Competitiveness Review
Guidelines for applying Porter's five forces framework: a set of industry analysis templates
Michael E. Dobbs

Article information:
To cite this document:
Permanent link to this document:
http://dx.doi.org/10.1108/CR-06-2013-0059

Downloaded on: 26 February 2017, At: 03:30 (PT)
References: this document contains references to 31 other documents.
To copy this document: permissions@emeraldinsight.com
The fulltext of this document has been downloaded 55301 times since 2014*

Users who downloaded this article also downloaded:

Access to this document was granted through an Emerald subscription provided by All users group

For Authors
If you would like to write for this, or any other Emerald publication, then please use our Emerald for Authors service information about how to choose which publication to write for and submission guidelines are available for all. Please visit www.emeraldinsight.com/authors for more information.

About Emerald www.emeraldinsight.com
Emerald is a global publisher linking research and practice to the benefit of society. The company manages a portfolio of more than 290 journals and over 2,350 books and book series volumes, as well as providing an extensive range of online products and additional customer resources and services.

Emerald is both COUNTER 4 and TRANSFER compliant. The organization is a partner of the Committee on Publication Ethics (COPE) and also works with Portico and the LOCKSS initiative for digital archive preservation.

*Related content and download information correct at time of download.
Guidelines for applying Porter’s five forces framework: a set of industry analysis templates

Michael E. Dobbs
Department of Management, Eastern Illinois University,
Charleston, Illinois, USA

Abstract
Purpose – The purpose of this paper is to provide practitioners and students a practical yet comprehensive set of templates for applying Michael Porter’s five forces framework for industry analysis.

Design/methodology/approach – Based on experiences with practicing managers, small business owners, industry analysts, academics, and students, a set of industry analysis templates that systematically guides an analyst through a comprehensive assessment of the five forces is presented with the following: copies of the templates themselves, descriptions of their structure and use, an example of a completed template (spectator sports industry), and a discussion of possible modifications and extensions.

Findings – The industry analysis templates described in this paper retain the comprehensiveness of Porter’s framework but in a format much more student/manager-oriented using graphics, visual cues, a uniform structure, and straightforward descriptions of concepts. Template users show evidence of deeper strategic insights and have a sophisticated tool for future analysis.

Practical implications – Managers, analysts, students, and others wanting robust industry analysis are provided with a comprehensive, structured, and practical set of templates to use in assessing an industry using the five forces framework.

Originality/value – Leading strategic management texts and other sources provide no comprehensive, systematic, and robust format for conducting a five forces analysis of an industry. The set of industry analysis templates described in this paper provides a visually compelling, user-friendly format that can assist those analyzing industries gain important strategic insights not only into industry drivers, but also important competitive advantages for individual firms.

Keywords Strategic management, Industry analysis, Five forces framework, Sport industry analysis, Teaching tools, Templates

Paper type Conceptual paper

In 1980, Michael Porter published *Competitive Strategy*, a work that shaped the thinking of a generation of academics and managers (Crowther, 2008; Magretta, 2012). Included in that foundational text (the first chapter, in fact) was Porter’s description of “five forces” that shape the structure of all industries and in large part establish the rules of competition and the root causes of profitability within an industry (Porter, 2008). The five forces are the threats posed by competitive rivalry, powerful buyers, powerful suppliers, potential new entrants, and substitute products. According to Porter (1980, p. 3), “the collective strength of the forces determines the ultimate profit potential in the industry”. But of more interest to Porter, as emphasized in his update of the five forces in 2008, is the potential to use the five forces framework to understand strategic implications for individual firms within an industry.
Challenges in using the five forces

The practical application of the five forces framework, however, has been more challenging. Porter (2008) himself admits as much and describes common misapplications of the framework. Magretta (2012), Allio and Fahey (2012) and Lee et al. (2012) also describe managerial difficulties. While working with practicing managers, small business owners, MBA and undergraduate business students, and other academics, I have witnessed many of the same things. The following challenges in using the five forces framework are taken from Porter (2008), Magretta (2012) and my own observations.

Lack of depth

Many people only understand the five forces framework and its use in an inordinately shallow way. At best, this leads to incomplete, inaccurate, and unhelpful analysis. At worst, it can lead to misanalysis, poor decision making, and disastrous organizational outcomes. Those of us in academia bear a good deal of the blame when it comes to a lack of depth in teaching students about the concepts and usage of the five forces framework. This begins with textbook coverage. I surveyed ten leading (Napshin, 2010) strategic management textbooks and catalogued the coverage of the five forces in each (Table I). The number of pages devoted to the five forces framework ranges from four to 21 pages. Only two of the textbooks provide in-depth descriptions, explanations, and applications (Thompson et al., 2012; Barney, 2011). Most textbooks summarize the basic concepts, reprint or adapt Porter’s graphical depiction of the framework, and provide examples from various industries. Two other textbooks (Wheelen and Hunger, 2012; David, 2011) provide only four pages of coverage, diluting the power and potential value of the framework considerably. Unless students read one of the two textbooks with in-depth coverage of the five forces and have an instructor who can comprehensively and effectively explain the framework, most will grasp only a superficial familiarity with five

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Title</th>
<th>Ed.</th>
<th>©</th>
<th>Pages of five forces coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barney</td>
<td>Gaining and Sustaining Competitive Advantage</td>
<td>4</td>
<td>2011</td>
<td>21</td>
</tr>
<tr>
<td>David</td>
<td>Strategic Management: Concepts and Cases</td>
<td>13</td>
<td>2011</td>
<td>4</td>
</tr>
<tr>
<td>Dess, Lumpkin, Eisner and McNamara</td>
<td>Strategic Management: Text and Cases</td>
<td>6</td>
<td>2012</td>
<td>11</td>
</tr>
<tr>
<td>Hill and Jones</td>
<td>Strategic Management: An Integrated Approach</td>
<td>10</td>
<td>2013</td>
<td>11</td>
</tr>
<tr>
<td>Hitt, Ireland and Hoskisson</td>
<td>Strategic Management: Competitiveness &amp; Globalization</td>
<td>10</td>
<td>2013</td>
<td>8</td>
</tr>
<tr>
<td>Marcus</td>
<td>Management Strategy: Achieving Sustained Competitive Advantage</td>
<td>2</td>
<td>2011</td>
<td>8</td>
</tr>
<tr>
<td>Pearce and Robinson</td>
<td>Strategic Management: Planning for Domestic and Global Competition</td>
<td>13</td>
<td>2013</td>
<td>7</td>
</tr>
<tr>
<td>Rothaermel</td>
<td>Strategic Management: Concepts and Cases</td>
<td>1</td>
<td>2013</td>
<td>8</td>
</tr>
<tr>
<td>Thompson, Peteraf, Gamble and Strickland</td>
<td>Crafting and Executing Strategy: The Quest for Competitive Advantage</td>
<td>18</td>
<td>2012</td>
<td>18</td>
</tr>
<tr>
<td>Wheelen and Hunger</td>
<td>Strategic Management and Business Policy: Toward Global Sustainability</td>
<td>13</td>
<td>2012</td>
<td>4</td>
</tr>
</tbody>
</table>

Table I. Five forces coverage in leading strategic management textbooks
forces terminology. When these students graduate and become managers, small business owners, and/or entrepreneurs, any industry analysis using the five forces framework will be crippled by its lack of depth. The restoration of depth of analysis is one of the purposes of the templates.

Lack of structured analysis
Porter (2008) laments the lack of quantitative measures used in typical applications of the five forces framework and the devolution of the analysis into a series of qualitative lists. These types of assessments of industry conditions are frequently rather arbitrary and make for poor substitutes for the rigor originally outlined and prescribed by Porter. However, the presentation of the framework in Competitive Strategy may have played a significant role in the development of this particular problem in applying the framework for two reasons. First, in the original explanation of the framework, Porter provides dozens, if not hundreds of examples of the five forces at work in a wide variety of industries; but in only very rare instances does he provide quantitative details of the examples. Second, the original description of the five forces is, in essence, a list. Granted, the list is not simple, but there are extensive lists of the sources of threats within the five forces. Users of the framework have naturally taken their cues from Porter, and following his lead have used lists and largely qualitative assessments of the five forces. It is the frequent arbitrary nature of five forces analyses that may be significantly diminished through a more structured approach to the implementation of the framework which is what the templates are designed to provide.

Lack of strategic insight
Perhaps Porter’s (2008) biggest disappointment in the misapplication of the five forces framework is the perception that the framework is primarily a tool to assess the attractiveness levels of industries rather than gain strategic insight as to how a firm can compete more effectively within its industry. The primary purpose of the framework is the latter; however, tying the analysis to specific strategic action items is challenging. There are many contingency factors to consider (e.g. stage of industry cycle) so that universal guidelines regarding actions to take given certain threat levels are not advisable. In Competitive Strategy, Porter’s links between the five forces and specific strategic actions are provided throughout much of the latter parts of the book and are not in a single place which would make them more accessible and likely to be seen and/or used. While this placement is understandable and warranted, it forces the user of the framework to be more proactive and perceptive in drawing actionable conclusions from his/her five forces analysis. The templates are designed to aid analysts with this aspect of using the framework, as well.

Millennial generation preferences
Another factor affecting how students process and apply the five forces framework may be the generation to which they belong. As of the 2010s, traditional college-aged students are classified as Millennials, or members of Generation-Y. While people in this generation are very media-conscious and familiar with how technology contributes to an increasingly complex environment (Considine et al., 2009), they also long for the stability that authority and structure bring (Jonas-Dwyer and Pospisil, 2004; Moore, 2007). In addition, they expect high levels of service, low levels of “busy work,” and will not
hesitate to voice their frustrations or dissatisfaction when those expectations are not met (Black, 2010; Eisner, 2011). The templates provide the structure desired by these Millennials and allow them to spend more time on analysis and less on formatting leading to higher overall levels of satisfaction with the education process.

Five forces templates
The challenges identified by Porter in applying the five forces framework have certainly been observed by others. Any instructor teaching a strategic management course or a consultant working with clients has witnessed the same issues. But in an intensive, professional MBA program in which students have a strong desire to take Monday evening’s principles and bring them to bear on Tuesday morning’s business problems, the challenges to proper and effective application of the five forces framework comes into much sharper focus. It was in such an environment that I made my first rudimentary attempts at developing a guide to help managers and students apply the five forces framework to their companies. Over the course of time, I continued to refine the emerging set of templates as I interacted with different types of students, consulting clients, academics, and professional industry analysts. My students and I used the templates to analyze large, small, and entrepreneurial businesses; government agencies; nonprofit and charitable organizations, and other types of organizations.

As the templates improved, students’ strategic insight improved. Rather than exhibiting a superficial familiarity with terminology like switching costs and exit barriers, students and professionals using the templates seemed to have a deeper understanding of the underpinnings of industry structure. This translated into more nuanced recognition and exploitation of competitive industry dynamics. Granted, not all users of the templates have become proficient in the application of the five forces framework – far from it in many cases. However, in my experience, each of the challenges described earlier regarding the application of the five forces framework is lessened significantly when these templates are used. The latest versions of these five forces templates are provided in Appendix 1.

As to the order in which the five forces are presented in the templates (competitive rivalry, buyer power, supplier power, new entrants, and substitutes), there are two primary reasons for the order I decided to use. First, Porter presents them in different orders himself, implying there is no correct order. In 1980, he uses the following order: new entrants, competitive rivalry, substitutes, buyer power, and supplier power. In 2008, he presented them in a different order: new entrants, supplier power, buyer power, substitutes, and competitive rivalry.

Second, by trial and error, I have found this particular order most effective. My experience with MBA and undergraduate students alike is that they are most familiar with concepts regarding competitive rivalry. They understand direct competition from previous business classes as well as life experiences. Therefore, I place competitive rivalry as the first force to examine in an attempt to start with the most familiar concepts. The second and third forces are buyer and supplier power, in that order. Typically, students and practicing managers are familiar with distribution channels and supply chain issues, so these two forces are not as challenging to grasp. The fourth force is the threat of new entrants. This is not a force some students and managers have thought about before in much depth, so it is placed fourth so that students/managers can have some momentum upon which to build. And finally, the
concept of substitutes, while extremely valuable, is frequently unknown to many students/managers. In my experience, I have found it best to save this force for last. Although this sometimes increases the likelihood that students struggling with comprehension of the concepts will fail to comprehend the essential concepts of substitute product threats. However, this would likely be the case for whichever force was fifth in the order. Users of the templates should feel free to experiment with their own order to see what works best for them.

Standard format of all templates
All of the five forces templates share the same underlying format. The particular force to be analyzed is listed at the top with an asterisk that directs the user to an explanation of how this force may threaten the profits of firms in the industry. Below the title are the individual components of the templates as follows and as depicted in Appendix 1.

Sources of threats. Six to eight contributing sources of threats from the underlying structure of an industry are listed for each force. These are taken from Porter’s 1980 and 2008 publications. For most of the threat sources there is consistency between what is listed on the template and what can generally be found in other explanations of the five forces (i.e. in textbooks). However, with substitute products in particular, greater detail is provided in the templates than what is typically found in other sources. Much of this is derived from Porter’s (1985) Competitive Advantage and is not ordinarily used in descriptions of the five forces. However, Porter devotes significant space to substitute product threats in this work and provides much greater detail as to how this particular threat can be assessed.

Threat level indicator bar. Each of these six to eight sources of threats is to be analyzed and the user may then indicate the relative threat level by marking (e.g. circling) the threat level indicator bar above the name of the item. The farther right the mark, the higher the analyst perceives the threat level to be (as indicated by the shaded bar just below the title). To aid the analyst, bar labels are provided for each threat source that indicate the value, level, or measurement that is associated with either high or low threat levels. Below the name of each threat source, there is space enough for the analyst to write brief explanations, thoughts, notes, analysis, etc. More detailed comments may be noted on the back of the template.

Driving factors. To the left of each potential threat source, there is a square box labeled “DF”. The analyst is to mark the box(es) of those contributing threat sources s/he determines to be a driving factor of the threat level of a particular force. The number of driving factors may vary by force and industry. Other formats have been considered and/or used to indicate the relative weight of a contributing factor. On one extreme, there is an implied equal weighting to each source of threat if no special designation is provided (Coulter, 2013). On the other extreme, mathematical weights could be used to assess each threat source (Lee et al., 2012). The format described here attempts to strike a balance between the two extremes and maintain depth of analysis without bogging down the analyst in three or four dozen mathematical assessments and their subsequent use in equations and calculations.

Threats and opportunities. Finally, in an attempt to more directly link analysis to strategic action, space is provided for the template user to indicate key opportunities and threats facing the focus organization. Without an explicit, clearly stated tie-in to opportunities and threats, the full value of an industry analysis utilizing the five forces framework is not realized. Often, the five forces are presented as a purely external
analytical exercise and are not linked to specific resources of the firm. This lays the groundwork for an unnecessary and unfortunate battle for paradigm dominance between Porter’s five forces and the resource-based view of the firm (Prahalad and Hamel, 1990; Barney, 2011). Contrary to common perceptions, the five forces framework does, indeed, take into consideration the unique resources of the firm, but that consideration is made after the industry analysis is complete. The five forces framework and the resource-based view of the firm can be considered complementary perspectives (Porter, 2008) rather than adversarial as is commonly the case (Makhija, 2003; Ronda-Pupo and Guerras-Martin, 2012). Specifically linking five forces assessments to opportunities and threats can help strategic thinkers develop powerful responses to industry pressures to improve competitiveness and increase profits.

Example template: competitive rivalry in North American spectator sports

Seeing an example of a completed template concretely illustrates the mechanics of the templates and provides additional clarity for users. Included as Appendix 2 is an example template assessing competitive rivalry in North American spectator sports. This industry includes the four “major” sports of baseball, football, basketball, and hockey at both the major and minor league levels (professionally) and collegiately; other team sports such as soccer; individual-based sports such as track and field, golf, tennis, and even auto racing. Only the competitive rivalry template is provided due to space limitations, but the form and structure is the same for all five of the forces. The text in italics font is meant to represent the hand-written analysis of a template user.

Below each of the eight sources of competitive rivalry, there are brief comments explaining the thinking behind the assessment and the placement of the shaded circles on the associated threat level indicator bars. Some of the comments include source citations and quantitative measures. The level of documentation and rigor used in the analysis is variable. In this particular example, four of the threat sources are identified with check marks in the corresponding boxes as the driving factors of competitive rivalry in the industry. Finally, key threats and opportunities are identified in the last two boxes near the bottom of the page. These could be used in different ways by the template user, including but not limited to incorporation into a larger SWOT analysis.

Possible modifications and extensions

These templates have evolved over time and significant alterations have been made to address observed confusion on the part of users and to strengthen their practical use. Future modifications are likely as new feedback is received and a wider audience utilizes them. A different system of indicating which sources of threats are more important could be developed. Originally, and following the example of most other attempts at practical application of the framework, the templates did not direct the user to distinguish between the most important and least important threat sources. A mathematical weighting system similar to a TOWS (Weihrich, 1982) or MOWST matrix (Dobbs and Pisarczyk, 2012) was considered, but ultimately rejected due to anticipated unwieldiness. One other modification has been seriously considered. While there is no room on the template to include detailed explanations of how each of the threat sources relates to one of the five forces (e.g. why/how slow or negative industry growth causes higher levels of competitive rivalry), these descriptions could be included on the back of the template. The advantage of this would be added convenience for the user, but there could be a
negative impact on student learning if there is too much concern for convenience and not enough individual processing of concepts.

Porter’s five forces framework is a powerful tool in the hands of a skilled manager or analyst. Unfortunately, no practical, systematic templates that balance comprehensiveness and ease of use have been developed to help in the application of the framework to actual organizations. The templates presented here have been developed with this need in mind. Thus, far, usage in classroom and consulting settings has yielded positive feedback and reports of higher levels of comprehension and better strategic insight demonstrating the value of this tool as a means of applying Porter’s five forces framework of industry analysis.

References


**Further reading**


**About the author**

Dr Michael E. Dobbs is an Assistant Professor of management in the Lumpkin College of Business and Applied Sciences, Eastern Illinois University. He received his PhD from the University of Texas at Dallas and MBA from Baylor University. His research interests include applied strategic management of non-profit organizations, small businesses, and sport organizations. Michael E. Dobbs can be contacted at: office.asc47@yahoo.com

(The Appendices follow overleaf.)

To purchase reprints of this article please e-mail: reprints@emeraldinsight.com

Or visit our web site for further details: www.emeraldinsight.com/reprints
Appendix 1

*Threat of Competitive Rivalry*

<table>
<thead>
<tr>
<th>THREAT LEVELS</th>
<th>DF†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Few/Leader</td>
</tr>
<tr>
<td>High</td>
<td>Industry Growth</td>
</tr>
<tr>
<td>Low</td>
<td>Fixed and/or Storage Costs</td>
</tr>
<tr>
<td>High</td>
<td>Product Differentiation</td>
</tr>
<tr>
<td>High</td>
<td>Switching Costs</td>
</tr>
<tr>
<td>Low</td>
<td>Strategic Stakes</td>
</tr>
<tr>
<td>Small Increments</td>
<td>Capacity Expansion</td>
</tr>
<tr>
<td>Low</td>
<td>Exit Barriers</td>
</tr>
</tbody>
</table>

**THREATS**

1. 
2. 

**OPPORTUNITIES**

1. 
2. 

(continued)

Notes: *Rivalry necessitates price cuts, new product development, advertising campaigns, service improvements depending on the intensity and basis of competition between rival organizations; †DF – driving factors of industry dynamics to be indicated with check marks
Notes: *Powerful buyers (the first five) and/or price sensitive buyers (the last three) force down prices, demand better quality/service, and play competitors off one another; †DF – driving factors of industry dynamics to be indicated with check marks
**Notes:** Powerful suppliers charge higher prices, limit product/service features/quality, and/or shift costs to other industry players; †DF – driving factors of industry dynamics to be indicated with check marks

---

### Threat of Suppliers/Supplier Groups *

<table>
<thead>
<tr>
<th>Low</th>
<th>High</th>
</tr>
</thead>
</table>

**DF†**

- **Many Organizations**
- **Supplier Concentration**
- **Few Organization**

- **High %**
- **Supplier Volume/Profit**
- **Low %**

- **Not Feasible**
- **Supplier Forward Integration**
- **Credible Threat**

- **Standardized**
- **Supplier Products**
- **Highly Differentiated**

- **Low**
- **Industry Switching Costs**
- **High**

- **Many Viable Options**
- **Supplier Substitutes**
- **No Viable Options**

### Threats

1. 
2. 

### Opportunities

1. 
2.

*(continued)*
Notes: *The threat of new entry puts downward pressure on prices, and upward pressure on costs/rate of investment necessary to keep new entrants out of the industry; †DF – driving factors of industry dynamics to be indicated with check marks
Notes: *Substitutes perform the same/similar function as products of the industry but by different means. Viable substitutes place a ceiling on prices and drive up costs related to product performance, marketing, service, and R&D; †DF – driving factors of industry dynamics to be indicated with check marks.
Appendix 2

**Threat of Competitive Rivalry*-- Spectator Sports (North America)**

<table>
<thead>
<tr>
<th>Threat Level</th>
<th>DF†</th>
<th>Existing Competitors</th>
<th>Numerous/Balanced</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low</strong></td>
<td>✓</td>
<td>Few/Leader</td>
<td>Hundreds of sports teams in North America, but consolidated leagues.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>High</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Threat Level</th>
<th>Industry Growth</th>
<th>Slow/Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>High</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Threat Level</th>
<th>Fixed and/or Storage Costs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>High</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Threat Level</th>
<th>Product Differentiation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>High</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Threat Level</th>
<th>Switching Costs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>High</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Threat Level</th>
<th>Strategic Stakes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>High</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Threat Level</th>
<th>Small Increments</th>
<th>Capacity Expansion</th>
<th>Large Increments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>High</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Threat Level</th>
<th>Exit Barriers</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>High</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**THREATS**

1. Continued escalation of player salaries driven by high value teams.
2. Emotions driving some team owners rather than sound business practices.

**OPPORTUNITIES**

1. Large, loyal fan bases can protect teams from competitor actions.
2. League structures protect teams from higher levels of competitive rivalry.

Notes: *Rivalry necessitates price cuts, new product development, advertising campaigns, service improvements depending on the intensity and basis of competition between rival organizations; †DF – driving factors of industry dynamics to be indicated with check marks
This article has been cited by:


2. Vendrell-Herrero Ferran Ferran Vendrell-Herrero f.vendrell-herrero@bham.ac.uk Myrthianos Vasileios Vasileios Myrthianos vasileios.myrthianos@upc.edu Parry Glenn Glenn Parry glenn.parry@uwe.ac.uk Bustinza Oscar F. Oscar F. Bustinza oscarfb@ugr.es Managerial Economics, University of Birmingham, Birmingham, UK Polytechnic University of Catalonia, Barcelona, Spain Strategy and Operations Management, University of the West of England, Bristol, UK Faculty of Economics and Business Studies, University of Granada, Granada, Spain . 2017. Digital dark matter within product service systems. Competitiveness Review 27:1, 62-79. [Abstract] [Full Text] [PDF]


5. David Guemes-Castorena, Miguel A. Toro Methodology for the integration of Business Model Canvas and technological road map 41-52. [CrossRef]