

Business Intelligence and Marketing Insights in an Era of Big Data: The Q-sorting Approach

Ki Youn Kim

Department of Marketing Information Consulting, Mokwon University
Daejeon, South Korea
[e-mail: gracekykim@mokwon.ac.kr]

Received November 23, 2013; accepted January 21, 2014; published February 28, 2014

Abstract

The purpose of this study is to qualitatively identify the typologies and characteristics of the big data marketing strategy in major companies that are taking advantage of the big data business in Korea. Big data means piles accumulated from converging platforms such as computing infrastructures, smart devices, social networking and new media, and big data is also an analytic technique itself. Numerous enterprises have grown conscious that big data can be a most significant resource or capability since the issue of big data recently surfaced abruptly in Korea. Companies will be obliged to design their own implementing plans for big data marketing and to customize their own analytic skills in the new era of big data, which will fundamentally transform how businesses operate and how they engage with customers, suppliers, partners and employees. This research employed a Q-study, which is a methodology, model, and theory used in 'subjectivity' research to interpret professional panels' perceptions or opinions through in-depth interviews. This method includes a series of q-sorting analysis processes, proposing 40 stimuli statements (q-sample) compressed out of about 60 (q-population) and explaining the big data marketing model derived from in-depth interviews with 20 marketing managers who belong to major companies(q-sorters). As a result, this study makes fundamental contributions to proposing new findings and insights for small and medium-size enterprises (SMEs) and policy makers that need guidelines or direction for future big data business.

Keywords: Big data, business intelligence, BI&A, marketing, Q methodology, subjectivity study

A preliminary version of this paper was presented at APIC-IST 2013, was selected as an outstanding paper.

<http://dx.doi.org/10.3837/tiis.2014.02.014>

1. Introduction

An enormous amount of data and information about companies, markets, industries, customers, products, and services can be gathered from the business web day after day. Many marketing researchers have emphasize the importance of advanced business intelligence based on the analytics of social media and big data; as a strategic tool of ‘interactive’ and ‘personalized’ marketing between companies and customers, business intelligence can provide companies with differentiated competitive advantages or business opportunities. Social media contents under Web 2.0 have created abundant unstructured and complex data sets regarding the environments of social, cultural, political, and business and marketing campaigns, as well as consumer behaviors and preferences [1].

In the past, public organizations and businesses could gain insights from the structured data gathered through their inner enterprise systems or databases. However, in this era of big data, they are poised on the brink of new business opportunities provided by advanced big data called business intelligence and analytics (BI&A), with which they can minimize uncertainty and create potentially revolutionary technologies. The opportunities associated with data analytics help an enterprise better understand its business, market, and consumer and thus make timely and exact decisions. Since many companies have begun to recognize the value of big data analytics as an important resource or capability realizing advanced business intelligence, big data is emerging as a key issues in modern society.

Big data means not basic storage of a huge volume of data accumulated over time, but new solutions or wisdom appropriated toward the great crux of difficult problems. According to EMC corporation report, in 2011, the amount of information on the internet was greater than 1.9 trillion gigabytes; this number was predicted to increase by 2.7 trillion gigabytes (50%) in 2012 and by 35 trillion gigabytes by 2020 [2]. However, it is not easy to use big data in a business perspective. IBM Tech Trends identified business analytics as one of the four major technology trends in the 2010s [3] and McKinsey predicted that by 2018 the United States alone will face a shortage of 140,000 to 190,000 people with deep analytical skills, as well as a shortfall of 1.5 million data-savvy managers with the know-how to analyze big data to make effective decisions [4].

The purpose of this study is to qualitatively identify the typologies and characteristics of the big data marketing strategy in major companies that are taking advantage of big data business in Korea. Big data means piles accumulated from converging platforms, such as computing infrastructures, smart devices, social networks and new media; it is also an analytic technique itself. Numerous enterprises have grown conscious that big data can be significant resource or capability since the issue of big data abruptly surfaced in Korea. Companies will be obliged to design their own implementing plans for big data marketing and to customize their own analytic skills in the new era of big data, which will fundamentally transform how businesses operate and how they engage with customers, suppliers, partners, and employees.

This research employed a Q-study, which is a methodology, model, and theory that is used in ‘subjectivity’ research to interpret professional panels’ perceptions or opinions through in-depth interviews. This method includes a series of q-sorting analysis processes, proposing 40 stimuli statements (q-sample) compressed out of about 60 (q-population) explaining the big data marketing model derived from in-depth interviews with 20 marketing managers who belong to major companies (q-sorters). As a result, this study can make fundamental contributions to proposing new findings and insights for small and medium-sized enterprises (SMEs) and policy makers that need a future guidelines or direction for future big data business.

2. Theoretical Background

2.1 Big Data Analytics and Business Intelligence

The term intelligence was first used in the field of artificial intelligence. In the late 1990s, ‘business intelligence’ became common usage in the business and information and communication technology (ICT) sector. Business analytics was introduced to represent the key analytical component in business intelligence (BI) in the late 2000s [5]; it is BI&A based on big data analytics fields that is increasingly important in both academics and business. Generally, big data and big data analytics refer to the data sets and the related analytical techniques of storage, analysis, business management, and visualization. The volume of big data is so large from terabytes to exabytes and the required format of big data is variously complex from sensor to social media data. Chen et al.(2012) defined BI&A as a unified term and treated big data analytics as a related field that offers new directions for BI&A research [6].

In brief, big data is an umbrella term for a variety of complex data sets, and it is difficult to analyze and control the related human resources (HR), organization and know-how, and techniques in a broader sense. In addition, there are two different types of enterprise-specific big data for big data processing. As shown in Fig. 1, big transaction data (BTD) refers to a sort of structured data, so-called current legacy system, that firms have retained over time and big interaction data (BID) means unstructured data that contain, for instance, social media data, click stream data, images/texts, scientific data, and all sorts of sensors and radio frequency identification (RFID) data.

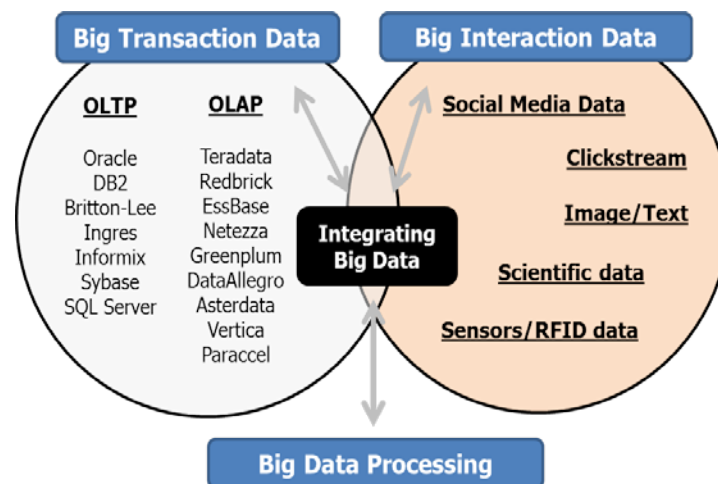


Fig. 1. Types of big data for processing [7]

2.2 Subjectivity and Q Methodology

The subjectivity study is qualitative research that seeks to theoretically discover and define each person’s inherent thinking or psychological schemata, including perceptions, feelings, preferences, emotions, ideals, and tastes, based on process and interpretative theory. Here, it means an “internal frame of reference” and is expressed in questionnaires using words such as ‘to me’ or ‘in my opinion’ [8].

The Q method is a useful model, and also a theory appropriate to ‘self’ or ‘subjectivity’ research in interpreting certain people’s experiences or thoughts in the academic fields of

psychology, education, policy and regulation, clinical medicine, social science (e.g., marketing, media and advertising, business management, decision making), and cross-disciplinary studies. This implies a sort of ‘subjective communication’ with the real world that has an experiential meaning latent within each person. Especially in the field of marketing, the Q method is helpful in understanding consumer psychology and psychology more systematically and deeply.

Because the Q method is appropriate for identifying the types of people for studying certain topics, this study can provide an insight or intuition that will be useful in determining targeted market segments and in creating a marketing strategic plan for the near future. Previously, numerous theories have verified that consumer behavior and lifestyle, purchasing pattern, and propensity are influenced holistically by intrinsic ‘parameters’ from various stimuli [9-11]. These refer to innate psychological processes such as motivation, recognition, awareness, attitude, and experiences that form psychological characteristics. Such ‘subjectivity’ in consumer behavior is mixed in complex interactions, and thus there is a limit to interpretation based solely on statistical empirical research. Marketing researchers have proven that while consumer behavior research can discern consumers as a group rather than individuals with similarities, consumers are not all the same, thus suggesting the importance of subjectivity research.

The Q method proposes a new approach to researching human behavior as a scientific discovery. The rationale underlying the Q method is often compared to a flashlight in a dark room. It is not an operational definition but a methodology that generates hypotheses by focusing on discovery. Compared to the Q method, the so-called R method is a general empirical or quantitative study. The variables in an R study consist of measurable items (questionnaire statements or stimuli), whereas the variable in a Q study is a person, because the R study seeks to prove and estimate the tendency of the total population based on investigation of a sample of people. Therefore, a sufficiently large sample size is a prerequisite for an R study.

On the other hand, the process of q-sampling is relatively more complicated than the R study. Because researchers are required to obtain every expression of subjectivity from each person (p-sample or q-sorter), it is crucial that the researcher proceed with care. In brief, the Q study focuses on human beings themselves. It is not about ‘inter-individual differences’ regarding one stimulus but is an ‘intra-individual significance’ [12-15].

3. Research Design and Methodology

In the last Q analysis, final data collected from a series of q-sorting processes are used. While q-sorting, p-samples (q-sorters) taken from any p-population are sorted based on the stimuli (so-called q-samples), which are compressed out of a q-population’s stimuli (concourse) in the form of a card. Thus, q-samples are statements or objects that each respondent (p-samples) should categorize. Q analysis includes six phases: (1) establishing of the q-population, (2) q-sampling from the q-population, (3) selection of the p-sample, (4) q-sorting, (5) data coding and q-factor analyzing by QUANL software, and (6) theoretically defining and interpreting the typologies or results discovered by analysis.

3.1 Q-Population and Q-Samples

To obtain the q-population and q-sampling form the most important stage in a Q study. Q analysis aims to classify people typologies, instead of stimulus items or variables, and interprets each type thus discovered. The q-population refers to the whole of self-reliant

statements or a concourse of stimuli collected from respondents regarding the research question. Essentially, a Q study focuses on conceptualizing the subjectivity of each p-sample.

This researcher should sequentially gather the items across primary in-depth interviews through e-mail, which aim to establish the q-population in parallel with the literature review, and secondary face-to-face interviews with respondents for q-sorting. For example, during the interviews, if an interviewer obtains 50 items from the first interviewee, he or she necessarily collects fewer than 50 statements during the next interview because duplicated items are excluded. As the number of interviews increases, the number of items decreases and becomes saturated at some point.

Research Question: In my opinion, it is desirable for the technology or services of big data to be used to _____ in the business intelligence perspectives.

This study researched in-depth about 20 high-level working group people (or experts) who were well versed in the field of big data marketing and affiliated with major corporations or public agencies, which lead the Korean big data industry. In addition, this study selected decision-makers above the position of direct manager in charge of related business. By repeatedly conducting interviews with 25 interviewees, a comprehensive q-population was established. One hundred and forty-six q-population items were accumulated.

To derive q-samples from the q-population, duplicate items were deleted and the remaining items were categorized into the following 20 sub-groups based on the ‘mutually exclusively and collectively exhaustive (MECE)’ principle [16]: improving business intelligence (BI), open platform, business innovation, competitive advantage, customer value (CV), dynamics, marketing new business model (BM), commerce, productivity, service quality, profitability, visualization, estimating, risk management, decision-making, allocating resources, interaction of information, knowledge management, synergetic effect, and cooperative network. This categorization reflects the variety in and the overall set of user opinions of big data without the q-sample statements being biased to a certain category.

The ideal size for a Q sample is 40 to 60 statements based on the principle of the general rule-of-thumb [12]. If the questions are relatively simple and easily understood by respondents, more than 60 ones are afforded. In contrast, if the questions are complicated and professional items are included, as in this study, the number of question can be dropped to 30 or fewer. Because q-samples are extracted from an identifiable group of a q-population, the sampling rules and procedures in the R method can be applied. This study derived 32 q-samples from the q-population, as shown in **Table 1**.

Table 1. Q-samples

Statements: “As I see it, big data can be used to..”
1. Find influencing variables to business process and cut down the operation expenses and risk.
2. Directly support and improve work efficiency of all business units over the company.
3. Help a company to effectively utilize its human resources or business users on real-time track.
4. Need to transform every process we have and simplify it.
5. Execute CRM activities that experience two-way and personalized communications with customers.
6. Conduct customer sentiment analysis and so discover customers’ intrinsic subjectivities or intends.
7. Optimize complicated networks of SCM value chain or related stakeholders based on data analytics.
8. Control predictive and precise flexible schedule management with real-time information of sensors.

9. Offer interactive and differentiated contents curation categorized by various customer segments through the analysis of unstructured social data.
10. Utilize big data to try direct marketing as an intellectual company-owned assets.
11. Be available to draw up some effective new promotional policy appropriate for the buying pattern, shopping propensity, or lifestyle of consumers.
12. Create emergent big data-based business models or services.
13. Increase effectiveness and efficiency of productivity across all buy-market-sell-services area.
14. Carry the productivity at work to the highest pitch and revolutionize business analytics.
15. Upskill our existing work force and production capacity and enhance yield optimization with BI.
16. Develop a new real financial model, which increase its earnings through big data services.
17. Quantify visibly the outcomes and impacts of business with data analysis of firms.
18. Visualize spatial and real-time information flow in business processes.
19. Minize the risk or error of loss by forecasting dynamicalys supply and demand movements.
20. Enable a company to better allow their optimal allocation of resources and budget.
21. Immediately afford business users to widespread prevention-detection-risk managements.
22. Enhance a company's ability to control business and lower the enterprise uncertainty or risk.
23. By analyzing B2B commerce data, marketers can use big data in a important decision making.
24. Be used for a variety of different decision marking activities ranging from a simple issue like corporations' current status, to a complex one like growth promotion or complex optimized business.
25. Can be a DSS tool available to a highest decision-maker which has depended on his own intuition.
26. Make it possoble to collect, analyze, utilize various unstructrued social network data.
27. Enable to check process or patterns of business streaming data on the internet.
28. Be on opportunity for a company to experience smart computing based on context-aware analysis.
29. Improve network effects among cooperative firms through big data analytics.
30. Ensure the decision-making quality, not among insiders within the firm, but also with outside firms.
31. Form data-based collaborated eco-systems focusing on open-type platforms of Linux or HTML5.
32. Have an easier time in fast-paced business environment, which requires speed, agility, and intelligence through dynamic analysis of consumer, marketing or competitors.

3.2 Selecting the P-Sample

P-samples are respondents who actually participate in q-sorting. They reflect the p-population people who belong to the actual working group of professionals. In a Q study, a larger p-sample may raise statistical problems. Stephenson's Q methodology is based on the 'small sample principle' theory. It is most desirable to sample respondents who have different but also uniform opinions, such as persons with a special interest in the research topic, dispassionate judges, authorities and experts, and those with a class interest in the case of investigating expert groups [17]. This study selected 17 samples based on 'purposive and judgmental sampling' with consideration of demographics variables.

3.3 Q-Sorting

Q sorting is similar to rank ordering and is a process analysis in which the respondents arrange stimuli in their order of importance from the respondents' subjective points of view. The

results of q-sorting are the collection of “subjective opinions of each respondent about a certain question.” In general, the desired q-sorting time is between 30 to 40 minutes. The q-sorting Excel version under the traditional card arranging rule was used with the Flash Q version to collect data. Flash Q is a drag-and-drop method similar to sorting paper on an offline tabletop and is effective for sorting by it overcomes gaps in time and/or spatial locations. There is a little difference in the sorting time per p-sample, but this method was suitable, as the average lead time was 30 to 40 minutes. The distribution shape of the q-pyramid adopted a 9-point scale from strongly disagree (-4) to ‘neutral’ (0) to strongly agree (+4) and the frequency of each scale is shown in Table 2 and Fig. 2. Q-sorting depends on the principle of ipsative sorting, which means intra-individual significance or of the self for two or more q-samples.

Table 2. Q-sorting and score (N=32)

	most disagree					most agree			
Q-sorting raw scale	-4	-3	-2	-1	0	1	2	3	4
Calculative scale	1	2	3	4	5	6	7	8	9
Frequency	2	3	4	4	6	4	4	3	2

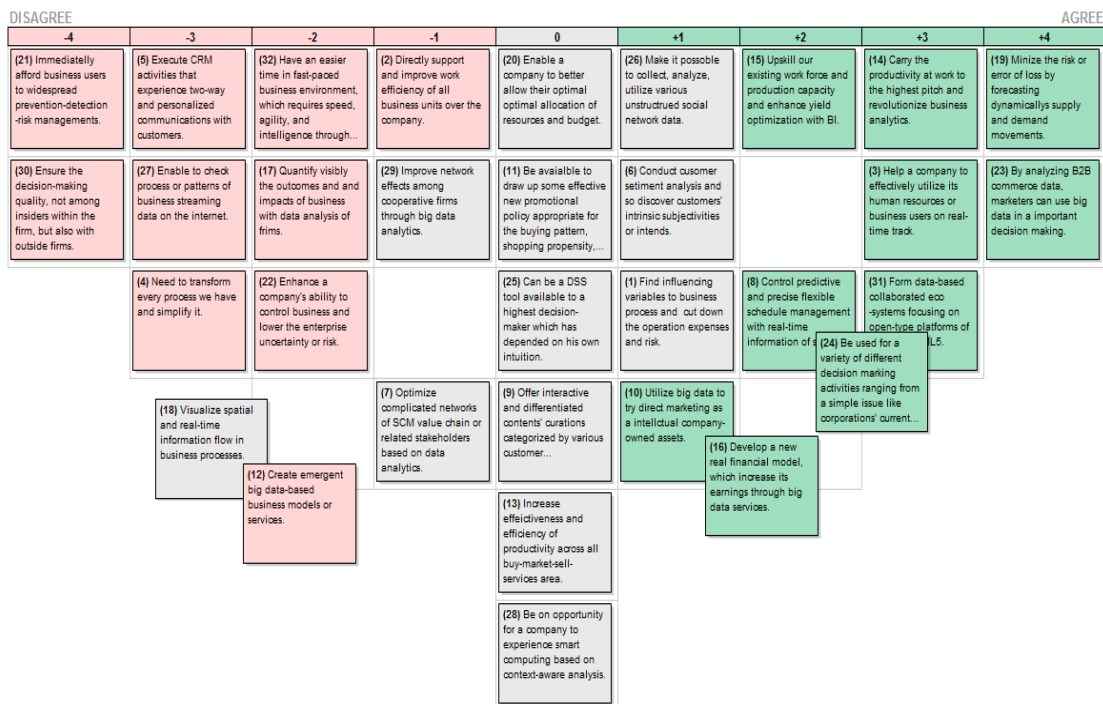


Fig. 2. Q-sorting using Flash Q software.

3.4 Coding and QUANL Analysis

Prior to the final q-factor analysis, each scale was converted to a calculative score and 1 point, 5 points, or 9 points were assigned to strongly disagree (-4), neutral (0), and strongly agree (+4), respectively. To categorize p-samples, this study analyzed the q-sorting data based on a principle component analysis, varimax rotation, and correlation analysis using the QUANL PC program. A q-factor analysis involves the process of grouping people with similar thought structures (schemata) about a certain topic. In other words, it is not a cluster grouping of

people who share certain attributes but a typology of each person's subjective thoughts. Seventeen data were used in the q-factor analysis.

As shown in **Table 3**, four types of respondents were discovered. The eigen value is a sum of factor loading values, and other values refer to the variance, total variance, and cumulative variance. As a result, each eigen value per factor is probable at more than 1.0. The cumulative variance was determined to be 0.4976 (about 50%) and so is desirable. The factor weights of the p-sample are categorized as T1 type (n=7), T2 type (n=3), T3 type (n=2), and T4 type (n=5). Among these types, as the factor weight of the p-sample becomes higher, the representativeness of the typical person of the relevant type increases. Factor loading value is $>0.333(1.96 \cdot 1/\sqrt{32})$ at a significance level of 95%. For correlation between types, refer to **Table 4**.

Table 3. P-sample and factor weight by type

Type		Industry/ Affiliation	Level of Big data	Position	Task	Gender	Age	Factor weight
Type 1 (N=7)	P7	major telcom	2	director	R&D mgt.	female	36	2.2680**
	P1	public/institute	5	senior researcher	data stand	male	37	.8820
	P8	audit consulting	5	managing director	business consulting	male	52	1.2346*
	P13	major telcom	3	director	business partnership	male	42	2.7654**
	P14	public/center	3	technical expert	management center	male	34	1.1466*
	P4	public/financial	6	manager	financial & tax	male	41	1.5906*
	P17	press & media	5	team director	media & marketing	male	40	.9587
Type 2 (N=3)	P2	major electronics	5	director	B2B marketing	male	49	1.1900*
	P15	portal company	2,3	team director	ICT policy & business	female	43	.9974
	P5	ICT consulting	5	CEO	policy consulting	male	42	.7396
Type 3 (N=2)	P3	public/institute	5	senior researcher	commercialize converging	female	34	.6809
	P6	major telcom	1	executive director	domestic business	male	42	1.2267*
Type 4 (N=5)	P9	public/alliance	5	director	investment mgt.	male	49	.8180
	P10	manufacturer	5	executive director	manufacture mgt.	male	57	.8544
	P11	SI	5	manager	SI business	male	41	.1675
	P12	major motor co.	5	director	technique researcher	male	38	.4879
	P16	major electronics	4	director	information strategy	male	40	1.2117*

Factor weight* >1.0 , ** >2.0

Table 4. Correlation between types

	Factor 1	Factor 2	Factor 3	Factor 3
Factor 1	1.000	.508	.535	-.185
Factor 2	.508	1.000	.377	-.654
Factor 3	.535	.377	1.000	-.216
Factor 4	-.185	-.654	-.216	1.000

Table 5. Q-items and z-score descending array of differences among types

Types	Q-item descriptions	z-score			
		T1	T2	T3	T4
Type 1	4. Need to transform every process we have and simplify it.	-2.1	-0.9	0.2	0.8
	19. Minimize the risk or error of loss by forecasting dynamically supply and demand movements.	0.7	-0.2	-0.3	0.5
	30. Ensure the decision-making quality, not among insiders within the firm, but also with outside firms.	1.4	0.9	0.1	0
	29. Improve network effects among cooperative firms through big data analytics.	-1.1	-0.5	0.3	0.3
Type 2	2. Directly support and improve work efficiency of all business units over the company.	0.9	-1.6	0	1.4
	3. Help a company to effectively utilize its human resources or business users on real-time track.	-2.2	-0.9	-1.8	-0.2
	17. Quantify visibly the outcomes and impacts of business with data analysis of firms.	0.8	-1.4	-0.3	2
	22. Enhance a company's ability to control business and lower the enterprise uncertainty or risk.	-0.2	-1.6	-0.5	0.6
	24. Be used for a variety of different decision making activities ranging from a simple issue like corporations' current status, to a complex one like growth promotion or complex optimized business.	-0.5	0.5	-1.3	-0.8
	28. Be on opportunity for a company to experience smart computing based on context-aware analysis.	-0.5	1.5	-1.6	0.2
	32. Have an easier time in fast-paced business environment, which requires speed, agility, and intelligence through dynamic analysis of consumer, marketing or competitors.	0.1	1.2	-0.1	0.1
Type 3	14. Carry the productivity at work to the highest pitch and revolutionize business analytics.	-0.9	-0.6	0.9	0.1
	21. Immediately afford business users to widespread prevention-detection-risk managements.	0.7	-0.1	-1.4	0.5
	26. Make it possible to collect, analyze, utilize various unstructured social network data.	0.5	0.7	-0.6	-0.1
Type 4	1. Find influencing variables to business process and cut down the operation expenses and risk.	-0.6	-1.6	-0.2	2.4
	6. Conduct customer sentiment analysis and so discover customers' intrinsic subjectivities or intends.	0.5	1.7	1.5	-2.1
	7. Optimize complicated networks of SCM value chain or related stakeholders based on data analytics.	-0.7	-0.5	0.2	0.9
	9. Offer interactive and differentiated contents curation categorized by various customer segments through the analysis of unstructured social data.	1.3	0.9	0.8	-1.1
	10. Utilize big data to try direct marketing as an intellectual company-owned assets.	1.2	0.5	1.4	-0.9
	11. Be available to draw up some effective new promotional policy appropriate for the buying pattern, shopping propensity, or lifestyle of consumers.	1.6	2	1.6	-1.1
	12. Create emergent big data-based business models or services.	1.3	1.2	2.1	-0.8
	13. Increase effectiveness and efficiency of productivity across all buy-market-sell-services area.	-1.3	-0.6	-1.8	-0.3

4. Results and Interpretations

4.1 Q-Factor Analysis

Previously, each type existed separately with unique factors. The interpretation of the q-factor is not based on a hypothetical-deductive point of view but rather on a hypothetical-building point of view. To interpret each type in a Q study, a researcher can minimize decision errors and exclude any subjective premise or prejudice by reflecting on the theoretical basis of the research topic, the demographics data, any additional survey information, and post-interview data on two bipolar factors of q-sorting, and z-score array of differences among types as shown in **Table 3**. To clearly understand differences among types, strongly positive ($>+1.0$) and strongly negative (<-1.0) in the q-samples were distinguished in **Table 5**.

4.2 Typologies and Interpretation

4.2.1 Marketing and Resources Allocation (T1)

The first type (T1) of people values big data in the field of marketing. As shown in **Table 6**, they consider big data an important strategic tool available to an enterprise to draw up effective new promotional policies appropriate for the buying pattern, shopping propensity, and lifestyle of consumers (Q_{11} , $z=1.58$). Specifically, there is a clear difference between the standard z-score of Q_{20} and those of other types ($z=1.42$). To be more specific, this type of respondent strongly agreed that big data can be applied to create emergent business models or services (Q_{12} , $z=1.42$) and may be also utilized to promote a strategy of direct marketing (Q_{10} , $z=1.20$). Also, based on the analytics of big data, such as unstructured real-time data gathered through various social networks, marketers can plan more aggressive marketing strategies, in which it is possible to offer customized contents curation for each customer segment (Q_9 , $z=1.25$).

Recently, big data analytics has become important in the perspective of unstructured or irregular analytics with descriptive text, image, and streaming data. Consequently, the first type of p-sample seeks to realize a true interactivity in customer relationship management (CRM) and values big data as a creative strategic tool of business intelligence focused on the marketing arena. To consider this psychological characteristic of the first type of p-sample respondents in detail, the interview material in relation to the stimuli of q-sorting was analyzed. Respondents have a clear idea of what Q_{11} leads their company to be in a better position to offer customized service (P_4) and big data can be adopted immediately in current business processes like Q_{11} (P_{13}). Also, respondent P_{13} answered that many firms actually need various data analytics to develop their new business model or products in response to the noted above Q_{12} ; meanwhile, a response of P_{14} emphasizes the effectiveness of customized curation services in interactive marketing.

On the other hand, respondents reacted most negatively to the Q_{29} item from among the 32 sentences. They disagreed that big data will enhance the effectiveness of cooperative networking among stakeholders (Q_{29} , $z=-1.13$). From the results of q-sorting illustrated by the respondents, we can determine who is representative of the first type. Respondents consider that "big data shared with their subcontractors is not essential, because the majority which maintains relations depends on getting their contract." In addition, "it blows of many ways in which a company uses the analytics of big data to assess that the needs of their subcontractor are costly and it is also doubted that much big data could raise the impacts of network" (P_{14}). In addition, respondents held opposite views to these opinions; they thought the use of big data

helps in visualizing spatial and real-time informatics flow over their company's business processes (Q₁₈, z=-1.14) and increases the effectiveness and efficiency of productivity across value chains of all buy – market – sell – services areas (Q₁₃, z=-1.32).

P-sample experts of this group were most strongly opposed to the Q₄ and Q₃ items. The rationale for Q₄ is that affected values lower than investment for business data analysis (P₁₃). P₁ explained why he strongly disagreed with Q₄ and Q₁₃; Q₄ is not directly related to big data and Q₁₃ is not near to big data intelligence but to artificial intelligence (AI). Regarding Q₃, P₇ said that this function is possible to be realized although not by big data. If big data analytics is used in the field of HR, P₁₃ and P₁₇ worried that it could cause a lot of animosity between employees by controlling or real-time monitoring. In other words, big data must not be an objective itself but a tool for HR management. In brief, this study summarized the impacts mentioned by the first type, marketing and resources allocation (T1).

Table 6. Z-scores and Q-items descriptions T1 (z-score>±1.00)

Q _i	Positive statements (+)	z-s
11	Be available to draw up some effective new promotional policy appropriate for the buying pattern, shopping propensity, or lifestyle of consumers	1.58
20	Enable a company to better allow their optimal allocation of resources and budget	1.42
12	Create emergent big data-based business models or services	1.27
9	Offer interactive and differentiated contents curations categorized by various customer segments through the analysis of unstructured social data	1.25
10	Utilize big data to try direct marketing as an intellectual company-owned assets	1.20
Negative statements (-)		
29	Improve network effects among cooperative firms through big data analytics	-1.13
18	Visualize spatial and real-time information flow in business processes	-1.14
13	Increase effectiveness and efficiency of productivity across all buy, market, sell, and services area	-1.32
4	Need to transform every process we have and simplify it	-2.07
3	Help a company to effectively utilize its human resources or business users on real-time track	-2.19

4.2.2 Dynamic and Flexible Adaptation (T2)

Respondents of the second type (T2) emphasized the importance of big data analytics in improving the ability to estimate and to be flexible in a changing market environment. The meaning of environment to them macroscopically includes market, competitor, and consumer perspectives. Like the first type, they strongly agreed that big data will become an important strategic tool for better promotional policy and the value of the z-score is higher than that of the first type (Q₁₁, z=2.00), as shown **Table 7**. The best feature of this type is mentioned in Q₆'s statement that big data analytics is profoundly necessary to discover inherent feelings, perceptions, or intentions of each customer based on customer sentiment analysis (Q₆, z=1.70).

This type aims for effective CRM. On the other hand, respondents explained that ultimately big data analytics inside their organization helps to flexibly defend against outside changes in business surroundings. Concretely, these intelligent analytics can support endless decision-making of executives or managers by extracting and analyzing necessary information from accumulated big data about the above three circumstances (Q₂₅, z=1.15). They believe that big data analytics can improve a company's ability to real-time detect or respond to the dynamic changes in the surrounding environment (Q₃₂, z=1.20). To sum up, experts of the second type have a varied response to some factors that influence the way big data is used in an

environmental analysis. For this type's opposite views, Q_2 ($z=-1.63$) and Q_1 ($z=-1.61$) are included. They consider that the long arm of the big data impacts could not reach to visualizing of spatial and real-time information flow in business processes (Q_{18} , $z=-1.06$). Also, big data analytics cannot quantify visibly the outcomes and performances of inside or outside firm data through analysis (Q_{17} , $z=-1.35$) or enhance a company's ability to control an entire business and lower an enterprise's uncertainty or risk (Q_{22} , $z=-1.56$).

To be more specific, the results of q-sorting interviews explained why respondents have thought alike. The group of the second type consists of three people, P_2 , P_{15} , and P_5 . Like both the first and second types, they also recognized the importance of the Q_{11} item because they think that big data analysis will help firms understand their markets or consumers in the future (P_5) and offer personal customized products to their users or sponsors (P_{15}). The other respondent, P_2 agreed with Q_6 and Q_{28} since they think that big data analytics is a big trend for the future. They ultimately dream of new business models and opportunities driven by big data (P_{15}). In contrast, P_2 explained that his company already uses business activities based on inside big data in response to Q_1 and that the amount of data for risk management is yet not sufficient to Q_{22} . P_{15} answered that there is potential feasibility in Q_{17} and P_2 emphasized that it is reasonable to offer members inside the organization the results of inner data analysis. We named this 'dynamic and flexible adaptation' impact of big data in the light of the opinions expressed by this second type.

Table 7. Z-scores and Q-items descriptions T2 ($z\text{-score} \geq \pm 1.00$)

Q_i	Positive statements (+)	z-s
11	Be available to draw up some effective new promotional policy appropriate for the buying pattern, shopping propensity, or lifestyle of consumers	2.00
6	Conduct customer sentiment analysis and so discover customers' intrinsic subjectivities or intends	1.70
28	Be on opportunity for a company to experience smart computing based on context-aware analysis	1.47
16	Develop a new real financial model, which increase its earnings through big data services	1.26
32	Have an easier time in fast-paced business environment, which requires speed, agility, and intelligence through dynamic analysis of consumer, marketing or competitors	1.20
25	Can be a DSS tool available to a highest decision-maker which has depended on his own intuition	1.15
Negative statements (-)		
18	Visualize spatial and real-time information flow in business processes	-1.06
17	Quantify visibly the outcomes and and impacts of business with data analysis of firms	-1.35
22	Enhance a company's ability to control business and lower the enterprise uncertainty or risk	-1.56
1	Find influencing variables to business process and cut down the operation expenses and risk	-1.61
2	Directly support and improve work efficiency of all business units over the company	-1.63

4.2.3 Shift from Past Data to Post BM (T3)

The third type (T3) of expert emphasizes new creative business chances through big data analytics. These are a small group of two persons but they have experiential knowledge about developing and planning new business models. In the positive statements as shown [Table 8](#),

the third type has very similar features to the second type. For example, the value of Q_{12} ($z=2.14$), Q_{11} ($z=1.57$), Q_6 ($z=1.45$), and Q_{25} ($z=1.41$) were somewhat higher than that of the second type. The difference between this type and the second type is clearly illustrated in the opposite statements. Concretely, the difference in the two group's responses was evident in Q_{28} . That is, the third type tends to have a gloomy view about big data analytics' ability to reach and realize the phase of smart ubiquitous computing in which we real-time collect context-aware data (e.g., time, space, objects, and location). According to P_6 's answer, it is impossible to perform perfect smart computing in the real world and the earnings will show miniscule amounts (P_6). Therefore, this study termed 'shift from past data to post BM' impacts for the third type.

Table 8. Z-scores and Q-items descriptions T3 ($z\text{-score} > \pm 1.00$)

Q_i	Positive statements (+)	z-s
12	Create emergent big data-based business models or services	2.14
11	Be available to draw up some effective new promotional policy appropriate for the buying pattern, shopping propensity, or lifestyle of consumers	1.57
6	Conduct customer sentiment analysis and so discover customers' intrinsic subjectivities or intends	1.45
10	Utilize big data to try direct marketing as an intellectual company-owned assets	1.41
25	Can be a DSS tool available to a highest decision-maker which has depended on his own intuition	1.41
Negative statements (-)		
31	Form data-based collaborated eco-systems focusing on open-type platforms of Linux or HTML5	-1.07
24	Be used for a variety of different decision marking activities ranging from a simple issue like corporations' current status, to a complex one like growth promotion or complex optimized business	-1.26
21	Immediately afford business users to widespread prevention, detection, risk mgt.	-1.37
28	Be on opportunity for a company to experience smart computing based on context-aware analysis	-1.57
3	Help a company to effectively utilize its human resources or business users on real-time track	-1.79
13	Increase effectiveness and efficiency of productivity across all buy, market, sell, services area	-1.79

4.2.4 Optimizing Process and Productivity (T4)

Finally, the particular feature of the fourth type (T1) is that the people focused on improving their firm's productivity and optimizing their holistic business process. As shown in **Table 9**, the fourth type considers big data as a key resource of business intelligence that helps to optimize work functions and qualify decision making with various inside and outside stakeholders or business partners. The four experts treat big data as a very useful tool or an important part of business intelligence. Thus, big data analytics helps to trace variables influence the business activities in their organization to reduce production time, expenses, the ratio of risk, and the like (Q_1 , $z=2.43$). This feature of the fourth type is quite contrary to the second type. The fourth type of respondent most strongly disagrees with the Q items with which the second type of people most strongly agrees. Major items consist of Q_{17} , Q_2 , and Q_{18} . Q_{17} mentions that big data analytics enable the analysis of the complicated data gathered from inside/outside firms and describe the real performance ($z=1.99$). In addition, the technology of big data can visualize real-time spatial information flow over the whole business process or value chain ($z=1.18$).

On the other hand, these respondents certainly do not advocate Q₆, Q₃, Q₁₆, Q₁₁, and Q₉. Unlike the second type, this type considers that big data analytics is not useful to support customer sentiment marketing (Q₁, z=-2.12). In addition, they emphasized that big data does not have huge influence yet (Q₉, z=-1.06). The results of the q-sorting interview revealed the reasons for each positive statement (Q₁, Q₁₇) and negative statement (Q₆, Q₁₆). P₁₀ strongly supported Q₁ because he considers that big data can offer very useful information to each member of organization and P₁₆ mentioned that big data analytics is a very innovative intelligence tool. Finally, P₁₀ disagreed that there is a limit to what big data can analyze regarding each customer's latent emotions or psychologies.

Table 9. Z-scores and Q-items descriptions T4 (z-score>±1.00)

Q _i	Positive statements (+)	z-s
1	Find influencing variables to business process and cut down the operation expenses and risk	2.43
17	Quantify visibly the outcomes and impacts of business with data analysis of firms	1.99
2	Directly support and improve work efficiency of business units over the company	1.41
18	Visualize spatial and real-time information flow in business processes	1.18
Negative statements (-)		
9	Offer interactive and differentiated contents curation categorized by various customer segments through the analysis of unstructured social data	-1.06
11	Be available to draw up some effective new promotional policy appropriate for the buying pattern, shopping propensity, or lifestyle of consumers	-1.14
16	Develop a new real financial model, which increase its earnings through big data services	-1.28
3	Help a company to effectively utilize its human resources or business users on real-time track	-2.02
6	Conduct customer sentiment analysis and so discover customers' intrinsic subjectivities or intends	-2.12

5. Summary and Conclusions

Today is the era of 'Big data' trends in both marketing and business. This research has focused on the impacts of big data analytics in the business perspective. For this, it is a research process based on Q methodology, a qualitative approach. Through Q research, the subjectivity of respondents, including experts or working groups, was discovered to be associated with different properties of the four typologies. To gain an accurate interpretation of the analysis results and improve the quality of the outputs of respondents' in-depth interviews and the results of q-sorting, this study devoted itself to p-samples (or q-sorters) and establishing q-population (or statements). The first type emphasized the impacts of big data analytics in the marketing and resources allocation (T1). The second type stated that the influence of the big data is important to the dynamic and flexible adaptation perspective. The third type of expert is interested in the issue of 'shift from past data to post BM' by the big data. Finally, the fourth type expects the big data to be used to optimize processes and improve productivity in the whole business arena.

For the properties of the four typologies, the impacts of the big data in the business perspective were discovered through a qualitative Q research based on in-depth interviews with high-level experts group. This study can derive and define the different features of each type by segmenting into four at this point, and propose desirable marketing direction and insights (or guidance). Therefore, this research proposed a theoretical outline and strategic

guidelines by synthetically analyzing experts' psychological tendencies and professional knowledge through their behavior and preferences via q-sorting. The results of this study have not only academic but also industrial values. With this research as a starting point, the outputs of this study can help to future marketing studies involving emergent services or business such as big data analytics.

References

- [1] B. Pang and L. Lee, "Opinion mining and sentiment analysis," *Foundations and Trends in Information Retrieval*, Vol. 2, No.1, pp. 1-135, 2008. [Article \(CrossRef Link\)](#).
- [2] EMC Corporation, "The journey to big data," 2012.
- [3] IBM, "The 2011 IBM tech trends report: the clouds are rolling in, is your business ready," November, 2012.
- [4] J. Manyika, M. Chui, B. Brown, J. Bughin, R. Dobbs, C. Roxburgh, and A.H. Byers, "Big data: the next frontier for innovation, competition, and productivity," 2011.
- [5] T.H. Davenport, "Competing on analytics," *Harvard Business Review*, Vol. 84, No.1, pp. 98-107, 2006.
- [6] H. Chen, R.H. Chiang, and V.C. Storey, "Business intelligence and analytics: from big data to big impact," *MIS Quarterly*, Special Issue: Business Intelligence Research, Vol.36, No.4, pp.1165-1188, 2012.
- [7] Informatica, "Big data unleashed," 2012.
- [8] S.R. Brown, "Q technique and method: new tools for social scientists," W.D. Berry and M.S. Lewis-Beck (eds.), Beverly Hills, CA: Sage, 1986.
- [9] J.F. Engel, D.T. Kollat, and R.D. Blackwell, "Personality measures and market segmentation: evidence favors interaction view," *Business Horizons*, Vol.12, No.3, pp.61-70, 1969. [Article \(CrossRef Link\)](#).
- [10] Feldman, M. Jack, and Lynch G. John, "Self-generated validity and other effects of measurement on belief, attitude, intention and behavior," *Journal of Applied Psychology*, Vol.73, No.3, pp.421-435, 1988. [Article \(CrossRef Link\)](#).
- [11] Wanke, Michaela, B. Hebert, and B. Biller, "Subjective experience versus contents of information in the construction of attitude judgments," *Personality and Social Psychology Bulletin*, Vol.22, pp.1105-1113, 1969. [Article \(CrossRefLink\)](#).
- [12] W. Stephenson, "The study of behavior: q technique and its methodology," Chicago: University of Chicago Press, 1953.
- [13] H.K. Kim, "Q-methodology," Seoul: *Communication Books*, 2008.
- [14] K.Y. Kim, B.G. Lee, and I.K. Song, "The typological classification of the participants' subjectivity to plan the policy and strategy for the smart mobile market," *Korean Management Review*, Vol.41, No.2, pp.367-393, 2012.
- [15] K.Y. Kim, H.K. Kim, and B.G. Lee, "Consumer segmentation based on smart device users' perception of mobile advertising," *Korean Society for the Scientific Study of Subjectivity*, Vol.23, No.4, pp.57-78, 2011.
- [16] B. Minto, "The pyramid principle: logical writing, thinking and problem solving," *Pearson Education Corporate*, Minto Books International, Inc., London, UK, 2008.
- [17] G.C. Thompson, "The evaluation of public opinion, B. Berelson and M. Janowitz (eds.)," *Reader in Public Opinion and Communication*, New York, USA, 1966.



Ki Youn Kim is an assistant professor in the department of Marketing Information Consulting at Mokwon University, Daejeon, South Korea. She received her Ph.D. degree in Management of Information Systems at Yonsei University. She conducted researches on the fields of business consulting, marketing strategy, ICT policies and industries, digital convergence, customer behaviors and new media advertising.