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Emotional Activities in Computer-mediated Communication: Facial Electromyography Response and Emoticon Use during Instant Messaging

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Abstract

In this study, we use electromyography data of the orbicularis oculi and zygomaticus major as indices of positive emotions to analyze facial muscle activities in computer-mediated communication. We find a difference in frequency of facial muscle activities, influence from stimuli, and other aspects under varied instructions on emoticon use. Results suggest that richness of nonverbal methods is a key factor that affects emotional activities in computer-mediated communication. Although we collected data from two counties, we could not find any significant difference between them. Instead, we found that participants from the two countries have some patterns of emoticon use in common. We believe that, in certain situations emoticon use and facial activities in computer-mediated communication can show commonality between countries on a certain level.

1. Introduction

Interpersonal communication involves not only information from words or messages but also from facial expressions and gestures. However, when we perform computer-mediated communication (CMC) by smart phone or PC, most of the time, these nonverbal behaviors cannot be communicated (Perry, 2010). To do this, users employ some new and simple, but easy-to-use methods. Emoticons are one of these methods. They can be used in most computer and smart phone software. Although emoticons have been discussed from various perspectives in previous studies, we still do not know how they correlate with our facial expressions. One of the purposes of our study is to confirm whether the use of emoticon has influence on facial expression. Similar to the facial expressions that we might make during a phone call, our facial expressions still manifest even when we cannot see each other in CMC. Nowadays, in the information society, the innate methods like facial expression and computer mediated methods like emoticon will be both functional in many occasions in our communications. We assumed the emoticon use might have influence on facial expressions in a direct or indirect way. The other purpose of our study is to confirm whether CMC users from different countries have different way of using nonverbal methods. As the result, correlation between emoticon use and facial expressions is confirmed. However, we found more similarity than difference in emotional expression between countries in CMC.

2. Material and methods

Facial electromyography (fEMG) has been used as a tool for inferring affective states in media-related studies; it has proven to have advantages over other methods. For example, fEMG has been used in studies of emotional responses to television commercials; results indicate that it can be more accurate and sensitive than self-report measures (Hazlett & Hazlett, 1999). A study of user experience with mobile phones proved that subtle emotional changes could be detected by fEMG measurements (Mahlke & Minge, 2006). Other research indicates that facial activities caused by unconscious stimuli can also be detected by fEMG measurements (Dimberg & Thunberg, 2000). These advantages can be very useful for CMC study, because when performing CMC, facial activities are less obvious and more difficult to recognize than in face-to-face situations. Under the circumstances, self-report or visual methods like Facial Action Coding System (FACS) might not be as efficient as fEMG measurements.

On the other hand, discriminating among different emotions is an important application of fEMG measurements, too (van Boxtel, 2010). Explanations for these connections between elementary emotions and specific facial muscle actions can be found in a study based on FACS (Cohn et al, 2006). Thus, using fEMG measurements to record specific emotional responses is feasible (Larsen et al, 2003).

Another reason for using fEMG in CMC study is about the emoticon use in instant messaging (IM) and e-mail. According to Xu et al. (2007), emoticons can help form an impression of the sender's personality and emotional state. This opinion is supported by study of gender differences in impressions about emoticon use (Constantin et al, 2002). Furthermore, other studies suggest that the use of emoticons is not

only for enjoyment but can also provide users with rich information (Huang et al, 2008; Thompsen & Fougler, 1996). Therefore, for people who are used to CMC, emoticons might be a reliable method for sending and reading emotional cues. Possibly, the emotional activities appear in this process can be detected by fEMG measurements.

Similar to facial expressions, emoticons can be classified by the emotions they convey. However, emoticon has features fundamentally differ from facial expression. According to recent studies, emoticons with positive meanings like "happy," "humorous," or "enjoyable" are used more than negative ones (Huffaker & Calvert, 2005; Derks et al, 2008); even the expressions of teasing or sarcasm carries positive meaning in most cases (Wolf, 2000). Therefore, for CMC study, conducting research focused on positive emotional activities seems necessary. In many facial activity studies using fEMG, the orbicularis oculi and zygomaticus major were indices of positive emotions (Kimura et al, 2013; Lang et al, 1993; de Wied et al, 2006; de Wied et al, 2009). The activities of the zygomaticus major are especially reported to be sensitive to positive emotions (Witvliet & Vrana, 1995). We conducted a small-scale experiment as a pilot study; collected fEMG data during chats on IM and ensured activities of the two muscles could be correctly recorded.

3. Main study

3.1. Participants

Our participants comprised 52 college students (age range of 21～25 with 0.693 as standard deviation). 24 of them were from Japan (12 females and 12 males), and 28 of them were from China (16 females and 12 males). Experiments were conducted in both countries, and participants were all local residents; none had long-term overseas experience in the other country. All the participants had had prior experience of CMC and emoticon use.

3.2. Stimuli and procedure

Participants were asked to perform this experiment in pairs. Each member of a pair sat simultaneously in different rooms, and each room was equipped with an Internet-accessible computer. Participants were asked to watch a short video (as stimuli for positive emotional activities) with Japanese or Chinese subtitles and then have a chat about their experiences related to that video with the participant in the other room for 10 minutes. These videos were all comedic from the situation comedy named *Friends* described some simple stories which our participants might also have experienced in their daily life. From nine videos used in the pilot study, we selected three because their fEMG data was found to be relatively obvious and stable. The video-chat procedure was repeated three times in the experiment, and we changed the three videos' playback order each time to avoid bias caused by interests or experiential differences.

In the first video-chat procedure (Part 1), no particular instruction about emoticon use was given (the "no-instruction" condition), and participants could use emoticons as they wished. For the second procedure (Part 2), participants received instructions to use emoticons more than three times (the "amplified-use instruction" condition); however, when or where to use them was decided by the participants. In the third procedure (Part 3), participants received instructions to inhibit emoticon use (the

"inhibited-use instruction" condition). The fEMG activities of these three parts were recorded by Mwatch type 101 (WADA Aircraft Technology) and two pairs of Ag/AgCl surface electrodes (4 mm in diameter). Figure 1 showed an image of the attached electrodes for each muscle. The electrodes were attached one pair each for zygomaticus major (lower left in Figure 1) and orbicularis oculi (upper right in Figure 1). The fEMG activity was amplified 8000 times and filtered (50 Hz to 500 Hz). Data collection was conducted at a sampling rate of 1000 Hz. We also used screen capture software to record all actions on computers to check every occurrence of emoticon use afterward.
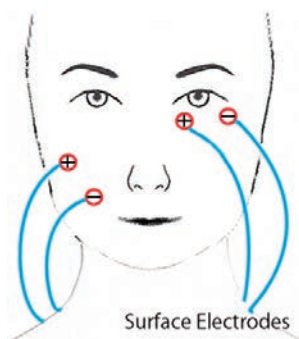

Figure 1. An Image of the Attached Surface Electrodes for Each Muscle

We used LINE in Japan, and WECHAT in China. We purposely used two different kinds of IM software because they were each widely used in one country, but not in the other. We wanted to obtain data reflected situations close to CMC in daily life. There were many kinds of emoticons and other similar methods such as "Stamp" in LINE and "Biaoqing" in WECHAT. These methods were widely used by many people in both countries. However, not all of them could be used from both countries, and some of them were with extremely complex meanings which might bring unpredictable influence to data analysis. Thus, we had to prevent the use of some methods and control the emoticons to ensure no strange or particularly complicated ones could be used.

For the convenience of waveform observation and calculation, we transferred all fEMG data to integrated EMG (iEMG) data (300 ms time constant). And to make our data comparable between individuals, all iEMG data was transferred into %iEMG data, which were proportional to an adequate baseline value (baseline %iEMG value =100%). At some level, this standardization also enabled direct comparison of the two muscles' activities. Because our experiment was basically conducted on computers, there should have been less distribution and influence from low-frequency artifacts. However, to ensure data's comparability; six samples showed unusually high values were removed, leaving 22 from Japan (12 females and 10 males), and 24 from China (14 females and 10 males) as the total number of participants.

4. Data analysis and results

4.1. Overview of fEMG data

All our participants used more than three times in Part 2, and most of them used emoticons in Part 1. In general, more emoticons were used in Part 2. Therefore, we believe that emoticon use was well controlled. Beyond that, most emoticons (431 times in 485) had positive meanings such as "happy," "exciting," and "satisfaction," etc. Other emoticons used to show "sarcasm," "confusion," and "apology" also showed some positive meanings.

No significant difference in %iEMG data was

found among general (undifferentiated as to Part 1, 2, or 3) videos or chats by group comparison. And after observation of the fEMG curve, we noticed that stronger fluctuations appeared while watching videos. Comparative results of mean %iEMG values revealed a significant difference between general chats and videos (t = –2.390, df = 550, p<. 05).

In the main study we found no significant correlation between the number of emoticons used and %iEMG data from the zygomaticus major (r = -0.05, p>. 05) or the orbicularis oculi (r = 0.03, p>. 05). Neither did we find significant difference in %iEMG values of chats among instructions. Thus, we assume that it is not a simple mechanism that more emoticon use cause stronger facial muscle activities.

4.2. The influence from emoticon use to facial expressions

4.2.1. The effect caused by emoticons as direct stimuli

First, we have to verify the possibility that emoticons themselves could be direct stimuli. Emoticons are graphical icons with emotional information; thus, it is possible that emotional activity may be caused by watching them.

We calculated the mean %iEMG values in time, i.e., from the participants' opening of the emoticon list to their click on an emoticon and compared these data with the mean %iEMG values of the corresponding chats. When the list was opened, it blocked participant's view of reading messages. The %iEMG data showed information more related to the effect caused by watching emoticons but not messages. Under the circumstance, the effect of emoticons as direct stimuli could be testified. The data from two muscles showed the same result. There were 256

times that emoticon use received higher values than mean %iEMG values; however, 229 times it received lower values. Nearly half of emoticon use indicated lower values than mean %iEMG values.

We also analyzed data of receiving emoticon side. When emoticons were received with messages, participants could see messages and emoticons simultaneously even without obvious eye movements. Thus, it was difficult to select the moment when only emoticons were watched. However, we noticed that sometimes emoticons were sent without messages (46 times in total). Under the circumstance, the effect caused by watching emoticons can be testified. We calculated the mean %iEMG values in time, i.e., from the moment emoticons were received to the start of typing messages for reply. Except for a few times (3 times in total) that two muscles showed different results, same tendency was showed by two muscles in most of time. There were 19 times that higher values than mean %iEMG values appeared; however, 24 times it received lower values.

Based on the data showed above, we cannot claim that as direct stimuli, emoticons promote emotional activities when participants were watching them. Additionally, as mentioned in 3.1, we could not find significant correlation between the number of emoticons used and %iEMG data. Thus, emoticon stimuli are at least not the greatest factors related to facial muscle activities.

4.2.2. The effect caused by video stimuli

In main study, significant responses by the two muscles appeared when watching videos. Thus, we can consider the video stimuli were functional. We believe they could have stronger influence on facial activates than emoticons as stimuli.

However, it is necessary to confirm whether the influence from video stimuli continued to be functional in chat parts.

Because videos and chats were on different timelines, we could not directly compare %iEMG value in each part of the experiment. We used mean %iEMG value instead and calculated the simple linear correlation of the mean %iEMG value between videos and chats. Table 1 presents the results.

Statistical significance of correlation between video and chat parts was found in almost all cases (r = 0.36 〜 0.72). It emerged from both muscles and both sets (Japan and China) of participants. Thus, we can presume that positive emotional activities caused by stimuli did not disappear after watching videos. These emotions and the subsequent facial activities also continued to emerge from chats. Beyond that, this correlation was lower in Part 3 than in Parts 1 and 2 in both countries. Higher correlation revealed that, in Chats 1 and 2, the emotional activities our participants had were closer to the ones directly caused by video stimuli. Thus, we can consider a possibility that the emotions directly or indirectly caused by video stimuli, could be expressed more easily when emoticons were allowed to be used.

However, this was not the only indication we obtained. We also noticed that although in most cases r-values were higher in Part 2 than in Part 1; the difference between Parts 1 and 2, and Part 3 was far more significant. As mentioned in 4.2.1, the number of emoticons used is not the main reason for facial activities. Perhaps this relates more to the richness of nonverbal methods. Because using emoticons was the only way of making nonverbal communication in our experiment, the richness of information would

Table 1 r-Values of Mean %iEMG in Every Part

	r-values of mean %iEMG		
	Part 1	Part 2	Part 3
All samples	.497**	.593**	.360*
JP samples only	.574**	.633**	.395
CH samples only	.612**	.568**	.406*
	r-values of mean %iEMG		
	Part 1	Part 2	Part 3
All samples	.639**	.692**	.376**
JP samples only	.675**	.684**	.428*
CH samples only	.538**	.718**	.433**

*p<0.05; **p<0.01; NS = Non-significant
JP = Japan, CH = China

differ much among instructions. Therefore, it is highly possible that the differences in r-valus relates to the difference of communication methods.

4.2.3. Difference in facial muscle activities among instructions

In our experiment, participants could not see each other. They could not conduct self-presentation or impression management by facial expressions. Thus, we can assume that if facial activities occurred, especially the obvious ones, most of them were caused by their emotional activities at those moments. As mentioned above, the emotional activities in chats were affected by video stimuli on a certain level, and no significant difference in %iEMG data was found among the three videos. Thus, if there were no other important factors existed, the facial muscle activities should not show significant difference among instructions. However, differences were found in the frequency of facial muscle activities.

When performing calculations, we wanted to select relatively obvious peaks from the electromyography curve, and then calculate their number and the time gaps between them. Most relatively obvious peaks can be confirmed by

observing the electromyography; however, to select these peaks in a more explicit, objective, and unified way, we did not use the observation way as a main method. Instead, we set a series of mathematical definitions and programmed them to ensure the peaks that we wanted could be automatically selected. We assumed the %iEMG value of n (ms) was a peak we wanted. We set the definition as follows:

(1) *%iEMG (n) = max %iEMG value in 1001 ms from (n − 500) to (n + 500)*

(2) *Max %iEMG value appeared only once in 1001 ms from (n − 500) to (n + 500)*

(3) *%iEMG (n) > mean (%iEMG) value of the chat*

(4) *%iEMG (n − 50) > %iEMG (n − 100) > %iEMG (n − 150) > %iEMG (n − 200) >…> %iEMG (n − 400) > %iEMG (n − 450) > %iEMG (n − 500)*

(5) *%iEMG (n + 50) > %iEMG (n + 100) > %iEMG (n + 150) > %iEMG (n + 200) >…> %iEMG (n + 400) > %iEMG (n + 450) > %iEMG (n + 500)*

This definition does not seem strict enough; however, it was sufficiently functional for our purposes according to the results. Because we used %iEMG data in this selection, most curves were smooth, and only relatively dramatic muscle activities could cause obvious peaks. Thus, for any obvious peak to appear and disappear in as short a time as under 1001 ms was nearly impossible. We also tested using longer or shorter time definitions, such as 501 ms and 2001 ms, but obtained no better results. Beyond that, %iEMG data was accurate to six decimal places, thus the appearance of a repeated value in a short time should be very rare. Although considered a very rare case, if several peaks appear in 1001 ms, part of the values we wanted can be excluded

by definition. To avoid influence from rare cases, we compared the result of processing with the electromyography curve. Most selected peaks were obvious enough to be confirmed from observation. At least, every obvious peak confirmed from the electromyography curve was selected by this method. Therefore, we believe that the peaks were well defined. Figure 2 is an example of %iEMG curve in 5 s (%iEMG range of 100%～300%). We can confirm an obvious peak at about 2.1 s from it.

To analysis the frequency, we used the number of peaks to calculate how many times peaks appeared in 1 minute (times/min value). As Table 2 shows, the times/min values were higher and closer to the values of video parts in Chats 1 and 2 than in Chat 3. To confirm influence from instruction and country factors, we conducted analysis of variance (ANOVAs), finding the effect from instruction significant on the zygomaticus major ($F_{(2, 88)}$ = 14.442, $p<.01$) and the orbicularis oculi ($F_{(2, 88)}$ = 6.768, $p<.01$). No significant effect of country factor was found on the zygomaticus major ($F_{(1, 44)}$ = 1.066, $p>.05$) or on the orbicularis oculi ($F_{(1, 44)}$ = 0.20, $p>.05$). After multiple comparisons by Scheffe, significant differences between Chats 1 and 3 and between Chats 2 and 3 were found in both muscles. However, no significant difference was found between Chats 1 and 2.

As for time gaps in chats, these values were an average of approximately 27 to 40 s. Significant facial muscle activities appearing at this frequency are acceptable results. No extremely short time gap was found in each sample's data. Thus, we believe that data of the peaks selected from chats are reliable.

The data above suggest that when emoticons could be used, the frequency of emotional
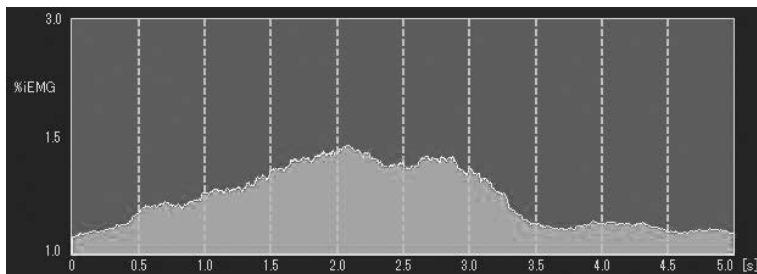
Figure 2. An Example of %iEMG Curve in 5 s

Table 2 Mean Value of Times/Min Value and Time Gaps

		Zygomaticus major					
		video part 1	video part 2	video part 3	chat part 1	chat part 2	chat part 3
Japan	times/min	1.81	1.93	2.02	1.20	1.21	0.94
	time gap	15563.67	14600.68	13423.42	34252.50	29153.65	34973.80
China	times/min	2.09	1.96	2.03	1.05	1.07	0.95
	time gap	11978.30	13094.85	12406.49	35291.60	36151.26	39945.98
		Orbicularis oculi					
		video part 1	video part 2	video part 3	chat part 1	chat part 2	chat part 3
Japan	times/min	1.70	1.89	1.78	1.12	1.13	0.88
	time gap	15251.09	13828.46	14800.87	31454.69	27073.38	39995.57
China	times/min	1.71	1.57	1.62	1.13	1.06	0.91
	time gap	14801.00	18285.64	15844.95	31099.21	27991.60	38809.27

activities was higher and closer to the condition of the videos. Thus, at least, it is highly possible that the instructions (whether emoticons could be used or not) have influence on emotional expressions, and the use of emoticons might be a key factor caused these differences.

4.3. The commonality of emotional activities between countries in CMC

4.3.1. Comparison of data from the two countries

To confirm whether significant differences in emoticon use and facial activities exist between the two countries, we conducted calculation and comparison. However, we obtained no data showed such differences.

First, we analyzed data of facial activities from both countries. We could not find significant difference in %iEMG data between two countries by group comparison on zygomaticus major (t = 0.054, df = 44, p>. 05), nor on orbicularis oculi (t = 0.115, df = 44, p>. 05). And none of the analyses we made in 4.2 showed any difference between countries. Therefore, it is highly possible that when strong emotional stimuli appear in CMC, users' facial activities show commonality on a certain level. Although there were differences in timing and intensity of muscle activities among individuals, none of them could show any pattern varied between countries.

Secondly, we compared data of emoticon use between the two countries. Emoticon use is not a physiological method like facial expression. Thus, there should be no physiological commonality in using them. However, we obtained no data showed significant difference between the two countries. We confirmed 9 times of emoticon use on average from Japanese

samples, and 11.96 times from Chinese samples. Chinese participants used more emoticons on average; however, the numbers were very close. No significant difference in the numbers of emoticon used could be found by group comparison between the two countries (t = 1.382, df = 44, p>. 05). We also conducted analysis about the meaning of emoticons used in chats. We confirmed 8.5 times of positive meaning on average from Japanese samples, and 10.2 times from Chinese samples. No significant difference could be found by group comparison (t = 1.382, df = 44, p>. 05). The emoticons showed other meaning like "sarcasm" and "confusion" were also found in both countries. Thus, we consider that the commonality may not only exist in facial expressions, but also in emoticon use.

4.3.2. The context in which emoticons were used

If we want to confirm the commonality of emotional activities in CMC, We need to know the context in which emoticons were used. We confirmed the messages used before and after each emoticon use, tried to discover whether patterns existed in these messages.

We found three patterns appeared many times in both countries. And as mentioned in 4.2.1, there were also emoticons used alone without messages. We consider it as an independent pattern, too. There were 402 times of emoticon use related to them. One of the patterns appeared mostly when participants shared their experiences. Especially when they had a chat about their particular experiences other people might not know. There were 195 times of emoticon use related to this pattern. Under the circumstance, most emoticons were used to show positive emotions; however, some of them were with meanings of "puzzled", "shy", "cautious", etc. The second pattern was confirmed on the occasion that participants had same opinions with each

Table 3 Patterns of Emoticon Use

| | | | Japanese | | | | Chinese | | | |
| | | | Chat 1 | | Chat 2 | | Chat 1 | | Chat 2 | |
	Patterns		Zyg	Orb	Zyg	Orb	Zyg	Orb	Zyg	Orb
when sending	1. experience sharing	times of occurrence	36		51		45		63	
		mean of %iEMG	3.53	2.11	3.16	3.54	3.77	3.09	2.91	3.92
	2. agreement expressing	times of occurrence	13		18		19		32	
		mean of %iEMG	4.21	3.80	4.92	4.77	3.56	5.17	3.33	3.95
	3. joke in a brief reply	times of occurrence	11		21		18		29	
		mean of %iEMG	2.81	2.72	3.41	2.68	2.92	3.01	2.70	2.14
	4. emoticon only	times of occurrence	13		7		10		16	
		mean of %iEMG	2.03	1.54	1.31	1.89	2.58	1.88	1.46	1.26
	5. other usages	times of occurrence	7		21		17		38	
		mean of %iEMG	1.43	1.53	1.57	1.41	2.13	1.86	1.47	2.10
when receiving	1. experience sharing	times of occurrence	36		51		45		63	
		mean of %iEMG	3.19	2.70	2.75	2.85	3.31	2.76	3.99	2.69
	2. agreement expressing	times of occurrence	13		18		19		32	
		mean of %iEMG	3.46	4.46	4.16	4.02	2.15	3.22	5.04	2.93
	3. joke in a brief reply	times of occurrence	11		21		18		29	
		mean of %iEMG	2.31	1.81	3.11	2.47	2.88	2.51	2.65	1.74
	4. emoticon only	times of occurrence	13		7		10		16	
		mean of %iEMG	1.47	2.84	1.82	1.32	1.75	2.09	2.01	1.44
	5. other usages	times of occurrence	7		21		17		38	
		mean of %iEMG	1.70	1.32	2.76	1.39	1.21	2.27	1.11	1.12

Zyo = Zygomaticus major. Orb = Orbicularis oculi

other. Especially when they chatted "me, too", emoticons were used very often. There were 82 times of emoticon use related to this pattern. It added emotional information into the chats, and made the conversation more dramatic than just saying approval. The third pattern was confirmed when participant made a joke in a brief reply. All the replies confirmed were under 8 words after translated into English. Emoticons with meanings of "exciting" and "sarcasm" were found many times in those replies. There were 79 times of emoticon use related to this pattern. The emoticons used alone without messages were confirmed 46 times. We confirmed more appearance of these four patterns in Chinese samples. However, if we consider the number of Chinese participants was bigger than Japanese, the appearances of these patterns in two countries are possibly closer than data showed. Thus, we believe participants from the two countries have these patterns in common. There were also some other usages of emoticons (83 times in total) could not be categorized or only appeared a few times, like emoticons used in greetings. The overall result was showed in Table 3 (%iEMG range of 111％～517％).

We calculated the mean %iEMG values in each time of sending (time from the beginning of typing messages to the click on the sending button) and receiving emoticons (time from the moment when messages were received to the start of typing messages for reply) of these patterns. These values were compared with mean %iEMG values of the chats in which the patterns appeared. As the result of comparison in situation of sending emoticons, in 255 times (157 times in pattern 1, 56 times in pattern 2 and 42 times in pattern 3), higher values emerged when the first three patterns appeared. In 101 times, we

obtained lower values. In only 16 times, higher values emerged when emoticons were used alone without messages. In only 14 times, we obtained higher values in other usages of emoticons. Data of the occasion when receiving emoticons showed a similar result, in 231 times (126 times in pattern 1, 46 times in pattern 2, and 59 times in pattern 3), higher values emerged when the first three patterns appeared. In 125 times, we obtained lower values. In only 19 times, higher values emerged when emoticons were used without messages. In only 9 times, we obtained higher values in other usages of emoticons. Because the result of comparison differed very little between two muscles, in order to give a more accessible image, data showed above was calculated as the average times of data from two muscles. The result revealed that stronger facial activities emerged in first three patterns. It is testified by group comparison of the %iEMG values on zygomaticus major between the first three patterns and last two ones when sending (Japan: t = 30.563, df = 173.618, p<. 05; China: t = 37.423, df = 245.727, p<. 05) and when receiving messages (Japan: t = 33.563, df = 129.875, p<. 05; China: t = 31.696, df = 282.590, p<. 05). The difference is testified on orbicularis oculi, too (when sending, Japan: t = 34.587, df = 165.073, p<. 05; China: t = 28.207, df = 280.399, p<. 05; when receiving, Japan: t = 11.385, df = 196, p<. 05; China: t = 38.264, df = 227.721, p<. 05). We also compared the time data of the first three patterns with the frequency data (time when peaks appeared) mentioned in 4.2.3. We found at least one time of peak appearance in 117 times of these patterns. Thus, we believe relatively strong facial activities did emerge in these patterns.

Because these patterns (especially the first three patterns) were found in chats of both

countries, to some extent, it explained why we could not obtain any data showing significant difference between countries. In the three patterns, more obvious emotional activities were found from data of both countries. Thus, the context in which emotional activities improved showed commonality at some level.

4.4. Result of the additional experiment

To confirm possible influence from factors varying with time axis change, like fatigue or concentration, a small-scale experiment was conducted as an adjunct. It was basically the same as the main experiment; only the order of no-instruction and inhibited-use instruction was swapped. Correlation of %iEMG data between video and chat showed lower values under inhibited-use instruction on both muscles. To be specific, on zygomaticus major, the r-values were 3.30 under inhibited-use instruction, 4.53 and 5.32 when emoticons were allowed to be used. And on orbicularis oculi, they were 5.25 and 4.87 when emoticons were allowed to be used; significance of correlation could not be found under inhibited-use instruction ($r = 3.58$, $p > .05$). Data of frequency showed lower values under inhibited-use instruction, too. Significant difference of times/min value was found by group comparison between the inhibited-use construction and no-instruction on zygomaticus major ($t = 1.933$, $df = 22$, $p < .05$); and on orbicularis oculi ($t = 2.126$, $df = 22$, $p < .05$). It was also found between the inhibited-use construction and amplified-use instruction on zygomaticus major ($t = 2.692$, $df = 22$, $p < .05$); and on orbicularis oculi ($t = 2.571$, $df = 22$, $p < .05$). No Significant difference was found between no-instruction and amplified-use instruction, not on zygomaticus major ($t = 0.103$, $df = 22$, $p > .05$) nor on orbicularis

oculi ($t = 0.087$, $df = 22$, $p > .05$). Data above indicated no evidence of influence from fatigue or concentration. Neither could we find evidence showing such possibilities by electromyography curves observation or getting such report from our participants. Although other variables might exist, our data still showed much evidence supporting our hypothesis.

5. Discussion

The analyses above lead us to a high probability that richness of nonverbal methods is a factor greatly influencing emotional activities. Although we found many differences among instructions, most were between Chat 3 and Chats 1 and 2. The difference we found between Chats 1 and 2 was very small. This result suggests that the number of emoticons used were not strong enough to be an important factor in emotional activities.

Under no-instruction and amplified-use instruction, %iEMG data showed a higher correlation of facial muscle activities between video and chat parts. We believe the emotional activities caused by video stimuli did not simply disappear in chat parts. And they could be expressed more easily when emoticons were allowed to be used (4.2.2). This hypothesis is based on not only our results but also previous studies. According to Walther et al. (2001), when emoticons and text were used together, positive emotion could be communicated more easily, and CMC interpretation improved. Other research provided detailed information for us. Affective evaluation of emoticons seems to be an automatic process that has been analyzed by Event Related Potentials measurements (Comesañaa et al, 2013). In contrast, lack of a nonverbal method

caused a more complicated situation when emoticon use was inhibited. Words and messages can also convey emotional information, however, in a verbal way. When participants could not use emoticons in Chat 3, part of the emotional expressions had to be verbally transferred. Words and messages include complicated information. This complication will cause difficulty in discriminating emotional information from other types. As mentioned in previous studies, the lack on nonverbal cues makes the miscommunication of emotion more likely (Perry, 2010; Byron, 2008). Thus, compared with using verbal and nonverbal methods together, this process of transferring nonverbal signals into verbal ones could be less efficient. We believe when messages could be used with a nonverbal method (emoticons), a more direct, less processed way of emotional expression appeared in our experiment.

During videos, our participants had no need to exchange information with others; thus, there was a natural condition with no process of transformation from emotions to words, messages, emoticons, or any other information. Under the circumstances, emotional expressions in facial activities were direct and efficient. We found that when emoticons and messages could be used together, the frequency of facial muscle activities was higher and closer to the frequency of those during videos (4.2.3). We also mentioned in 4.1 that no significant difference in %iEMG data was found among the three instructions by group comparison. Therefore, the differences caused by emoticon use exist in frequency, but cannot be simply reflected by the comparison of mean %iEMG value in general. Compared with words and messages, emoticons are closer to nonverbal methods; thus, transformation from emotion to

emoticon is more efficient, and emotional signal recognition is eased. When emoticons could be used, participants' emotions could be expressed easily, and then new emotions could appear one after another. However, during the time when these emotions did not appear or when they did not appear obviously enough, the emotional activities emerged might not be stronger than under inhibited-use instruction. We believe it is the reason why the %iEMG value was not stronger in average than under inhibited-use instruction. It is not a simple mechanism that more emoticon use caused stronger facial activities. We believe it is more related to the efficiency of affective delivery and the process of transformation mentioned above. Of course, not all emotional activities were transformed into verbal or nonverbal information. This depends on the participants' judgments. In our experiment, because strong emotional stimuli (video stimuli) existed, the subjective demand of emotional expression should be enhanced. Thus, the chance of using emoticons became a more valuable and effective way of delivering emotional information. In contrast, under inhibited-use instruction, the inhibitory effects were also enhanced and affected participants stronger than in other situations. Under the circumstances, the complementary effect of verbal and nonverbal methods disappeared; low efficiency of emotional signal recognition could influence their judgments. If it was sensed by participants, part of the emotional expressions might even be canceled. We believe this is also one of the reasons why difference in frequency appeared among instructions.

When our participants used emoticons in context with some patterns, stronger emotional activities appeared much more than under other

circumstances (4.3.2). Because this tendency was observed from both sending and receiving occasions, we believe the improvement of affective delivery was a mutual effect on both sides. The %iEMG values of emoticon use in the three patterns were recalculated by using the method introduced in 4.2.1 (mean %iEMG values in time from the participants' opening of the emoticon list to their click on an emoticon). In 191 times, emoticon use received higher values than mean %iEMG values; in 165 times it received lower values. Based on this result, we still cannot claim that as direct stimuli, emoticons promote emotional activities when participants were watching them. However, when emoticons and messages were used together in context mentioned above, evident improvement of emotional activities was confirmed. We selected some chats (150 times) with messages of experience sharing, agreement expressing and jokes randomly from Chat 3. Then the mean %iEMG values during sending and receiving messages were calculated with the methods mentioned in 4.3.2. We compared these values with the ones of Chats 1 and 2 introduced in 4.3.2. Significant difference of %iEMG values on zygomaticus major was found in sending occasions (t = 11.198, df = 498.346, p<. 05) and receiving occasions (t = 13.232, df = 463.282, p<. 05). Significant difference were found on orbicularis oculi in sending occasions (t = 9.859, df = 482.693, p<. 05), but not in receiving occasions (t = 1.032, df = 504, p>. 05). However, the mean value of data in Chats 1 and 2 (2.78) was found higher than in Chats 3 (2.56) when receiving. Thus, possibly, the obvious improvement of affective delivery mentioned above could not be caused by using emoticons or messages independently. When verbal and nonverbal

methods could be used together, the richness of information improved. We believe it brought efficiency and smoothness to affective delivery.

Furthermore, we obtained no data indicating significant differences of facial activities or emoticon use between countries. We even found certain patterns of emoticon use from two countries in common. Although emoticon use is not an innate method of nonverbal communication, it has functional similarity to facial expressions (Comesañaa et al, 2013). And some social factors— e.g., education level—do not significantly influence facial activities (Cacioppo et al, 1992). We believe that under strong emotional stimuli, emoticon use can show features similar to facial activities.

6. Conclusions

As the conclusion of this study, we consider it is highly possible that richness of nonverbal methods is a key factor affecting emotional activities in CMC. We also believe that in certain situations emoticon use and facial activities in CMC can show features in common between different countries on a certain level. However, because this study is based on samples of Japanese and Chinese college students, results might not generalize to users' conditions in other counties. It is a limitation of this study. As mentioned above, some other nonverbal methods such as "Stamp" in LINE could not be included in this study. It is not because they are not important. Some of them are widely used and may have their own features as nonverbal methods. We believe it is necessary to find a more appropriate way to do research on these methods in future. We also realized that not all people can be influenced by emoticon use on the same level, some people who are not used to CMC or using emoticons

may show different result. We believe the discussion of more detailed information like above is necessary in future study.

In our study, we used fEMG measurements to record and analyze emotional activities emerged in CMC. It made the use of two nonverbal methods intercomparable and with calculating practicability. Detailed comparisons were conducted among different instructions, patterns and specific occasions. We believe this method can provide accuracy and logicality to CMC study. As mentioned in the beginning, in the information society, the innate methods and computer mediated ones will be both functional in many occasions. People are getting used to fusing and combining these methods so that they can take full advantage of using them. We believe our study provided a feasible method of analyzing the interaction between these methods. And we wish our works can inspire more research in this area.

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An Analysis of the Campaign Context in the U.S.: How did Political Parties Use Social Media in the 2014 Midterm Election Campaign?

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Abstract

   Contextual factors influence the ways in which social media are used in elections. By observing the 2014 U.S. midterm election campaign, this paper will consider the impact of social media on political parties, the new professionalization of campaigns, and campaign finance reform. It will first address political parties' use of social media in the election campaign. Second, it will discuss which new trends in the professionalization of campaigns have been instigated by new media. Third, it will examine the role of super PACs and 501 (c) (4) organizations in the current campaign finance regulatory regime. These questions will be tackled in this paper based on interviews with those who played a firsthand role in the campaigns, newspapers, professional journals, and official documents, including political parties' websites. In conclusion, it will reveal three significant contextual factors to consider in the polarized social media environment of American election campaigns. One is that political parties use social media to advertise their campaigns to voters, while they still prefer to use e-mails as a fundraising source. Another is how the changing media environments affect media consultants and other types of political consultants. The more digital technology advances, the more the circumstance of political consultants changes. The other factor is that super PACs play an important role in providing plentiful campaign finance for candidates, although there are regulations banning coordination with individual candidates' campaigns under the current regulatory system. Thus, in the American election system and fundraising mechanism, will American political parties really have more presence in the election campaigns by using digital media? To further research on this topic, this question needs to be considered in depth.

1. Introduction

Contextual factors such as characteristics of the political party system, regulation of electoral processes, political culture, and the roles of old and new media in election campaigns influence the ways in which social media are used in elections. By observing the 2014 U.S. midterm election campaign, it will consider the impact of social media on political parties, campaign finance reform, and the new professionalization of campaigns in the U.S. Consequently, it will suggest further discussions on examining American election campaigns using social media in comparison with other countries.

It will first address political parties' use of social media in the election campaign. There is deeper partisan antipathy and starker political polarization in the U.S. than at any point during the last two decades (Pew Research Center 2014a, 6). Moreover, ideological overlap between the two parties has declined, and the rise of ideological consistency within parties has increased negative views of the opposite party (Pew Research Center 2014a, 6).

Furthermore, political polarization prevails in the current American social media community. It has affected voters' media habits, including their use of social media. Liberals and conservatives get political news from different news sources (Pew Research Center 2014b, 1). Consistent conservatives prefer Fox News as their primary news source, while consistent liberals prefer CNN and MSNBC. There is little overlap in the news sources upon which each group relies. Similarly, voters' social media spheres are divided between right and left. The report indicates that consistent conservatives are more likely to see favorable political opinions and views on

Facebook than are typical Facebook users. Here, "typical Facebook users" means, "Facebook users who see at least some posts about governments and politics on Facebook and pay at least some attention to them" (Pew Research Center 2014b, 7).

On the other hand, consistent liberals on Facebook tend to block or unfriend someone on social media if they disagree with something that person posted about politics (Pew Research Center 2014b, 4-7). Thus, in the polarized social media sphere, the following question will be addressed: how are political parties using social media to foster their relationship with voters?

Next, the paper will give an overview of the new regulatory environment around campaign finance. In the U.S., public funding is only available for presidential elections. The regulation of campaign financing was established by the 1972 Federal Election Campaign Act (FECA). The FECA has imposed strict contribution limits and disclosure requirements on candidates and national party committees. These statutory provisions based on FECA and subsequent rules adopted under the 2002 Bipartisan Campaign Reform Act (BCRA) were not altered in advance of the 2012 election (Corrado 2014, 47). The regulatory environment around campaign finance has dramatically changed as a result of the Supreme Court's 2010 decision in *Citizens United v. Federal Election Commission* and subsequent legal and regulatory decisions (Corrado 2014, 46–47). The new regulatory environment around campaign finance has brought wealthy new political actors known as "super PACs" into election campaigns. They are considered to play an important role in campaign financing.

There are also critical organizations defined as "Section 501(c) organizations," which are named

after the applicable section of the Internal Revenue Code. The Center for Responsive Politics claims that spending by social welfare groups known as "501(c)(4) organizations" for the applicable provision of the tax code has dramatically increased in past election cycles (Center for Responsive Politics 2015a). Thus, the following question will be examined: what are the role of super PACs and 501(c)(4) organizations in the current campaign finance regulatory regime?

Third, the paper will discuss professionalization and the rise of a new class of political communication specialists in the social media election campaign. While political consultants have long played important roles in American campaigns, with a rapid proliferation of broadband and mobile phones, a new class of specialists is required to manage campaign social media, for example, by making campaign advertising available on voters' mobile devices (Kiyohara 2013, 35–36).

As the Federal Communications Commission's (FCC) 16th report (2015, 4-5) on competition in the market for the delivery of video programing shows, the number of subscribers to cable TV has been declining. Patterns of consumer behavior have changed with the high penetration of digital video recorders (DVRs), mobile digital television (DTV), Video on Demand (VOD), and social media. This pattern of program consumption has changed the political consultants' world and affected campaign ads. Thus, we ask: which new trends in the professionalization of campaigns have been instigated by new media?

These questions will be tackled in this paper based on interviews with those who played a firsthand role in the campaign, newspapers, professional journals, and official documents, including political parties' websites. The paper

will highlight the 2014 midterm election. However, these questions will be addressed in light of trends in the 2012, and 2016 presidential campaigns as well.

2. Context: Political Parties

(1)Social Media as New Campaign Ads

In the U.S., every presidential election since 2000 has showed us phases of campaign Internet use. Barack Obama's 2008 campaign became a blueprint for American political parties on how to approach social media (Owen 2013, 238). Owen (2013, 246-247) claims that political parties' approaches to social media have changed in the post-2008 election era and that the digital campaign played a more central role for the Democratic and Republican parties in the 2012 election than before. In the background, more and more registered voters have followed political parties on Facebook and Twitter (Pew Research Center 2014c, 3).

The Democratic National Committee (DNC) and the Republican National Committee (RNC) attempt to appeal to voters to follow their Facebook pages and Twitter accounts. As of February 7, 2016, the DNC had 1,190,309 fans, and the RNC had 1,949,930 fans on Facebook. In addition, the DNC had 463,050 followers, and the RNC had 563,995 followers on Twitter. The numbers show that both the RNC and the DNC have many fans and followers on Facebook and Twitter. They both post content related to their candidates and negative statements against their rivals, the electoral process, issues, and events, including ads. However, the reality is that few people pay attention to the political parties' engagements when posting and tweeting. The larger goals for the political parties in using social

media are to gain attention through other media sources that would reach a much larger audience (Owen 2013, 254–255).

Moreover, social media is the tool that allows political parties to deliver their messages to voters without being filtered by traditional media (AP 2012). For example, a day before the GOP's first TV debate of 2016 presidential candidates on August 6, 2015—although a lot of traditional media such as CNN delivered information about the event to voters—the DNC posted a three minute, 27 second video called "Brush up on basic GOP terms before tomorrow's debate" on its Facebook page. Similarly, social media enables political parties to deliver their messages to their voters directly. However, it is not always interactive communication. In fact, for political parties, social media plays a "broadcasting" role in approaching voters. The national party committees were said to have paid hundreds of thousands of dollars for advertising on social media (Willis 2014). Interestingly, it is not a tool to communicate with voters interactively. Rather, like TV ads, it is to broadcast the political parties' messages to voters.

In an interview with the author, Brandon English, Digital Director, Democratic Congressional Campaign Committee (DCCC), also recognized the role of social media in spreading information. For political parties, social media is a new political advertising channel. According to English, Internet radio and video ads are effective. English mentioned that TV ads had not been replaced by online ads, but digital media was very useful to combine users' demography and voters' data profiles, which can allow the political party to do more micro-targeted campaign ads (English, 2015).

Pandora is also an interesting new advertising channel. On Pandora, which is a music-streaming service, you can create your own profile page like Facebook, and, once you become "friends" with someone, you will see what songs your "friend" is hearing on Pandora. In a phone interview with the author, Sean Duggan, VP Advertising Sales, Pandora, also mentioned that Pandora's information, including listeners' zip codes, would be very helpful to campaign micro-targeting. He identified over 560 campaigns that used Pandora in 2014, while 180 campaigns did so in 2012. Based on the large number of Pandora's audience/listeners, more campaigns preferred to use it in 2014 than previously (Duggan 2015).

On the other hand, the Republican Party recognizes that there remains a digital divide between it and the Democratic Party. Since 2008, the Democrats are considered to have left the Republicans far behind in social media use because the Obama campaign used it quite well to win the presidential election. It is still uncertain that the Republicans have caught up with the Democrats.

For example, in an interview with the author, Democratic strategic consultant Andrew Feldman said, "I don't think they are catching up because database of voters for Democrats is better than Republicans (Feldman, 2015)." On the other hand, in a phone interview with the author, Republican pollster and political consultant Kristen Soltis Anderson said, "I don't think there was a huge difference between the Republicans and Democrats as to the 2014 campaigns. Republicans caught up with using data and social media significantly (Anderson, 2015)."

As for the 2012 presidential election, the RNC recognized there was a digital divide between the Republicans and Democrats. The RNC led the Growth and Opportunity Project under Chairman Reince Priebus in December 2012. It announced

how to grow the Republican Party and improve its campaigns, and highlighted the importance of using new media and more digital technology because it felt that the Republican Party was behind the Democrats (Barbour et al, 2014, 24–25). Compared with the Democrats, the RNC held that building better data and analyzing the data were very important to improve its campaigns. It recommended that all media incorporate social media and mobile phones into their media campaign plans because consumption of media by audience was increasingly fragmented (Barbour et al, 2014, 40). However, at this moment, it may be hard to tell whether or not Republicans will catch up with Democrats in digital strategy during the 2016 election cycle.

(2) E-mail Remained an Important Fundraising Tool

Political parties see social media as a new advertising tool. Thus, another question should be considered here: how are they fundraising on the Internet? American elections need massive funds, and the amount of online donations has been dramatically increasing.

Many presidential candidates have started to use e-mails for their fundraising strategies since the early 2000s. Presidential candidates received online donations through their websites during the 2000 presidential election campaign (Bimber and Davis 2003, 38–39).

In addition, there was a new trend whereby candidates asked for smaller, multiple donations via social media, e-mail, telephone calls, and direct mail during the 2012 presidential election (Green et al, 2014, 81). They indicate that not only Obama but also some Republican presidential candidates such as Ron Paul had extensively used online fundraising (Green et al, 2014, 93). Thus, what are

political parties using for their online fundraising?

The short answer is that they prefer to use e-mail rather than social media. To explain why, I should mention that political parties play an important role in redistributing campaign funds and redistribute the money from party leaders and safe incumbents to candidates who are running in close races. In addition, the DNC and RNC get more involved in congressional elections (Herrnson et al, 2014, 149). Furthermore, the importance of Internet-based fundraising programs by political parties' efforts is reinforced (Herrnson et al, 2014, 150).

It is suggested that American political parties are following the example of their European counterparts by transforming their presence in campaigns using digital media (Owen 2013, 247). That may be explained by the fact that political parties play a more critical role in redistributing campaign fundraising.

I then would like to articulate why political parties prefer e-mail as their fundraising tool. I attended CampaignTech Conference East in Washington D.C. on April 21 and 22, 2015. One panelist said that social media was similar to broadcasting, while e-mail was like one-on-one conversation. E-mail is considered to be a more personal and effective social media tool in campaign fundraising.

The RNC also emphasizes that e-mail remains a very important source of fundraising and notes, "E-mail continues to generate significant revenues. State parties and campaigns must invest in the data to continue to grow their working e-mail lists" (Barbour et al, 2014, 58). It recognizes a big growth in online fundraising as well, as the RNC added 1.2 million donor e-mails to their file and 2.2 million additional e-mails (Barbour et al, 2014, 56).

The National Republican Senatorial Committee

(NRSC) also acknowledges the importance of the former presidential candidate's e-mail list. Mat Lira, executive director of the NRSC, said that e-mail was the NRSC's most successful digital fundraising source (Miller, 2014). In 2012, the Romney campaign rented almost every GOP e-mail list available to build its own list of contacts and donors. In 2014, the party used the Romney campaign's list as the most important source list for online donations. In October 2014, the NRSC emailed the list no fewer than 16 times in one week. E-mails were often addressed from Romney, while the National Republican Congressional Committee (NRCC) also used it at least once. However, not only the Republicans but the DNC also used the e-mail list from the Obama campaign in 2012 (Miller, 2014).

In 2012, thanks to the 2008 Obama campaign, the Democratic Party had the advantage of an e-mail list. Laura Olin, a Democratic strategist, also said, "E-mail is still going to be the main driver. We had some success in 2012 with raising money online with social, but compared to e-mail it was still a drop in the bucket. E-mail is still going to be the most important fundraising tool in 2016" (Campaigns & Elections 2015, 28).

In the interview with the author, Brandon English also explained that e-mail played a more significant role in campaign fundraising and recruiting volunteers than social media because social media could spread information but it was easier to move people to action over e-mail (English, 2015).

However, the important thing is whether or not parties and individual campaigns have a good e-mail list. In the interview with the author, Andrew Feldman also said, "Online donation is very important. But social media fundraising doesn't work well, and it will be up to how good

your (the candidate's) e-mail list is" (Feldman 2015). It can be obviously said that e-mails remain fascinating tools for political parties' fundraising in the social media campaign era.

Furthermore, access to the voter database of the political party is crucial for presidential candidates. In the 2016 presidential election campaign, access to political party's voter databases is a big issue. The DNC shares a voter database with the presidential candidates who want to get its nomination. However, the DNC cut off the access by the campaign of Sen. Bernie Sanders (I-Vt.) because the campaign breached the firewall and accessed the voter data file of the Hillary Clinton campaign. The DNC charged that multiple staffers from the Sanders campaign downloaded the voter data of the Clinton campaign (Brumfield, Merica, 2015). On the other hand, the Sanders campaign sued the DNC in federal court and they said DNC tried to undermine the campaign (Treyz, Merica, Diamond, and Zeleny, 2015).

Thus, it can be likely said that political parties have gained more presence in election campaigns, providing the good e-mail lists that candidates need.

3. Context: Campaigning Money & Regulation

(1) Rise of Super PACs under the New Regulatory Regime

As noted already, the basic federal regulation of campaign financing was enacted by the 1972 Federal Election Campaign Act (FECA). The FECA has imposed strict contribution limits and disclosure requirements on candidates and national party committees. In addition, the Federal Election Commission (FEC), which administers and enforces the FECA, was

established by Congress in 1975. These statutory provisions based on the FECA and subsequent rules adopted under the 2002 Bipartisan Campaign Reform Act (BCRA) did not change in advance of the 2012 election (Corrado 2014, 47).

However, the Supreme Court's 2010 decision in *Citizens United v. Federal Election Commission* and subsequent legal and regulatory decisions resulted in a new regulatory environment of unrestricted financial activities in federal campaigns (Corrado 2014, 46–47). The conservative group "Citizens United" produced a documentary movie criticizing Democratic presidential candidate Hillary Clinton and tried to air it during the 2008 presidential campaign. In opposition to their intentions, the FEC invoked the 2002 BCRA to stop "Citizens United" from airing the movie. "Citizens United" subsequently filed a lawsuit against the FEC that eventually made it to the Supreme Court, which found that the FEC had violated the First Amendment (Kiyohara 2013, 30–31).

The Supreme Court decision opened a new way for federal political committees called "super PACs" to use unlimited contributions to expressly advocate the election of candidates (Corrado 2014, 46). This phenomenon is based on the Court's majority ruling that the First Amendment does not permit restrictions on speech based on the identity of the speaker (Corrado 2014, 49). In short, the Court's decision permitted any organization that is allowed to engage in political activity to spend money independently in support of candidates.

The FEC thus implemented the decision in 2010 and approved super PACs as independent expenditures-only committees distinguished from traditional PACs. Super PACs can raise unlimited amounts of money from corporations, unions, associations, and wealthy individuals, and spend unlimited amounts to advocate for or against political candidates. However, the FEC prohibits them from directly donating to political candidates or coordinating with political candidates on expenditures, such as campaign ads. In other words, super PACs should not be coordinated with political candidates. Still, super PACs often have close connections with candidates, congressional leaders, and party leaders (Magleby and Goodliffe 2014, 216).

It is said that super PACs played an important role in financing TV ads during the 2012 presidential campaign (Kiyohara 2013, 31, 38). For instance, "Restore Our Future," which supported Romney, broadcast advertisements attacking Newt Gingrich because Gingrich jeopardized Romney's lead in the polls before the Iowa caucuses (Magleby and Goodliffe 2014, 228). Most super PACs spent a tremendous amount of money on TV ads. Not only in presidential elections, but also in congressional elections, super PACs played an important role in financing (Magleby and Goodliffe, 2014, 229). With regard to the 2014 senate election, super PACs comprised half of the top 10 Senate election spenders (Vandewalker, 2015a, p. 7).

In the 2016 election cycle, super PACs have already helped presidential candidates. For example, a super PAC backing Carly Fiorina, a Republican presidential candidate, "is organizing events for the candidate in early nominating states, handling advance work and setting up merchandise tables (Confessore, 2015)." Also, Gold and Rucker (2015) reported that super PACs had played an extremely important role for fifteen Republican contenders that month.

The intense race among many Republican candidates causes candidates to run out of

money. The former Texas governor and Republican candidate Rick Perry was short of funding in early August 2015. His campaign was no longer able to pay its staff. The Opportunity and Freedom PAC, a super PAC supporting Perry, tried to backfill the campaign. Gold and Rucker (2015) quotes Austin Barbour, senior adviser to the Opportunity and Freedom PAC: "We knew we would have to do more than just paid media and there's nothing in the playbook that says we can't do that." The pro-Perry effort was one of the most epochal examples of super PACs playing a very important role in the 2016 presidential race (Gold and Rucker, 2015). Finally, Rick Perry withdrew from the presidential election campaign on September 11, 2015. It is too early to tell how long super PACs can prolong campaigns.

As of September 2015, super PACs fund many candidates, and Republican super PACs, in particular, have already raised or committed hundreds of millions of dollars in the 2016 election. On the other hand, Democrats have tighter restrictions on super PACs than Republicans, but super PACs will function to keep the race intense for a longer period (Confessore, 2015). Thanks to super PACs, cash-strapped campaigns will not need to withdraw from the race immediately.

(2) 501(c)(4) Organizations and "Dark Money"

Super PACs are not the only influential organizations that should receive attention here. There are also some types of 501(c) groups categorized by Internal Revenue Service (IRS) Code. Among them, nonprofit and social welfare 501(c)(4) organizations play an important role in campaign financing. Since their primary purposes are social welfare activities, they can keep their donors secret; on the other hand, standard political committees must disclose the donors under the FEC guidelines (Schwartz, 2012). They existed before the 2010 Supreme Court decision. The IRS brought a regulation into effect in 1959, which meant that these groups were allowed to participate in some political activities as long as politics was not their main purpose (Center for Responsive Politics 2015b). However, in 2012, they were considered the most-interested organizations since the number of such groups increased and since they rivaled super PACs in expenditures (Magleby and Goodliffe 2014, 243–244).

The primary purpose of 501(c)(4) organizations' activities thus should not be political engagement, while they can also receive unlimited donations from corporations, individuals, or unions. These donations are not tax-deductible, in contrast to 501(c)(3) organizations under the IRS code. Furthermore, there are some limitations on 501(c)(4) organizations getting involved in political activities. For example, they are not allowed to give money directly to candidates and endorse a particular candidate (Johnson 2016, 231). However, they can run ads mentioning issues such as regulations and taxes related to a candidate, and lobby for particular causes. They also do not have to disclose their donor lists to the IRS except during audits (Johnson 2016, 231). That is why these organizations' donations are often called "dark money" (Center for Responsive Politics 2015a).

Many groups and political operatives that formed super PACs also established affiliated 501(c)(4) organizations as they can provide choice to donors who want to contribute a huge amount of money yet remain anonymous (Corrado 2014, 67). For example, the conservative

501 (c) (4) organization, Crossroad GPS, and its sister super PAC, American Crossroads spent $48 million in the 2014 midterm election. Both organizations have the same president, Steven Law. These two groups were the biggest outside spenders in the midterms, excluding the parties themselves (Vandewalker, 2015b). While Republican donors complained about both groups for spending hundreds of millions of dollars in 2012, only to lose most of the races in which they campaigned (Goldmacher, 2014), the Center for Responsive Politics shows that their success rate dramatically increased in the 2014 midterm election, as compared to the 2012 election (Center for Responsive Politics, 2012, 2014).

4. Context: Change of Professionalization

It is quite well known that political consultants have played a big role in U.S. election campaigns. The development of political consultants promoted the development of election campaigns from party-centered to candidate-centered (Herrnson 2013, 136). Furthermore, campaigns are considered to depend heavily on various political consultants such as media teams, pollsters, and direct-mail specialists (Johnson 2016, 235).

Since the 1990s, a transformation has occurred, which means professional political consultants have played a significant role in advising even those who run for office below the statewide level, and political consultants make key decisions and strategy as well as develop campaign communications for the clients (Johnson 2016, 15). However, Johnson (2016, 15) remarks that new digital technology such as mobile and the Internet is leading to another conversion.

As indicated previously, according to the FCC,

the number of subscribers to cable TV has been declining. Broadcasters too are using various ways to respond to consumers' demands, which means that they are providing their programs not only on traditional TV but also on mobile DTV, VOD, online video distribution, and social media (Federal Communications Commission 2015, 4). The change of consumption patterns thus has affected TV advertisements, and the revenue of TV ads is decreasing (Lafayette, 2015).

For instance, in the interview with the author, Kristen Soltis Anderson answered, "I think very much so," when I asked her, "Do you think change of media environment (consumption of TV programing from cable to online) affects political consultants' jobs? (Anderson, 2015)" In addition, in an interview with the author, Democratic political media and creative consultant Colin Rogero admitted that people's viewing habits had changed, although TV was still the primary information source for them. He commented about campaign ads in the 2014 midterm election, "The old way doesn't work well anymore." He also suggested that 30 seconds for TV ads was still standard because of cost effectiveness and repeat messages, but most Internet and mobile ads are 15 seconds long. He emphasized that the percentage of media budgets allocated for digital advertising for campaigns would continue to grow (Rogero, 2014).

In an interview with the author, veteran Democratic media consultant Peter Fenn suggested that popular media consumption had changed rapidly. Where advertising was concerned, he signified that people were watching programming on Apple TV and Amazon Prime rather than on network TV and cable TV. As for changing political consultants, since the way of media consumption was transformed,

Fenn attached significance to reaching voters who depended on smartphones and skipped TV ads on their DVRs. He commented, "people are relying on social media, so that creativeness is more important to media consultants. (Fenn, 2015)".

Furthermore, as campaign strategies are becoming more and more digitalized such as through use of social media and creation of sophisticated data to reach voters, American election campaigns need more and more consultants. In the interview with the author, Andrew Feldman emphasized that data consultants came into election campaigns as new consultants. He told me that they played an important role in creating models for how campaigns could reach voters online (Feldman, 2015).

Thus, changes in programming consumption patterns affect both TV advertising and the way media consultants work in election campaigns. Not only that, but the more they are digitalized, the more consultants are needed in campaigns. It is clear that more sophisticated digital technology is transforming the role of political consultants.

5. Conclusion

This paper reveals three significant contextual factors to consider in the polarized social media environment of American election campaigns. One is that political parties use social media to advertise their campaigns to voters, while they still prefer to use e-mails as a fundraising source. Political parties also have the advantage of good voters' email lists to candidates for fundraising in campaigns. Another is that super PACs play an important role in providing plentiful campaign finance for candidates, although there are

regulations banning coordination with individual candidates' campaigns under the current regulatory system. New outside groups, including super PACs and 501(c)(4) organizations, are considered to fund the candidates indirectly to fight intense races. The other factor is how the changing media environments affect media consultants and other types of political consultants. It is interesting that, in the interview with the author, Colin Rogero said, "The old way doesn't work well anymore" (Rogero, 2014). The more digital technology advances, the more the circumstance of political consultants changes. It is rapidly changing; thus we need to observe carefully how it is advancing.

As a closing statement, the paper covers contextual factors to provide further discussions on examining American election campaigns using social media in comparison with other countries. For example, unlike in the U.S., the Japanese election system is more party-centered. In Japan, there is a public subsidy system for political parties, in line with the Political Party Subsidy Act passed in 1994. Because of this public subsidy system, candidates for public offices in Japan do not need to put as much effort into fundraising as politicians in the United States do, although online contributions are gradually increasing in Japan (Chen & Kiyohara, 2015).

On the contrary, in the U.S., public funding is available only for the presidential election. Furthermore, once presidential candidates receive the public funding, they have to agree to limit campaign spending to a specified amount. Presidential candidates feel the public funding has few advantages (Kiyohara, 2011, pp. 10-12). Outsider groups such as super PACs play an important role in financing the campaigns.

Thus, in the American election system and

fundraising mechanism, how will the relationship between candidates and political parties transform as the campaigns become more digitalized? Will American political parties really have more presence in the election campaigns by using digital media? To further research on this topic, these questions need to be considered in depth.

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A Proposal for Open Data of Sightseeing Event Information

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Abstract

Development events and application contests are held in various locations as a way to promote open data, and have demonstrated results to an extent. Promotions of open data by basic units of government require implementation of open data into daily municipal services upon considering the acceptability of local governments, and not merely launching the above measures intensively in the short term. Nevertheless, many local governments are promoting open data with limited human resources and budget amid vast operations. Following such circumstances, the research attempted to create open data and develop applications from sightseeing events hosted by local governments with the objective to establish open data promotion in conventional municipal operations. Using the sightseeing events hosted by local governments as case examples, the research attempted to create open data from organizing data from pamphlets distributed by local governments. The data was leveraged to develop an application for mobile devices that guide users through sightseeing events, and its demonstration experiment using this application was conducted at the "*Dai 15 kai Arukou! Bunka no Michi* (15th Annual Let's Walk the Cultural Path)*"* event held in Higashi-ku, Nagoya. The demonstration experiment clarified the application's effectiveness, and succeeded in demonstrating that the tested open data of sightseeing event information were useful. In addition, as a result of the research, the sightseeing event information for the "*Dai 16 kai Arukou! Bunka no Michi* (16th Annual Let's Walk the Cultural Path)*"* event is now scheduled to be made public as Nagoya's open data. Based on the above, the paper discusses on the promotion of open data for conventional municipal operations while considering the acceptability of local governments.

1. Introduction

Japan's promotion of open data is starting to become active among basic units of government ("local governments"), and the number of cities that are promoting data has reached to 164 as of October 2015[1]. Local governments are promoting open data by converting information that they possess into open data with usage rules that enable secondary usage and in machine-readable formats. In promoting open data, many local governments are disclosing statistics, disaster prevention and sightseeing information as information that is readily available for disclosure (MIC, 2014). The Japanese government has also assisted in the promotion of open data for local governments by opening a public cloud system[2] with sightseeing information as branches, and further vitalization of promoting open data among more local governments are anticipated. However, promotions of open data for local governments face the issue of having unclear specific advantages for local governments because there are only a few public service case examples (LASDEC, 2014). Development events and application contests such as Ideathons and Hackerthons are held and demonstrate results to an extent, but not many of them directly led to promotion of open data for local government. Moreover, according to Hayashida (2007), operation loads for local government employees, who are also the main players for the promotion of open data to decentralize the government, are increasing and call for consideration. Promotion of open data by basic units of government require implementation of open data into daily municipal services upon considering the acceptability[3] of local governments, and not merely launching development events, application contests and

other open data promotion measures intensively in the short term.

Following such circumstances, the research aims to establish the promotion of open data in conventional municipal operations. Sightseeing information in which local governments can easily convert to open data were used as case examples upon considering the acceptability of local governments. The research test-created open data from actual sightseeing information communicated by local governments, and conducted demonstration experiments with sightseeing applications that leveraged the data. The results will also be taken into account in addition to acceptability to discuss promotion of open data in conventional municipal operations.

2. Considerations of Open Data and Their Utilization

2.1 Relevant Case Studies

Since the promotion of open data started in full scale in 2012, open data trials and creative utilizations are being conducted in Japan to promote open data among local governments (Fukuyasu, Ura et al., 2013) (Koike, Fukuyasu et al., 2015) (Sugimoto, Ikeda, 2015). In particular, creative service developments that leverage open data were conducted through hosting events such as Ideathons and Hackerthons, including International Open Data Day. Players of various status and background participated in these events and materialize the creation of public services through collaboration between the private and public sectors.

2.1.1 Biwako Great Fireworks Festival

Shiga's civic hack group, Code for Shiga/ Biwako[4], started its open data promotion

operations for the Biwako Great Fireworks Festival in 2014. The group collected and organized information on the fireworks festival and sightseeing owned by the local government and relevant groups to convert into open data. As a result, nine types of applications that used open data were created to provide new services during the fireworks festival. According to the group (2014), although measures were implemented on a concentrated and short-term basis through aiming for the common factor, the fireworks festival, promoting measures with long-term perspectives is essential when considering the future. In addition, as Shoji (2012) points out, development in events have issues in that they are difficult to brush up as administrative services. Furthermore, Hayada (2014) argues on the importance of promoting open data from a circulating perspective, and mentions how open data events are not being coordinated well with local governments is one issue requiring a solution. Event personnel need to have event achievements and developed contents linked to open data promotion measures conducted by local governments, such as brushing them up as public services, instead of positioning them as temporary trends through working together with local governments. The research will display utilization case examples through testing of open data conversion so that they will lead to promotion of open data by local governments in the middle to long-term perspectives. It will thus focus more on open data promotion for conventional municipal operations through methods that will not increase burden for local government employees.

2.1.2 Open Data Use Case Contest

The Open Data Use Case Contest[5] hosted by MIC and METI was held in the end of 2013. The contest aimed to develop actual services based on ideas created at Ideathons. Out of the numerous works submitted, "NGY Night Street Advisor: The Safe and Reliable Navigation System for Pedestrians that Guide through Bright Routes" by the National Institute of Technology, Akashi College, won the Grand Prize. The application prevents crime by displaying how bright street lights are on the map to avoid gropers and crimes. The data on street lights were acquired from Nagoya after students and teachers requested cooperation (Arai, Itani et al., 2014).

The data on Nagoya's street lights, however, were provided for use only in the contest, and are not yet disclosed as open data as of 2015. In an interview conducted by us, Nagoya commented that the data on street lights cannot be disclosed as open data due to security reasons. Like this case, there are limits on converting some data to open data even when there are needs to do so because local governments have information that cannot be disclosed for a variety of reasons. In addition, each set of information is possessed by departments in charge. Acquiring the information requires understanding and cooperation of the government agency, but there are still many local governments that have yet to fully acquire understanding internally. Although it is important to newly convert beneficial information possessed by local governments in order to accelerate their open data promotion, it is desirable to first promote open data based on information that are already disclosed. The research will consider testing open data conversion of information already disclosed by local governments so that open data of information applicable for disclosure by local governments can be utilized.

2.2 Research Principles

Based on the issues revealed in preceding cases, the research aims to promote open data with consideration towards acceptability of local governments. Promotions of open data are conducted through methods that differ by local government, ranging from data collection, organization and disclosure. Aoki (2013) argues that when local governments work on promoting open data, it is more effective to start from the information that has conventionally been communicated already. In addition, Shimizu (2013) states that development based on data rather than needs will lead to higher degrees of completion when utilizing open data in Hackerthons. Working from conventional information is thus effective when promoting open data upon considering the acceptability of local governments, and contents that can better lead to public services can be anticipated for development as well. The research assumes that local governments will convert information collected, organized and communicated as their conventional operations to open data from the acceptability standpoint. Following this, the flow from information collection to communication in conventional municipal operations and the flow from information collection to disclosure in open data promotion were compared so that conventional municipal operations and open data promotion methods will correspond (Figure 1). The method described in "Let's Start Open Data: The Handbook for Local Governmental Bodies" by MIC (2014) was determined to be the method appropriate. The handbook describes contents on information organization in Step 3, and information communication in Steps 4 and 5. Following this, the research distinguishes between the two stages of "Information
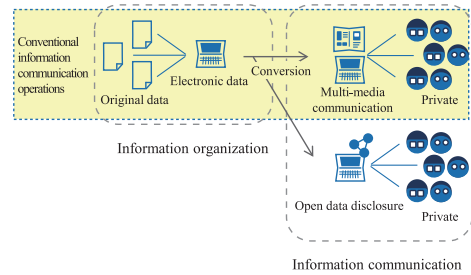

Figure 1 Open Data Promotion in Conventional Operations

organization" and "Information communication" through using sightseeing event information as model cases, and discusses open data promotion that will be readily accepted in conventional municipal operations (Figure 1).

3. Attempts to Convert to Open Data

3.1 Converting Sightseeing Event Information to Open Data

3.1.1 Subjects of Research

The research will examine regional events in the "Cultural Path" area in Higashi-ku, Nagoya, Aichi[6] ("Higashi-ku"). The Cultural Path area is about 8km^2 in area, stretching from central to western Higashi-ku, and is one of Nagoya's prominent sightseeing areas in which precious historical and cultural heritages from modern times remain. The area is maintained and utilized as an area with vivid modern culture of Nagoya as indicated in the "Historical Town Planning Strategy" developed by Nagoya (2011). The Cultural Path Area conducts walking events as well as historical and cultural events that utilize its characteristics. One of such events is the walking event, "*Arukou! Bunka no Michi* (Let's Walk the Cultural Path)" Events and stage events that educate on the region's history are held in sightseeing spots ("spots") scattered within the

Cultural Path area in the event. The event also possesses the following characteristics:

(1) Continuous hosting through public-private collaboration

The "*Arukou! Bunka no Michi*" event is held on November 3 (Culture Day) every year, and marks its 15th anniversary in 2014. Higashi-ku hosts the event, and forms an executive committee with Nagoya, residents and citizen groups to conduct planning and operation. The event is held through cooperation between public and private sectors, and is one in which local residents also embrace.

(2) Approaches for younger generations

"*Arukou! Bunka no Michi*" is an event that is popular among seniors due to geographical characteristics, and faces the issue of not being as recognized by younger generations. The event is considering various approaches for younger generations by communicating information through Facebook, for example, and anticipates participation from the generation in addition to seniors for its executive committee.

(3) Information communication from the local government

The executive committee manages and communicates information pertaining to the event. In particular, Higashi-ku conducts collection, organization and communication of event information as part of its municipal operations. Sightseeing events are generally held responsible by divisions that promote sightseeing and town planning, but "*Arukou! Bunka no Michi*" has been run by accounting departments.

Based on the following characteristics, the research will examine "*Arukou! Bunka no Michi*"

to experiment on open data. First, the private-public cooperation structure is focused for promotion of open data in (1), but according to Nishida et al. (2013), but one of the reasons that Sabae, Fukui is proactive in open data promotion is that the city already had private-public cooperation rooted within them. Therefore, a cooperating structure between the private and public sectors can anticipate vitalization of open data promotion. For (2), one of the advantages of promoting open data for local governments is resolution of regional issues (MIC, 2015). Through utilizing open data, applications for mobile devices can be developed. And considering the penetration rate[7] of smartphones among younger generations, participation of the generation in the event can be incited by developing applications that leverage open data. For (3), many local governments have mainly information departments work on the promotion of open data, but information to be converted to open data are possessed by various departments. When considering the medium to long-term effects of open data promotion, the department that originally possesses the information should work on the promotion rather than concentrating the operations to information departments. It is thus important in terms of acceptability from local governments as well if the original department works to promote open data for information collected, organized and communicated through conventional operations. Based on the above, the research will examine "*Arukou! Bunka no Michi*" as its research subject.

3.1.2 Flow of Sightseeing Event Information

The flow of sightseeing event information in conventional municipal operations are represented as below when converting the sightseeing event

information of "*Arukou! Bunka no Michi*" into open data (Figure 2).
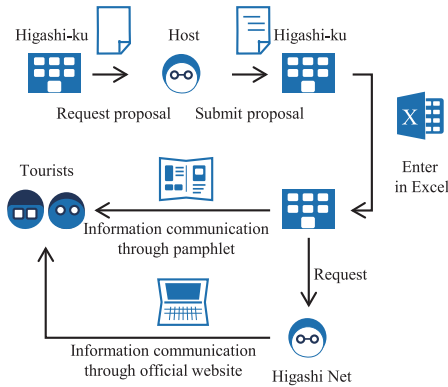

Figure 2 Flow of Event Information for Research Subject

In order to collect event information, the executive committee first had local residents and citizen groups that host events in each spot write a proposal. Based on the information written in the proposals, Higashi-ku employees organized the information on Microsoft Excel ("Excel"). Because data confirmation by employees need to be streamlined and tasks were consigned to private companies, the formatting needed to be legible to humans. The formatting thus required shaping of data, such as combining cells and entering multiple contents within a cell, and is not as machine-readable. Information is communicated through pamphlets and the official website[8] based on the organized information. Leaflets are printed doubled-sided onto A2-size papers, distributed to participants on the day of the event as information and support event participation for tourists (Figure 3). The area map and event information are printed on the leaflet, and event information are listed by spot to see at a glance (Figure 4). On the other hand, the official website is managed and operated by the citizen group "Higashi Net[9]," a member of the executive committee. The information included are similar to those on the pamphlet, but also play the role of communicating pre-event information prior to the event date.

Figure 3 "*Dai 15 Kai Arukou! Bunka no Michi* (15th Annual Let's Walk the Cultural Path)*" pamphlet
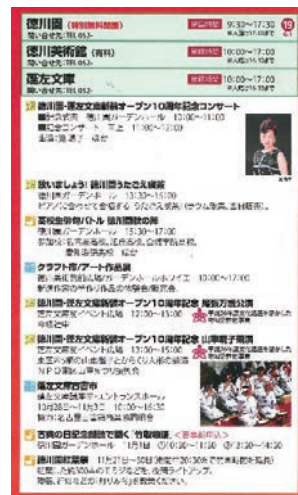
Figure 4 "*Dai 15 Kai Arukou! Bunka no Michi* " pamphlet (magnified view of dotted area in Figure 3)

3.1.3 Procedures for Open Data Conversion

The research experiments on the conversion of information in the pamphlet to open data. The pamphlet information is entered in Excel and digitalized. The Excel formatting is not excellently machine-readable through cell combinations and multiple contents included in single cells, but involves little work for local governments because it is information that has already been communicated by them and digitalized beforehand, and thus easy to link to open data promotion from conventional municipal operations.

Following this, we organized information to convert to open data based on the information printed on the pamphlet. The organized data was test-converted to open data upon using an open data platform (Figure 5).
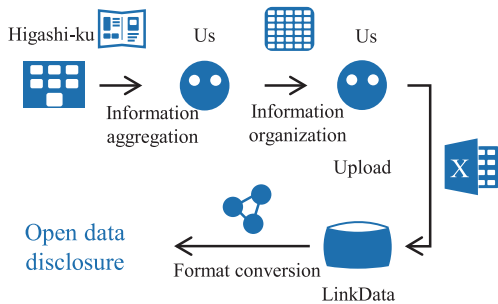
Figure 5　Flow of Open Data Conversion

3.2 Organization of Sightseeing Event Information

3.2.1 Types of Information

Open data of sightseeing event information are disclosed by some local governments other than the Biwako Great Fireworks Festival mentioned in the previous chapter. Key governments include Fukui and Toyohashi, Aichi (Table 1).

Fukui discloses open data on sightseeing events held in the prefecture in CSV format[10]. Names, phone numbers and locations of public

Fukui	Toyohashi	
Name of event	Event name	Event detail information
Content	Summary	
Genre		
Event start date	Scheduled date	Event time information
Event end date		
Event location	Location	
District	Address	Facility information
Town		
Street address		
Phone number	Phone number	
Transportation method	Transportation	

Table 1 Examples of Open Data on Sightseeing Event Information

facilities and sightseeing facilities where events are held are disclosed in addition to information on event names, times and details. Toyohashi, Aichi also discloses open data on sightseeing events in CSV format[11]. Similar to Fukui, the city discloses names, phone numbers and locations of public facilities and sightseeing facilities where events are held in addition to information on event names, times and details.

Based on these examples, the information necessary as sightseeing event information are those pertaining to event details and event locations. Many sightseeing events are held in public facilities and sightseeing facilities. Facilities can be used for purposes other than sightseeing events, and when considering the versatility of information, the information on facilities and events should be separately categorized when converting to open data. Both Fukui and Toyohashi disclose open data on sightseeing facilities and public facilities as well, and can be concluded as information that has value in usage for situations other than sightseeing. In addition, sightseeing events are sometimes held multiple times with the same

title. Local governments can skip the task of repeatedly entering information by making information on event times independent from event details. The research considers the acceptability of local governments to distinguish between facility information and event information, and have event details and event times separated within event information (Figure 6).
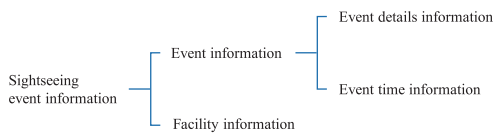

Figure 6 Organization of Sightseeing Event Information

3.2.2 Organization of Information for Research Subject

The leaflet information that is collected, organized and communicated by the local government was categorized into three: facility information, event details information and event time information. These information are conventionally organized through Excel that has been used in event management by local government employees. By considering open data conversion and reviewing the Excel format while also keeping legibility for humans, the research speculated that the data will lead to open data promotion that demonstrates acceptability for the local government.

(1) Facility information

Information on the spots that would be the event venues were organized as facility information (Table 2). The information printed on the pamphlet were facility names, phone numbers, opening hours

and numbers for the stamp rally to be held on the event day. Together with organizing the data, addresses, latitudes, longitudes, transportation and closing days were acquired through the official website and Google Maps based on the case examples of Fukui and Toyohashi. Addresses and other added information were thought to be additional burdens for the local government when considering acceptability for the local government, but such information are basic information on the facilities and are also made public on the official website, and thus can be concluded as information possessed by the local government. Location information can also be continually used for the years ahead after once acquired because they don't significantly change. The acquisition of such information thus can be concluded as not causing considerable burden to the local government.

Term	Summary	Example
id	ID number	1
spot_name	Facility name	徳川園
yomi_name	Pronunciation	Tokugawaen
stamp	Stamp rally number	19
comment	Notable information	Special free admission
info	Outline	
open	Opening hours	09:30:00
last_admission	Last admission	17:00:00
close	Closing hours	17:30:00
subway	Nearest subway station	Get off at Meijo Line "Ozone" …
bus	Nearest bus stop	Get off at Meiguru "Tokugawaen" …
tel	Facility phone number	0529358988
fee	Usage fee	
map	Address and name when searching map	
url	Website url	http://arukou.higashinet.net/facil…
img	Photo	http://arukou.higashinet.net/bunk…
lat	Latitude	35.194478
lng	Longitude	136.932575

Table 2 List of Facility Information

(2) Event details information

For the event details information, sub-event information held in respective spots were each organized based on the information in the

pamphlet (Table 3). Event names, venues within spots, outlines, performers, costs, capacities and conditions including reservation requirements were included in the pamphlet, and were organized. Furthermore, genre information were also organized following that the pamphlet categorized event genre.

In addition, as part of event details information, spot IDs in which events are held were referred to from the facility information and organized. Assigning Ids based on the structure of the relational database facilitates calling of data. This enables association with other data, and eliminates tasks to enter relevant information.

Term	Summary	Example
id	ID number	1
title	Event title	Newly renovated, 10th anniversary concert…
subtitle	Event subtitle	
place	Detailed location in which the event will be held within the venue	Tokugawaen Garden Hall
spot	Venue information ID	1
genre	Event genre ID	2
info	Event details	Commemorative ceremony and concert…
limit	Capacities and information for bad weather conditions	
fee	Participation fee	Free
presenter	Presenters, supporters	Satoko Kakehi, Mamiko Kakehi, Kimura…

Table 3 List of Event Details Information

(3) Event time information

Information on event dates, starting times and ending times were organized as information pertaining to event times printed on the pamphlet (Table 4). Event names are linked with time

Term	Summary	Example
id	ID number	1
event_id	Event information ID	1
date	Event date	11/03
start	Starting time	10:00:00
end	End time	11:00:00
comment	Supplementary information	Concert

Table 4 List of Event Time Information

information through using Ids assigned to events in the event details information.

3.3 Conversion to Open Data

The organized data were test-converted to open data. When converting the research used LinkData[12], an open data platform.

3.3.1 LinkData

LinkData is an open data platform operated by LinkData. Once registered an account, various private entitites together with local governments can disclose open data. More than 2,700 data has been registered as of July 31, 2015, of which about 2,000 are widely disclosed as open data.

Advantages of using LinkData are that Excel files can be easily converted to open data just by uploading, data can be jointly edited by multiple users and that data can be automatically converted to RDF and various formats when making them open data. Entities that do not possess much information technology may thus easily disclose open data to expand their capabilities of utilizing their information.

The research uploaded the Excel data as organized in the previous chapter according to the procedures directed by LinkData. The dataset "Walking the Cultural Path 2014[13]" was also prepared, and data were uploaded within the dataset. As indicated in Table 5, files on cooperating stores and transportation information, in addition to sightseeing event information, were registered onto the dataset and disclosed as open data.

Parts of open data on bus information[14] provided by the Transportation Bureau City of Nagoya are also disclosed within the dataset. Because the open data provided by the Transportation Bureau City of Nagoya is not in a

File name	Details
bunkanomichi_bus_route	Information on bus services operating within the area
bunkanomichi_bus_stop	Information on bus stops in the area
bunkanomichi_event_genre	Information on event genre
bunkanomichi_event_list	Information on event details
bunkanomichi_spot_list	Information on facilities holding events
bunkanomichi_event_timetable	Information on event times
bunkanomichi_kyousanten_genre	Genre of cooperating stores
bunkanomichi_kyousanten_list	Information on cooperating stores
bunkanomichi_station	Information on stations within the area

Table 5 List of Open Data Tested

format that excels in machine readability through cell combinations, we shaped the data requiring revision before registering them to the dataset.

3.3.2 Rights Handling of Open Data

In addition, rights handling need to be conducted to display "usage rules applicable for secondary usage" when converting to open data. We referred to Creative Commons Japan[15] and notated licenses for respective data.

Many of the open data by local governments possess "CC-BY" license, which only requires display of credit for the original author, and permits changes and usage for commercial purposes. The license has the least amount of limitations among Creative Commons Licenses, and data licensed can be widely used. Nagoya, Higashi-ku's superior organization, also discloses open data with "CC-BY" license. Following such circumstances, the test-converted open data were disclosed as data with "CC-BY" license upon obtaining approval from the executive committee.

4. Application Developments with Utilization of Open Data

4.1 System Development

An event guide application for mobile devices was prototyped upon utilizing the test-converted

open data on LinkData. The application targeted external tourists visiting "*Arukou! Bunka no Michi*". The event had the issue of having "few younger generations participating in the event," and the executive committee hoped for contents that will stimulate the generation's participation. Following such circumstances, the research developed an application for mobile devices as an approach targeting the younger generation.

The application development was conducted on "LinkData App[16]," the affiliated sister site of LinkData. LinkData App uses open data on LinkData to enable online application developing on browsers, and various entities may develop contents as long as they have and established internet environment. The research used LinkData App to develop the sightseeing event guid application, "Arukou! (Let's Walk) Guide (Figure 7)."

Figure 7 "Arukou! Guide" Screen Display Example

4.2 Application Features

A guiding feature that urges tourists to participate in sightseeing events was thought to be an effective application feature. In order to achieve this, information on the official website

were used for missing information together with test-converted open data (Figure 8).
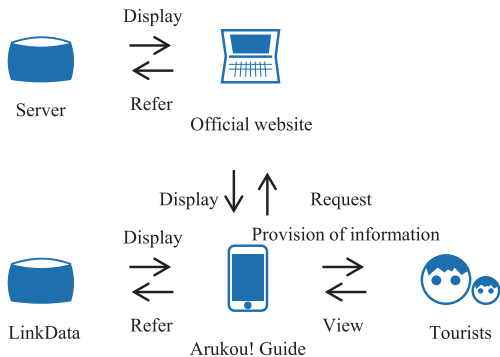

Figure 8 Coordination with the Official Website

In addition to event details held in spots, information to access sightseeing spots in which the events are held are also necessary to guide through sightseeing events. Conventional printed pamphlets only display access information through maps, and event information were only grouped by spot. On the other hand, application guides enable event searches by genre and timefor event details, and may be added bus information and routes in addition to maps for access information. In addition, information that was missing in the test-converted open data were compensated by coordinating also with the official website. Materializing these guiding features enable tourists themselves to select information as desired and create an event guide customized to individual tourists compared to conventional methods.

Features of the "Arukou! Guide" are as follows:
"Research surroundings" feature

This feature enables searching for spots and bus stops within 500m-radius of the user's current location by using the GPS feature of mobile devices. Spots and bus stops are listed in order of proximity to the user's current location. Features

that link to spot detail pages on the official website, display bus route information and link to bus route schedules disclosed by the Transportation Bureau City of Nagoya by bus service were also added. The route guide provided by Google Maps was also linked to display routes leading to the destination to achieve an even smoother sightseeing guide. The feature was added through using Google Maps JavaScript API v3 made public by Google.
"Research venue" feature

The feature enables searching for spots within the area from a list. Similar to the "Research surroundings" feature, the application added features that link to the spot details page of the official website and guide through routes. Keyword searches for spot names and time were also enabled by adding a search window, and made selection of information possible for users.
"Research bus" feature

Because "*Arukou Bunka no Michi*!" is held in the Cultural Path area, aimlessly walking in the event would be quite exasperating even for adults. Following such circumstances, a search function for bus routes running within the area was added. Bus routes are listed to see spots along the way at a glance. In addition, features that links to the spot details page of the official website and guides through routes were also added, similar to the previous features.
"Research events" feature

The feature enables searching by genre and time for events held within the area, and lists results. Detailed information for events listed can also be viewed. In addition to information included in the pamphlet, map information around the venue through Google Maps, venue pictures taken from the official website, and transportation methods to event venues are

displayed.

"Research nearby stations" features

This feature enables researching of train stations within the area together with surrounding areas. The feature considers needs when tourists head home after the event, and by adding route guide functions as similar to the previous features, the application can present smooth routes heading home to tourists.

4.3 Demonstration Experiment
4.3.1 Outline

A demonstration experiment was conducted to verify the usefulness of the application that utilized the test-converted open data. The usefulness of the event guiding feature was compared with the pamphlet, the conventional guiding method. The promotion of open data on sightseeing event information will be discussed through the experiment results.

The experiment was conducted on the "*Dai 15 kai Arukou! Bunka no Michi* (15th Annual Let's Walk the Cultural Path)." There were a total of 22 participants including students and general event participants. Ages ranged from 20s to 50s, with participants in their 20s construing 80% overall. Participants gathered at the former residence of Sasuke Toyoda in the center of the Cultural Path, and each toured around the area using the pamphlet and application for about six hours after receiving explanation on how to use the application. With 27 spots scattered within the area, the participants went around as they wished. After certain time passed, all participants gathered at the former residence of Sasuke Toyoda once again, and answered questions on the evaluation sheet.

4.3.2 Results

For the four features that used the test-converted open data for the research, participants evaluated on a scale of 5 (5: Strongly agree, 4: Agree, 3: Neither, 2: Don't agree as much, 1: Disagree). For the event guiding method as well, the application and leaflet were compared on a scale of 5 (5: The app helped, 4: The app helped slightly more, 3: Same, 2: The pamphlet helped slightly more, 1: The pamphlet helped). Evaluations on features are indicated on the top part of Figure 9, and the evaluations compared with the pamphlet are indicated on the bottom part of Figure 9.
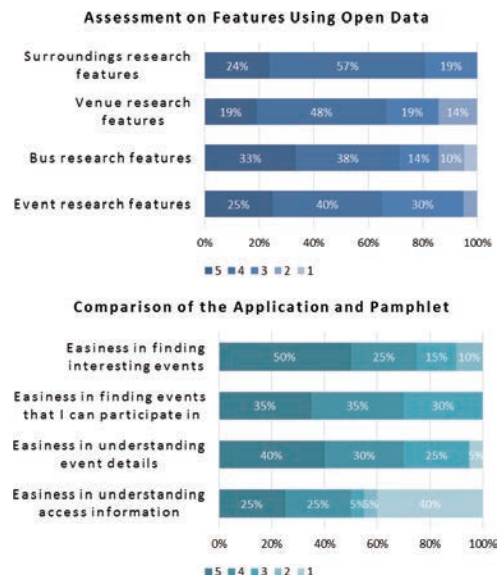

Figure 9 Experiment Results

The app generally received good evaluation for all questions. According to the question pertaining to "ease of understanding access information" comparatively evaluating the application and pamphlet, the app was easier to understand than the pamphlet. In addition, comments such as "Content categorization was

helpful in searching what I wanted," "Details of events were easy to see" were written in the free-answer question, indicating that the guiding application successfully assisted tourists to participate in events. As for the types of information, the experiment revealed needs for information on restaurants, public restrooms, parking and resting areas.

4.3.3 Discussion

Through the demonstration experiment results, it was verified that the application features were useful to tourists following the high evaluation points for all features that used open data. In addition, results from comparing the application and pamphlet indicated that converting information that have been conventionally communicated by local governments to open data enables tourists to select information they want, and assist in having tourists efficiently participate in sightseeing events. The testing of open data for conventional information using LinkData as conducted in the research can be concluded as an useful method to create new public services for local governments. Open data promotions by local governments try to disclose information responding to various needs amid vast operations to create new public services. As indicated in this research, however, converting information that has been conventionally communicated can also lead to creation of useful public services if converted to open data upon considering machine readability.

4.4 Research Achievements

The application developed in this research was well-received by the "*Arukou Bunka no Michi*!" executive committee members and

Transportation Bureau City of Nagoya employees. Executive committee members commented, "The event guiding features such as event searches and route guide are excellent," and "I have always wanted to guide like this but couldn't. This system is just what we wanted." Transportation Bureau City of Nagoya employees also commented, "This is the first case example in which open data disclosed by the Transportation Bureau City of Nagoya was utilized," and "Examples like this is very meaningful for open data to cultivate."

The application developed in this research was very well-received by both parties. As the first case for the Transportation Bureau City of Nagoya's open data to be utilized, the application also contributed to the promotion of open data for Nagoya.

As a result of such positive feedback, we have received requests from the "Computerization Promotion Department" of Nagoya that is responsible for promoting open data starting this fiscal year to work with them in open data promotion. In addition, the conversion to open data demonstrated in the research was interpreted as not increasing work for local governments, and the sightseeing event information for the "*Dai 16 kai Arukou! Bunka no Michi*" to be held this year has been decided to be officially disclosed as Nagoya's open data. The testing of open data and its utilization as demonstrating in the research can be concluded as having led to actual promotion of open data for local governments.

5. Discussion of the Research Overall

The research conducted testing and demonstration of open data conversion to

promote open data for conventional municipal operations. The fact that the research results actually led to promotion of open data for local governments supports the interpretation that the method used in the research is one way to promote open data that possesses acceptability to local governments. In order to connect the research results too future open data promotions, the promotion of open data upon considering acceptability in the two stages of "information organization" and "information communication" in conventional municipal operations will be discussed:

(1) Information organization

Local governments have conventionally organized information pertaining to operations by using Excel. The information tend to not consider machine readability, such as combining cells or having multiple information included in the same cell. On the other hand, the information communicated by local governments require comparatively little work for employees, including information gathering and organization, and many can also be disclosed as open data as well as possess value. Compiling the information into a machine-readable format can thus anticipate effective utilization as open data. It is therefore important to conduct information organization with an eye for open data conversion beforehand when organizing collected information.

On the other hand, there are limits for local governments to organize information with machine-readable formatting when considering acceptability for local governments. Information gathering in conventional operations involve organization and compiling of information for employees to manage and view, or to consign operations to private firms, instead of organizing

to prepare for secondary use through machine processing. Formatting that is adequately legible for humans are thus desirable, and in turn challenging to consider machine readability for conventional municipal operations. Therefore, open data promotion through public-private cooperation while also receiving cooperation from experts including private businesses, educational institutions and citizen groups. A cooperative attitude in working for open data promotion is required such as having local governments conduct open data promotion operations within an acceptable range so that experts will convert the information into machine-readable format.

In addition, versatile information organization methods that are common with other regions need to be considered when actually organizing information. For example, the field name for phone number information may differ by local government, i.e. "Phone number," "TEL" or "Number." Standardizing such vocabulary will enhance interoperability of contents utilizing open data, and utilizations can be anticipated to increase. There are many regions already that have developed contents that utilized open data in advanced ways. Promoting open data while using such advanced cases as reference can anticipate increased utilization and facilitate open data promotions with higher acceptability. The Japanese government is currently working on the Public Vocabulary Framework Project[17] as part of its measures to assist vocabulary standardization. Local governments should establish and develop versatile formatting while also effectively taking advantage of such measures.

(2) Information communication

Local governments are communicating their organized information through various media. Information communication through websites has become the norm after digitalization of regions, and most of open data from local governments are disclosed on their respective websites. Publicity departments are generally responsibly for local government websites, but much of the information communicated belong to different departments. On the other hand, information departments are responsible for open data promotion for most local governments. The promotion of open data with consideration of acceptability for local governments thus requires strengthening of cooperation upon obtaining publicity departments that manage the website and respective departments that possess information to become open data.

Website and open data linkage systems are currently being developed by private enterprises, including CMS (Contents Management System) that converts entered data on websites into appropriate formatting as open data[18]. Usage of these systems will anticipate further promotion of open data conversion for conventional information.

6. Conclusion

The research aimed to establish open data promotion through conventional municipal operations, and developed an application upon testing open data conversion of a sightseeing event hosted by a local government. Sightseeing event information on the pamphlet distributed by the local government was organized and test-converted into open data. The data was then leveraged to develop an application for mobile devices that guide through sightseeing events,

and a demonstration experiment using this application was conducted in the "*Dai 15 kai Arukou! Bunka no Michi* (15th Annual Let's Walk the Cultural Path)" held in Higashi-ku, Nagoya. The demonstration experiment revealed the application's usefulness, and demonstrated that the open data prototype on sightseeing event information was also useful. In addition, as an achievement of this research, the sightseeing event information for the "*Dai 16 kai Arukou! Bunka no Michi* (16th Annual Let's Walk the Cultural Path)" is scheduled to be disclosed as Nagoya's open data. Based on the above, the promotion of open data for conventional municipal operations with consideration for acceptability of local governments was discussed.

When considering the interoperability of applications that will become public services, vocabulary standardization needs to be conducted for open data formatting disclosed by local governments. Wide-area cooperation will also become necessary so that the formatting using standardized vocabulary can be used with versatility. For example, the Shinetsu region that includes Nagano and Niigata is regularly holding open data conferences with experts, and is receiving good reviews on its promotion of open data. The true value of open data promotion shall be revealed by expanding such measures to various regions and creating connections. It is important for the achievements acquired in this research to not be a mere case example, and instead increase cases pertaining to open data promotion. We plan to continue with our research so that it will contribute to vitalization of the information society.

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Notes

(1) List of Japan's open data cities <http://fukuno.jig. jp/2013/opendatamap> Accessed 2015, October 18.

(2) Public cloud system https://www.chiikinogennki. soumu.go.jp/k-cloud-api/> Accessed 2015, October 18.

(3) Acceptability of local governments refer to new concepts and technology being accepted upon acquiring understanding and endorsement from the local government and its employees.

(4) Code for Shiga/Biwako <http://opendata.shiga. jp/> Accessed 2015, October 18.

(5) Open Data Use Case Contest <http://openlabs. go.jp/opendata_contest/usecase/products_ report.htm> Accessed 2015, October 18.

(6) Higashi-ku is located in the heart of Nagoya with an area of 77km^2 and population of approximately 75,000 (as of March 2015).

(7) According to results from "Survey on Usage Time of Information Communication Media and Information Activities" conducted by MIC in 2014, smartphone ownership rates are 68.6% among ages 10-19, and 94.1% among ages 20-29.

(8) Official website of *Arukou! Bunka no Michi* <http://openlabs.go.jp/opendata_contest/ usecase/products_report.htm> Accessed 2015, October 18.

(9) Higashi Net is a citizen group that operates mainly in Higashi-ku, Nagoya. It operates the community site "Higashi Net," and is involved in the digitalization of Higashi-ku. <http://higashinet. net/nagoya/> Accessed 2015, October 18.

(10) List of Fukui prefecture's open data <http:// www.pref.fukui.jp/doc/toukei-jouhou/ opendata/category.html> Accessed 2015, October 18.

(11) List of Toyohashi's open data <http://www.city. toyohashi.lg.jp/16399.htm> Accessed 2015, October 18.

(12) A website operated by LinkData. More than 2,500 datasets have been uploaded, of which a little less than 2,000 are disclosed as open data. <http://linkdata.org/> Accessed 2015, October 18.

(13) Dataset "*Arukou! Bunka no Michi 2014*" <http://linkdata.org/work/rdf1s1870i> Accessed 2015, October 18.

(14) The Transportation Bureau City of Nagoya's open data <http://www.kotsu.city.nagoya.jp/ about/opendata/> Accessed 2015, October 18.

(15) Creative Commons Japan <http://creative commons.jp/> Accessed 2015, October 18.

(16) LinkData App <http://app.linkdata.org/> Accessed 2015, October 18.

(17) Public Vocabulary Framework Project <http:// goikiban.ipa.go.jp/> Accessed 2015, October 18.

(18) Examples include "4Uweb/CMS" by Hitachi Government & Public Sector Systems, Ltd. and "i-City Portal" by Fujitsu Limited.

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