Applying Search Words and BBS Posts to Societal Risk Perception and Harmonious Society Measurement

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***Abstract*—Current China is undergoing social transformation with economic miracle and emerging big poor-rich gap. Mission to a Harmonious Society has been promoted by Chinese top leaders. This paper briefly outlines several indicators to evaluate the harmony society. As a variety of Internet tools provides ways to record and disseminate fresh community opinions conveniently, mining of those kinds of public opinions is expected. This paper discusses one approach to societal risk perception using hot search words and BBS posts, which aims to provide another access to societal risk perception different from those in traditional socio psychology studies. Problems are also indicated.**

Keywords—harmony society measures, BBS posts, Baidu hot search words, societal risk perception

I. INTRODUCTION

Economic reforms in China after 1978 makes economic miracle, leading the country to the world's second largest economy by nominal GDP and purchasing power parity. Both Engle coefficients of urban and rural households are on a falling trend. In 1978, Engle coefficient of urban households is 58% and it has fallen to 36% in 2007. With regards to the rural households, the Engle coefficient has decreased from 68% in 1978 to 43% in 2007. The decrease of the Engel coefficient indicates that the residents' consuming level and quality are significantly improved. However the Gini coefficient of China increases significantly. Even disputes aroused toward the country's Gini coefficient between 2003 and 2012 disclosed by the National Bureau of Statistics (NBS) of China for the first time since 2000 [1], it is undoubted that the China's Gini coefficient probably will maintain over 0.4 for a long period, indicating widening wealth disparities have emerged between different regions and industries, as well as among various groups of the social stratum. Current China is under going grand social transformation with "an increasing divided society: a tattered social and welfare system, massive unemployment, structural poverty, and rising environment concerns" [2]. "Harmonious Society" and the Scientific Development Concept proposed by Chinese top leaders since 2004 become main goals of the government toward "Xiaokang Society". Enabling government online promotes more openness, and online administrative consultation is also adopted by local administration or congress representatives [3]. Meanwhile more social conflicts and disputes are exposed, disseminated and widely debated among Chinese netizens drives call for further changes or reforms. On the other hand, more free active discussions over social media are leveraged with Internet governance and censorship [4, 5]. Lots of studies, especially toward those highlighted events, are undertaken on microblogging public opinions. With higher Gini coefficients during the past years and intensively exposure of a variety of social conflicts among different social strata, how to measure a harmonious society in China is an issue worth discussions, especially for effective social management. This paper at first addresses some known indicators relevant to measures of a harmonious society. Problems are also referred about the data collection for appropriate measuring. We then try to apply socio psychology research results to societal risk perception based on Baidu hot search words and BBS posts, which may be another vision of daily risk or accumulated individual anxieties. Such a way may be a useful supplement to tell us daily harmony state, which are quite concerned by both the public and the governmental officials. Some initial results are given.

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II. RELEVANT INDEXES OF HARMONIOUS SOCIETY

In September of 2004, the top leaders of China proposed to construct a socialist harmonious society with scientific development concept [6]. Such an endeavor is an active response to the problem of social inequality which may lead to social unrest and even turmoil. Since then there are a lot of studies in China toward how to measure a harmonious society. As a matter of fact, how to measure a harmony society is not a well-defined problem. Researchers in Hong Kong conducted studies toward constructing a modern theoretical conception of a harmonious society and took a test [7]. This section outlines some relevant indexes or indicators, some of which are results of domestic research in China.

A. The Gini coefficient

In January of 2013, the National Bureau of Statistics (NBS) of China released annual Gini coefficient figures from 2003 to 2012. China's Gini coefficient reached its highest level in 2008, standing at 0.491, but began to drop after that. In 2012, the coefficient reached 0.474. Those figures aroused disputes. Some other reputable economists and research institutes have

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voiced skepticism about the NBS Gini coefficient figures, arguing that it cannot fully reflect the reality of China's massive income inequality. A report released on December 9, 2012, by China Household Finance Survey and Research Center, affiliated with the Southwestern University of Finance and Economics (SWUFE) located in Chengdu, indicated that in 2010 the Gini coefficient based on China's household income was 0.61 [1], a sharp contrast with NBS' figure. Whatever, high-level Gini coefficient figures brought calls for reforming the income distribution system.

B. The Tightness Score

The tightness score comes from a study on comparing societal cultures, to make the distinction between tightness and looseness cultures. "Tightness-looseness is part of a complex, loosely integrated multilevel system that comprises distal ecological and historical threats (e.g., high population density, resource scarcity, a history of territorial conflict, and disease and environmental threats), broad versus narrow socialization in societal institutions (e.g., autocracy, media regulations), the strength of everyday recurring situations, and micro-level psychological affordances (e.g., prevention self-guides, high regulatory strength, need for structure)" [8]. To provide a systematic analysis of tightness-looseness in modern societies, 45 authors collected statistical data from 6823 respondents across 33 nations as well as from existing databases of ecological and historical threats and sociopolitical institutions. The surveyed individuals classified their own nation as tight, loose, or in between by degrees of agreement with six statements, yielding tightness scores that ranged from a low of 1.6 in the Ukraine to a high of 12.3 in Pakistan. China's score is 9.5, ranked just below Pakistan (12.3), Malaysia (11.8), India (11.0), Singapore (10.4) and South Korea (10.3).

The study also theorizes there is a close connection between the strength of everyday situation and the chronic psychological processes of individuals within the nations.

C. The Legatum Prosperity Index

As the most prosperous nations in the world are not necessarily those that have only a high GDP, but are those that also have happy, healthy and free citizens, the Legatum Prosperity Index tries to show "a unique and robust assessment of global wealth and wellbeing, which benchmarks 142 countries around the world in 8 distinct categories: Economy, Education, Entrepreneurship & Opportunity, Governance, Health, Personal Freedom, Safety & Security and Social Capital". In 2012 China's rank is 55 among 142 nations with Economy (11), Education (66), Entrepreneurship & Opportunity (65), Governance (50), Health (67), Personal Freedom (101), Safety & Security (128) and Social Capital (29). The Legatum Institute also conducted in-depth study on China. "China had morphed from an agricultural backwater to the world's second largest economy". In three decades, China had lifted 600 million people out of poverty. From 1980 to 2008, per capita income, measured in terms of purchasing power, rose eleven-fold". The specialist R. Meredith speculated that after 1978-1990 and 1990-2008 2-phase development, China entered the 3rd phase while it is concerned whether Chinese economy could keep growing at anywhere near that pace without fundamental structural changes [10]. The in-depth study also listed several measures for comparisons, Average Life Satisfaction Ranking (2011, 80/142), Per Capita GDP Ranking (2010, 77/142), WEF Global Competitiveness Index (2011, 26/142), UN Human Development Index (2011, 101/187), Heritage/WSJ Economic Freedom Index (2011, 135/179), TI Corruption Perceptions Index (2011, 75/182) and World Bank Doing Business Index (2012, 91/183). Those ranks also prove that China is still a developing country.

Even there is doubt toward China' transformation at the 3-phase development, some studies in China exhibit quite different ways. It was widely discussed in some Twitter-like microblog websites in China, e.g. Sina's Weibo, in 2012 about a study on Chinese revitalization Index. In order to monitor and measure "Chinese Nation's Revitalization Process", Yang and Tan constructed an index framework which consists of 6 primary levels with 20 indicators [11]. By their defined calculation, the index in 2005 is 46.4% and 2010 is 62.7%, which showed big progress. The results shocked Chinese netizens and aroused disputes on study of scientific measures [12].

D. The Harmony Index

In October of 2006, Beijing municipal Bureau of Statistics released the report on Beijing's Harmonious Society Index, which consists of 34 indicators by 3 categories, reality of social conflicts (13: the poor-rich gap (3), social stability (5), resources & environment (5)), social attitudes and requests (6), and social intervention capabilities (15: social security(4), public opinions (2), legal system (4), emergency responses (2) and community services (3)) [13-14]. It was reported that the 2006 Beijing's HSI was 115.77 with measurement of 21 indicators. The annual average growth between 2001 and 2006 was 2.47% [14]. Whatever, no further results are released in recent 5 years.

E. The Psychological Harmony Levels

In comparison with the above-mentioned index framework to measure the harmonious society in China, researchers in the CAS Institute of Psychology conducted serious research on social harmony and early warning of social conflicts, especially mass incidents [15, 16]. They took periodical survey on socio psychological harmony indicators to monitor measure public attitudes and sensed symptoms of the mass incidents in Guangdong province [16]. Then they call for inclusion of socio psychological indicators into social management decision support system and construct platforms to monitor public attitudes across the country. Before 2008 Olympic Games, they conducted a survey to perceive the societal risk in Beijing area [17]. Those studies contribute soft or subjective indicators to measure harmony society, as a supplement to those hard or objective indicators, such as the Gini coefficient.

F. The Happiness Index

It is quite natural to suppose if the society is harmonious, the societal members are happy. Thus happiness is an important indicator about the quality of life and society. In 1972, the King of Bhutan declared "Gross National Happiness" GHP) to be more important than Gross National Product.

Bhutan's GNH index is a multidimensional measure, provides an overview of performances across 9 domains, psychological well-being, health, time use, education, culture diversity and resilience, good governance, community vitality, ecological diversity and resilience, and living standards [18].

The 2012-released World Happiness Report gave a comprehensive summary on Happiness studies. On the happiness measures and improving happiness levels, both external factors and personal features which causes the happiness were discussed [19]. Currently, happiness measures are mainly conducted by the Gallup World Poll (GWP), the World Values Survey (WVS) and the European Social Survey (ESS). Helliwell and Wang did an in-depth analysis and made use of measures of subjective well-being which is the general expression used to cover a range of individual self-reports of moods and life assessments [20]. Their studies summarized the three surveys in well-being measures. Based on GWP 2007-2010 data, China ranked No. 92 among 129 countries or regions on life satisfaction.

No further details were addressed how GWP or WVS collected data on their surveys in China in [20]. Easterlin, Morgan, Switek and Wang took more analysis on China's life satisfaction (1990-2010) based on 6 surveys conducted by 5 different organizations [21]. Surveys are also taken by institutions in China mainland [22]. In 2010 a research group of the Financial and Economic Affairs Committee of the National People's Congress released the results of a survey on urban residents' sense of happiness, which showed 74.2% percent of the 4,800 respondents in 24 cities felt "comparatively happy" or "very happy", and 12.3% answered "unhappy"[23]. During August-October 2012, the China Population Welfare Foundation carried out, jointly with the Renmin University of China, "Chinese Family Happiness Development Index" research project and conducted a door-to-door survey of 9604 adults and 2372 children in 16 cities. The results showed that 83.8% Chinese families felt "very happy" or "happy" [24].

During the 2011 week-long National Day holiday, the China Central Television (CCTV) broadcast a series called 'Happiness Survey' in which journalists carried out *vox pop* interviews to ask people whether they were happy and what happiness meant for them. A very famous eccentric response was hot discussed on-line via BBSs and microblogs in China. Initially those discussions were just simple criticisms of that program. Gradually the debate went further about the meaning of happiness, and the conditions required in the attainment of happiness [25]. Such kind of discussions continued after the 2013 Chinese Family Happiness Survey results were released on May 15, the International Day of Families.

G. Green GDP and GDP Quality Index

As a matter of fact, the Scientific Development Concept reflected that the top leaders in China have been noticed that the pursuit of GDP growth has caused environmental degradation and widening income disparities, and resulted in insufficient industrial innovation and affected the development of a harmonious society. On September 8, 2006, "China Green National Accounting Study Report 2004" was issued jointly by the State Environmental Protection Administration of China (SEPA) and NBS. "Green National Accounting (Green GDP Accounting for short) refers to an accounting system deducting natural resources depletion costs and environmental degradation costs, so as to assess the quality of economic development in real sense" [26]. Green GDP Accounting is also referred as Green Accounts, a program originally proposed by the World Bank "to measure the value and benefits of ecosystems to provide countries with more information to assess the true costs and benefits of projects that may threaten the integrity of important ecosystems" [27]. The report released in 2006 was the first of that kind on environmentally-adjusted GDP accounting in nation's government level worldwide. "The preliminary results show that economic loss caused by environmental pollution reaches 511.8 billion yuan, accounting for 3.05% of national GDP in 2004 while imputed treatment cost is 287.4 billion yuan, accounting for 1.80% of that" [26].

The central government expected to enable the Green GDP serve as a political tool to adjust local governments' pursuit from pure GDP growth to "people-centered" development [28]. Whatever, the Green GDP effort was ill-fated in China and might not be much more than a "propaganda slogan". Despite initial support for the project from the central government and some pilot programs, "local recalcitrance, bureaucratic infighting, and elite party politics eroded support" [29]. 5 years later, Professor Niu Wenyuan, a professor in CAS Institute of Policy and Management, proposed a new "GDP quality index" that measures the economy not just by size, but by sustainability, social equality and ecological impact. The GDP quality index includes 5 components with 15 indicators. The 1st component refers to the economic quality, which considers the amount of resources and energy needed to generate each 10,000 yuan of GDP, together with the proportion of fiscal revenue to GDP. The 2nd denotes the social quality, which measures social progress, including education levels, unemployment ratios and differences between urban and rural areas. The 3rd is the environmental quality, which assesses the amount of waste and carbon generated per 10,000 yuan of economic activity. The 4th refers to the quality of life, which figures in per capita income, life expectancy and farmers' living standard. The final refers to the management quality, which measures the proportion of tax revenue used for public security, the durability of infrastructure and the proportion of public officials in the overall population [30]. Niu conducted the calculation using analytical hierarchical method toward 31 provinces, autonomous regions and municipalities and generated ranks for 30 except Tibet region. The ranks brought political pressure, not from the central government but from the local level. While "quality index is simpler to understand and calculate because it is based on available government statistics. Green GDP, by contrast, required officials to compile extra data" [29].

The fate of GDP quality index is still under observation. The index computing method also needs to be adjusted to avoid just a rank of different areas within the same year. The values or scores of the GDP quality index for one area along different years are required to show the quality improvements of socioeconomic development of that area, which may also help to decrease the political pressures to some extent.

Above we brief 8 indicators/indexes which provide diverse modeling of the Harmonious Society. There may be other relevant measures in different perspectives. For example, before talking about the so-called harmonious society, social stability is often discussed among sociologists. The social alarming systems then contribute conceptual models on societal risks during developing a harmonious society [31, 32]. Actually those indexes are transformed into harmonious indexes by use of same social indicators, most of which are hard measures and come from different governmental offices. If no official data provided, few measures work. Whatever, even to acquire the results of 8 models take cost and time, while the public may question the results and express criticisms on-line nowadays.

Next we present an initial research to acquire public concerns from the BBS or search engines to perceive societal risks, as another way to measure harmony society.

III. On-line Perception of Societal Risks

Currently media revolutions are happening in China with the Internet plays a central role. New media bring living and cultural changes, offering people to fully express opinions and then rebuilding the public life. During the period of 1990s, referred as an era of the BBS, famous sites such as Tianya Club (or Tianya Forum) and the Strong Nation Forum under People's Daily Online contributed diversified opinions. As we enter into Web 2.0 era, microblogging enables any specific issue in any place attract public attentions from almost every microblogger. It is natural to make use of those free opinions by both Web 1.0 and Web 2.0 tools to get images of societal situations.

A. Monitoring societal risk levels by search words and BBS posts

In happiness research, questionnaire is a normal method. When taking questionnaires, subjects have to answer questions, such as "How happy are you now?" or "What comes to mind when you hear the word 'Risk'?" The words or phases, "happy", "lol"(laugh out loud), "like", "love", "joy", "got an offer", "delicious food", etc. maybe all relevant to state of happiness. On the other hand, subjects may not speak out real thoughts due to a variety of factors. Regarding this point, human's own posts, comments freely and actively published via Web 1.0/2.0 media may be more objective to reflect one's mind. With help of computational linguistics, it is possible to use written languages to explore the state of happiness instead of asking people directly. The development of a number of algorithms to detect positive and negative sentiments has emerged to make large-scale online text sentiment research possible, such as diagnosing trends for happiness in society via blogs [33]. Earlier people started to use query data of Google search or social media to detect influenza epidemics [34, 35]. Then it is worth exploring to detect societal risks from queries, BBS and microblogs.

One salient advantage of using Web texts is the timeliness. It is quite efficient that those Happiness survey reports are released once a year. Seasonal screening may be only limited to one specific sector or area, while there are no such kind limitations with on-line monitoring and detecting. Thus on-line detection of the netizen's Happiness State will be one meaningful supplement to the public's happiness state, as well as to the societal risk perception.

Zheng, Shi and Li constructed a framework of societal risk indicators including 7 categories and 30 sub categories based on word association tests [17]. During that study, 2 qualitative meta-synthesis supporting technologies, CorMap and iView, were applied to help grouping the associated words into clusters and detect the main hazards [36]. Table 1 lists the index system of societal risks resulted from that study.

TABLE I. Category of Societal Risks

Risk Category	***Sub Category***
National Security	Terrorism & Cults, Taiwan Issue, Political Stability, National security and foreign relations, Beijing Olympic Games*
Economy & Finance	Financial Problems, Economic Problems
Public Morals	Ethics & Morality, Faith & Reputation, General Mood of Society
Daily Life	Health, Education, Employment, Prices, Transportation, Food and Medicine Safety, Housing, Fake & Shoddy Goods
Social Stability	Serious Epidemic, Poor-Rich Gap, Safety at Work, Crime & Mass Incidents, Issues on agriculture, farmer and rural area
Government Management	Corruption and Degeneration, Governance Ability, Legal System, Social security & Social Warfare
Resources & Environments	Natural Disaster, Population, Energy Shortage & Environment Pollution

* Changed to Very Important Events

Baidu is the biggest Chinese search engine worldwide. The news portal of Baidu presents 10-20 hot query words of news automatically updated every 5 minutes, as shown in Figure 1.

Fig. 1. Hot News Search Words from Baidu News Portal

By crawling hot search words hourly and assigning different scores from 20 to 1 according to the word's hourly rank, we get a daily list of hot words normally around 30-70, together with their frequencies and accumulated hot scores [37]. It was found that the top 20 words in both frequencies and

scores are somewhat different from the Baidu's daily top 20 hot words. Due to censorship, Baidu may remove sensitive words daily while our specific crawler has captured them. For example, one day in July of 2011, our top 1 hot word "knifeman in Xijiang" by hot score was not seen in that day's Baidu own daily list.

By identifying the risk of those hot words daily, we acquire the risk levels of that day. We can also get weekly or monthly risks levels. Figure 2 shows the monthly total and sub category risk levels from November of 2011 to October of 2012.

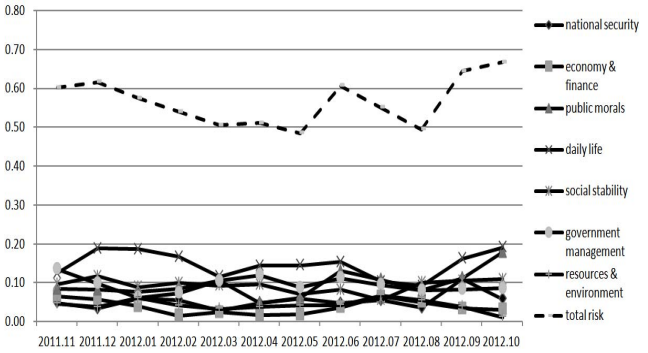

Fig. 2. The Total and Sub-category Risk Monthly Levels on Baidu Hot Word (November, 2011 to October, 2012) [38]

From Figure 2, we see that "daily life" risk proportion is often higher than those of other category of risks. A drop of risk level in August of 2012 may be caused by the London Olympic Games, when most of hot words on sports were not relevant to risks. Currently, the risk identification of Baidu hot words is undertaken manually. Experiments of automatic discerning the risk identification are conducted, while accuracy is barely needed to be improved [38].

Trials were also taken to the posts published at the 2nd largest board "Tianya Zatan" at the one of largest Chinese BBS "Tianya Forum". By manual labeling, we got 3-month risk levels from risk labels of daily new posts in the Tianya Zatan board, which is the main board of public opinions on living and society. Still drops in risk levels were observed during Chinese New Year holidays. The average daily risk level in Tianya is around 0.8, much higher than that acquired from Baidu hot news words which is up to 0.6 based on 3-month data (December of 2011 to February of 2012). And "public morals" risk is somewhat the highest risk on average among 7 sub categories, followed by "daily life" and "government management" detected from Tianya posts. Whatever, 3-month posts may not enough in practical studies. More labor in labeling is expected for more samples and corpus for automatic risk identification.

B. Challenges to Automatic Risk Identification of Hot words or Tianya posts

Both Baidu Vision and Tianya Vision were developed to collect Baidu hot words and posts at Tianya Zatan Board daily [37, 39]. Around 1000 new posts and over 4000 updated posts are generated in Tianya Zatan Board every day. Normal Web text mining steps are taken to process Tianya posts. More difficulties are being confronted when designing algorithms of automatic identifying risk of one hot phase or post. Firstly, the risk identification is not like the sentiment analysis, which usually classifies texts into positive/negative or positive/neural/ negative emotions. The majority of sentiment words are rather stable with no quick change. As to feature words corresponding to risk, the stable sets are smaller as new words emerged quickly. In China, social events represented by human names such as "郭美美 Guo Meimei" (whose societal risk usually corresponds to Government Management, sometimes to Public Morals), "我爸是李刚 My Dad is Li Gang"(either Social Stability or Governmental Management), "小悦悦 Xiao Yueyue" (either Daily Life or Social Stability) are emerging almost weekly. Secondly, the word's corresponding risk is evolving along the time. For example, during the 2012 Olympic Games, the phase "Liu Xiang's failure in hurdles" is labeled "daily life/health" at first as the famous hurdles athlete LIU Xiang, a super star in China, was failed from the 1st hurdle and then hopped the full 110 metre stretch. Soon it was disclosed that Liu Xiang's show was a designed plan, then risk label relevant to "Liu Xiang" was "public morals" with sub category of "faith & reputation". In October of 2012, Liu Xiang went to USA for surgery. We labeled the risk of "Liu Xiang went USA for surgery" as "daily life/health" again. Thus the risk is transferring and only use phase in machine learning does not work. Then relevant news texts are crawled simultaneously to provide corpus [38]. Thirdly, due to Internet censorships [40], in order to avoid blocking, people prefer use different terms even metaphors to express their opinions. Such kind of situations happens too often toward those posts of Tianya Zatan Board. By trials, the precision of automatic risk identification, especially toward Tianya Zatan posts is not significantly improved with more samples. Feasible ways are still under exploration.

IV. CONCLUDING REMARKS

It was said that "China averaged 500 large-scale protests per day" in 2011 [5]. Thus constructing a socialist harmony society is still an urgent task in order to achieve China Dreams. Besides those controversial indexes or models to measure the Harmonious Society, some widely accepted models, Gini coefficient, Happiness Indexes, etc. are referred to show a meta-synthetic vision toward the Harmonious Society. When modeling and measuring in reality, whatever survey is time consuming and of high cost. We propose to map the on-line public opinions into societal risks for indirect perception. An initial study is introduced of using Baidu hot search words and posts of Tianya Zantan Board to perceive risks which may make it possible to monitor the societal risk daily. Difficulties of automatic identifying risks are addressed. Lots of work will be done. Whatever, it is expected to explore a new way to add more evidences toward traditional societal risk perception.

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