Technological Forecasting & Social Change 78 (2011) 1158–1163

Contents lists available at ScienceDirect

Technological Forecasting & Social Change

The state of research on technological uncertainties, social uncertainties and emerging markets: A multidisciplinary literature review

Rajesh K. Pillania *

Management Development Institute, Sukhrali, Gurgaon , India and Asia Fellow, Harvard Kennedy School, Boston, MA
MDI, Sukhrali, Gurgaon and Institute for Strategy, New Delhi, India

ARTICLE INFO

Article history:
Received 31 March 2010
Received in revised form 1 February 2011
Accepted 9 February 2011
Available online 6 May 2011

Keywords:
Technological uncertainties
Social uncertainties
Emerging markets
Bibliometric analysis
Literature review

ABSTRACT

The objective of this research work is to study the progress of research on technological uncertainties, social uncertainties and emerging markets and outline and identify the key disciplines, journals, articles and authors. For this the author studied the existing literature from the various fields in which technological uncertainties, social uncertainties and emerging markets research work have been published using ISI Web of Knowledge database. The paper finds that there is increasing research work on technological uncertainties, social uncertainties and emerging markets and the bibliographical search resulted in ninety-one documents written by one-hundred-sixty-one authors in eighty-four journals in seventy-two disciplines. The five major disciplines and their underlying journals are business and economics, agriculture, psychology, public administration, and environmental sciences and ecology accounting for majority of publications. In journals the most prolific, measured by number of articles published are Harvard Business Review, Social Science and Medicine, World Development, and Higher Education; and most influential, measured by the global citation received, are Harvard Business Review, Social Science and Medicine and Sociological Review. The top 10% of the journals are responsible for 23% of all publications but 85% of all global citations received. This highlights that despite the high, diverse and increasing number of journals; only few are dominating and shaping the research arena of technological uncertainties, social uncertainties and emerging markets. Further, in the ten most cited articles, no author appears more than once.

1. Introduction

Emerging markets are increasingly becoming the growth drivers of the global economy and there is increased scrutiny and interest in emerging markets since the 1990s [1]. The interest can be viewed from a demand and supply perspective. With a huge population and increasing income, emerging economies provide a big market for goods and services. Also, with talented manpower and low costs, emerging economies are supplying more and more goods and services to the world [2]. With increasing growth rates and liberalization of economies, many of the emerging markets are investing and opening up for newer technologies and technology upgrades for better future. The increasing growth rates and rising income coupled with rapid urbanization, liberalization and technological upgrades is resulting into societal changes and transformations in many emerging markets. This has resulted in increasing interest in exploring the social uncertainties and technological uncertainties in context of emerging markets.

Using bibliometric analysis, the objective of this paper is to enhance our understanding of the research arena of technological uncertainties, social uncertainties and emerging markets as well as our knowledge on key disciplines, journals, articles and

* Management Development Institute, Sukhrali, Gurgaon, India. Tel.: +91 9818961019 (cell).
E-mail address: rajesh@pillania.org.

0040-1625/$ – see front matter © 2011 Elsevier Inc. All rights reserved.
doi:10.1016/j.techfore.2011.02.006

researchers on the subject. Bibliometric analysis represents a relatively new form of meta-analytical research [3]. It is valuable in illustrating the links between and among scholarly works and the nature of development in a given research field or discipline by measuring and analyzing published materials [4]. It has been used in diverse range of disciplines in the science and humanities [5–7], and social sciences [8], such as communications [9], advertising [10], marketing [11], and international management [12,13].

This paper consists of five parts including this introductory part. The second part builds a brief theoretical background for the paper. Third part gives the objective and elaborates the research methodology. The fourth part presents and discusses the research results. The last part concludes the research note.

2. Theoretical background

2.1. Definitions

2.1.1. Emerging markets

The term 'emerging market' was originally coined by IFC to describe a fairly narrow list of middle-to-higher income economies among the developing countries, with stock markets in which foreigners could buy securities. The term's meaning has since been expanded to include more or less all developing countries.

2.1.2. Social uncertainty

Webster's unabridged dictionary defines uncertainty as "the state of being uncertain, doubt, hesitancy…vague or indistinct, not perfectly apprehended…ambiguous, unreliable, undependable, dependent upon chance…unforeseeable outcome or affect.... That which is uncertain is doubtful or problematical; it often involves danger through an inability to predict or place confidence in the unknown". Uncertainty is thus caused by incomplete information, as discussed by Galbraith [16] in a task-related, organizational context; conversely, certainty is related to complete information. Uncertainty is an important concept because of its relation to perceptions of risk [17]. Social uncertainty, then, is uncertainty related to or located in the social field, where hesitancy, vagueness, ambiguity or lack of confidence is reflexive characteristics of social objects or actors in a community. It should be noted that 'social uncertainty' is predominantly a cognitive concept, caused by incomplete information about the social field, which may well be but is not necessarily associated with any emotional manifestations [18].

2.1.3. Technological uncertainty

There are various ways to look at technological uncertainty. Technology uncertainty, in relation to automotive parts, is the perceived unpredictability and need for closer coordination that result from rapid technological changes in related fields, an increase in part complexity, and the novelty of part function [10,19–22]. Technological uncertainty exists when it is not clear which technology will emerge to dominate in the industry [23–25]. The established technology, in fact, often competes with one or more alternative technologies. Under these conditions, firms must select which technology to embed in their products and processes to fulfill future market requirements [26]. Even in the presence of a growing demand for its new products, a firm could be forced out of the market because of not being able to rapidly adopt the dominant technology [27]. Technological uncertainty is related to the evolution of industry-level technology patterns [28] and is 'exogenous' to firms' actions [29]. We define technological uncertainty as the unpredictability about various technologies available in a particular industry. It depends upon the number of competing technologies and stage of industry.

2.2. Importance of technological and social changes in emerging markets

With increasing growth rates and liberalization of economies, many of the emerging markets are investing and opening up for newer technologies and technology upgrades for better future. On the one hand there are huge efforts by government in investing and promoting investment in research and development in countries like China and India. Facing tough competition and with global aspirations, increasing number of companies from emerging markets are investing in research and development for newer technologies. On the other hand, many big multinationals from developed markets are opening up research and development centers in emerging markets due to higher costs at home and availability of trained manpower and low costs in emerging markets. China and India are fast emerging as favorite places for R & D among developed country MNCs. Thus emerging markets are increasingly becoming places 'hot places' for technological developments which comes with related technological uncertainty. The increasing growth rates and rising income coupled with rapid urbanization, liberalization and technological upgrades is resulting into societal changes and transformations in many emerging markets. Thus technological and social uncertainty have become very important in emerging markets and this has resulted in increasing interest in exploring the social uncertainties and technological uncertainties in context of emerging markets.

3. Objective and research methodology

3.1. Objective

The objective of this research work is to study the progress of research on technological uncertainties, social uncertainties and emerging markets and outline and identify the key disciplines, journals, articles and authors.

3.2. Research methodology

Bibliometric analysis is based on the assumption that researchers publish their most important findings in scholarly articles which base their research predominantly on materials previously published in high quality outlets [14]. Data for this research were collected in March 2010, for articles published from the ISI Web of Knowledge databases consisting of the ISI Web of Science (1960–present) consisting of Science Citation Index Expanded (SCI-expanded), Social Sciences Citation Index (SSCI), and Arts & Humanities Citation Index (A&HCI); BIOSIS Previews (1960–present); CABI: CAAAB Abstracts (1960–present); MEDLINE (1960–present); and Zoological Record (1960–present). We have looked in all available databases to make the study comprehensive. The study covers the last five decades (1960 to 2010). In order to collect comprehensive data, the publication needed to be classified as an article on the topic including a combination of the following terms 'technological uncertainty(ies)' or 'technology risk' or 'technological risk(s)' or 'technology challenges(s)' or 'technological challenge(s)' or 'emerging technology(ies)' or 'technological change and social uncertainty(ies)' or 'social challenge(s)' or 'social risk(s)' or 'social transition(s)' or 'social transformation(s)' or 'social change' or 'societal change(s)' or 'societal challange(s)' or 'societal risk(s)' or 'societal uncertainty(ies)' and 'transition market(s)' or 'transition economy(ies)' or 'transition country(ies)' or 'emerging market(s)' or 'emerging economy (ies)' or 'emerging country (ies)' or 'developing market(s)' or 'developing economy(ies)' or 'developing country(ies)'. The words for search were selected after discussion with thirty faculty colleagues from operations and social sciences background. The author searched 'in topic' for articles as this allows him to search the title, the abstract, the keywords. The search option 'in title' would have restricted the author to the article title only. By employing these keywords, the author has captured the most relevant articles on technological uncertainties, social uncertainties and emerging markets. After running the words search in the database, each outcome was looked into manually and 91 results were found to be relevant for the study. Fig. 1 is a scatter plot depicting the productivity in terms of number of records and the Global Citation Score per year. Uniformity of the percentage scores of lower ranked journals also hint to the fact that the data collected is valid and pertinent to the study undertaken. Further calculation of confidence interval (at $\alpha = .95$) returns a value of 0.005114 which is very near to zero thus strongly pointing towards the reliability of the study undertaken.

4. Results and discussion

4.1. Development and disciplines

The research retrieved ninety-one documents consisting of journal articles (60), proceedings (12), books (7), review articles (3), reports (3), abstracts (2), editorial articles (1) and others (12) written in many languages but English (80%), Spanish (4%), French (2%), German (2%) and Portuguese (2%) accounted for 90% of publications. This shows that journal articles are dominant in publication and English is the most widely used language. The first document was published in 1964 and Table 1 shows the documents published since 1990. We can observe that although fluctuating, there is overall increasing number of papers over the last two decades with a total of 25% articles published in 2007–2009.

The retrieved documents were written by one-hundred-sixty-one authors and were published in eighty-four different journals and classified in seventy-two multiple disciplines. However, the seven key disciplines are business and economics (59%), agriculture (29%), psychology (26%), public administration (23%), environmental sciences and ecology (19%), plant sciences (15%) and social sciences–other topics (15%).

4.2. Journals

Researchers have been using bibliometric analysis to assess journal performance for many years [15,16]. In order to conduct such an analysis, this section is focusing only on journals in order to assess which journals are the most prolific and most influential

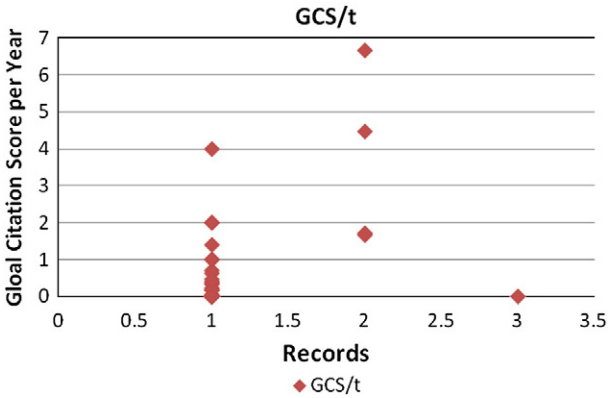

Fig. 1. Global citations per year for journals.

Table 1
Yearly output of research publications.

Year	Number of papers	Papers (Percentage)
2009	8	8.7912
2008	8	8.7912
2007	7	7.6923
2006	3	3.2967
2005	4	4.3956
2004	5	5.4945
2003	4	4.3956
2002	5	5.4945
2001	1	1.0989
2000	3	3.2967
1999	3	3.2967
1998	3	3.2967
1997	3	3.2967
1996	1	1.0989
1994	2	2.1978
1993	4	4.3956
1992	3	3.2967
1991	3	3.2967
1990	1	1.0989

ones. There are a total of sixty papers, written by one-hundred-thirteen authors and published in fifty-four journals. Table 2 presents the top ten journals in terms of total number of articles published and the total global citation per year (TGC).

The result highlights that the most prolific journals, measured by number of articles published are Harvard Business Review, Social Science and Medicine, World Development, and Higher Education; and most influential, measured by the global citation received, are Harvard Business Review, Social Science and Medicine and Sociological Review. The top 10% of the journals are responsible for 23% of all publications but 85% of all global citations received. This highlights that despite the high and increasing number of journals; only few are dominating and shaping the research arena of technological uncertainties, social uncertainties and emerging markets.

4.3. Article and authors

In order to further investigate, we analyze the key articles by looking at their average global citation per year (TGC/t). This value gives an indication of the importance of that article to the current existing literature. *Will you survive the services revolution?* by Karmarkar is the most cited article. Table 3 shows the ten most cited articles and corresponding authors related to technological uncertainties, social uncertainties and emerging markets. Incidentally, no author appears more than once in the top ten list.

4.4. Word associations

Within the results obtained, we looked at records, percentage and total global citations for words for finding word association (Fig. 2). The biggest association is of economy, employment and education which shows that economy, employment and education are the most co-related and globally cited topics in social change and technological change in emerging markets, which is closely followed by technological, new and adoption; health, human, implications and development; and lastly China, farmers and women.

Table 2
Ranking of journals.

Rank	Journal	No. of papers published	Total global citation (TGC)
1	Harvard Business Review	2	27
2	Social Science & Medicine	2	20
3	Sociological Review	1	20
4	Higher Education	2	13
5	World Development	2	12
6	American Journal of Agricultural Economics	1	12
7	Environment	1	10
8	Marketing Science	1	7
9	Food Policy	1	6
10	Netherlands Journal of Agricultural Science	1	6

Table 3
Most cited articles and authors.

Rank	Author/year/journal (complete list in references at the end of the paper)	Average citations per year	Total citations
1	Karmarkar, U (2004) Harvard Business Review	3.71	26
2	Mythen, G (2005) Sociological Review	3.33	20
3	Monda, KL; Gordon-Larsen, P; Stevens, J, et al.(2007) Social Science & Medicine	2.5	10
4	Menendez, M; Benach, J; Muntaner, C, et al.(2007) Social Science & Medicine	2.5	10
5	D'Costa, AP(2003) World Development	1.5	12
6	Torres, CA; Schugurensky, D(2002) Higher Education	1.33	12
7	Cheung, KC; Leung, HM; Wong, MH (2008) Archives of Environmental Contamination and Toxicology	1.33	4
8	Debruyne, M; Reibstein, DJ (2005) Marketing Science	1.7	7
9	Alam, GM (2009) Scientific Research and Essays	1	2
10	RENKOW, M (1993) American Journal of Agricultural Economics	0.66	12

5. Conclusion, limitations and direction for future research

Emerging markets are the growth centers of the current global economy. The increasing growth rates and rising income coupled with rapid urbanization, liberalization and technological upgrades is resulting into societal changes and transformations in many emerging markets. This has resulted in increasing interest in exploring the social uncertainties and technological uncertainties in context of emerging markets. For this the author studied the existing literature from the various fields in technological uncertainties, social uncertainties and emerging markets using the ISI Web of Knowledge database.

The results show that there is increasing research work on technological uncertainties, social uncertainties and emerging markets and the bibliographical search resulted in ninety-one documents written by one-hundred-sixty-one authors in eighty-four journals in seventy-two disciplines. The five major disciplines and their underlying journals are business and economics, agriculture, psychology, public administration, and environmental sciences and ecology accounting for majority of publications. In journals the most prolific, measured by number of articles published are Harvard Business Review, Social Science and Medicine, World Development, and Higher Education; and most influential, measured by the global citation received, are Harvard Business Review, Social Science and Medicine and Sociological Review. The top 10% of the journals are responsible for 23% of all publications but 85% of all global citations received. This highlights that despite the high and increasing number of journals; only few are dominating and shaping the research arena of technological uncertainties, social uncertainties and emerging markets. Further, in the ten most cited articles, no author appears more than once. The biggest word association is of economy, employment and education which shows that economy, employment and education are the most co-related and globally cited topics in social change and technological change in emerging markets, which is closely followed by technological, new and adoption.

5.1. Limitations and direction for future research

Despite its high degree of objectivity, bibliometric analysis has a subjective dimension [27] since the researcher had to make choices on the search terms and the time period used. While the dataset is comprehensive, is it not exhaustive as many new journals are not part of ISI Web of Knowledge. Further, the research did not exclude self-citations in the analysis. Although this is common practice [28] future research may exclude self-citations to yield a more accurate assessment of an article's contribution. Future research could take patent data into account as they are a valuable source of information concerning technological and social uncertainties in emerging markets [29].

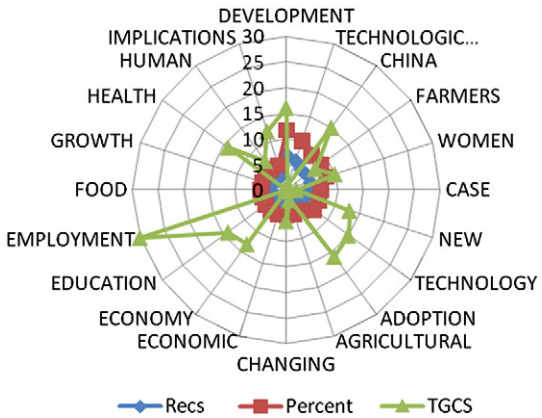

Fig. 2. Word association.

References

[1] R.K. Pillania, Multinationals and emerging markets, Business Strategy Series 10 (2) (2009) 100–103.
[2] R.K. Pillania, Multinationals and emerging markets guest editorial, Multinational Business Review 17 (2) (2009) i-v.
[3] J. Kim, S. McMillan, Evaluation of internet advertising research — a bibliometric analysis of citations from key sources, Journal of Advertising 37 (1) (2008) 99–112.
[4] C.L. Borgman, Scholarly Communication and Bibliometrics Revisited, in: B. Cronin, H.B. Atkins (Eds.), The Web of Knowledge, Medford, NJ, 2000, pp. 143–162.
[5] D.J.D. Price, General theory of bibliometric and other cumulative advantages processes, Journal of the American Society for Information Science 27 (5–5) (1976) 292–306.
[6] H.D. White, K.W. McCain, Bibliometrics, Annual Review of Information Science and Technology 24 (1989) 119–186.
[7] S.E. Wiberley, A methodological approach to developing bibliometric models of types of humanities scholarship, Library Quarterly 73 (2) (2003) 121–159.
[8] W. Glanzel, A bibliometric approach to social sciences, national research performances in 6 selected social science areas, 1990–1992, Scientometrics 35 (3) (1996) 291–307.
[9] Y. Pasadeos, R.B. Renfro, M.L. Hanily, Influential authors and works of the public relations scholarly literature: a network of recent research, Journal of Public Relations Research 11 (1) (1999) 29–52.
[10] J. Kim, S. McMillan, Evaluation of internet advertising research — a bibliometric analysis of citations from key sources, Journal of Advertising 37 (1) (2008) 99–112.
[11] D.C. Arnott, Research on trust: a bibliography and brief bibliometric analysis of the special issue submissions, European Journal of Marketing 41 (9–10) (2007) 1203–1240.
[12] R.K. Pillania, M. Fetscherin, Multinationals and emerging markets guest editorial, Multinational Business Review 17 (2) (2009) 1–9.
[13] J. Acedo, C. Casillas, Current paradigms in the international management field: an author co-citation analysis, International Business Review 14 (5) (2005) 619–639.
[14] A.F.J. Van Raan, The use of bibliometric analysis in research performance assessment and monitoring of interdisciplinary scientific developments, Technikfolgenabschätzung, Theorie und Praxis 12 (1) (2003) 20–29.
[15] B. Reeves, C.L. Borgman, A bibliometric evaluation of core journals in communication research, Human Communication Research 10 (1) (1983) 119–136.
[16] A. Schubert, W. Glanzel, T. Braun, Scientometric datafiles. A comprehensive set of indicators on 2649 journals and 96 countries in all major science fields and subfields 1981–1985, Scientometrics 16 (1–6) (1989) 463–478.
[17] U. Karmarkar, Will you survive the services revolution? Harvard Business Review 82 (6) (2004) 100–109.
[18] G. Mythen, Employment, individualization and insecurity: rethinking the risk society perspective, Sociological Review 53 (1) (2005) 129–149.
[19] K.L. Monda, P. Gordon-Larsen, J. Stevens, et al., China's transition: the effect of rapid urbanization on adult occupational physical activity, Social Science & Medicine 64 (4) (2007) 858–870.
[20] M. Menendez, J. Benach, C. Muntaner, et al., Is precarious employment more damaging to women's health than men's? Social Science & Medicine 64 (4) (2007) 776–781.
[21] A.P. D'Costa, Uneven and combined development: understanding India's software exports, World Development 31 (1) (2003) 211–226.
[22] C.A. Torres, D. Schugurensky, The political economy of higher education in the era of neoliberal globalization: Latin America in comparative perspective, Higher Education 43 (4) (2002) 429–455.
[23] K.C. Cheung, H.M. Leung, M.H. Wong, Metal concentrations of common freshwater and marine fish from the Pearl River Delta, south China, Archives of Environmental Contamination and Toxicology 4 (2008) 705–715.
[24] M. Renkow, Differential technology adoption and income-distribution in Pakistan — implications for research resource-allocation, American Journal of Agricultural Economics 75 (1) (1993) 33–43.
[25] G.M. Alam, The role of science and technology education at network age population for sustainable development of Bangladesh through human resource advancement, Scientific Research and Essays 4 (11) (2009) 1260–1270.
[26] M. Debruyne, D.J. Reibstein, Competitor see, competitor do: incumbent entry in new market niches, Marketing Science 24 (1) (2005) 55–66.
[27] A.F.J. Van Raan, The use of bibliometric analysis in research performance assessment and monitoring of interdisciplinary scientific developments, Technikfolgenabschätzung, Theorie und Praxis 12 (1) (2003) 20–29.
[28] R.K. Pillania, M. Fetscherin, Multinationals and emerging markets guest editorial, Multinational Business Review 17 (2) (2009) 1–9.
[29] D. Thorleuchter, D. Van den Poel, A. Prinzie, A compared R&D-based and patent-based cross impact analysis for identifying relationships between technologies, Technological Forecasting and Social Change 77 (7) (2010) 1037–1050.

Dr. Rajesh K. Pillania is a prolific researcher with many papers in international/national journals and conferences. His areas of expertise are global strategy, innovations and emerging markets. He is an advisory board member of many international research journals, professional bodies, and conferences. Professor Pillania has worked in the Americas, Europe and Asia and his academic experience includes the Business School, Panjab University (Chandigarh, India); R. H. Smith School of Business, University of Maryland (Maryland, USA); Northumbria University (Newcastle, UK);and most recently, Harvard (Cambridge, USA); and COPPEAD (Rio, Brazil). Currently he is Honorary Chairman, Institute for Strategy, India; Asia Fellow, Harvard Kennedy School, USA and faculty, Management Development Institute, India. He holds a PhD and MBA. He can be reached at: rajesh@pillania.org.