An Integrative Analysis of

Innovation Survey Characteristics

Abstract:

This paper analyzes the most popular *innovation scales* used in popular business media and applies an integrative analysis framework to identify individual characteristics of the surveys, and discover any overriding themes. Finally, areas for further study are proposed.

The impetus for this article and its accompanying research stemmed from a distinct challenge: while the term innovation is touted as an essential strategy for growth, and is used pervasively in business media, there is no singular definition of innovation or what it might means or entail. The term *innovation* can and has been used to signify a company's flexibility, nimbleness, creativity, or popularity. And that is only when describing a company as a whole – not a process, a procedure, a person which can all be innovative. According to Wired magazine, innovative is the most overused buzzword of 2013, with little to no consensus or standardization in the usage of the term. Popular magazines and analysts compile lists of the most *innovative* companies, but all utilize the term with different contexts, emphases, and results. We know that innovation is critical to the long-term success of corporations and economies, but determining a standardized and cross-functional mechanism for measuring innovation is both a challenging and specific endeavor.

In recent years, innovation has become a term du jour – used interchangeably to describe the creativity, performance, success, and personality of companies. However, theorists have begun to connect abstract indicators to innovation – quality of workplace, personality of workforce, strength of leadership, and clarity of corporate communications. My intent in undertaking this study was to analyze the different ways the term innovation was defined by each media or research group, note any similarities in common usage, and attempt to drive to a standardized and multi-disciplined measure for innovation.

This paper analyzes the most popular *innovation scales* used in popular business media and applies an integrative analysis framework to identify individual characteristics of the surveys, and discover any overriding themes. Finally, areas for further study are proposed.

In this study, the researcher considered the following business media surveys used to measure corporate innovation: Booz & Co. Global Innovation 1000, Boston Consulting Group Most Innovative Companies, Forbes Most Innovative Companies, Fast Company 50 Most Innovative Companies, MIT Smartest Companies, Thomson Reuters Global 1000 Innovators, OECD Community Innovation Survey, and the United States Business Research & Development and Innovation Survey, all briefly summarized below, and further interpreted in the analysis section.

1. *Booz & Company 2013 Report - The Global Innovation 1000: Navigating the Digital Future*

A leading management consulting organization, Booz & Company (since acquired by PricewaterhouseCoopers in April 2014) has been researching and releasing their annual innovation report for the past nineteen years. The Booz research report focuses on innovation at the firm level, as defined by the most money spent on research and development in the fiscal year ending June 30th, 2013 (Jaruzelski, Loehr, & Holman, 2013). The report compiles key financial metrics for the top 1,000 public companies including sales, gross profit, operating profit, net profit, historic R&D spend, and market capitalization figures. The results are then ranked according to amount of annual R&D spend. Additionally, the most *innovative* designation is determined by the survey responses of 400 senior managers and R&D professionals (Booz & Co., 2013).

2. *Boston Consulting Group – Most Innovative Companies*

Boston Consulting Group has been studying innovation since 2005. Their list, assembled from the survey results of 1,500 applicants, particularly focuses on the perceived innovation of the respondents' companies. Before 2008, the list was

determined solely by survey responses. However, after 2008, the responses were supplemented with available financial data for each company, creating a weighted score. The weighting is as follows: 80% participant responses, 10% three-year shareholder returns, 5% revenue growth, and 5% margin growth. Participants were also asked to rate their companies' overall innovation performance relative to their peers in the marketplace. More than half of the most innovative companies on the 2013 list are more than 50 years old, and some can trace their roots to the 19th century, and that these companies create value, jobs, and growth because of their ability to institutionalize innovation (Wagner, Foo, Zablit, & Taylor, 2013, 2013).

3. ***Forbes Most Innovative Companies***

Forbes Magazine is an online business and investment journal featuring content related to business, technology, investing and lifestyle. Forbes also ranks innovative companies annually, however they set definite criteria in place for consideration, and outsources the research to a firm that uses a proprietary methodology known as the *innovation premium* (Dyer & Gregersen, 2013). This premium is calculated by projecting cash flows from existing businesses plus anticipated growth, and comparing that with current market capitalization – i.e. companies with a current market cap above the net present value of cash flows have an innovation premium built into their stock.

4. ***Fast Company – 50 Most Innovative Companies***

Fast Company is a popular business media brand, with a "unique editorial focus on innovation in technology, ethonomics (ethical economics), leadership, and design" (Fast Company, 2014). Each year, the magazine and its online counterpart compile 50 companies that "matter the most, the ones whose innovations are having an impact across their industries and our culture". Analysis is performed by the magazine's writers and editorial staff, who vote on which companies should be included.

5. ***MIT - 50 Smartest Companies***

The Massachusetts Institute of Technology is one of the most esteemed universities for technological development and innovation. The MIT Technology Review is "an innovative, digitally oriented global media company" whose…"mission is to identify important new technologies…and how they will change our lives". The subscriber base includes 580,000 members, with another 2.4 million visitors annually (MIT Technology Review, 2013).

6. ***Thomson Reuters Global 100 Innovators***

Thomson Reuters is a media company that delivers news and information to business clients in the areas of risk, governance and compliance, finance and tax, and intellectual property. In its third year, the Thomson Reuters Global 100 Innovators report ranks companies based on the definition of innovation – what it calls "getting to the essence of what it means to be truly innovative" (Thomson Reuters, 2013). The list identifies the most innovative organizations in the world from 4 different criteria: overall innovation/patent activity, success rate, globalization, and influence (Thomson Reuters, 2013, p.3).

The first, volume, specifies that only organizations with 100 or more patents from the most recent three years is included in the study. The second criterion weights companies with the highest ratio of published patent applications to granted patents over the same three year period. The third element emphasizes the degree to which these patents are protected in major world markets. Finally, influence reflects the resulting impact of the company and the frequency it is cited by other companies over the last five years (Thomson Reuters, 2013).

7. ***OECD Community Innovation Survey***

While the OECD's Community Innovation Survey is not necessarily a ranking, it does attempt to capture innovation in an organization, so it should be included in this analysis. The Organization for Economic Cooperation and Development (OECD) is a unique forum where the governments of 33 democracies work together to address the economic, social and environmental challenges of globalization. Data is collected every three years voluntarily by European Union countries. The study focuses on the innovation and innovation activities of any enterprise with 10 or more employees, and is defined by the following parameters: innovativeness of sectors by type of enterprises, different types of innovation, and various aspects of the development of an innovation. The OECD provides statistics broken down by countries, type of innovators, economic activities and size classes (OECD, 2005). Data collection is carried out using guidelines for collecting and interpreting innovation data – known as the Oslo Manual.

8. ***United States Business R&D and Innovation Survey***

Similar to the OECD's efforts, the United States has attempted to standardize innovation, and has developed a survey of their own – called the Business R&D and Innovation Survey. This study is limited to R&D efforts throughout the US, and covers five topics: Financial information about the companies' R&D (R&D expenses); Strategic and technical information about the companies' R&D expenses; Financial and technical

information about R&D that is paid for by others (contract or government grant); R&D employment; Information about the companies' innovation activities, intellectual property, and technology transfer activities (National Science Foundation, 2011).

Analysis of Individual Surveys

After completing a thorough review of innovation theory including the definition of innovation, measures of innovation, disciplines of innovation, innovation metrics, nature of innovation, corporate innovation, the researcher analyzed the above surveys that are the most widely used and most influential in business and management consulting. All titles but one directly referred to the concept of innovation, and the one that did not - MIT Smartest Companies - referenced the specific term *innovation* in its description. All studies measured and reported innovation at the firm level, all survey research had been performed in the last five years, and most were annual studies.

Then, each survey was analyzed for the following traits: frequency of data collection, sample size, criteria, key characteristics and findings, and methodology used. A matrix was developed to represent these findings. (see table 1 below) The focus of each survey was then critiqued and categorized according to their interpretation of innovation - i.e. revenue, R&D, leadership, process. This list of foci was analyzed using an integrative analysis framework, a qualitative method built to adequately represent disparate and varied data sets in order to define concepts, review theories, review evidence, and analyze methodological issues of a particular topic (as cited in Whittemore & Knafl, 2005, p. 548).

Using the matrix illustrated above in Table 1, the researcher reviewed the perceived properties of innovation for each survey, identifying 20 unique characteristics used in the reduction model, and their unique elements.

Table 1 Innovation Scale Matrix

Title	Organization	Frequency	Sample Size	Criteria	Key Characteristics	Methodology
The Global Innovation 1000	Booz & Co	annual	1,000	public companies; Most R&D Spend in FY; must make R&D spend public	R&D focused	sales, GP, operating profit, net profit, historical R&D spend, market cap
The Most Innovative Companies (2013)	Boston Consulting Group	annual	1,503		total shareholder return, revenue and margin growth	Survey of senior executives. Survey respondents' votes count for 80 percent of the ranking, three-year TSR for 10 percent, and revenue and margin growth for 5 percent each three-year total shareholder return (TSR), three-year revenue growth, and three-year margin growth.
50 Most Innovative Companies	Fast Company	annual	60	Annual guide to the businesses that matter most, the ones whose innovations are having an impact across their industries and our culture		chosen by editorial staff
The World's Most Innovative Companies	Forbes	annual	50	7 years of public financial data and $10 in market cap; threshold for R&D spending	investor-centric; banks/energy/mining firms eliminated	Reveals % Sales Growth, 5 yr. total return, but ranked by "innovation premium" -- proprietary metric considered the "Myers-Briggs for innovation"
Smartest Companies	MIT	annual	50	Whether a company had made strides in the past year that will define its field	reputation does not matter	chosen by editorial staff
100 Top Global Innovators	Thomson Reuters	annual				patent-based metrics including overall innovation (patent) avtivity, success rate, globalization and influence

Analysis and Critique of Each Survey

Booz & Co.: In its 19th year, Booz & Co.'s survey is one of the longer-standing studies and focused specifically on research and development (R&D) spending for each company. Their survey was very quantitative in nature, designed to capture sales, profits, market capitalization and R&D. And while R&D is a critical component to innovation, it is only one step in the innovation process. Strength in innovation can come from many of the non-R&D related activities in which a company may participate. As the literature showed, innovation involves a number of activities that stretch beyond R&D, including incremental innovations, training and market preparation for product innovations, and development and implementation activities for new marketing methods or new organizational methods (OECD, 2005, p. 90).

Since R&D is very product-centric, and because services businesses do not manufacture products, they often have difficulty expressing their innovative capabilities. Using R&D as a predictor is a disadvantage to services business because their processes are harder to define than traditional manufacturing. In an attempt to rectify

this, the Oslo Manual set the basic criteria of innovation to include non-R&D innovation activities that "result in new knowledge or use of knowledge to devise new applications" (OECD, 2005, p. 97). However, as the Booz survey currently stands, any company who specifically focuses on these activities, or any company that does not actively participate in R&D would not be captured in its definition. Booz & Co. did, however, ask surveyed companies about their use of technology in an effort to understand how digital tools may be aiding their innovative capabilities.

Boston Consulting Group: Though the research methodology Boston Consulting Group (BCG) uses is proprietary, they place significant emphasis on the result of innovation -- how it translates to profits and margin growth. Specific interest is given to shareholder return, which means that the innovative behavior must not only be harnessed and exploited, but the company must then create and express its value to investors and shareholders. This restriction limits the dimension of innovation used to one that is able to be quickly translated to the financial statements and company earnings. One could argue that this is an external interpretation of innovation, limited to the response of financial markets, and how investors can recognize the company's value by extrapolating financial results.

Before 2008, the survey's single consideration was the response of the participants. However, since 2008, surveys have included three additional financial measures intended to neutralize any perceived bias from survey respondents. However, since the survey results still account for a majority of the ranking methodology, there could be considerable bias from senior executive respondents.

According to Dunning, Heath & Suls (2004), there is an overestimation of the likelihood of desirable events (as in making or topping the list) and placing too much confidence in the insightfulness of company executives' judgments (p. 95). Furthermore, there could be considerable bias in the responses, since executives are asked to rank their companies' innovation performance relative to their peers in the marketplace. Dunning et al. (2004) note that it is imperative to keep in mind that senior executives, especially the CEO, can often suffer from skewed perceptions of their abilities, particularly prone to overconfidence. Thus, by extension, their company's performance could also be skewed to reflect this phenomenon.

Fast Company: This study was included in the initial sample, but excluded from any further analysis. The most obvious critique of Fast Company's list is that it is completely subjective, with inclusion determined by the editorial staff. While one could argue this study is the most inclusive (taking all kinds of ventures into account) it is also one of the least rigorous studies, due to the lack of criteria or limitations in place. Therefore, reputational bias is a significant risk that compromises the validity of this study. Instead of critically examining the innovative activities one company might promote, the past performance of perennial listmakers like Google and Apple, as well as the public relations campaigns of certain newcomers may influence the results of this study. Concern from other media outlets is that the Fast Company study is a popularity *contest* (Dyer & Gregersen, 2013).

The 2013 results rank the companies based on undisclosed criteria, and include additional companies that represent of three of the magazine's featured articles. These

additional profiles are grouped according to similarities like leadership style (brash CEO personality), geography (Chinese entrepreneurial endeavors) or specialty (companies focusing on the food revolution).

***Forbes**:* The Forbes list uses a proprietary methodology developed by innovation scholar Clayton Christensen and colleagues that is dependent upon a firm's market capitalization and cash flow. Christensen and his team sought to create a measure that could serve as a balanced scorecard for innovation. Their resulting *Innovation Premium* weights the financial data from public firms against the percentage of market share that cannot be attributed to tangible products. In other words, innovation is ranked on the volume of the expectational *premium* the company enjoys in the eyes of investors. As such, those firms on the list must have a market capitalization large enough to sustain its short term sales in addition to its projected success. This limits the ranking participants to those organizations that have at least $10B in market capitalization, and may exclude smaller organizations that might be disrupting the industry. These smaller companies have yet to become profitable or scalable enough to register on the scale – the very nature of what Christensen discusses as a *disruptive innovator* (Christensen, 2002).

Forbes is unique in that they mandate several other factors for inclusion: that a firm has seven years of publicly available financial data, and $10 billion in market capitalization, thereby creating a threshold for R&D spending as a percentage of sales. Forbes excludes banks and energy and mining firms, whose presence would skew the listing. Since banks have a huge market capitalization, and energy and mining firms'

market value is tied to commodity prices, their presence would result from their size, valuation and market fundamentals and not from their innovation successes (Dyer & Gregersen, 2013).

Forbes' methodology is a good start to adopting rigor to the process of evaluating innovation, and is facilitated by Christensen, Gregersen and Dyer, the world's authorities in innovation. The concept of a score is key in standardizing the measurement of innovation; however, the Innovation Premium is still too limiting. It restricts the frame of innovation to R&D and stock performance over time, which past discussion cautions against. Instead, a better option would be to include some of the *softer* yet interdependent variables of innovation that Christensen and their team include in their other research including process, management capability, or corporate motivations (Christensen, 2002).

MIT Smartest Companies: The MIT Technology Review has been observing innovative trends since 2010, when their first list was compiled. This is the only list in which user-submitted entries are judged – companies wishing to be considered must submit their justification via email, and the editorial staff selects the listmembers. Public and private companies are eligible for inclusion – the most important criterion is that the companies "have displayed impressive innovations in the past year. It is not based on quantitative measures such as patents or R&D spending" (MIT Technology Review, 2013).

Much like the Fast Company rankings, MIT's Smartest Companies is compiled by the editorial staff of the magazine from user-submitted proposals outlining innovative

behavior in their firms. The list specifically asks for the company to justify their performance in their own words. Since these submissions are likely prepared by marketing and public relations staff or CEOs, they may suffer from the same bias of self-assessment mentioned earlier. Both parties may be incented to or benefit from the overly exuberant view of their organization.

However, MIT should be recognized for being the most egalitarian ranking, as they had little to no restrictive criteria for inclusion, and both private, public, and foreign enterprises were evaluated. Additionally, they made a point to discount past reputation so as to present a list that is representative of current innovation.

Thomson Reuters: Thomson Reuters' proprietary methodology scores innovation from a purely patent standpoint, which is a common metric, however not the most complete. Though beneficial, using only patent activity can be both limiting and misleading. As the Oslo Manual (2005) explains, while patent statistics may indeed reflect the technological prowess of a company, and predict technology trends, they may eliminate certain activity that is innovative, but has not yet been captured in patent form. Many innovations are not patented, and some are covered by multiple patents; many patents have no technological or economic value, and others have very high value (Oslo Manual, p. 22). In fact, Dyer and Gregersen (2012) reveal that academic researchers never use patents as a measure of innovation prowess because patenting patterns are very different across industries.

By narrowing the focus of innovation to patents alone, the results can be skewed to amplify certain companies, and exclude others. In the Japanese culture, patents are

seen as a professional achievement, resulting in a disproportionate amount of patents filed (Nishimura, 2013, p. 2). China, whose economy is the world's largest, is excluded from consideration in this survey, merely because it does not defend patents in global markets (a criteria for the study) - only domestic ones. Additionally, patent volumes have increased as companies take a more defensive stance and use patents and their infringements to stave off challenges from competitors.

The results are compiled in an alphabetical list of the top 100 companies that fit the above criteria. Unsurprisingly, both the semiconductor and electronic components industry continues to lead, with computer hardware following closely behind. Notable absences were any companies from China, since they only defend patents domestically, and any UK firms, a result of low R&D investment as a percentage of GDP. As the survey notes "The innovative success of a country or region is influenced by government policies and initiatives" (Thomson Reuters, 2013, p.6) which would explain why tax credits and other government initiatives in countries like the United States, Japan and France create what Thomson Reuters bills as *Top Global Innovators*.

OECD Survey: The OECD Community Innovation Survey is the most comprehensive measure for trying to capture the all-encompassing and multi-disciplinary nature of innovation. The Oslo Manual guidelines attempt to identify the drivers of innovation so that studies can be more homogenous and easily comparable. The Manual is considered the foremost international source for the collection and use of data on innovation activities in industry, known as the *gold standard* to which other research should be compared. Their research is more detailed than much of the

scholarly research to this point, and takes specific care to focus on *non-technological* innovation, broadening the parameters to include more than recognizable economic impact (OECD, 2005).

As it is a survey-based study, the weaknesses of survey research previously discussed may affect the output. Since the survey collection is left up to the individual countries in the EU, participation and enforcement may vary. This creates an unintentional bias due to accidental sampling, shrinking the sample set to those who find it most convenient to respond. Additionally, the hard copy of the survey is lengthy, approximately twenty pages, and may influence the return rate.

Business R&D and Innovation Survey: The BRDIS, administered by the US Government's National Science Foundation, is a new entrant into the category of innovation studies. As it was adapted from previous government research enacted to study R&D, it is limited in its scope. Given that 2008 was the first time this study was undertaken, it is preliminary data. Innovation is currently addressed only in relation to sales made from R&D rather than internal, or non-revenue creating innovative activities. While the OECD's study abides by the Oslo Manual as a guide to data collection, the National Science Foundation does not offer any further guidance. By their own admission, the National Science Foundation reports that the innovation portion is only briefly addressed in its inaugural survey, and it will be expanded in future survey cycles as experience is gained in implementing the survey and analyzing its data (National Science Foundation, 2011).

Extrapolation of Characteristics Present in Each Study

After critically examining each of the studies for their inherent differences, they were then analyzed to determine the distinct characteristics each survey presents. Employing the method of data reduction allowed the researcher to "organize the characteristics of the experiences in the studies" and integrate specific themes that were identified in the research (Walsh, 2009, p. 233). These themes were: Economic Indicators, Leadership, Technology-based, and Creativity. (see Figure 1)

- **Economic Indicators:** Surveys that placed specific value in quantitative metrics were classified as economic indicators. These listings synthesized specific financial information to chart company performance, expenses, growth targets and other economic data.

- **Leadership:** This theme focused on surveys that described the working environment, competencies, strategic direction, and climate of the organization.

- **Technology-based:** Any survey that collected information about the technology, software, and computing tools were assigned this theme.

- **Creativity:** This theme consisted of surveys that inquired about marketing process, and harnessing creativity within the organization.

Figure 1 (following) illustrates the data reduction model used to identify themes present in the research.

Data Reduction Model

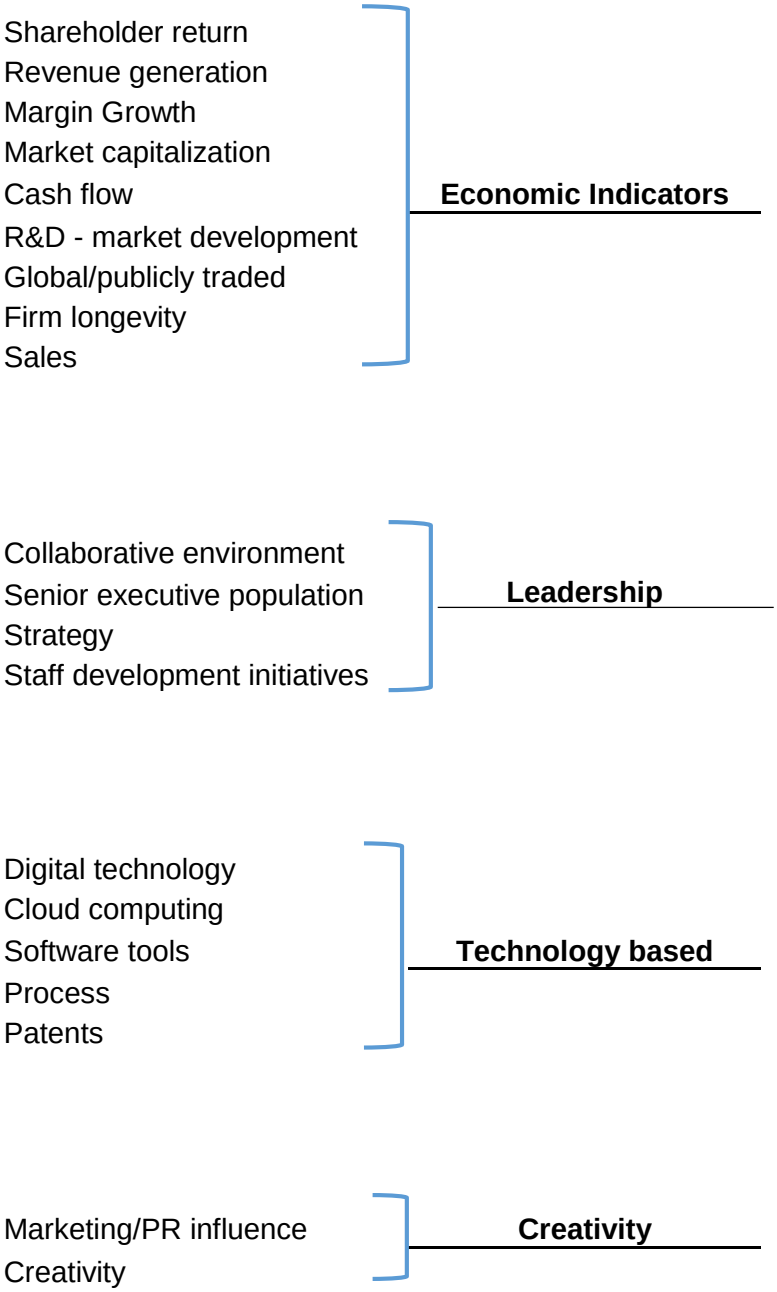

Figure 1. Data reduction model.

Figure 2 further illustrates the analysis of each survey for their focus and their content, including its characteristics and themes. Only one survey – the OECD survey – contained characteristics found in all four themes. Of all surveys reviewed, there was an uneven distribution of characteristics. Few made any distinction on leadership and creativity. Some surveys did not consider any activity that was not economic-focused. In fact, the number of characteristics included in the Economic Indicators theme outnumbered those in all others, suggesting that most survey organizations view innovation through a narrow lens rather than across many disciplines.

Cross-section of Characteristics

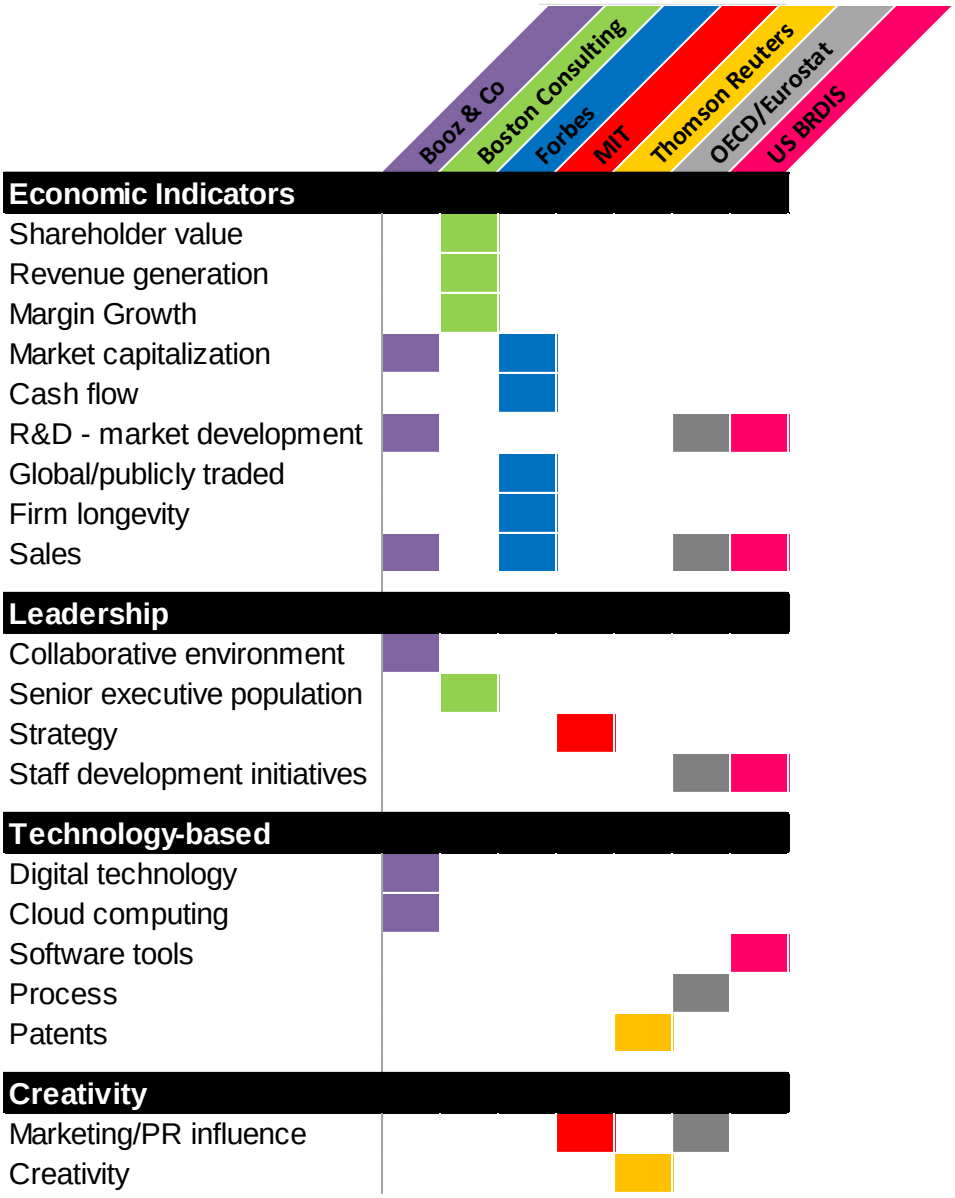

Figure 2. Diagram of Survey Characteristics.

Limitations and Future Implications for Research

A significant limitation is the use of a survey as an accurate data collection tool to measure innovation. First, surveys are better designed to capture activities that can be easily codified, quantified or completed *freezing the picture* of innovative processes (Salazar and Holbrook, 2004) to a specific and static time period versus ongoing activity. Therefore, the survey only provides a snapshot, and any innovation that occurs after this time period risks being reported inaccurately, incompletely, or perhaps not at all.

Additionally, surveys can often have a gender-bias overlay. As Salazar and Holbrook (2004) observe that women can be underrepresented for two reasons. First, "in many economies, female employment is concentrated in the services sector" (p. 263). Also, "women innovators are far less visible and in less senior positions in most organizations" (p. 263). Since women are less represented in the senior executive suite, the respondents of the surveys that target this group are more likely to be male, which could present an unintentional bias.

Finally, qualitative metrics such as the working environment, organizational culture, and individual and team leadership concepts that are valuable to measure the innovative climate cannot be limited to singular data points, and may be under-represented as compared to *hard* technological innovations.

Since research and a literature review revealed that the concept of innovation is multi-factorial, the eight surveys traditionally used in ranking innovation do not measure a broad and inter-disciplinary view, and instead focus on exclusive representations of

innovation rather than a multi-dimensional perspective. If the term innovation can describe financial performance, and research and development acumen, or leadership style, then our measurement tools and process should reflect and incorporate all of these definitions. The current surveys measure innovative activities in silos which lack the perspective that interactions, internal processes, and relationships can provide. (Porter-O'Grady and Malloch, 2015; Salazar and Holbrook, 2004) Caraballo and MacLaughlin (2012) suggest "ignoring the dimensionality of innovation reduces its overall influence and success" (p. 560).

The Elastic Innovation Index may provide a new paradigm for innovation study – one that specifically highlights an organization's potential. It is the first multi-factor innovation index, and uses 35 criteria to benchmark companies' innovative capabilities across five categories– Social, Platform and Data, Leadership, Strategy, and Business Process (Shaughnessy, 2014). It is summarized in the diagram below.

The Factors of Elastic Innovation

Figure 3. Elastic Innovation Index.

Published in 2014, The Elastic Index is a compelling assessment tool for a variety of reasons. The fact that this is not a survey-based tool introduces rigor and attempts to remove bias from the data collection process. As a mixed methods analysis, the tool equally weights quantitative information, through regression analysis of stock and sentiment data, with qualitative information such as strategy and leadership styles. The Elastic Index is the first to evaluate social media behavior as a way to monitor consumer sentiment. Adapting this Index as a predictive innovation tool administered online would offer an accessible platform for real-time evaluation. This would be a great benefit, as most innovation surveys are concerned with a finite amount of time, and results can lag considerably.

The goal of the Elastic Index to expand the definition of innovation past pure outputs. While none of the surveys intentionally focus on capturing innovation using a multi-disciplinary approach, the themes that emerged in the integrative analysis share attributes with the five essential elements of the Elastic Innovation Index, echoing a need for a holistic view of innovation research. By extending this vision, Shaughnessy (2014) says, “we are no longer bounded by companies inventing new products…or by using mass media to push products into a market”. He further suggests a broadened approach will “capture the innovation efforts of companies that tend not to make it into the usual list of innovators” (p. 5) but that are undergoing change that may not be evident to external observers.

Until the term innovation can be standardized across the business and media vernacular, surveys will be continue to be myopic and will focus on individual criteria versus an aggregate of business functions. Though the Elastic Innovation Index is in its infancy, its properties are consistent with a wider, comprehensive view of innovation, and the practices that are critical in creating strong organizations. The researcher proposes further evaluation of the Elastic Innovation Index in hopes that this concept and methodology can spark further discussions.

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