

Entrepreneurship in Industrial Engineering: The Shoe Selling Case

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Abstract

This paper presents a literature review of articles on entrepreneurship published exclusively by leading journals in operations management and industrial engineering (OM) fields. Our purpose is to develop an overview of how entrepreneurship issue has evolved among OM disciplines, and discusses the relevance of it for OM scholars.

Key words: Entrepreneurship; Literature review; Industrial Engineering; Operations Management.

1. Introduction

To illustrate market opportunity analysis, some teachers have told their students a popular tale in business folklore. In this story, two salesmen of a shoe company are sent to a very poor country to analyze and estimate the local market opportunity for selling shoes. The first salesman wrote back and declared: "There is no market for our shoes in this country. Nobody wears shoes here!" Nevertheless, the second salesman also wrote back and stated happily: "There is a huge market for our shoes in this country. Nobody wears shoes here!"

Our research shows that entrepreneurship plays the same role of the shoes when we review the literature published by leading journals in operations management and industrial engineering (OM) fields.

Although entrepreneurship is a strategic element for innovation and wealth creation, scholarly research in entrepreneurship remains quite limited (Shane, 2006). With exceptions of periodicals Management Science and Harvard Business Review, articles on entrepreneurship published at leading OM periodicals are rare. This context lead us to a similar question raised by the boss of the two salesmen: Is Entrepreneurship an opportunity or a lost of time for OM scholars?

2. Research Method

To organize the literature review, firstly, we have developed an integrated ranking of the leading journals of operations management and industrial engineering based on previous rankings created by Barman et al (2001), Olson (2000) and Soteriou et al (1999). Barman et al (2001) explains that over the years many studies have attempted to evaluate the quality of journals in various disciplines, and in OM is not different. The most popular research technique to rank journals is to conduct a survey among scholars in a specified academic field.

Barman et al (2001) themselves developed a ranking with the 21 journals in the OM considering the opinion of US members of the Production and Operations Management Society (POMS). Olson (2000) also conducted his study in the United States by surveying faculty of top U.S. graduate schools of business to determine their expert views as to the best

journals in OM. He build a ranking with 28 journals. Soteriou et al (1999) developed a ranking with 35 journals considering the perception of members of the European Operations Management Association (EurOMA).

Taking into consideration these three rankings, we developed a new one with the 10 top journals considering their average position. This new list can be observed in the Table 1.

Table 1 – Leading articles by relevance

Rank	Journal (average position)	Rank	Journal (average position)
1	[JOM] Journal of Operations Management (3.0)	6	[OR] Operations Research (6.3)
2	[MS] Management Science (3.3)	7	[DS] Decision Sciences (6.7)
3	[IJPR] International Journal of Production Research (4.0)	8	[HBR] Harvard Business Review (8.3)
4	[POM] Production and Operations Management (4.0)	9	[EJOR] European Journal of Operational Research (10.0)
5	[IJOPM] International Journal of Operations and Production Management (6.3)	10	[IIE] IIE Transactions (10.3)

Source: Authors' review

We concentrated efforts in collecting articles published by the 10 journals mentioned above. All articles, since the first volume, of these journals with the word “entrepreneur”, “entrepreneurship” or “entrepreneurial” in the title, key word or abstract were identified and analyzed. It is important to note that key words such as “small and medium enterprises” or related words like SME or SMB were not considered in this review because the concepts of entrepreneurship and SME are not interchangeable (DRUCKER, 1985). Drucker (1998) explains that entrepreneurship concept is necessarily linked to innovation while small business management not.

We identified 248 articles during the collection phase as observed in the following figure.



Figure 1 – Number of articles by journal

Source: Authors' review

Each article was submitted to Citation Index¹ in order to find out its relevance in terms of the number of citations by other papers. As number of citations of a given article can be influenced by the time it has published, the number of citations observed was divided by number of days since its publication to get an average index of citation. In this case, beginning of calculation was the first day of the month when the article was published and the

¹ <http://isiwebofknowledge.com/index.html>

last day was December 31, 2005. At least, top five articles by relevance of each journal were included in this literature review, but only MS, HBR and EJOR published more than five articles about entrepreneurship as observed in the Figure 1.

What called our attention is the supremacy of HBR in terms of number of articles on entrepreneurship. On the other hand, journals such as IJPR and OR have not published any article in this field.

In a simple taxonomy approach, journals listed above can be clustered into four main groups.

The first group is formed by publications with no article collected, specifically IJPR and OR.

A second group joins the *typical* “OMs” publications such as JOM, POM and IJOPM, and other main journals such as DS and IIE. What put these journals together is the minor number of published articles and their little impact in terms of citations by other articles

MS and EJOR form up the third group considering the number of articles. Besides its expressive number of papers [36], articles of MS have a greater impact if compared to their peers. For example, four of the five most cited articles analyzed were published by MS.

The last group is represented by HBR. This publication, alone, represents the most remarkable group [75.4 percent share] in terms of number of articles.

Figure 1 shows that only MS and HBR accounted for nearly 90% of the total number of articles on entrepreneurship published by leading OM periodicals. Therefore, it represents an investigation bias taking into consideration that both periodicals do not deal with OM issues in a continuous basis.

3. Literature Review

Literature review can be organized in several ways. It can be organized by theme, by research issue, by publication period, by author, among others.

Review taking into consideration the publication timeline (see figure 2), for example, shows that entrepreneurship reached a modest popularity in three periods. The first one was between 1984 and 1987. In this period, issues such as venture capital (SYKES, 1986, TYEBJEE and BRUNO, 1984), entrepreneurship concept (STEVENSON and GUMPERT, 1985, REICH, 1987, BEHRMAN and LEVIN, 1984) and strategy (SHOSTACK, 1984 and SEGEV, 1987) got scholar's attention.

The second period is observed between 1992 and 1994. In this period, typical research field associated to entrepreneurship was customer orientation (TREACY AND WIERSEMA, 1993), results drivers (BARTLETT and GHOSHAL, 1994 AND DOWLING and MCGEE, 1994) and entrepreneurship in international contexts such as in China (KAO, 1993), Russia (LAWRENCE and VLACHOUTSICOS, 1993) and Japan (WEBER, 1992).

The last period of popularity was observed between 2000 and 2003 and it was clearly marked by the technology-based entrepreneurship (SHANE and STUART, 2002, THURSBY and THURSBY, 2002, SHANE, 2001) and networked relations (SHANE and CABLE, 2002 and SAWHNEY and PARikh, 2001).

This timeline analysis was significantly influenced by HBR and MS due their vast majority share in the research population.

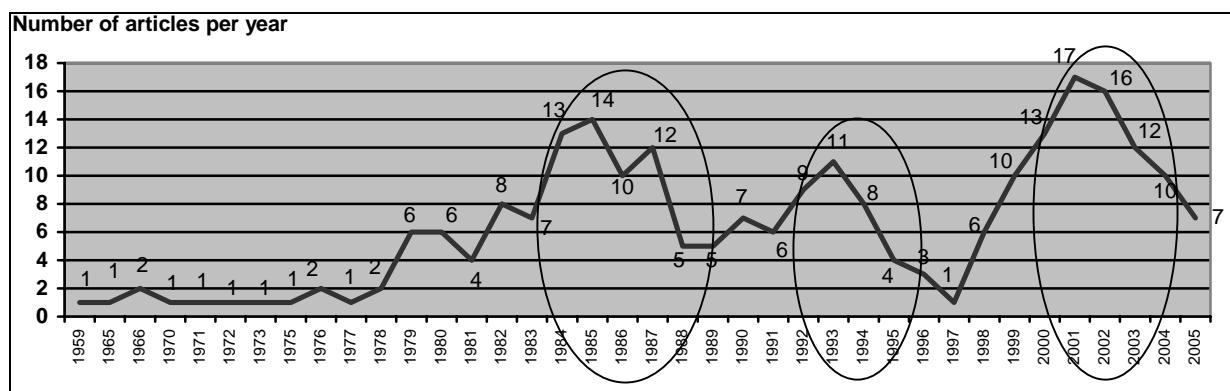


Figure 2 – Timeline of articles publishing

Source: Authors' review

In addition to timeline and other mentioned ways, literature review can also be made from the journal classification perspective based on the number of articles. In this case, four clustered groups of journals were identified, as mentioned before.

Tabela 2 – Publication groups by number of articles

Group	Number of articles identified	Members
Group 1	0	IJPR and OR
Group 2	1 ~ 9	POM, JOM, DS, IJOPM and IIE
Group 3	10 ~ 50	EJOR and MS
Group 4	50 +	HBR

Source: Authors' review

The first group joins publications that have not published any article related to entrepreneurship. In this context, no article from IJPR or OR was identified and collected.

A second major group is comprised by publications that published from one to nine articles. From this point of view, POM, JOM, DS, IJOPM and IIE are members of this group.

POM, for example, published a solitary article from the entrepreneurial point of view. In this lonely work, McDougall *et al* (1992) developed case studies of computer and communications equipment industries to understand manufacturing strategy and business origin of new venture firm.

Only two articles linked to entrepreneurship were identified at JOM. Both of them were published recently. Nassimbeni (2003) analyzed the small and local based Italian eyewear industry compared with the global economy, and Jambulingam et al. (2005) studied the case of entrepreneurial orientation of retail pharmacy industry.

DS also published only two articles. Both covered typical OM issues, namely decision making process (ABE, 1972) and new product development (BROCKMAN, 2003).

From the three articles collected from IJOPM, two investigated typical OM issues – production allocation (VOS, 1991) and practice performance models (CAGLIANO and SPINA, 2002). Insightfully, the third article “Operations management in the USA”, written by Meredith and Roth (1998) is the sole one amid the research population that declares specifically that entrepreneurship was becoming more popular among OM students.

IIE has also published only three articles. The older one examined project duration (ROSENBLATT and ROLL, 1985), another typical issue in OM. However, the latter two articles deal with entrepreneurship with more emphasis. Khalil (1995) analyzed innovation management and entrepreneurship in technology-based firms, and Wilson and Goldsman (2001) covered Alan Pritsker's multifaceted career, demonstrating that it is possible to be a first-rate practicing engineer, scholarly researcher, devoted teacher, and successful entrepreneur.

In addition to the modest number of articles published, from zero to three articles per publication, this second cluster of publications has minor or no impact on other papers. Number of citations by other articles ranges from zero (mostly) up to two per article.

EJOR and MS represent a third group and here it is possible to see changes in researched themes, number of articles and impact on other papers.

Different from journals previously mentioned, EJOR presents an eclectic range of article themes on entrepreneurship. Themes included typical OM issues such as supply chain (GUNNARSSON et al, 2004), capacity decisions (PERRONE, 2002) and insightful entrepreneurship research problems such as management scientists versus managers (BALL, 1985), successful and less successful new innovative businesses (PICOT et al, 1990) and venture capital (ELITZUR and GAVIOUS, 2003). What ties EJOR and previous mentioned publications is the little impact on subsiding other literature. Number of citations of EJOR articles ranges from zero to two.

MS, on the other hand, breaks rules of the ongoing situation related to number of publications and citations. Although MS has fewer articles published when compared with HBR, they published more influential studies, if we pay attention to the number of articles citing MS's papers.

Four of five most cited articles among those examined in this review were published by MS. The first two articles (140 citation each) deal with entrepreneurship and classification of firms (MILLER, 1983) and archetypes of strategy formulation (MILLER and FRIENSEN, 1978). The third most influential article explored corporate entrepreneurship and its relation to strategic management (BURGELMAN, 1983).

MS also published top cited article about venture capital investment (TYEBJEE and BRUNO, 1984) and entrepreneurial process (AMIT et al, 1990).

HBR represents itself the fourth group because it accounts for 75.5 percent of the number of articles selected and analyzed which represents 182 articles.

Entrepreneurial strategy, personal characteristics of entrepreneurs, fund raising and discussion on entrepreneurship concept have accounted for nearly 50 percent of articles published by HBR about entrepreneurship as observed in the table 3.

In addition to the large number of articles published, HBR also contributed to seed seminal ideas on the entrepreneurship field such as "The R And D Entrepreneur - Profile Of Success" written by Schrage (1965) or "The Discipline of Innovation", one of the Drucker's (1985) most respected paper.

Our database of articles on entrepreneurship published by HBR also indicates that there are an interesting distribution of key entrepreneurial research issues.

Table 3 – Key entrepreneurship research issues at HBR

Key entrepreneurship research issue	# of articles	% (share)	Key entrepreneurship research issue	# of articles	% (share)
Strategy	33	17.46%	Industry-related issue	6	3,17%
Personal characteristics	27	14.29%	Innovation	6	3,17%
Fund raising	20	10.58%	Non-profit	4	2,12%
Entrepreneurship concept	15	7.94%	Process design	4	2,12%
International issue	15	7.94%	Corporate venture	6	3,17%
Public policy	14	7.41%	Lessons learned	4	2,12%
Case study	11	5.82%	Education	3	1,59%
Marketing	10	5.29%	Negotiation	2	1,06%
Planning	7	3.70%	Others	2	1,06%

Source: Authors' review

The most popular research issue was entrepreneurial strategy with 33 articles (17.5 percent), followed by entrepreneurial personal characteristics (14.3 percent) and fund raising

(10.6 percent). Scholars has also paid attention to the entrepreneurship concept *per se* (7.9 percent) and entrepreneurship in international contexts such as in China, Japan or Russia. Curiously, traditional research issues in OM such as production management or quality system have not been identified in the collected articles.

4. Discussion

It is not our intention here to raise questions about the research limits of OM as a discipline as those discussed by Pilkington and Liston-Heyes (1999), but if entrepreneurship is relevant or not for OM scholars and students.

As can be observed in the literature review, entrepreneurship is not a common research issue among OM publications. Nearly seven of ten publications analyzed had inexpressive number of articles on entrepreneurship. Entrepreneurship was also not listed in the pipeline research of OM scholars according to Filippini (1997).

Familiar with modeling and theory building through quantitative techniques, OM scholars could ask why entrepreneurship research is necessary if it does not explain or predict empirical phenomena beyond what is known from work in other fields (SHANE and VENKATARAMAN, 2000).

This situation can bring us back to the first salesman who did not identify any potential market for his shoes.

However, the context of the second salesman can also lead us to insights about the role and relevance of entrepreneurship for OM field.

Shane and Venkataraman (2000, p.219) call the attention that “*many scholars ask, either implicitly or explicitly, why anyone should study entrepreneurship. Data are difficult to obtain, theory is underdeveloped, and many findings to date are the same as those obtained in other areas of business.*” These authors offer three reasons for studying the topic.

- *First, much technical information is ultimately embodied in products and in products and services, and entrepreneurship is a mechanism by which society converts technical information into these products and services.*
- *Second, entrepreneurship is a mechanism through which temporal and spatial inefficiencies in a economy are discovered and mitigated.*
- *Finally, of the different sources of change in a capitalism society, entrepreneurially driven innovation in products and processes is the crucial engine driving the change process.*

If we consider the point of view of Shane and Venkataraman (2000) and the OM mission as an academic discipline stated by Chopra et al (2004, p.8) as “*identify, extend, and unify scientific knowledge that contributes to the understanding and practice of operations management, defined as the design and management of the transformation processes that create value for society*”, entrepreneurship as an emerging research issue for OM scholars can make sense.

5. Final considerations

Entrepreneurship has gained attention increasingly at different academic programs around the world. According to Meredith and Roth (1998, p. 672). it is also valid for OM in US. These authors declares that their “*students are increasingly interested in courses on entrepreneurship, family businesses and small business. Part of this may be driven by the increasing opportunity in these areas as more and more firms outsource their traditional functions. Another driver is the downsizing occurring in these same firms. resulting in fewer*

opportunities for hiring into firms.”

From the point of view of the scholars, it is possible to note some signals of the emergence of entrepreneurship as a field research in OM. The increasing relevance of empirical research in OM to bridge the gap between OM research and practice (FILIPPINI, 1997) is one example.

Moreover, MS, the second most relevant publication for OM community, included entrepreneurship as one of the core research field in 2003 as observed in the Table 4.

Table 4 – Changes of OM editorial departments at Management Science

▪ Production management; ▪ Logistics	▪ Production management ▪ Logistics; ▪ Dynamic Programming and Inventory Theory.	▪ Production and Operations Management; ▪ Logistics, Distribution, and Inventory.	▪ Production and Operations Management; ▪ Manufacturing, Distribution, and Inventory.
1969	1974	1981	1985
▪ Manufacturing, Distribution, and Service Operations.	▪ Manufacturing, Distribution, and Service Operations. ▪ Supply Chain Management	▪ Design and Operations Management. ▪ Supply Chain Management	▪ Operations and Supply Chains ▪ Technological Development, Product Development, and Entrepreneurship.
1987	1997	2002	2003

Source: Chopra et al. 2004, p. 11

Although MS has elected entrepreneurship as one of its key research topic, Shane (2006) has many critics on the current situation. For him (SHANE, 2006. p. 155) “*although the number of researchers who have investigated this phenomenon has increased in recent years, the quality of their theoretical and empirical contributions has been relatively poor, with few studies meeting the standards of leading academic journals, such as Management Science. As a result, scholars have a limited understanding of this important topic*”.

As a closing consideration, great entrepreneurs such as Henry Ford (Ford Motor), Ray Kroc (McDonald's), Bill Boeing (Boeing) or Sam Walton (Wal Mart Stores) that developed breakthrough solutions in typical OM issues (production management, quality system, design and operations management and supply chain management respectively), were, in fact, examples of the second salesman.

References

- ABE. M. A Positive Dynamic Approach To Industrial Decision-Making Process. **Decision Sciences**..Vol. 3. Issue 3; p. 15. Jul 1972.
- AMIT. R.. GLOSTEN. L.. MULLER. E. Entrepreneurial Ability. Venture Investments. and Risk Sharing. **Management Science**. Vol. 36. Iss. 10; p. 1232-1246. Oct 1990.
- BALL. B. C. Management Scientists and Managers: Experiences of an OR-Practitioner with a Critical Interface. **European Journal of Operational Research**. Vol. 21. Iss. 1; p. 17-25. Jul/85.
- BARMAN. S; HANNA. M.D. & LAFORGE. R. L. Perceived relevance and quality of POM journals: A decade later. **Journal of Operations Management**. Vol.19. Iss. 3; pg. 367. May 2001.
- BARTLETT C.A. & GHOSHAL S. Changing The Role Of Top Management - Beyond Strategy To Purpose. **Harvard Business Review**. Vol.72 . Iss.6: p. 79-88. Nov-Dec 1994.
- BEHRMAN. J.N.. LEVIN. R.I. Are Business Schools Doing Their Job? **Harvard Business Review**. Vol. 62. Iss. 1; p. 140-146. Jan/Feb 1984.

BROCKMAN B.K. & MORGAN R.M. The role of existing knowledge in new product innovativeness and performance. **Decision Sciences**. Vol. 34. Iss. 2; 385-419. Spring 2003.

BURGELMAN. R.A. Corporate Entrepreneurship and Strategic Management: Insights from a Process Study. **Management Science**. Vol. 29. Num. 12; pág. 1349-1365. Dec 1983.

CAGLIANO R. & SPINA G. A comparison of practice-performance models between small manufacturers and subcontractors. **International Journal of Operations & Production Management**. Volume: 22 Number: 12 Page: 1367 - 1388. 2002.

CHOPRA. S.. LOVEJOY. W. & YANO. C. Five Decades of Operations Management and the Prospect Ahead. **Management Science**. Vol.50.No.1..pp.8 –14. January 2004.

DOWLING M.J. & MCGEE J.E. Business And Technology Strategies And New Venture Performance - A Study Of The Telecommunications Equipment Industry. **Management Science**. Vol. 40, n. 12. p. 1663-1677. Dec 1994.

DRUCKER. P. F. The Discipline of Innovation. **Harvard Business Review**. Vol. 63. Iss. 3; p. 67-73. May/Jun 1985.

ELITZUR R. & GAVIOS A. A multi-period game theoretic model of venture capitalists and entrepreneurs. **European Journal of Operational Research**. Vol. 144. Issue 2. 16 Pages 440-453. January 2003.

FILIPPINI. R. Operations management research: Some reflections on evolution. models and empirical studies in OM. **International Journal of Operations & Production Management**. Vol. 17. No. 7. p. 665-670. 1997.

GUNNARSSON H.. RÖNNQVIST M. & LUNDGREN J.T. Supply chain modeling of forest fuel. **European Journal of Operational Research**.Vol. 158. Issue 1. p.103-123. October 2004.

JAMBULINGAM T.. KATHURIA R. & DOUCETTE W. R. Entrepreneurial orientation as a basis for classification within a service industry: the case of retail pharmacy industry. **Journal of Operations Management**. Volume 23. Issue 1. Pages 23-42. January 2005.

KHALIL. T. M. Managing Innovation and Entrepreneurship in Technology Based Firms. **IIE Transactions**. Vol. 27. Iss. 6; p. 821. Dec 1995.

LAWRENCE P.. VLACHOUTSICOS C. Joint Ventures In Russia - Put The Locals In Charge. **Harvard Business Review**. Vol.71 . Iss.1: p. 44. Jan-Feb 1993 .

MCDOUGALL P.P. DEANE R. H.. &D'SOUZA D. E. Manufacturing Strategy and Business Origin of New Venture Firms in the Computer and Communications Equipment Industries. **Production and Operations Management**. Vol. 1. Issue 1. Winter 1992.

MEREDITH J. & ROTH A. Operations management in the USA. **International Journal of Operations & Production Management**. Volume: 18 Number: 7 Page: 668 –674. 1998.

MILLER. D. The Correlates of Entrepreneurship in Three Types of Firms. **Management Science**. Vol. 29. Num. 7; pág. 770-792. Jul 1983.

MILLER. D. & FRIESEN. P. H. Archetypes of Strategy Formulation. **Management Science**. Vol. 24. Num. 9; p. 921. May 1978.

NASSIMBENI G. Local manufacturing systems and global economy: are they compatible?: The case of the Italian eyewear district. **Journal of Operations Management**. Volume 21. Issue 2. Pages 151-171. March 2003.

OLSON. J. E. Top Journals in Operations Management and Operations Research. *Paper*. Available at: <http://www.isye.gatech.edu/~jsokol/jfig/OM-OR%20Journals-rept.pdf>. Mar 02. 2005.

PERRONE G.. AMICO M.. NIGRO G. & LA DIEGA S.N. Long term capacity decisions in uncertain markets for advanced manufacturing systems incorporating scope economies. **European Journal of Operational Research**.. Vol. 143. Issue 1. 16 Pages 125-137. November 2002.

PICOT A.. LAUB U. & SCHNEIDER D. Comparing successful and less successful new innovative businesses . **European Journal of Operational Research**. Vol. 47. Issue 2. 25 Pages 190-202. July 1990.

PILKINGTON A. & LISTON-HEYES. C. Is production and operations management a discipline? A citation/co-citation study. **International Journal of Operations & Production Management**. Vol. 19 No. 1. pp. 7-20. 1999.

- REICH. R. B. Entrepreneurship Reconsidered: The Team as Hero. **Harvard Business Review**. Vol. 65. Iss. 3; p. 77-84. May/Jun 1987.
- ROSENBLATT. M. J. & ROLL. Y. A Future Value Approach to Determining Project Duration. **IIE Transactions**. Vol. 17. Iss. 2; p. 164-168. Jun 1985.
- SCHRAGE. H. The R And D Entrepreneur - Profile Of Success. **Harvard Business Review**. Vol.43 . Iss.6: p. 56-69. Nov-Dec1965.
- SEGEV. E. Strategy. Strategy Making. and Performance - An Empirical Investigation. **Management Science**. Vol. 33. Num. 2; p. 258-270. Feb 1987.
- SHANE, S. Introduction to the Focused Issue on Entrepreneurship. **Management Science**. Vol.52, No.2; p. 155 –159. Feb 2006.
- SHANE S. & STUART. T. Organizational endowments and the performance of university start-ups. **Management Science**. Vol. 48. Iss. 1; p. 154-181. Jan 2002.
- SHANE S. & CABLE. D. Network ties. reputation. and the financing of new ventures. **Management Science**. Vol. 48. Iss. 3; p. 364-382. Mar 2002.
- SAWHNEY. M. & PARIKH. D. Where value lives in a networked world. **Harvard Business Review**. Vol. 79. Iss. 1; p. 79. Jan/01.
- SHOSTACK. G. L. Designing Services That Deliver. **Harvard Business Review**. Vol. 62. Iss. 1; p. 133-140. Jan/Feb 1984.
- SOTERIOU. A. C; HADJINICOLA. G. C & PATSIA. K. Assessing production and operations management related journals: The European perspective. **Journal of Operations Management**. Vol.17. Iss. 2; pg. 225. 14 pgs. Jan 1999.
- STEVENSON. H.H. & GUMPERT. D.E. The Heart of Entrepreneurship. **Harvard Business Review**. Vol. 63. Iss. 2; p. 85-95. Mar/Apr 1985.
- SYKES. H. B. Lessons from a New Ventures Program: Lessons learned. **Harvard Business Review**. Vol. 64. Iss. 3; p. 69-75. May/Jun 1986.
- THURSBY J.G.. THURSBY M.C. Who is selling the Ivory Tower? Sources of growth in university licensing . **Management Science**. Vol. 48. n.1. p. 90-104. Jan/02.
- TREACY. M. & WIERSEMA. F. Customer intimacy and other value disciplines. **Harvard Business Review**. Vol. 71. Iss. 1; p. 84-94. Jan/Feb 1993.
- TYEBJEE. T.T. & BRUNO. A.V. A Model of Venture Capitalist Investment Activity. **Management Science**. Vol. 30. Iss. 9; p . 1051-1067. Sep 1984.
- VOS. G.C.J.M. A Production-allocation Approach for International Manufacturing Strategy. **International Journal of Operations & Production Management**. Volume: 11 Number: 3. 1991.
- WILSON J.R. & GOLDSMAN D. Alan Pritsker's multifaceted career: Theory. practice. education. entrepreneurship. and service. *IIE Transactions*. Vol. 33. Iss. 3; p. 139-148. Mar 2001.