Differences in Perception of Big Data Analytics in E-commerce between the U.S. and China

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ABSTRACT:

The rapid development of e-commerce is benefited not only the evolution of information technology in the past two decades, but also the boom of big data resources produced by a hugely heterogeneous user base. That's what makes China and United States the top two largest e-commerce markets in the world and why China is more than U.S. in e-commerce share of total retail sales nowadays. This paper seeks to examine the cause decided by institutional differences and commercial value that are two of reasons of China society is more likely to accept than U.S. in perception of BDA in e-commerce. In brief, it better for U.S. e-commerce corporations that cooperate with big data companies closely is suggested in this paper.

I. Introduction

It is a funny, but effective and useful way to help predict outbreaks of flu all over the world using the Google Flu Trends (GFT), which depends on aggregating google search queries first launched in 2008 by Google company. However, in February 2013, the GFT was predicting doctor visits for influenza-like illness (ILI) differed conspicuously from the Centers for Disease Control and Prevention (CDC). (Lazer et al., 2014) This error triggers this ongoing controversy about the value of big data, more precisely, one group believing that big data is the revolution that will change everything forever (Fichman et al., 2014); the other maintaining that big data is basically a meaningless buzzword, and that Big Data Analytics (BDA) is really nothing more than using traditional analytics on an ever-growing scale (Ohm, 2013). (Aaron, 2016) Recently, commercial-driven BDA is the most widely studied and applied both in U.S. and China, undoubtedly, we should be most concerned about BDA in e-commerce. Particularly, what do the U.S. and China hold respective attitudes?

II. Hold Opposed Attitudes in U.S.

From past to present, American people are used to stand on neutralist and conservative with the advent of new technology (Kranzberg, 1986), BDA is not exception (Danah *et al*., 2012). On the one hand, as David (2011) regards Big Data as 'destabilizing amounts of knowledge and information that lack the regulating force of philosophy' under the era of sociology has been obsessed by the goal of becoming a quantitative science (Bruno, 2009), besides, data can not represent an 'objective truth' subject to any interpretation necessarily biased by some subjective filter (Danah *et al*., 2012). On the contrary, Liran *et al*. (2014) presented positive attitude on BDA in economic research that also offer researchers a look inside the 'black box' of firms and markets by providing meaningful statistics on economic behavior. Big data in today's globally connected networked economies arises from many sources, mainly that of large-scale enterprise systems, online social graphs, mobile devices, Internet-of-things, or open data/public data (Baesens *et al*., 2016), and we should assert positively the value of big data most and take appropriate techniques and methods to analyse.

The uppermost controversy focuses on individual information privacy raising concerns over the arrival of emerging technologies that enable companies to easily collect considerable amounts of data from their customers (John *et al*., 2016). This is a reason why practitioners and academicians have recently witnessed significant calls for research on privacy issues in the era of big data in U.S. (Baesens *et al*., 2016). Not only worry about private data itself, for example, the quality of data is not a given either, as data can be outdated, corrupted, biased or even manipulated, but also are afraid of the phases of analysis and use of big data, such as any analysis based on statistical probabilities also produces both false positives and false negatives. (Dennis *et al*., 2017). These indicate the anonymization of data must be robust, monitored and enforced (Rosemary *et al*., 2015), and the algorithmic accuracy of analysis and automated decision-making of use in big data should be anchored in legislation (Dennis *et al*., 2017). It is believed that appropriate use big data must remain coherent with evolving societal values (Rosemary *et al*., 2015), people hold opposed attitudes in U.S. attributes to social and personal perception of BDA. Accordingly, China is not like U.S. who show mixed feelings and partly opposed attitudes in the era of big data.

III. Take More Consistent Views in China

In China, basically, nearly all of scholars are paying attention on positive issues of big data, and people are optimistic about the challenges and applications of big data. Search 'big data' classified by paper title on the Chinese uppermost literature database 'CNKI' limited to journal articles on May 3rd 2018, there are a number of 12482 papers discussed the big data, and further search 'crisis' in these papers extent also classified by title again, the result is just only 15 relative papers to big data crisis, principally concerning personal privacy and public information safety. Zheng *et al*. (2012) appeal that people should correctly understand the pros and cons of big data, and take an initiative aggressive research to explore the potential advantages and challenges of big data and how to use. Due to big data is being developed extremely fast, the legislation of big data applications has not yet gone so far. It the main privacy rights crisis in the age of big data is owing to that it is not enough to protect privacy lied in the scope of responsibility under the current legal framework (Xu, 2017). To ease people's fear, Zheng et al. (2012) puts forward the legislative way to protect information safety. Hence, it is believed that Chinese scholars are not so worried about the big data crisis in e-commerce, in addition to big data crisis, people either scholars or practitioners are delighted to announce their new perception and partnership with big data.

Commercial practices of big data in China are being widely improved and developed. Due to large population and increased frequent people flow, there are rich sources of data from all walks of life, being interesting in the application of big data in the past few years. As we known, in March 2012, U.S. government announced a USD 200 million investment to launch the 'Big Data Research and Development Plan,' which was a second major scientific and technological development initiative after the 'Information Highway' initiative in 1993 (Chen et al., 2014). Relatively, the Ministry of Industry and Information Technology of China issued the 'Big Data Industry Development Plan (2016-2020)' in December 2016[1]. Compare to U.S. government, China government action in big data may be two or three years later. However,

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[1] Data comes from China government website,
http://www.miit.gov.cn/n1146295/n1652858/n1652930/n3757016/c5464999/content.html

the pace of development of Chinese industrial big data exceeds expectations. The year of 2017 China Big Data Industry Annual Conference pointed out, there are over 300 competitive big data enterprises all of whom market value is about \$50 billion spread all over the application[2]. Actually, there is no reason to worry too much in China, the development of China big data is more market-driven in essence, it has a huge market demand and value here, and this is one of crucial reasons why there are significant differences in perception of BDA in e-commerce between U.S. and China.

IV. Causing the Different Perception of BDA in E-commerce between U.S. and China

The reasons of differences in perception of BDA in e-commerce between U.S. and China can be summarized two aspects, institutional differences and commercial value. Institutional theory has been used to explain a number of significant and substantive managerial differences found in different parts of the world (Garry et al., 2003), as a result of the beliefs, goals, culture, and actions of individuals and groups are strongly influenced by various environmental institutions (Scott, 2013). China's institutional environment shown that nation's socialist tradition and strong culture together create a distinct social and commercial milieu (Boisot et al., 1988; Scarborough, 1998) is quite different from the West (Boisot et al., 1996; Peng, 2000). Therefore, the institutional differences between U.S. and China profoundly affect e-commerce (Chatterjee et al., 2002) of which using BDA to initiative in firms (Jennifer et al., 2004). The institution does differ U.S. and China makes the American people not trust private companies in protecting personal privacy somewhat exceeding the Chinese people at the same status, who are less concerned about the possibility of personal privacy being misappropriated. And that, private fundamental or crucial information is in the hands of most of private companies in U.S., but it is out of the ordinary to China, this information is protected vast majority by government or state-owned enterprises, or relatives.

An additional factor is the different value of BDA in e-commerce for U.S. and China.

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[2] Data comes from China government website, http://www.zgc-bigdata.org/

Generally speaking, the more beneficial are a service process characteristics, the less is its users' negative perception regarding their information privacy (John et al., 2016). The Statistics Portal shows retail e-commerce worldwide in 2017 amounted to 2.3 trillion dollars[3], approximately accounts for one-tenth of total retail sales worldwide[4]. As the world's two biggest e-commerce markets, in 2017, U.S. e-commerce represented 13 percentage of total retail sales ($5.076 trillion) and 49 percentage of the growth, reported by Digitalcommerce360[5], consumers spent $453.46 billion on the web for retail purchases, correspondingly, China retail e-commerce sales amounted to 7175.1 billion yuan RMB in 2017, represented 19.6 percentage of total retail sales (RMB 36.6262 trillion yuan) and 14.9 percentage of the growth[6]. So as to know the inevitability of coming up to the current state of e-commerce in U.S. and China, does a contrast investigated from 2001 to the present, and shows that are vivid different in proportion of e-commerce in total retail and growth rate of retail e-commerce followed by **Table 1** and **Fig. 1, Fig. 2**. After 2002, China's proportion of e-commerce in total retail was more than U.S., and for the growth rate of retail e-commerce except for the year of 2006. To sum up, China's e-commerce market continues to see high growth in the past, at the present and in the future, will bring about a tremendous market in e-commerce industry applying big data analytics than U.S.

Tab. 1   Retail E-Commerce sales in U.S. and China

Year	U.S.					China			
	Total Retail	Retail E-commerc	Proportion of	Growth Rate of	Total Retail Sales	Retail E-commerc	Total Retail	Retail E-commerc	Proportion of	Growth Rate of

[3] Data comes from Statista website, https://www.statista.com/statistics/379046/worldwide-retail-e-commerce-sales/
[4] According to eMarketer's estimates,
https://www.ipc.be/en/knowledge-centre/e-commerce/articles/global-ecommerce-figures-2017
[5] Data comes from Digitalcommerce360 website, https://www.digitalcommerce360.com/article/us-ecommerce-sales/
[6] Data comes from ECRC website, http://www.100ec.cn/zt/17wlls/

	Sales ($ billion)	e Sales ($ billion)	E-commerce in Total Retail	Retail E-commerce	(¥ billion)	e Sales (¥ billion)	Sales** ($ billion)	e Sales** ($ billion)	E-commerce in Total Retail	Retail E-commerce
2017	5076.00	453.46	8.93%	16.54%	36626.20	7175.10	5420.64	1061.91	19.59%	39.17%
2016	4856.33	389.11	8.01%	14.39%	33231.63	5155.57	5002.46	776.08	15.51%	32.97%
2015	4725.99	340.16	7.20%	13.98%	30093.08	3877.32	4789.13	617.05	12.88%	38.98%
2014	4639.44	298.44	6.43%	14.47%	27189.61	2789.80	4415.24	453.03	10.26%	49.70%
2013	4458.45	260.72	5.85%	13.23%	23780.99	1863.60	3865.39	302.91	7.84%	42.15%
2012	4302.23	230.26	5.35%	15.38%	21030.70	1311.00	3332.67	207.75	6.23%	67.52%
2011	4102.95	199.56	4.86%	17.45%	18391.86	782.60	2844.60	121.04	4.26%	53.72%
2010	3818.05	169.92	4.45%	16.78%	15699.84	509.10	2319.04	75.20	3.24%	96.87%
2009	3612.47	145.51	4.03%	2.76%	13267.84	258.60	1942.32	37.86	1.95%	105.73%
2008	3935.32	141.59	3.60%	3.75%	10848.77	125.70	1560.35	18.08	1.16%	124.06%
2007	3995.18	136.47	3.42%	20.41%	8921.00	56.10	1171.77	7.37	0.63%	163.38%
2006	3871.57	113.33	2.93%	24.02%	7641.00	21.30	958.37	2.67	0.28%	10.36%
2005	3689.28	91.39	2.48%	25.88%	6717.66	19.30	819.73	2.36	0.29%	141.25%
2004	3473.05	72.60	2.09%	27.02%	5950.10	8.00	719.16	0.97	0.13%	105.13%
2003	3262.73	57.16	1.75%	28.08%	5251.63	3.90	634.47	0.47	0.07%	129.41%
2002	3128.55	44.62	1.43%	30.25%	4813.59	1.70	581.57	0.21	0.04%	183.33%
2001	3062.27	34.26	1.12%	24.09%	4305.54	0.60	520.06	0.07	0.01%	--
2000	2983.28	27.61	0.93%	90.53%	3910.57	--	472.37	--	--	--
1999	2803.09	14.49	0.52%	190.73%	3564.79	--	430.64	--	--	--
1998	2581.76	4.98	0.19%	--	3337.81	--	402.11	--	--	--

Notes: (1) the data of 2017 U.S. total retail sales and retail e-commerce sales is from Digitalcommerce360 website (https://www.digitalcommerce360.com/article/us-ecommerce-sales/), other years are from United States Census Bureau website (https://www.census.gov/); the data of 2017 China total retail sales and retail e-commerce sales is from China National Bureau of Statistics website and ECRC website (http://www.stats.gov.cn/tjsj/zxfb/201802/t20180228_1585631.html, and http://www.100ec.cn/zt/17wlls/), other years are from Yue Hongfei, NATIONAL REPORT ON E-COMMERCE DEVELOPMENT IN CHINA.Inclusive and Sustainable Industrial Development Working Paper Series WP 17, 2017. United Nations Industrial Development Organization.

(2) ** the yearly average exchange rate for USD US Dollar to CNY Chinese Yuan during the period from 1990 to 2017 shown on the website https://www.ofx.com/en-us/forex-news/historical-exchange-rates/yearly-average-rates/.

| Date (GMT)	Rate	Date (GMT)	Rate	Date (GMT)	Rate
31-Dec-2017	6.756806	31-Dec-2007	7.613239	31-Dec-1997	8.319331
31-Dec-2016	6.643058	31-Dec-2006	7.972895	31-Dec-1996	8.338875
31-Dec-2015	6.283627	31-Dec-2005	8.19495	31-Dec-1995	8.370025
31-Dec-2014	6.158134	31-Dec-2004	8.273679	31-Dec-1994	8.639665
31-Dec-2013	6.152292	31-Dec-2003	8.277176	31-Dec-1993	5.779529
31-Dec-2012	6.310468	31-Dec-2002	8.276877	31-Dec-1992	5.52057
31-Dec-2011	6.46553	31-Dec-2001	8.278869	31-Dec-1991	5.333729
31-Dec-2010	6.769961	31-Dec-2000	8.278676	31-Dec-1990	4.792069
31-Dec-2009	6.830938	31-Dec-1999	8.277917	1 UNIT of USD = X UNITS of CNY	
31-Dec-2008	6.952764	31-Dec-1998	8.300753		
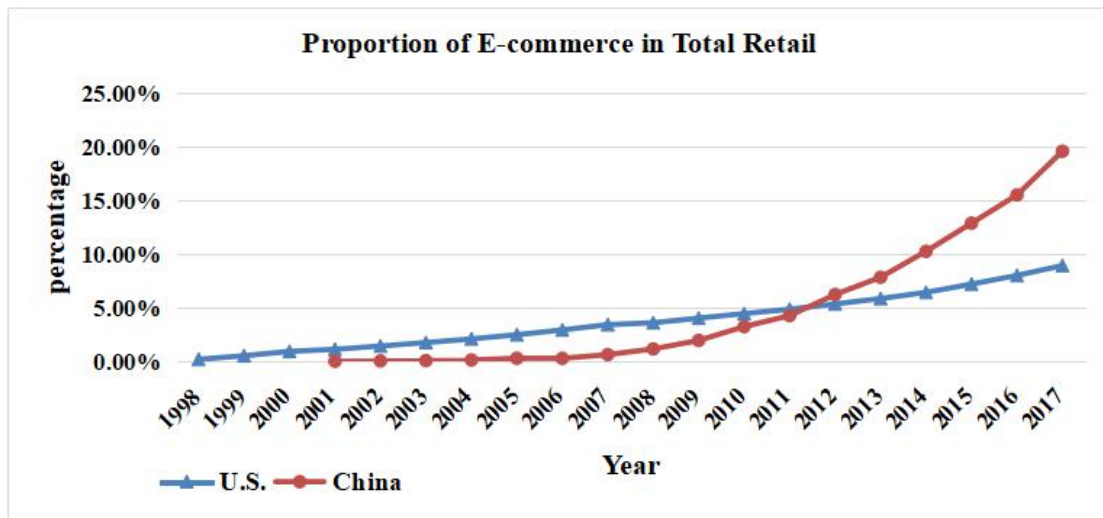
Fig. 1   The comparison of U.S. and China's proportion of E-commerce in total retail per year
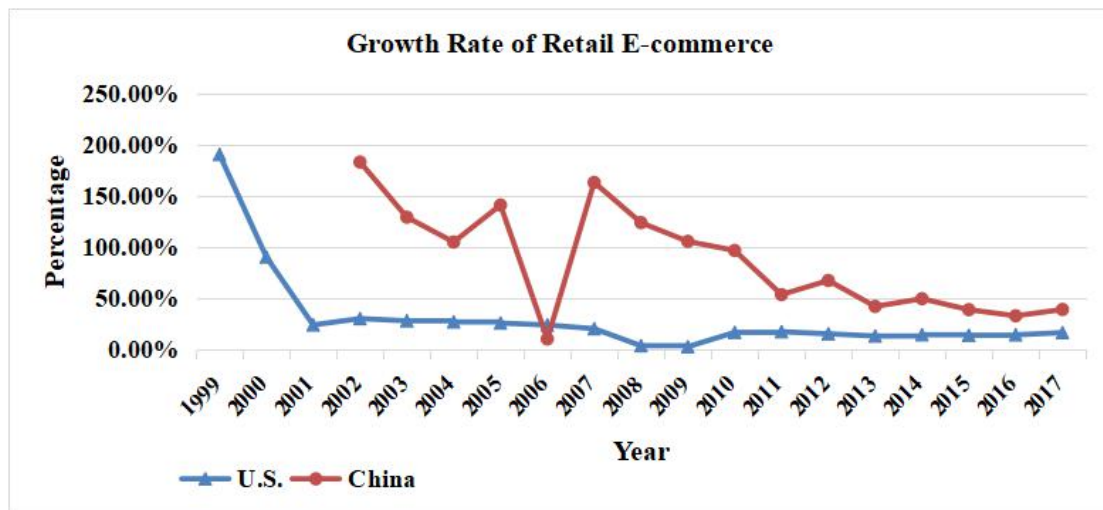

Fig. 2   The comparison of U.S. and China's growth rate of retail E-commerce per year

There are various types of tools such as Big Data Analytics or serve to improve the process of analyzing data: data storage and management, data cleaning, data mining, data analysis, data visualization, data integration, and data collection (Sun et al., 2018) are wide-used in e-commerce, and plenty of big data companies come into being in the past 20 years referred to **Table 2**. This table lists a certain (limited) number of data companies in U.S. and China divided by year subject to the difficulty of getting the complete information about big data company, collecting and organizing data from 'OpenData500' for U.S. and 'Data Technology Industry Innovation Institute' for China, can see the difference of U.S. and China.

Tab. 2   Listed a limited number of data companies in U.S. and China by founded year

Founded Year	Number of Data Companies in U.S.					Number of Data Companies in China				
	Total	Data/Technology	Business Analytics	Industrial Application	Research/Consulting	Total	Data/Technology	Business Analytics	Industrial Application	Research/Consulting
2016						106	13	17	40	36
2015	1	0	0	0	1	221	35	31	128	27
2014	8	2	0	6	0	230	34	35	140	21
2013	30	8	3	18	1	148	27	28	80	13
2012	41	5	3	32	1	129	31	19	71	8
2011	51	9	1	37	4	110	23	25	58	4
2010	50	10	4	35	1	79	20	10	46	3
2009	32	7	1	23	1	76	18	10	43	5
2008	26	5	2	14	5	66	15	17	28	6
2007	28	8	1	18	1	57	16	17	22	2
2006	21	3	1	15	2	49	11	13	20	5
2005	17	2	1	14	0	47	15	7	22	3
2004	13	2	0	10	1	30	9	3	18	0
2003	11	4	2	5	0	42	18	3	20	1
2002	6	1	0	5	0	27	7	6	12	2
2001	10	1	2	3	4	30	11	1	17	1
2000	16	6	1	7	2	38	13	6	17	2
1999	10	3	1	6	0	22	9	5	7	1

1998	10	1	1	7	1	19	7	2	10	0
1997	4	0	0	4	0	12	2	4	6	0
1996	4	1	0	3	0	1	1	0	0	0
1995	6	2	0	4	0	10	3	4	3	0
1994	4	0	1	3	0	3	2	0	1	0
1993	5	1	0	2	2	4	1	1	2	0
1992	2	2	0	0	0	4	2	0	2	0
1991	0	0	0	0	0	0	0	0	0	0
1990	2	0	1	1	0	0	0	0	0	0
1980s	27	3	3	17	4	3	2	0	1	0
1970s	18	4	6	6	2	0	0	0	0	0
1960s	16	4	1	5	6	0	0	0	0	0
1950s	5	1	2	2	0	2	1	0	0	1
Total	474	95	38	302	39	1565	346	264	814	141

Notes: the data of number of Data Companies in U.S. is from OpenData500 website (http://www.opendata500.com/us/list/), and China's data is from Data Technology Industry Innovation Institute (a report published a listing of 1574 big data companies in 2017); the category of data companies both in U.S. and China are definitely disposed according to their initial data.

V. Conclusion

In a word, BDA in e-commerce brings consumers along for lower cost and higher value, better service quality and better understand their needs (Nir, 2017), consumers would like to offer up their own real information for enterprises to improve data mining and analysis. At this point in time, e-commerce companies facing different technical environment in U.S. and China, such as cloud computing, big data, cellphones, mobility and low cost sensors (Nir, 2017), for example, China did not go through the era of pay-by-check and entered a new era of mobile payment that creates real-time huge data resources directly (Loo et al., 2012; Yang et al., 2012; Shaikh et al., 2017), are different in subjective perception for facing the value of big data to them (Francisco et al., 2018). Except for the reason of difference in technical environment, another reason leading to present diverse perception of the value of BDA in e-commerce between U.S. and China is the source of big data. Constantiou et al. (2015) consider as that big data is different data, thanks to it being generated by social and organizational arrangements, and internet and social media users do not often belong to the organizations or networks to which they contribute data. But in China, it is not exactly like this, most e-commerce transactions can not be separated from social media, also a lot of e-commerce data come from social media. Consequently, Chinese people are more favorable and more receptive for BDA in e-commerce than U.S.

Acknowledgments

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