The Media's Representation of the Knowledge Economy

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Abstract: The concept of the knowledge economy first came into our vocabulary more than 60 years ago when accountants and economists observed a shift in our national accounts. The study of knowledge economics is now a well-established academic discipline, with several peer-reviewed journals. This paper begins to explore how the knowledge economy is understood outside of academia. This exploratory research investigates how the concept is represented in the print media around the world. The research reviews 771 print media stories focused on the knowledge economy found in LexisNexis. A linguistic register is created to understand the language of the media stories. Each story is analyzed with two semantic profiles – one representing the World Bank's characterization of the knowledge economy and one focused on the nature of intellectual capital. The results suggest that the print media has a suboptimal understanding of the knowledge economy. The research team further examined the representation of the knowledge economy within the discourse of primary sources (e.g., economic think tanks, knowledge economists, labor and trade unions, professional associations), and the representation of knowledge economists in the media. The research suggests there is a need for increasing the public discourse around the knowledge economy, in particular through media sources and among primary source institutions.

Keywords: Knowledge economy, knowledge economy index, intellectual capital, media representation

1. Introduction

The concept of the knowledge economy first came into the vocabulary 65 years ago (Porat and Rubin, 1977; Machlup, 1980) when accountants and economists noticed a shift away from factors that produced wealth in an industrial economy (e.g., land, facilities, financial capital) to knowledge as a new factor of production. Today, the concept and fundamental behavior of the knowledge economy is well known to academics and researchers. There are several journals dedicated to reporting research and discussions of the knowledge economy, including The Journal of the Knowledge Economy, Management Dynamics in the Knowledge Economy, Review of Knowledge Economy, Journal of Knowledge Economy and Knowledge Management, and closely related journals such as the Journal of Intellectual Capital, and the International Journal of Learning and Intellectual Capital. In addition, peer-reviewed articles related to the knowledge economy appear in important journals in related disciplines such as economics, knowledge management, organizational learning, and strategic workforce management.

While there is vigorous academic discourse around the knowledge economy there is less evidence of a discussion in the public and business environments. Anecdotal evidence from blogs (Linkon, 2015), newspaper stories (Spicer, 2015; Reisz, 2016) and conversations with governmental officials and politicians (Bedford, Carlson and Wagner, 2015; Bedford, et al., 2015a; Bedford, et al., 2015b) suggests that the concept is not well understood outside of academia.

The shift to a knowledge economy is affecting the lives of individuals around the world. In 2017, new skills and competencies are needed to succeed in the knowledge economy, behavioral competencies now are important qualities, attitude and cultural intelligence are critical differentiators, and relationships and networks are highly valued. In order to succeed in the 21st century knowledge economy, cities, communities, organizations, households and individuals must invest in, manage and grow their intellectual capital (Bontis, 2001; Bontis, 2003; Bonfour and Edvinsson, 2005). In the 21st century, knowledge and intellectual capital will be the most important asset an organization can possess. For this investment and growth to occur, the general public needs to have a solid understanding of the knowledge economy and the elements of intellectual capital. There should be a more vigorous discussion of the knowledge economy, its behavior and impacts, in the public media. This exploratory research is a first step towards understanding the media's treatment and understanding of the knowledge economy.

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2. Literature Review

There is a rich treatment of the knowledge economy in the economics literature (Drucker 1969; Bell 1973; Porat and Rubin 1977; Machlup 1980; Lundvall and Johnson, 1994; Mann and Carter, 1996; Gregory and Stuart, 1999; Houghton and Sheehan 2000; Dahlman and Aubert 2001; Rosen, 2001; Dahlman, 2002; Edvinsson 2002; Organisation for Economic and Co-operative Development, 2002; Smith, 2002; United Nations Economic Commission for Europe, 2002; Dahlman 2003; Malhotra, 2003; Daugeliene, 2004; Dahlman and Chen 2005; LaMore, 2005; Carlaw, et al., 2006; Kahin and Foray 2006; Leydesdorff, 2006; Lin 2007; Boydell et al., 2008; Atkinson and Andes 2010; Minton and Glasheen, 2010; Dutta and Mia, 2011; Schwab, 2011). For the purpose of this research, we adopt the following definition of the knowledge economy (United Kingdom Dept. of Trade and Industry, 1998):

> "A knowledge economy is one in which knowledge is a key resource. …one in which the generation and the exploitation of knowledge has come to play the predominate part in the creation of wealth. It is about…. the more effective use and exploitation of all types of knowledge in all manner of economic activity."

In the field of knowledge management, knowledge is often represented broadly as intellectual capital. Intellectual capital is knowledge that produces or creates value. It is an organization's source of competitive advantage and it is an individual's most valuable competitive asset (Stewart, 1991; Stewart, 1997; Roos, 1998; Agor, 1997; Skyrme and Amidon, 1998; Teece, 2000; Edvinsson, 2002; Sveiby, 2002; Bonfour and Edvinsson, 2005). An organization's intellectual capital includes its employees' knowledge, brainpower, know-how, and processes, as well as their ability to continuously improve those processes. Andriessen (2004) and Amidon, Formica and Mercier-Laurent (2005) define intellectual capital to include (1) Human Capital – tacit knowledge, skills and attitudes; (2) Structural Capital – culture, procedural knowledge and explicit knowledge; and (3) Relational Capital – communication, knowledge and social networks as well as overall reputation and brand. Individuals have intellectual capital (Figure 1).

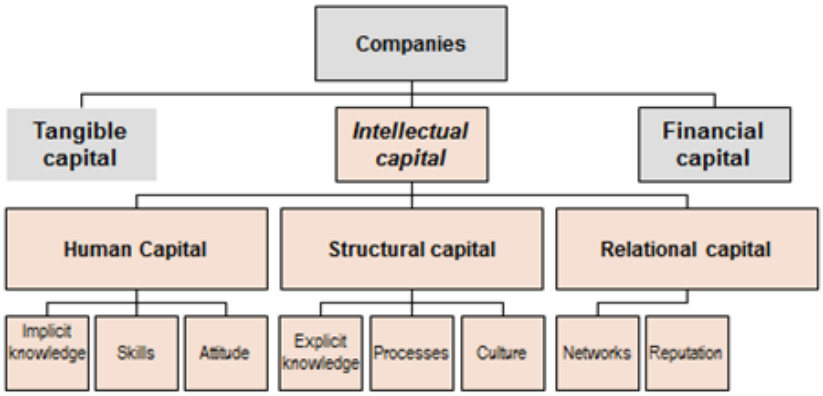

Figure 1: Andriessen's Intellectual Capital Model

While we have a solid definition to support this research, we acknowledge that this definition may not be widely known outside of academia. The knowledge economy is sometimes correlated with the information economy, the services economy, the networked economy, and a high tech economy. We expect to find these concepts used interchangeably for the knowledge economy in public discourse.

3. Research Goals and Questions

The goal of this research is to gain a deeper understanding of the print media's reference to and characterization of the knowledge economy. We hope to find that the characterization accurately represents the knowledge economy and the role of intellectual capital in that economy. We present five research questions to achieve this goal.

- Research Question 1: What is the extent of coverage of the concept of knowledge economy in the media?
- Research Question 2: Is the media coverage of the knowledge economy consistent with the evolution of the knowledge economy on a practical level?

- Research Question 3: Is there a geographic focus of the media's coverage of the knowledge economy?
- Research Question 4: Does the media's treatment of the knowledge economy reflect the role of intellectual capital?
- Research Question 5. From what sources does the media draw its coverage of the knowledge economy?

3.1 Research Question 1: What is the extent of coverage of the concept of knowledge economy in the media?

The research team conducted a simple search of LexisNexis for stories that focused on the knowledge economy. No time or geographic qualifiers were used to filter the search results. The intent was to gain an unbiased sample and to create a rich corpus for further exploration. LexisNexis was chosen as a primary source because it is the most comprehensive source of news and media available. Google Scholar was chosen as a contrasting source for scholarly reports and publications, not necessarily including news stories. Google was selected as a third contrasting source that we expected to include news, reports, and some publications. Finally, Bloomberg was selected as a major source of business and economic news. In addition to searching 'knowledge economy', we also searched 'economy', 'information economy', 'service economy', and 'technology economy' for comparison purposes.

The results for each source were noted. We downloaded all 1,017 stories from LexisNexis as these represented the highest quality examples of media stories. As part of the manual build of the media corpus, we checked for duplication of stories – on the presumption that stories may have been captured twice. The corpus after deduplication of media stories consisted of 771 unique stories. As each file was opened, metadata was manually recorded in the codebook. The codebook included the following data fields: (1) file number; (2) source country; (3) source date; and (4) words in the story. The codebook was used to collect data produced throughout the research project. Additional fields added included (5) year; (6) geographic region; and (7) knowledge economy fact.

3.2 Research Question 2: Is the media coverage of the knowledge economy consistent with the evolution of the knowledge economy on a practical level?

The methodology for Research Question 2 was simple. The research team translated the exact date of each story to a year value in the codebook. This value was used to create a timeline of appearance of media stories.

3.3 Research Question 3: Is there a geographic focus of the media's coverage of the knowledge economy?

In addition to understanding the date ranges and the areas of focus of the media stories, we were interested in understanding the geographic coverage. We sense from our professional networks and from previous research into the knowledge economy that certain regions of the world and particular countries, have invested more heavily in knowledge management. Are these areas well represented in media coverage? To support this research, we leveraged the codebook created for Research Question 1, specifically the data recorded for source country. We note that country was defined as the focus of the media story. In all but a small number of cases, this aligned with the country of origin of the source publication (e.g., Irish Times = Ireland).

3.4 Research Question 4: Does the media's treatment of the knowledge economy reflect the role of intellectual capital?

We leveraged a linguistic and semantic analysis methodology to objectively and quantitatively characterize the nature of coverage of the knowledge economy. The first step involved generating a linguistic register of all 771 media stories. In sociolinguistics, a linguistic register is defined as the specific lexical and grammatical choices made by speakers, where speakers are defined by situational context, a knowledge domain, the participants of a conversation and the function of the **language** in the discourse (Halliday**,** 1989). We used the ATLAS.ti software to generate a word-by-word extraction across all stories. The application generated an aggregated list of every word that appeared in the corpus, frequencies for those individual words for each media story, and total word list for each individual story. The second step involved part-of-speech tagging of the individual words.

The third step involved constructing two semantic profiles – one to represent the World Bank Knowledge Economy Index's four pillars and a second that represented Daniel Andriessen's categories of intellectual capital. As of 2012, the World Bank has abandoned the Knowledge Economy Index (KEI). We use this model, though, because it was the predominant characterization of the knowledge economy at a global level from 2000 to 2012. In 2017, it is understood to represent a model of an advanced industrial economy rather than a knowledge economy. In contrast to the World Bank model, Andriessen's model of intellectual capital focuses on the heart of the factor of production in a knowledge economy. To the extent that media stories align with the KEI model and not with the intellectual capital model, it is unlikely that they are presenting a meaningful representation of the knowledge economy. To the extent that the media stories demonstrate strong alignment with the Andriessen model, media stories are more likely to be representing the knowledge economy appropriately.

The semantic profiles were built out as rule-based categorization profiles in the SAS Content Categorization Studio. The rule-based categorization profiles were created using knowledge engineering and knowledge representation methods. The profiles were constructed based on literature that describes and supports these two models. In addition, the reader should understand that these profiles were not generated using statistical methods. Neither were they constructed based on the concepts used only in the media stories. Constructing a knowledge-engineered semantic profile is a focused and disciplined method, the intent of which is to achieve a semantic representation of an expert's understanding of the model.

The rule-based categorization profile for the World Bank's KEI (Figure 2) included knowledge-engineered semantic markers (e.g. concepts and rules) for discovering treatment of (1) economic incentives and business; (2) education and skills; (3) Information and Communication Technology Infrastructure; and (4) Innovation Systems. The focus of the KEI is on whether the environment is conducive for knowledge to be used effectively for economic development, including an economic and institutional regime to provide incentives for the efficient use of existing and new knowledge and the flourishing of entrepreneurship; an educated and skilled population to create, share, and use knowledge well; an efficient innovation system of firms, research centers, universities, consultants and other organizations to tap into the growing stock of global knowledge, assimilate and adapt it to local needs, and create new technology; and information and communication technology to facilitate the effective creation, dissemination, and processing of information.

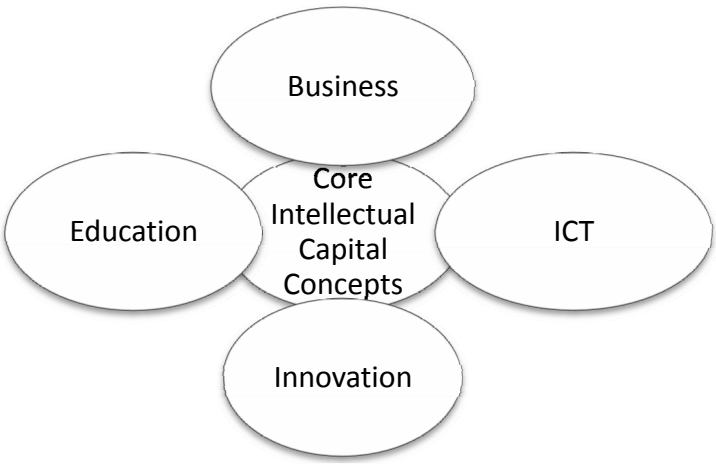

Figure 2: World Bank's Knowledge Economy Index

The categorization profile for Andriessen's intellectual capital model (Figure 1) included knowledge-engineered concepts and rules for discovering treatment of (1) tacit knowledge; (2) skills and competencies; (3) attitude; (4) explicit knowledge; (5) procedural or "how to" knowledge; (6) culture; (7) relational capital; and (8) reputational capital.

Both semantic profiles were applied to all 771 media stories. The semantic processing involved matching semantic markers (e.g., concepts) found in the media stories with semantic markers (e.g., concepts) engineered into the semantic profiles. The full list of matching markers and their frequencies provided data to use in describing the areas of focus of the media stories. The final step in the methodology for Research

Question 4 was a comparison of the alignments of the media stories with the KEI and the Intellectual Capital models.

3.5 Research Question 5: From what sources does the media draw its coverage of the knowledge economy?

Today's broadcast media focuses primarily on reporting or communicating what has been investigated by others. While investigative journalism exists in some media organizations, the public expectation is that the new media report what is collected and assembled over wire sources such as the Associated Press, Reuters, the Press Association, United Press International, the Canadian Press, Agence France Press, and the Press Association. To better understand the underlying factors of our research results, we need to examine the sources from which such information would typically come. On the topic of the knowledge economy, such information would come from economic think tanks and research institutes where both applied and theoretical research is conducted, from labor and trade unions concerned about the transition of members and employees from an industrial to a knowledge economy, and from professional associations representing the future of their members. In addition, we would expect the professionally- and publicly-recognized knowledge economists to be a factor in media sourcing.

Research Question 5 leverages two variations on a general search methodology. The first variation pertains to institutions and involved selecting a sample for searching for references to the knowledge economy. The sample consisted of 24 economic policy institutes and think tanks (Figure 3), 19 trade and labor unions (Figure 4), and 20 professional associations (Figure 5). The websites for each of these institutions included in the first three categories were identified. Because search capabilities can vary by website, the research team used Google's Advanced Search which supports url domain-specific full text searching. The url for each website was specified as the domain. A simple keyword search for "knowledge economy" was launched. The research methodology involved collecting the results, noting the number of hits and making a manual judgment as to their relevance. High Relevance was assessed as treatment that aligned with Andriessen's intellectual capital and knowledge worker characterization of the knowledge economy. Medium Relevance was assessed as treatment that aligned with the World Bank's earlier characterization of the knowledge economy. Low relevance suggests that there was a mention of the term but there was no further context given that would lead to or signify understanding.

- American Enterprise Institute
- Brookings Institution
- Cato Institute
- Center for American Progress
- Center for Economic and Policy Research
- Center for Economic Policy Analysis
- Center for Full Employment and Price Stability
- Century Foundation
- Committee for Economic Development
- Economic Policy Institute
- Economic Research Council
- Economic Strategy Institute
- Employment Policy Foundation
- Heritage Foundation
- Hoover Institution
- Institute for International Economics
- Jerome Levy Economics Institute
- Joint Center for Political and Economics Studies
- Kiel Institute of World Economics
- National Bureau of Economic Research
- Progressive Policy Institute
- RAND
- Rochester Center for Economic Research
- Urban Institute

Figure 3: Institute and Think Tanks Sampled

- AFL-CIO
- AFSCME
- Amalgamated Transit Union
- American Federation of Government Employees
- American Federation of Teachers
- American Postal Workers Union
- Communications Workers-America
- IATSE International Alliance of Theatrical and Stage Employees
- International Brotherhood of Electrical Workers
- Nurses United
- OPEIU Office and Professional Employees International Union
- Seafarers International Union
- Service Employees International Union
- The Bakery, Confectionery, Tobacco Workers and Grain Millers International Union
- UAW
- United Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry of the United States and Canada
- United Brotherhood-Carpenters
- United Food and Commercial Workers
- United Transportation Union

Figure 4: Trade and Labor Unions Sampled

- American Bar Association
- American Nurses Association
- American Counseling Association
- National Society of Professional Engineers
- National Child Care Association
- Regulatory Affairs Professionals Society
- Association for Financial Professionals
- American Occupational Therapy Association
- Association of Fundraising Professionals
- American Medical Association
- National Association of School Nurses
- American Association of Naturopathic Physicians
- National Association of Workforce Development Professionals
- Association of Clinical Research Professionals
- American Occupational Therapy Association
- Alliance of Hazardous Materials Professionals
- Society of Professional Benefit Administrators
- National Association of Insurance and Financial Advisors
- National Association of Securities Professionals
- National Roofing Contractors

Figure 5: Professional Associations Sampled

The second variation involved selecting eight internationally recognized economists who specialize in and are the thought leaders on the knowledge economy (Figure 6). We selected economists who are living today and are active in the field of knowledge economics. While there may be other knowledge economists, for them to be referenced in the media they must be available to speak to the media and have current work in the field. For this sample, we searched three sources, including: (1) a general Google search; (2) Google Scholar; and (3) LexisNexis Academic. Because these sources do not have authority control (e.g., they identify and align all variations of an individuals name), it was necessary to search all variations of the economist's name. Variations were identified by reviewing their scholarly publications and popular references. The intent of implementing a pseudo-authority control in searching was to ensure that the results were comprehensive and inclusive.

- Bronwyn H. Hall, University of California, Berkeley
- Carl Dahlman, Georgetown University and World Bank
- Dominique Foray, Ecole Polytechnique Federale de Lausanne
- Francisco Queiro, Harvard University
- Joseph Stiglitz, Columbia University and World Bank
- Maria Carvalho, National Bureau of European Policy Advisors
- Mary O'Sullivan, The Wharton School, University of Pennsylvania
- Paul A. David, Stanford University

Figure 6: Internationally Recognized Knowledge Economists

For the general Google and the LexisNexis Academic searches, all variations of the name of each economist were searched in the open keyword search. Search results in these two sources included stories "about" the economists, interviews with or references to the economists, as well as to sources that were created or produced by the economists. The search strings for each economist – including name variations – are described in Table 1 below.

Table 1: Knowledge Economist Name Variations

Knowledge Economist	Name Variations Included in Search
Joseph Stiglitz Columbia University; World Bank	"Joseph Stiglitz", "J E Stiglitz", "J Stiglitz", Joseph Stiglitz, J E Stiglitz, J Stiglitz, Stiglitz economist
Francisco Queiro Harvard University	"Francisco Queiro", "F Queiro", Francisco Queiro, F Queiro, Queiro Harvard, Queiro economist
Dominique Foray Ecole Polytechnique Federale de Lausanne	"Dominique Foray", "D Foray", Dominique Foray, D Foray, Foray Lausanne, Foray economist
Maria Carvalho National Bureau of European Policy Advisors	"Maria Da Graca Carvalho", "Maria Carvalho", "M Carvalho", Maria Da Graca Carvalho, Maria Carvalho, M Carvalho, Carvalho BEPA, Carvalho economist
Paul A. David Stanford University	"Paul A David", "Paul David", "P A David", Paul A David, Paul David, P A David, Paul David Harvard, Paul David economist
Bronwyn H. Hall University of California, Berkeley	"Bronwyn H Hall", "Bronwyn Hall", "B H Hall", Bronwyn H Hall, Bronwyn Hall, B H Hall, Bronwyn Hall Berkeley, Bronwyn Hall economist
Mary O'Sullivan, The Wharton School, University of Pennsylvania	"Mary A. O'Sullivan", "Mary O'Sullivan", "M A O'Sullivan", Mary A. O'Sullivan, Mary O'Sullivan, M A O'Sullivan, O'Sullivan Wharton, Mary O'Sullivan economist
Carl Dahlman Georgetown University; World Bank	"Carl Dahlman", "C J Dahlman", "Carl J Dahlman", Carl Dahlman, C J Dahlman, Carl J Dahlman, Dahlman Georgetown, Dahlman economist

Exploration of references in Google Scholar began with a search for a Google Scholar profile (e.g., for identifying and ranking citations) for the knowledge economist. Where an academic profile existed, the profile and citations were readily available through citation analysis and ranking score. Where a Scholar profile did not exist, the research team considered the full set of search results.

4. Research Results

The research corpus consisted of 771 unique news stories that were drawn from around the globe and over a twenty year time span.

4.1 Research Question 1: What is the extent of coverage of the concept of knowledge economy in the media?

There were two parts to this research question. The first part focuses in simple coverage of the concept itself. To answer this research question, the research team used LexisNexis Academic to identify media stories covering the knowledge economy. Because of the limitations imposed upon results sets in the Academic version, we were unable to determine the relative difference in coverage of similar terms such as information economy, service economy, technology economy and networked economy. In fact, a general search of LexisNexis Academic for each of these terms retrieved a high result of 998 for all of these terms except for networked economy. The term networked economy returned only 685 search results. As a point of comparison, we also searched Google as another source that covers media stories. We note that Google includes many more types of content than just media stories. Table 2 illustrates the relative difference of treatment of terms. The rate of reference to the knowledge economy was notably lower than the general treatment of "economy" in Google, and it was notably higher than the other similar terms. Because the research team believes that the knowledge economy is a topic more frequently discussed and covered in the scholarly rather than the popular press, we also searched these terms in Google Scholar. Table 2 suggests that there is a healthy discourse around all of these concepts in scholarly sources. The results suggest, though, that treatment of the knowledge economy is more prevalent than other related concepts. While this is an important observation, we note that these results are only 10.7% of the total number of references to economy in Google Scholar, and less than .07% of all references to the economy in Google.

Table 2: Sources Searched and Results Retrieved

Source Searched	Google	Google Scholar
Knowledge Economy	507,000	373,000
Economy	719,000,000	3,480,000
Information Economy	428,000	66,500
Service Economy	455,000	72,000
Technology Economy	228,000	15,100
Networked Economy	133,000	9,830

The second part of this research question addressed coverage from a linguistic and semantic perspective. The linguistic analysis of the media stories began with a simple characterization of the stories, including number of words, unique concepts, and frequencies of occurrence of concepts (Table 3). The average number of words in a media story was 762.25 or 1.6 pages. The total number of unique concepts extracted across all 771 stories was 4,291, or 5.56 unique words per story. This suggests that there was a large percentage of use of commonly occurring words. On average the unique concepts were used 6.4 times in media stories.

Table 3: Basic Data for LexisNexis Media Stories

Source	Average # Words	Total Unique Concepts	Total Frequencies
LexisNexis	762.25 High = 23,156 Low = 55	4,291	27,453

The linguistic register produced a very interesting picture of the media's use of language (Table 4). By far, nouns were used more frequently than verbs or adverbs. This makes sense – we understand that the media is reporting on the "what" focus of the news. This suggests that there is a rich corpus for conducting semantic analysis – and for determining the focus of the media stories.

Table 4: Linguistic Representation (Parts of Speech) of the Discourse

Part of Speech	Parts of Speech Tags (% of Total Discourse)	Frequencies of Parts of Speech (% of Total Discourse)
Adjectives	14.29%	12.07%
Nouns	67.25%	76.23%
Verbs	17.77%	10.74%
Adverbs	0.70%	0.17%

We conclude from this simple exercise that while there is coverage of the knowledge economy the vast majority of the references are found in scholarly sources. We understand that it is often confused with other types of non-industrial economies – in Google open search the number of references to other kinds of economies are not dramatically different. This observation requires and would benefit from further exploration to determine the level of overlap and differentiation.

4.2 Research Question 2: Is the media coverage of the knowledge economy consistent with the evolution of the knowledge economy on a practical level?

The media stories do not demonstrate any predictable pattern or alignment with the development and growth of the knowledge economy when viewed year by year (Table 5). For example, the number of stories produced in 2015 was similar to those produced in 2009 and 1999 (Table 5).

Table 5: Media Reports on Knowledge Economy by Year

Date	Frequency
2015	34
2014	78
2013	43
2012	42
2011	30
2010	59

Date	Frequency
2009	39
2008	52
2007	25
2006	15
2005	17
2004	16
2003	12
2002	22
2001	45
2000	46
1999	34
1998	7
1997	1
1996	1
1995	1

While the overall pattern for the twenty year period appears somewhat erratic, a different pattern emerges when we view the data in five-year increments (Figure 7)

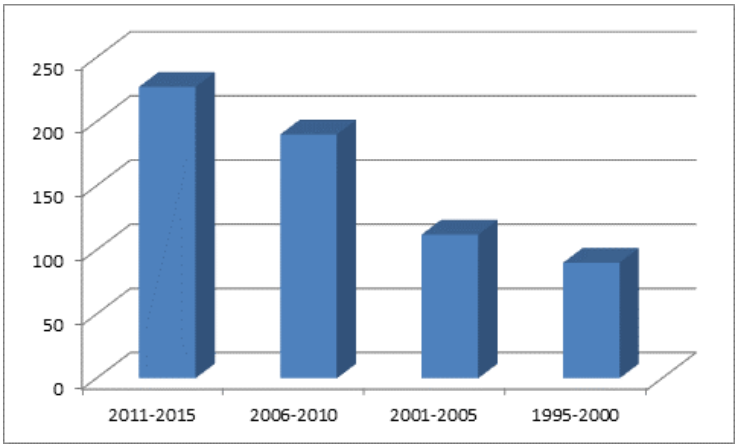

Figure 7: Appearance of Media Stories in 5-Year Periods

From this perspective, it would appear that the references to the knowledge economy are increasing with the development and growth of the economy. If this is the case, we might expect the media to continue to report on knowledge economy issues in the future

4.3 Research Question 3: Is there a geographic focus of the media's coverage of the knowledge economy?

The data recorded in the codebook for geographic location of news source are described in Table 6. In fact, the most frequently represented countries are those associated with the United Kingdom and its closely related and former colonies – specifically U.K., Ireland, Australia and Canada. Other countries that were well represented such as South Korea, Pakistan, Sri Lanka, India and Singapore are often associated with high investments in the technology sector. Also noteworthy is the United States 11th place ranking. We note that the only European country from the European Union represented in the news media was Germany. The number of references to countries in Asia was not surprising. We were surprised to find stories from Africa, but no media stories coming out of Latin America or the Caribbean region.

Table 6: Geographic Source of Media Stories

Country	% of Media Stories
UK	15.68%
Ireland	11.85%
Australia	9.06%
South Korea	6.97%
Canada	6.62%
Pakistan	5.57%
Sri Lanka	5.57%
India	4.88%
Scotland	4.88%
Singapore	4.88%
US	4.88%
New Zealand	4.53%
Tunisia	2.79%
China	2.44%
South Africa	1.74%
Malaysia	1.39%
UAE	1.05%
Egypt	0.70%
Lebanon	0.70%
Nigeria	0.70%
Germany	0.35%
Hong Kong	0.35%
Jordan	0.35%
Kenya	0.35%
Nepal	0.35%
Philippines	0.35%
Qatar	0.35%
Thailand	0.35%
Zambia	0.35%

The visual representation of the results for Research Question 3 is striking in the countries that are included and those that were not included. From these results, we initially concluded that there is little treatment of the knowledge economy outside of a few countries. We observe that the countries that do rate higher in their alignment with the semantic profiles are also those that have made significant investments in information technology and higher education. We are encouraged by the existence of even small coverage sourced in Africa.

The lack of references to Latin America and the Caribbean region was puzzling. Further discussions with Dr. Gregorio Perez Arrau, Universidad de Santiago de Chile, Facultad de Administracion y Economia, provided further explanation. Dr. Perez Arrau suggested that economic issues pertaining to the current interpretation of the knowledge economy might be considered local topics. Such local economic issues might more likely be treated in local media. For countries in Latin America and the Caribbean, local media would communicate in the local language including Spanish, Portuguese and French. Results for localized treatments might not have been included in the LexisNexis results because they are largely represented in English. We are grateful to Dr. Perez Arrau for sharing his insights on this question.

4.4 Research Question 4: Does the media's treatment of the knowledge economy reflect the role of intellectual capital?

As previously noted, two reference points were selected to analyze the focus of the coverage in the media stories. The first reference point was the World Bank's Knowledge Economy Index, which was the most publicly recognizable representation of the knowledge economy for several years. The second was Andriessen's model of intellectual capital.

The results of the semantic analysis of media stories using the World Bank's KEI profile were both expected and surprising (Table 7). The surprising result was the large number of semantic markers that fell outside of the four pillars or areas of focus. More than one quarter of the semantic markers did not align with any of the four areas. The focus with the largest number of semantic markers was "Business and Industry". The Business and Industry focus comprise a little over 30% of the coverage. This suggests that most media coverage of the knowledge economy related in some way to current business conditions and investments. There was some treatment of innovation but only in the context of business. Policy and Governance registered the next highest focus at 15%. This reflects the media's focus on government and business policies or government planning for knowledge economy. Again, this reflects a superficial treatment of the knowledge economy. The coverage of Education and Research and ICT are lowest in the ranking. This represents an advanced industrial economy perspective – the production of knowledge through formal education and training and research as opposed to the development of a broad range of intellectual asset types.

Table 7: Alignment of Media Stories with World Bank's Knowledge Economy Pillars

WB KEI Focus Area	% of Occurrences	% of Unique Markers
Non-WB KEI Topics	32.29%	27.53%
Business & Industry	30.52%	36.24%
Innovation	15.00%	13.24%
Education & Research	10.59%	12.54%
Technology	11.60%	10.45%

The results of the semantic analysis of media stories using the Andriessen Intellectual Capital profile were also both expected and surprising (Table 8). What was surprising was the very large percentage of semantic markers that related to none of the eight categories (58.06%). This is double the rate of non-matching markers found in the World Bank's model. We did not expect to find many Intellectual Capital matching semantic markers in the media stories. While the number was low, we did find some markers. Structural Capital ranked second, specifically including explicit knowledge as represented in documents, publications, and presentations. This is consistent with what we observed in the KEI analysis – the focus tends to be on more formal representations of knowledge as they were understood in the advanced industrial economy, and in particular references to formal training and education. The remaining categories of intellectual capital are barely touched upon in the media stories.

Table 8: Alignment of Media Stories with Andriessen's Intellectual Capital Assets

Andriessen's Intellectual Capital Categories	% Total Occurrences	% Total Markers
No Intellectual Capital Reference Point	58.06%	49.48%
Structural Capital - Explicit	18.50%	18.82%
Human Capital - Attitude	9.53%	14.63%
Human Capital - Tacit	4.12%	5.92%
Structural Capital - Procedural	3.61%	1.74%
Human Capital - Skills	2.96%	3.83%
Structural Capital - Cultural	2.59%	4.53%
Relational Capital - Relational	0.52%	0.70%
Relational Capital - Reputation	0.09%	0.35%

The greatest concentration of semantic markers for both semantic profiles was on general economic conditions and terms. There were few references to essential knowledge economy concepts in the total corpus of media stories. This is likely the most significant observation – that in fact, most media stories of the knowledge economy do not address the knowledge economy in any substantive way. It is not surprising that there is a better alignment with the World Bank Knowledge Economy Index model because it received significant press over ten years of the period covered. During that period of time the World Bank created an impression of the knowledge economy that has sustained in some contexts. The World Bank's interpretation of more accurate representation of knowledge management and intellectual capital has been part of an internal discourse. The external discourse tends to focus on the older KEI representation. From this exploratory analysis, we suggest that a substantive treatment of the knowledge economy in the media is lacking.

4.5 Research Question 5: From what sources does the media draw its coverage of the knowledge economy?

The search results suggested that economic policy institutes and think tanks reference the 21st century concept of the knowledge economy more often than do labor and trade unions or professional associations. Across all three types of organizations, results were more likely to refer to the advanced industrial economy (e.g., World Bank's KEI model). These results are noteworthy because they represent the primary sources from which the media would draw their references and upon which they would build their understanding of the knowledge economy.

Economic policy institutes and think tanks should be a major primary source of discourse about the knowledge economy. Research results suggest this is not the case. It is clear from Table 9 that the more relevant references to the knowledge economy and intellectual capital were produced by think tanks and policy institutes that focus on people and employment issues, including the National Bureau of Economic Research and the Urban Institute While the numbers of references were greater from Brookings Institution, Rand, and American Enterprise Institute – these references were primarily related to technology and business topics such as those identified by the World Bank's model of the knowledge economy, and not to intellectual capital. The number of economic policy institutes and think tanks with no references to the knowledge economy was also noteworthy.

Table 9: Economic Policy Institutes and Think Tanks Websites and Search Results

Organization	Website	Google Scholar Results	Relevance
National Bureau of Economic Research	http://www.nber.org/	353	High
Center for Full Employment and Price Stability	http://www.cfeps.org/	39	High
Kiel Institute of World Economics	https://www.ifw-kiel.de/	39	High
Urban Institute	http://www.urban.org/	24	High
Center for American Progress	https://www.americanprogress.org/	7	High
Heritage Foundation	http://www.heritage.org/	6	High
Center for Economic Policy Analysis	http://www.economicpolicyresearch.org/	2	High
Joint Center for Political and Economics Studies	http://jointcenter.org/	2	High
Progressive Policy Institute	http://www.ppionline.org/	2	High
Jerome Levy Economics Institute	www.levy.org	1	High
Brookings Institution	https://www.brookings.edu/	397	Medium
RAND	http://www.rand.org/	120	Medium
American Enterprise Institute	http://www.aei.org/	102	Medium
Institute for International Economics	https://piie.com/	27	Medium
Center for Economic and Policy Research	http://cepr.net/	25	Medium
Cato Institute	https://www.cato.org/	15	Medium
Hoover Institution	www.hoover.org	11	Medium
Committee for Economic Development	http://www.ced.org/	7	Medium
Economic Strategy Institute	http://www.econstrat.org/	3	Medium
Century Foundation	https://tcf.org	2	Medium
Economic Policy Institute	www.epi.org	2	Medium
Economic Research Council	http://www.ercouncil.org/About.htm	0	None
Employment Policy Foundation	http://www.epf.org/	0	None
Rochester Center for Economic Research	http://rcer.econ.rochester.edu/	0	None

Because of their focus and interest on the economic future and well-being of their members, trade and labor unions should also be a primary source of discourse about the knowledge economy. Of those trade and labor unions we queried (Table 10), only one – the American Federation of Teachers – had relevant references to the knowledge economy. The references were relevant because this union focuses on the future economic conditions facing their students. The "zero" reference responses were noteworthy and troubling.

Table 10: Trade and Labor Union Websites and Search Results

Organization	Website	Google Scholar Results	Relevance
American Federation of Teachers	http://md.aft.org/	68	High
OPEIU Office and Professional Employees International Union	http://www.opeiu.org/	11	Medium
AFL-CIO	http://www.aflcio.org/	5	Medium
Service Employees International Union	www.seiu500.org/	3	Medium
American Federation of Government Employees	https://www.afge.org/	1	Medium
Nurses United	http://www.nationalnursesunited.org/	1	Medium
Amalgamated Transit Union	http://www.atu.org/	20	Low
AFSCME	http://www.afscme.org/	16	Low
The Bakery, Confectionery, Tobacco Workers and Grain Millers International Union	http://www.bctgm.org/	3	Low
IATSE International Alliance of Theatrical and Stage Employees	http://www.iatselocal22.com/index.cfm	0	None
Communications Workers-America	https://www.cwa-union.org/	0	None
United Food and Commercial Workers	http://www.ufcw.org/	0	None
American Postal Workers Union	http://www.apwu.org/	0	None
UAW	https://uaw.org/	0	None
International Brotherhood of Electrical Workers	www.ibew.org/	0	None
Seafarers International Union	https://www.seafarers.org/	0	None
United Brotherhood-Carpenters	https://www.carpenters.org/	0	None
United Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry of the United States and Canada	https://www.helmetstohardhats.org/	0	None
United Transportation Union	http://www.utugca687.org/	0	None

Similarly, professional associations take as a primary area of interest the future of a profession and the economic and professional well-being of their members. The references to the knowledge economy among this group of primary sources were more troubling than the other two sources (Table 11). Only seven of the 21 associations queried had any references to the knowledge economy. The American Bar Association produced 28 references to the knowledge economy, all of which were relevant to the 21st century representation of the concept. However, the references pertain to intellectual capital as it relates to intellectual property protections rather than to the development of and investment in intellectual capital.

Table 11: Professional Associations Websites and Search Results

Organization	Website	Google Scholar Results	Relevance
American Bar Association	www.americanbar.org	28	High
American Nurses Association	http://www.nursingworld.org/	2	High
American Counseling Association	https://www.counseling.org	2	High
National Society of Professional Engineers	https://www.nspe.org/	1	High
National Child Care Association	http://www.nccanet.org/	1	High
Regulatory Affairs Professionals Society	http://raps.org/	1	Medium
Association for Financial Professionals	www.afponline.org/	0	None
American Occupational Therapy Association	http://www.aota.org/	0	None
Association of Fundraising Professionals	http://www.afponline.org/	0	None
American Medical Association	https://www.ama-assn.org	0	None
National Association of School Nurses	http://www.nasn.org/	0	None
American Association of Naturopathic Physicians	http://www.naturopathic.org/	0	None
National Association of Workforce	http://nawdp.org/	0	None

Organization	Website	Google Scholar Results	Relevance
Development Professionals			
Association of Clinical Research Professionals	https://www.acrpnet.org/	0	None
American Occupational Therapy Association	http://www.aota.org/	0	None
Alliance of Hazardous Materials Professionals	http://ahmpnet.org/	0	None
Society of Professional Benefit Administrators	https://spbatpa.org/	0	None
National Association of Insurance and Financial	http://tnaifa.org/	0	None
National Association of Securities Professionals	http://www.nasphq.org/	0	None
National Roofing Contractors	http://www.nrca.net/	0	None

Research Question 5 also looked at references to eight internationally recognized economists whose work has focused on the knowledge economy (Table 12). The eight economists were selected based on the appearance of their knowledge economy research in peer reviewed knowledge economy and intellectual capital focused journals. As leading researchers in this area, their stature would be important to explaining the transformation from an industrial to a knowledge economy to the general public. We conducted a simple search in LexisNexis for ndications of their presence in the public media specifically related to the topic of the knowledge economy. This research question is a weaker indication of the presence of the topic in the media discourse, but it reinforces what we have found in relation to the other research questions. While all eight knowledge economists were found in the LexisNexis results, only three were found to be referenced in the news and newspaper references in the filtered LexisNexis – Joseph Stiglitz, Paul David and Bronwyn Hall. Table 12 describes the search results for name variations in a general Google search, results from Google Scholar and LexisNexis. As a check point we also note the years of coverage represented in the searches. Where the search results predate our treatment of the knowledge economy, we might assume they are likely to be of lower relevance than those that coincide with the rise of the concept. While there are thousands of references to these individuals in the general Google search, the true test of media coverage is found in the LexisNexis results. Joseph Stiglitz is covered at twice the rate of either Paul David or Bronwyn Hall. Stiglitz and Hall's range of coverage are similar, though David's predates the knowledge economy. Stiglitz may also be referenced more frequently invited to comment in the media because of his early affiliation with the World Bank and his economic analyses of the cost of the Iraq War. We also note that there is a contrast in the Google Scholar citations and media references for both Stiglitz and Hall. Academic citations far outpace the rate of coverage in the public discourse.

Table 12: Knowledge Economists in LexisNexis Academic Search Results

Economist	Name Variant	Google	Google Scholar	LexisNexis
Joseph Stiglitz	"Joseph Stiglitz"	~519,000	234,294 citations [1988-2017] *GS profile	998 [1993-2017]
	"J E Stiglitz"	~84,700		
	"J Stiglitz"	~108,000		
	Joseph Stiglitz	~510,000		
	J E Stiglitz	~443,000		
	J Stiglitz	~514,000		
	Stiglitz economist	~442,000		
Francisco Queiro	"Francisco Queiro"	491	4 results [2008-2016]	0 *Note: The 3 results were actually for Francisco Queiros.*
	"F Queiro"	387		
	Francisco Queiro	~230,000		
	F Queiro	~1,660,000		
	Queiro Harvard	~23,400		
	Queiro economist	~11,100		
Dominique Foray	"Dominique Foray"	~24,700	385 results [1984-2016]	53 [1994-2017]
	"D Foray"	~26,600		
	Dominique Foray	~285,000		
	D Foray	~6,570,000		
	Foray Lausanne	~259,000		
	Foray economist	~916,000		
Maria Carvalho	"Maria Da Graca Carvalho"	~5,610	7,379 citations [1991-2017] *GS profile	5 [2010-2014]
	"Maria Carvalho"	~396,000		
	"M Carvalho"	~393,000		

Economist	Name Variant	Google	Google Scholar	LexisNexis
	Maria Da Graca Carvalho	~380,000		
	Maria Carvalho	~53,500,000		
	M Carvalho	~1,280,000		
	Carvalho BEPA	~60,300		
	Carvalho economist	~350,000		
Paul A. David	"Paul A David"	~107,000	486 results [1961-2016]	421 [1989-2016]
	"Paul David"	~462,000		
	"P A David"	~243,000		
	Paul A David	~758,000,000		
	Paul David	~821,000,000		
	P A David	~416,000,000		
	Paul David Harvard	~54,300,000		
	Paul David economist	~18,200,000		
Bronwyn H. Hall	"Bronwyn H Hall"	~30,500	41,030 citations [1989-2017] *GS profile	380 [1988-2017]
	"Bronwyn Hall"	~40,800		
	"B H Hall"	~78,600		
	Bronwyn H Hall	~404,000		
	Bronwyn Hall	~519,000		
	B H Hall	~29,200,000		
	Bronwyn Hall Berkeley	~107,000		
	Bronwyn Hall economist	~184,000		
Mary O'Sullivan	"Mary A. O'Sullivan"	~25,000	14 results [2002-2016]	10 [2000-2016] *Note: Upon quick glance, most of these do not actually appear to be the individual in question.*
	"Mary O'Sullivan"	~279,000		
	"M A O'Sullivan"	~23,800		
	Mary A. O'Sullivan	~9,650,000		
	Mary O'Sullivan	~9,560,000		
	M A O'Sullivan	~10,200,000		
	O'Sullivan Wharton	~232,000		
	Mary O'Sullivan economist	~1,370,000		
Carl Dahlman	"Carl J Dahlman"	~7,250	119 results [1971-2013]	95 [1992-2016]
	"Carl Dahlman"	~13,800		
	"C J Dahlman"	~3,190		
	Carl J Dahlman	~153,000		
	Carl Dahlman	~248,000		
	C J Dahlman	~93,400		
	Dahlman Georgetown	~98,300		
	Dahlman economist	~240,000		

5. Findings and Observations

The exploratory research was undertaken to understand the level and nature of print media's coverage of the knowledge economy. While we found some coverage, that coverage tends to reflect the earlier definition of an advanced knowledge economy promoted by the World Bank. Furthermore, we observed that treatment of the knowledge economy in media sources is low when compared to its treatment in scholarly sources and via web search engines. The media's treatment of the knowledge economy does not reflect the current characterization of one grounded on intellectual capital. While the generic terms such as know-how, knowledge, knowledge-based, intellect, and knowledge economy appear in the media stories, the critical concepts associated with intellectual capital are scarce or missing entirely.

We also observed that there is some coverage in all regions of the globe. However, the greatest concentration of coverage is in the United Kingdom, Ireland, Australia, South Korea and Canada. The United States does not appear in the top 10 countries of media coverage. A striking observation was the almost total lack of coverage of European Union countries in the coverage, outside of the U.K. and Ireland. Those countries which have made investments in information technology appear to generate more stories about the knowledge economy than those which have not. The lack of stories coming from Latin America and the Caribbean is noted. We also note that coverage of issues related to the knowledge economy may be treated as local issues – pertaining to employment, intellectual capital development and investment – and covered in local language media. This may account for some of the gaps in coverage found in English language media represented in the LexisNexis search results.

Of particular note is the lack of coverage and treatment of the knowledge economy in the primary sources from which the media would routinely draw. The lack of coverage by economic policy institutes, think tanks,

trade and labor unions, and professional associations was unanticipated. In contrast, the academic coverage of the knowledge economy is strong. This result speaks to the need to increase the discourse between organizations and academics. Until this discourse increases, and is brought to the attention of the media, we are unlikely to see an increase in coverage for the general public.

When viewed chronologically, we observe an small increase in the media's coverage of the knowledge economy. However, the overall coverage and reference is small. In general, the research team concludes that there is a need to reach out to the media to improve their understanding of the knowledge economy, and to introduce them to the thought leaders in the field. There also should be a continuing discourse between academics working on this topic, and media sources. The media can be an important source of information for populations striving to adapt to a new economic environment. Also, it can be a valuable source of understanding for businesses trying to survive in the new economic environment.

This paper represents an initial exploration of the topic. This research focused on coverage in formal print media sources which were also accessible online. Future research should explore the coverage of the topic in other media sources, including social and broadcast media. In addition, future research should compare the particular regional knowledge economy research agendas with regional media coverage. Another potential future research focus might include focused interviews with media sources and business reporters.

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