated sufficiently.

Following this introduction, a theoretical background and a literature review on current disruptive innovation research is presented. In the third section, the methodology with

identified limitation is given, while in the following fourth section the analysis of obtained results is presented. Paper ends with concluding section and the references list.

2. Background

In his works (Christensen, 1997; Christensen and Raynor, 2003) portrays the theory of “disruptive innovation” and argues that it is often incorrectly misused to various exceptionally novel products that are “disrupting” the market in rather colloquial terms. In the same work Christiansen is presenting additional theoretical assumption stating that radical or discontinuous types of innovations *de facto* provide also major levels of novelty. This is often expressed in terms of significant technology advancements and drastic changes in customer use, which is opposite from disruptive innovations which are introducing a new value proposition.

The theory of disruptive innovation deals with the phenomenon how smaller players by attempting to provide more affordable and accessible solutions are disrupting already established firms - incumbents in an industry (Gaul, 2014). Opposite to sustaining type of innovation, the so called entrant is able to gain its position in a saturated market and start to develop its offerings unaffected by the incumbent firms. Due to the reason that disruptive offerings are usually simpler for use, more convenient and cheaper than the existing solutions, they enable the inclusion of customers who were previously not participating to the market. Summing, the disruptive innovation as a dichotomy to sustaining type of innovation (Garcia and Cantalone, 2002), usually generate a real growth and creates jobs in a competing industry (Lambert, 2014). Hence, as a consequence it presents an opportunity for smaller players to successfully compete against well established companies (Gaul, 2014).

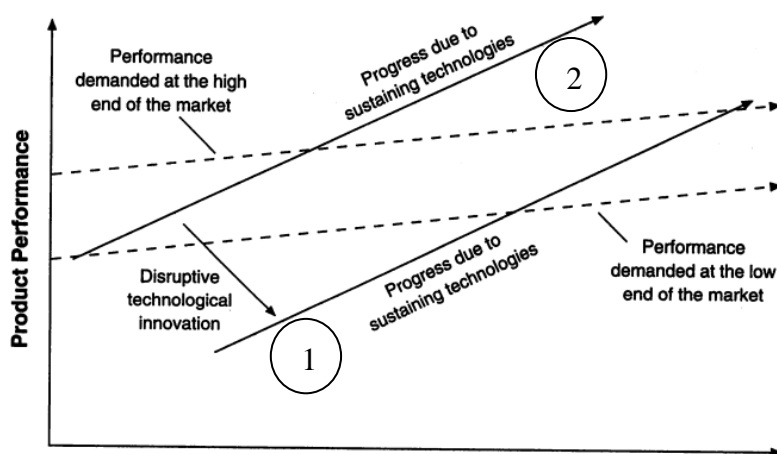


Figure 1. The Impact of Sustaining and Disruptive Technological Innovation (Christiansen, 1997, pag.16), adapted by the author

Disruptive innovation positioning and its impact are presented on the graph (figure 1.) (Christiansen, 1997) which is displaying two basic strategy lines. The first one (1), which is addressing the over-served end low end users with lower cost products or business models, and the second line (2), that defines the development of sustaining innovation strategy essentially bringing a better product into the established market. As emphasized in Guttentag and Smith (2017), the disruptive innovations’ initial appeal is typically small, and early consumers consist of low-end consumers and/or previous non-consumers of the incumbent competing product. They continue explaining that the disruptive product improves over time

such that it can satisfy the demands of mainstream consumers. In doing so, it encroaches upon the existing market as it is increasingly adopted as a substitute for the incumbent product, which may be superior along some dimensions but offers a ‘performance oversupply’. Guttentag and Smith (2017) are concluding by claiming that because early on a disruptive innovation appeals only to a small market with minimal profits, it initially tends to be dismissed by leading firms that are content to concentrate on their more profitable market segments. Once these leading firms recognize the threat posed by the disruptive product, it may be so entrenched in the new market it has created that these firms struggle to compete. To obtain clearer perception on disruptive innovation it has to be placed in the comparative position with other innovation types. Although there are many typologies of innovation presented, Christiansen (2013) is offering the one where the innovation is classified into two main categories, sustaining and disruptive. Sustaining innovation refers to the type of innovation, which does not relatively impact the current available market and society. It may come in as an improvement type to the current product. However, it does not necessarily create a new product (Tran, 2008; King and Baartartogtokh, 2015). In their work Rahman, Hamid and Chin (2017) presented a review of some of the previous disruptive technology in the last few decades as summed in the table 1.

Table 1. Disruptive innovation technologies presented in Rahman, Hamid and Chin (2017), modified by author

Technology	Disruptive Impact	References
Digital Media Store	Compact Disc (CD)	Berinato, S. (2010). Waldfoegel, J. (2010). Wlömert, N., & Papiés, D. (2016).
Streaming Video Portal	DVD, BlueRay, TV Cable	Wayne, M. L. (2017). Yu, Y., Chen, H., Peng, C. H., & Chau, P. (2017).
Smartphones	Classic mobile phones, photo digital cameras, etc.	Sarwar, M., & Soomro, T. R. (2013). Church, K., & de Oliveira, R. (2013).

On the other side, the emerging technologies within industry 4.0 that are possessing emerging disruptive ability and potential are presented in table 2.

Table 2. Technologies with emerging disruptive ability, author’s selection

Examples of technologies with disruptive ability
Car and ride sharing
Internet of things (IoT)
Drones and autonomous vehicles (air, ground, marine)
Driverless vehicle
Autonomous robots
Virtual/augmented/mixed reality
Blockchain
3D printing

These examples above show the existing disruptive innovation and their disruptive effects toward the existing technology. For the industry 4.0 however, there are several new emerging technologies which are expected to possess the disruptive feature. Schwab (2017) is claiming that Industry 4.0, which revolves around the development of many new emerging technologies with disruptive innovation feature, is said to disrupt a lot of industry sectors globally. The disruption does not only disrupt sectors but it also disrupts firms' businesses and strategic positions, particularly these with larger or global market share, which corresponds and relates to corporations.

Being disrupted by newcomers the question arises: why big companies are losing when it comes to disruptive innovation, and if so how to get back on track. In his article Torben (2012) is presenting a case with 11 corporations that struggled with disruption, where MICROSOFT, NOKIA, Bang & Olufsen, Hewlett-Packard-Dell and BLOCKBUSTER are listed as disrupted one. Particular accent on disruption in the hospitality industry (accommodation sector) related to the disruptive effect that AIRBNB is creating in their work is presented by Guttentag (2015) and Guttentag and Smith (2017). Dealing with disruptive innovation requires firms' engagement of numerous resources, procedures and capacities. Among other, possessing evolved absorptive capacity is very important in identifying knowledge and trends outside firms' boundaries (author 2017; Kranz, Hanelt and Kolbe, 2016), thus elevated absorptive capacity, particularly in its acquisition component acts as effective mean to oppose the threatening disruption.

Several researchers have attempted to overcome the ambiguities in identifying disruptive innovations, but the examples which are quantifying the effects of the disruption are very scarce, or almost absent. As one component of these assessments, they have generally considered whether a product aligns with the classic characteristics of disruptive innovation, relying on their own market research analysis or the opinions of industry members or experts Rafii and Kampas (2002). In this optic when the measurement of the disruption effects, the empirical determination and its categorization is in question there's still an enormous space available for focused research efforts.

In studying disruption among researchers there are controversies on several areas, ranging from the exact typology of disruptive innovation, the disruptive effects (job creation and others), the classification of disruptive examples that are reflected through case studies, and others.

In disruption innovation evaluation one of the most important questions is how to identify, resist and overcome by opposing it from the incumbent position, or how to adapt the strategic positioning of the incumbent in order to avoid the KODAK like scenario and fate (Scott, 2016). This effect was among others studied by Bradley and O'Toole (2016) with the focus on evaluating the disruption from the incumbent position.

Research on disruptive innovation in Croatia

When it comes to structured scientific research of disruptive innovation phenomenon in Republic of Croatia, according to accessible primary and secondary information, it is visible that the researched field did not yet occupy or enter in the focus of its scientific community. It may be assumed that the genesis of such situation is grounded by the fact that proposed field is *a priori* by limited scope unexplored at the global level. Also producing thorough and relevant disruptive innovation related studies requires a multidisciplinary scientific approach to satisfactorily encompass and evaluate its complex scope. Another reason for such void may lay in the fact that national market is rather limited and thus visible, where the corporations which are most influenced by the disruptive innovation, in the role of incumbents, are predominantly foreign owned. Thus by nature their strategic positioning and business policies

are dictated by their foreign ownership structure, which might be ignorant about the plausible emergence of the disruptive innovation on the limited national or linked regional markets. Concluding this section, the relevant available and published literature in Croatia unveils a complete lack of conceptual and empirical scientific work on disruptive innovation of firms; in particular, there are no documented efforts of the operationalization of the topic at any level.

Research question

As a conclusion of this section, which might also present a research question is: how influencing and interested is the disruption itself. Would it present in a near future a phenomenon that deserves much higher attention due to its operating nature and possible impacts on firms as incumbents, particularly on corporations? What are the business and market consequences for the incumbents of neglecting it, or even ignoring? Finally is there a critical mass of theoretical background available to consider the examined area as relevant and researchable, which thus enable and/or stimulate future research particularly in the regional context.

3. Methodology

With the purpose of to identify the research activity on disruptive innovation, a ProKnow-C instrument (knowledge/development/process-constructivist) suggested by Ensslin, Ensslin, Lacerda and Tasca (2010) were used. In principle ProKnow-C offers a structured process to provide information to the researcher on a selected topic or subject, subdivided into four steps: 1) selection of the bibliographical portfolio; 2) bibliometric analysis of the selected articles; 3) systemic analysis of the selected articles, and 4) definition of the research question and research objective (Ensslin, Ensslin & Pacheco, 2012; Waiczuk & Ensslin, 2013; Ensslin, Ensslin, Imlau, & Chaves, 2014). For the purpose of this analysis the first three stages were sufficient in application in order to determine the relevance of current disruptive innovation theoretical background, and thus meet the objective of this paper. In order to determine and satisfy the criteria of selected publications relevance, an overview of filtered abstracts was made as well.

The first ProKnow-C stage implementation foresees the selection of the articles aiming to create the bibliographic portfolio. Selection of the portfolio is made through: 1) definition of the keywords for the research topic, 2) selection the data bases, 3) quarry for the articles in selected data bases.

In accordance to ProKnow-C first step, which is the definition of the keywords for disruptive innovation area to be explored in one axis was made. Articles in the database were retrieved using the search function and the lexemes (TS=(disruptive innovation) AND TS=(firms) AND DOCUMENT TYPES: (Article). The search is conducted on January 17th, 2018 which resulted filtering 317 articles which have been cited 4997 times. The Boolean 'AND' expression is introduced in data base search to ensure selection of articles that use both keywords.

Next ProKnow-C methodology step foresees the selection of appropriate databases. Since disruptive innovation *per se* represents a multidisciplinary hybrid area between social/humanistic and technology learning sciences, the Web of Science (WoS) Core Collection as the primary and dominant source of information was selected as the appropriate and relevant one.

In order to determine the research relevance of disruptive innovation, as also suggested in Dabic, González-Loureiro and Furrer (2015), the third step was to systematize filtered

bibliographic records contained in WoS. The search included works that had been published until the very early 2018, and as mentioned earlier the key words used were *disruptive innovation AND firms*.

Limitations

Some limitations to the applied methodology were identified in the creation process of this paper. The first one is result of author’s deliberate decision to exclude published books (except those listed in WoS), where Christensen, C. M., as the one of the pioneers in studying the disruptive innovation, records thousands of citations, thus making him the highest cited author in the field. The second limitation is related to the selection of filtering keywords. Since the research goal of this paper is to explore the innovation as an underlying process in the context of disruption, somehow biased results may be obtained. This may primarily be caused due to the fact that highly cited authors registered their works using somehow different keywords as: ‘*disruptive technologies*’, ‘*innovators’ dilemma*’ or ‘*disruptive change*’.

4. Results and discussion

Within the procedure of a bibliometric analysis of the selected articles and systemic analysis of the same the filtered search has extracted 317 relevant papers which were identified to contain composites of required examined keywords.

Firstly, the chronological profile of published papers is observed displayed in Figure 1. The results are showing that, since the very first one recorded in the mid 1990s, the growth in published papers has been increasing by approximate cubic curve growth. A noticeable increase in publishing frequency may be observed from the mid 2000s onwards, where the field has been strongly advancing in its visibility and scientific relevance.

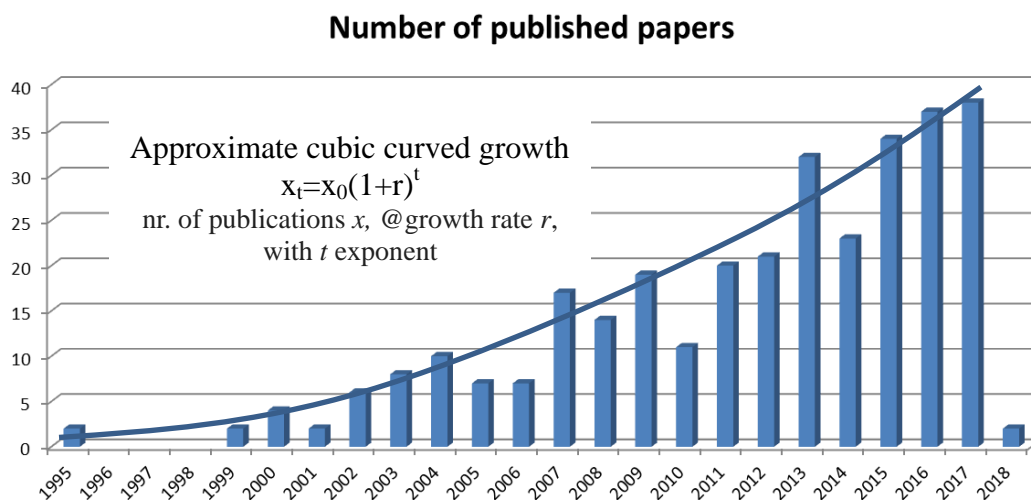


Figure 2. Chronological records of disruptive innovation publishing, source: WoS core collection

When it comes to the analysis of published articles in relevant publications, a relative balance may be noticed. Nevertheless, *Journal of Product Innovation Management*, *Technological Forecasting and Social Change Journal*, *Technovation* and *Research Policy* are preferentially selected in the observed field of disruptive innovation. Table 3 displays the top ten publishing journals and sources that cumulatively cover more than 36% of total publishing.

Table 3. Top 10 disruptive innovation publishing journals, source: WoS core collection

No.	No. of public at.	JOURNAL NAME	% of total	% cum.
1	18	Journal of Product Innovation Management	6,27 %	6,27 %
2	18	Technological Forecasting and Social Change	6,27 %	12,54 %
3	11	TECHNOVATION	3,83 %	16,38 %
4	10	Research Policy	3,48 %	19,86 %
5	9	IEEE Transactions on Engineering Management	3,14 %	23,00 %
6	9	Technology Analysis and Strategic Management	3,14 %	26,13 %
7	8	International Journal of Technology Management	2,79 %	28,92 %
8	8	Portland International Conference on Management of Engineering & Technology	2,79 %	31,71 %
9	7	Creativity and Innovation Management	2,44 %	34,15 %
10	6	book chapters (WoS registered)	2,09 %	36,24 %

The presence of disruptive innovation may be identified within a wide number of specific research areas. This research has identified more 40 specific areas where the disruptive innovation paper has been published least once. These papers are usually classified by a multicategory selecting principle, which means that 'disruptive innovation' topic presents itself as a rather multidisciplinary field. Larger number of examined papers is related to innovation (technological) in engineering, disruptive innovation in public administration and operation, as well as in pure research and development segment. Nevertheless, by far, most of papers are published in the field of business and management, which indicates that the majority of research activities and interest on disruptive innovation derive from the business and management related research efforts. Table 4 displays the first ten classified areas of this bibliographic research.

Table 4. Most disruptive innovation research published areas, source: WoS core collection

Research area	No. of papers	% of total
1 Business; Management	43	13,65%
2 Business; Engineering, Industrial; Management	36	11,43%
3 Management	27	8,57%
4 Business	20	6,35%
5 Business; Planning & Development	18	5,71%

6	Engineering, Industrial; Management; Operations Research & Management Science	12	3,81%
7	Economics	11	3,49%
8	Management; Planning & Development	10	3,17%
9	Management; Multidisciplinary Sciences	9	2,86%
10	Engineering, Multidisciplinary; Management; Operations Research & Management Science	8	2,54%

Finally, by conducting a meta-analysis based on 317 filtered works, we have identified a total of 4997 citations registered in WoS. A list of fifteen most cited papers is shown in Table 5. The table displays that Danneels's paper '*Disruptive technology reconsidered: A critique*' published in 2004 is leading the citation scoreboard by being cited 249 times since. In the second place is held there's Adner with the paper entitled '*When are technologies disruptive? A demand-based view of the emergence of competition*' published in 2002 with over 200 citations. Adner is followed by Grabher's '*Temporary architectures of learning: Knowledge governance in project ecologies*' published in 2002 summing a total of 200 citations. The first 15 papers listed in the table are cumulatively exceeding the 40% of total citations in the researched bibliography, which furthermore indicates the level of importance for these fifteen presented works that influenced past disruptive innovation research.

Table 5. Disruptive innovation leading citing papers/authors, source: WoS core collection

nr.	Author(s)	year	title	tot. citat.	% of total cit.	cum. cit %
1	Danneels, E	2004	Disruptive technology reconsidered: A critique and research agenda	249	4,98%	4,98%
2	Adner, R	2002	When are technologies disruptive? A demand-based view of the emergence of competition	205	4,10%	9,09%
3	Grabher, G	2004	Temporary architectures of learning: Knowledge governance in project ecologies	200	4,00%	13,09%
4	Walsh, ST	2004	Roadmapping a disruptive technology: A case study - The emerging microsystems and top-down nanosystems industry	141	2,82%	15,91%
5	Kappel, TA	2001	Perspectives on roadmaps: how organizations talk about the future	141	2,82%	18,73%
6	Puranam, P; Srikanth, K	2007	What they know vs. what they do: How acquirers leverage technology acquisitions	131	2,62%	21,35%
7	Kostoff, RN; Boylan, R; Simons,	2004	Disruptive technology roadmaps	127	2,54%	23,89%

GR						
8	Lyytinen, K; Rose, GM	2003	The disruptive nature of information technology innovations: The case of Internet computing in systems development organizations	127	2,54%	26,44%
9	Song, M; Podoyunitsyna, K; van der Bij, H; Halman, JIM	2008	Success factors in new ventures: A meta-analysis	119	2,38%	28,82%
10	Baker, WE; Sinkula, JM	2007	Does market orientation facilitate balanced innovation programs? An organizational learning perspective	117	2,34%	31,16%
11	Paruchuri, S; Nerkar, A; Hambrick, DC	2006	Acquisition integration and productivity losses in the technical core: Disruption of inventors in acquired companies	109	2,18%	33,34%
12	Massa, S; Testa, S	2008	Innovation and SMEs: Misaligned perspectives and goals among entrepreneurs, academics, and policy makers	107	2,14%	35,48%
13	Walsh, ST; Kirchhoff, BA; Newbert, S	2002	Differentiating market strategies for disruptive technologies	90	1,80%	37,28%
14	Lee, S; Yoon, B; Lee, C; Park, J	2009	Business planning based on technological capabilities: Patent analysis for technology-driven roadmapping	86	1,72%	39,00%
15	Malhotra, A; Gosain, S; El Sawy, OA	2007	Leveraging standard electronic business interfaces to enable adaptive supply chain partnerships	80	1,60%	40,60%

Discussion

As previously mentioned, the ProKnow-C backed meta-analysis has produced 317 examined publications, which might indicate relatively low available bibliographic quantity for particular research topic. This is, amongst other indicating at the first place that the phenomenon of disruptive innovation is relatively newer research topic rather than being unattractive to scholars to be dealt with. On the other side, the disruptive innovation as a category is equally or even more frequently represented in expert publications, book publications and other databases. In addition the publication quantity in the examined WoS would be much higher in case of usage of modified keywords which would combine words '*disruptive*' or '*disruption*'.

Other keywords that would significantly increase the produced quantity are '*technology development*', '*emerging technologies*' or '*disruptive technologies*'. However, the usage of

different combinations would certainly lead to biased view on the bibliographic relevance because the '*innovation*' and innovation related process is representing the leading key word in this paper.

The number of quotes identified by this meta-analysis is somehow lower than those presented by Google Scholar; however these are primarily referring to cited books or book chapters.

Produced results have shown that disruption is an area which represents an interdisciplinary scientific mix, mainly dealing with the segment of business and organization, strategic management and technological innovation of products or services.

The outputs are mainly related to the private business sector, although the presence of works from the public sector which are in continuous growth can be detected as well. The results thus obtained are prevalently dealing with technology development, although papers which are dealing with disruptive business models or disruptive services in somewhat lower quantities are present as well.

5. Conclusions

Presented trends are showing a continuous increase in the publishing volume related to disruption, which leads us to conclude that disruption innovation area will continue to be a very attractive and interesting area for further research not only for researchers in Croatia, but at the global level as well.

The results of the conducted meta-analysis are showing a noticeable multidisciplinary and interdisciplinary character of the disruptive innovation. The analysis unveiled that the examined area, although not investigated at the particularly extended levels, is becoming increasingly attractive, very actual and scientifically relevant.

Due to its multidisciplinary and interdisciplinary character, which requires a thorough understanding of a large number of operating variables in firms, understanding the impact of the disruption is often too complex to be operationalized. This complexity leads to possible creation of contextual approaches in its measurement and operationalization, but so far none of the existing models or methodological approaches has shown themselves to be ideal or highly prescriptive for determining the disruptive effect and impact.

Unfortunately, the disruptive innovation has been rather neglected and unembraced by scholars the Republic of Croatia, including those in regional economies. In these countries almost none or very little research activity has been recorded in relation to the disruption field. This is particularly visible in terms of scientific related publishing, which is practically absent.

Among other objectives, this paper aims at raising awareness of the importance of disruptive innovation at any level and geographical scope and possibly encouraging interest in topic publishing within the Croatian research milieu. This would be a step forward in assisting national and regional firms, particularly corporations in understanding the topic and shaping strategies to identify, resist and overcome disruptive impact.

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