IOSR Journal of Business and Management (IOSR-JBM)
e-ISSN: 2278-487X, p-ISSN: 2319-7668. Volume 16, Issue 11.Ver. III (Nov. 2014), PP 47-52
www.iosrjournals.org

Constructing a Model for Creating an Attractive Digital Signage Contents at Universities

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Abstract: *Recently digital signage is gathering attention as a new type of media because of its only features. With this media we can select the time and places to advertise and we can advertise attractively by using a display. Universities are also trying to use this media in their campuses. But there is a problem that the viewing rate of this media is still rather poor. One reason for this is that universities have not been able to accurately grasp the needs of students. In this study, we identify the factors that lead to visibility improvements by cluster analysis and factor analysis. After identifying the factors we create new contents considering the analysis result and verify them by brain wave measurement. Then we use these insights to boost the visual interest of digital signage at universities.*
Keywords: *statistics, electroencephalography, digital signage*

I. Introduction

Digital signage has become widely used as an advertising media in recent years, and is now readily recognized across vast segments of society. This effective communications tool is now beginning to be used by educational institutions as well. Digital signage can be placed in a variety of locations—outdoors, in stores, public spaces, public transportation, and more. Network-linked digital display devices make up a system designed to communicate information. It is thought that companies blindly spend massive amounts of money on mass media advertising in order to get consumers' attention—which they believe is the only function of their promotional efforts. What is needed is for companies to quantitatively grasp the amount of publicity generated by different forms of advertising media [1-3]. In the past, many researchers have studied consumer response patterns as a way of quantitatively grasping advertising performance [4]. Numerous consumer response models, which predict consumer behavior from the time they learn about a new product through an ad until the time they purchase it, have been offered.

In considering the indicators that can be used to assess digital signage, we can look at the same fundamental measure used for other types of media; namely, the number of people that it is able to reach. However, we are left with the question of whether a simple quantitative yardstick is really a sufficient evaluation tool. Surely the effects of digital signage vary greatly depending on its location, as well as display content and other factors, and we must recognize that there are more numerous and more powerful variables affecting our outcomes, in fact, than with other media channels. For example, some of the key factors that might impact the effectiveness of digital signage are installation site, distribution time, display content, and cross-media tie-ins.

We applied research in recent years, with alternative models such as the AIDMA (Attention, Interest, Desire, Motive, Action) and AISAS (Attention, Interest, Search, Action, Share) also being proposed. Despite these variations, the one thing that all of these models have in common is that attention can be considered the most critical element in the process whereby viewer moves towards actually making an action [5,6].

Shu-Gao Ma and Wei-Qiang Wang [7] and Iida, Goto, and Fukuchi [8] cited the effectiveness of using statistics and GSR (Galvanic Skin Response) biometrics in the creation of movie trailers. These studies focus on video as a characteristic of movie trailers and the authors have sought to clarify, quantify, and quantitatively assess the relationship between time and scenes by using the same statistical science techniques employed by Amasaka et al. as well as brain activity measurement techniques utilized by Kono and Muranaka [9] in order to develop a creative support approach model for contents.

This study sought to optimize the digital signage display content at universities through the use of surveys, statistics, and electroencephalography (EEG) [10].

II. Important Elements of Digital Signage Contents

We first sought to identify the kinds of digital content that students preferred in order to put together a system with optimized content. We did this by conducting a student survey and then analyzing the results.

2.1 Questionnaire survey

We asked thirty students to identify what was important in content distributed via digital signage using a seven-point scale to rate individual content elements. Ten elements were created based on interviews with a company that creates content for digital signage, to which we added the real-time (newsflash) element to come up with the eleven items shown in the figure below (Fig.1).

Elements	1 2 3 4 5 6 7	Free opinions
The title display		
The speed		
The simplicity		
The intonation		
The value		
The music		
The picture		
The moving images		
The appearance		
The narration		
The real-time		

Fig.1 the seven-point scale to rate individual content elements

The text of the survey read: This table lists visual elements shown on digital signage. Start with the element on the left and go in order, scoring each one and providing your own feedback. Circle the level of importance of each element in your opinion and then use the free response section to explain the reasons for your choice.

2.2 Cluster analysis

In order to identify the types of students who took the survey, we subjected the data to a cluster analysis (Ward's method, Euclidean distance). This allowed us to identify five student types among respondents. The result of the cluster analysis is given below (Fig.2).

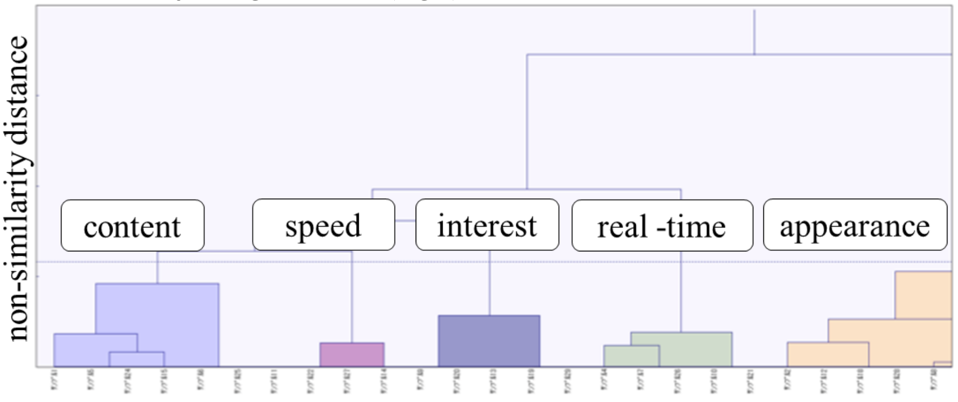

Fig.2 the result of the cluster analysis

2.3 Factor analysis

Next, we subjected the survey data to a factor analysis in order to identify the common factors among content elements. We changed the conditions of this analysis in the hopes of getting more stable results, repeating it several times. Ultimately, we achieved the most consistent results when we used Maximum Likelihood Estimation for the factor sampling method and Promax with Kaiser Normalization for the rotation method. The results of the factor analysis are given below. The elements are listed vertically in the table, with the expressed common factors listed horizontally. The values in the table represent factor scores, with different factor scores shaded in different colors.

Table 1 the first result of factor analysis (factor loading: .701~=grade3, .700~.351=grade2, .350~.201=grade1, ~.200=grade0)

	1	2	3	4	5
Title display	0.13	-0.11	0.28	0.02	0.02
Speed	-0.01	-0.07	0.20	0.60	0.11
Simplicity	0.10	-0.15	-0.02	0.00	-0.14
Intonation	-0.21	-0.13	-0.02	0.04	0.16
Value	0.03	-0.36	-0.05	0.14	0.78
Music	0.14	0.71	0.51	-0.30	0.20
Picture	0.16	0.12	0.10	0.09	-0.09
Moving images	0.01	-0.42	-0.54	-0.14	0.18
Appearance	0.24	0.82	-0.27	0.39	-0.23
Narration	0.10	-0.18	0.00	-0.01	0.02
Real-time	-0.52	0.21	-0.01	-0.08	0.16

Table 2 the last result of the result of factor analysis (factor loading* .501~=grade3, .500~.301=grade2, ~.300=grade0)

	1	2	3
Title display	0.303	-0.488	0.164
Speed	0.000	0.102	-0.005
Music	0.001	0.422	0.001
Picture	0.002	0.351	0.000
Moving images	0.099	0.708	0.109
Narration	0.000	0.000	0.001
Real-time	-0.841	0.008	0.353

We named the shared factors identified through the factor analysis as follows: (1) title display, (2) moving images, (3) real-time (newsflash) quality. The results told us that the three elements students find most important in digital signage are (1) the title display, (2) the moving images, and (3) the real-time (newsflash) quality of the information, and suggest that students want displays with more impact and more meaningful information.

In the future, we will add these results to create new digital signage contents, carry out experiments that compare new and existing content using EEG measurements, and verify the results of the survey conducted in this study.

III. Creating new contents

The next step was to create content that would appeal to students based on the results of the survey. We combined the three elements that respondents indicated were most important to them ((1) title display, (2) moving images, and (3) real-time (newsflash) quality), and created content with the following three patterns: (1) + (2), (2) + (3), and (1) + (2) + (3).

3.1 (1) Title display + (2) Moving images

For this pattern, we created notification content for a competition event being held on campus. The content was the same as what was being distributed on digital signage at the university, but we made the title more prominent and created moving images by animating the text and pictures.

3.2 (2) Moving images + (3) Real-time (new flash) quality

To create information with a real-time quality, we prepared a video featuring a weather report. We also considered offering urgent information like breaking earthquake or traffic reports.

3.3 (1) Title display + (2) Moving images + (3) Real-time (new flash) quality

For the pattern that included all three elements, we created content that announced the winners at the recent competition event at a school festival held on campus. The primary feature of this content was its newsworthiness.

IV. Verification by EEG measurement and re-creating contents

4.1 Verification by EEG measurement

Our next task was to use EEG to visualize people's attention level when looking at (1) the new content identified in the previous section and (2) the existing content, and conduct a comparative verification. For the existing content, we used a one-minute segment that the university was currently distributing. For the new content, we compiled a one-minute segment from the content created in the previous section. The experiment was designed to show the existing content to ten students, and then show them the new content five minutes later.

A result of the EEG is shown in the graph below (Figure 3, 4). The upper portion shows the students' brain activity when looking at the existing content, while the lower portion shows brain activity when looking at the new content. We compared the two by using the red line as a reference EEG value and then counting the number of instances when the subjects' value went above that point. The reference EEG value was derived by adding two standard deviations to the subjects' standard EEG value. Doing so gave us the results shown in the graph; namely, nine instances for the existing content and fifteen instances for the new content. Brainwave frequency thus spiked more often with the new content. Since higher frequency indicates that the person is more focused and serious about the information, the results suggest that the new content had a more profound psychological effect on the subjects than the existing content.

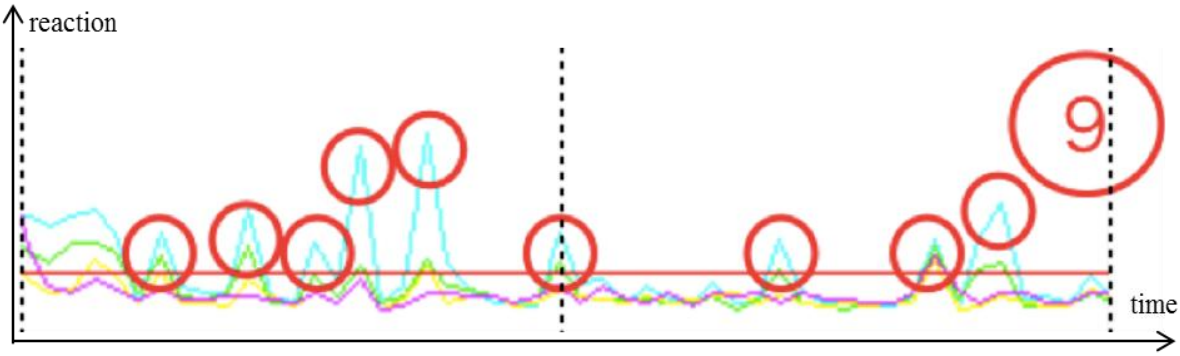

Fig.3 the result of the EEG measurement (existing content)

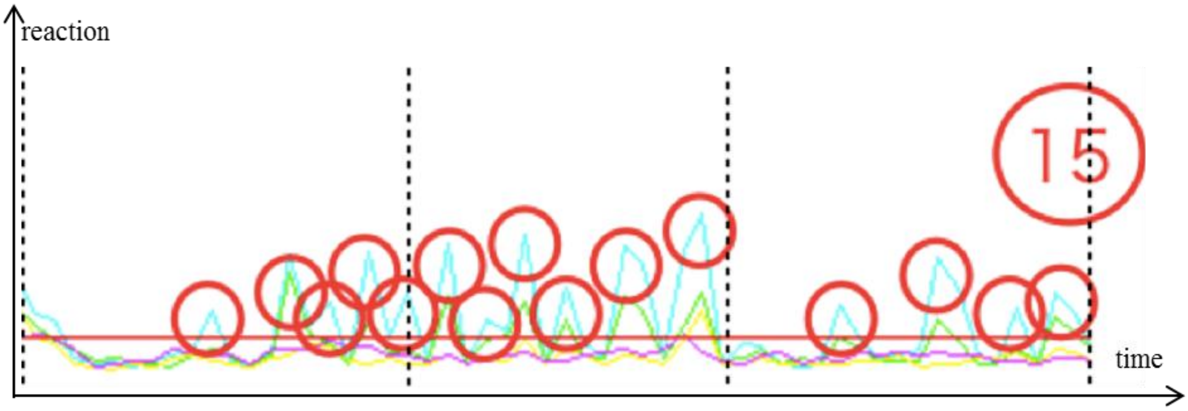

Fig.4 the result of the EEG measurement (new content)

We also looked at the kind of content being shown during areas of disrupted brainwave patterns. The results of this investigation are shown in the Figure 5.

As you can see, the areas with high wave values are those where the content changed and/or the text was moving. They indicate screen transitions or other visual alterations. The results suggest that while grabbing viewers' attention naturally depends on content, it can also be achieved through subtle movements used to express that content.

The results of the comparative verification showed that the new content resulted in more instances of increased brainwave values among respondents. Another new insight gained by using EEG was that spikes in brainwave values often coincided with changes in content. In other words, we can conclude that displays should not be static in content or expression. Instead, making subtle changes to the content and increasing the amount of information presented are important strategies for attracting viewer attention.

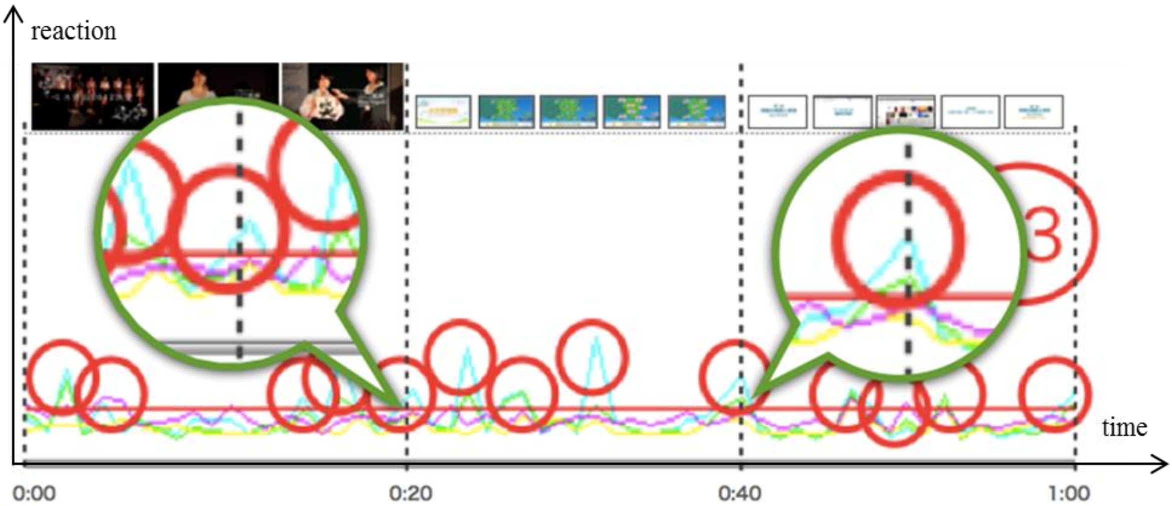

Fig.5 the kind of content being shown during areas of disrupted brainwave patterns

4.2 Re-creating contents

We found in the last section that the digital signage elements that are most effective in terms of boosting visual interest are (1) the title display, (2) the moving images, and (3) the real-time (newsflash) quality of the information. We add to this the insight that increasing the volume of information is effective—which we learned through EEG verification. Based on the content created through the process described above, we can strive to better capture viewer attention with more subtle movements and by cutting between scenes more frequently.

4.3 Re-verification

We verified in the previous section that subtle screen transitions with an increased amount of information would increase viewers' interest. In order to reconfirm this conclusion, we prepared the same content used in 4.1 with even more information and took EEG measurements from five students viewing the content before and after the improvement. Results are indicated in the Figure 6, 7 below.

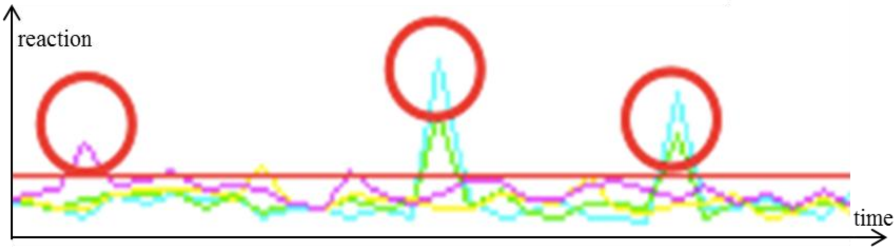

Fig.6 the result of EEG measurement (before)

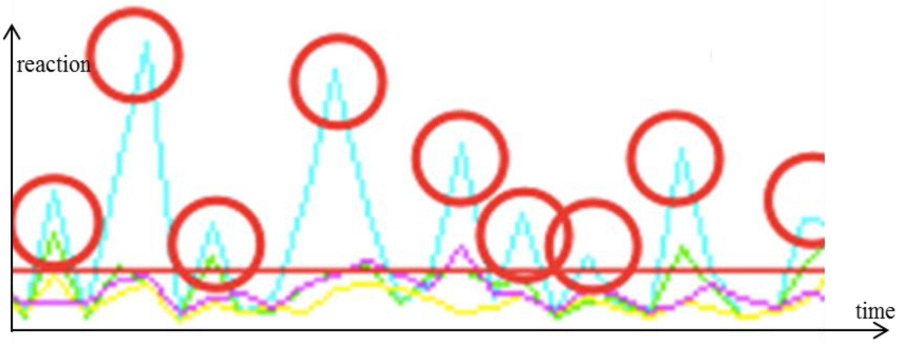

Fig.7 the result of EEG measurement (after)

The repeat verification revealed that among the five subjects, four showed an increased response following the change—indicating that adding subtle screen transitions and increasing the amount of information was an effective means of boosting viewer attention.

V. Conclusion

This study used digital signage at a university as an example in order to identify types of distribution content that would boost visual interest. The use of digital signage requires that we consider factors like installation site, distribution time, display content and cross-media tie-ins. However, none of these elements were being considered in the university setting, and the signs were therefore not being used effectively. Here we focused on display content, making use of statistics and EEG measurements to find ways to boost visual interest in on-campus digital signage. Our research has led us to propose the following approach.

Of the elements that comprise digital signage, we found that students place the highest priority on (1) the title display, (2) the moving images, and (3) the real-time (newsflash) quality of the information and created new content accordingly. We then found that using subtle movements to change the way that content was presented (moving text, transitioning screens, and so on) further boosted visual interest.

Finally, we verified this approach using EEG. A side-by-side comparison of visual interest toward the existing and new content revealed that the new content was more effective at capturing viewer attention.

References

[1] K. Amasaka, Constructing a Customer Science Application System CS-CIANS - Development of a global strategic vehicle Lexus utilizing New JIT -, WSEAS Transactions on Business and Economics, 2(3), 2005 135-142.

[2] K. Amasaka, The validity of Advanced TMS - A strategic development marketing system utilizing New JIT -. The International Business & Economics Research Journal, 6(8), 2007, 35-42.

[3] K. Amasaka, Changes in marketing process management employing TMS: Establishment of Toyota Sales Marketing System, The Academic Journal of China-USA Business Review, 10(7), 2010, 539-550.

[4] K. Amasaka, The effectiveness of flyer advertising employing TMS: Key to scientific automobile sales innovation at Toyota, The Academic Journal of China-USA Business Review, 8(3), 2009, 1-12.

[5] O.C. Ferrell and M. Hartline, Marketing Strategy (Thomson South-Western, 2005).

[6] A. Mehta, Advertising attitudes and advertising effectiveness, Journal of Advertising Research, 40(3), 2000, 67-72.

[7] G.M. Shu and Q.W. Wei, Effectively discriminating fighting shots in action movies, Journal of Computer Science and Technology, 26(1), 2011, 187-194.

[8] T. Iida, A. Goto, S. Fukuchi, and K. Amasaka, A study on an effectiveness of movie trailers boosting customer’s appreciation desire: Using statistics and GSR, Aoyama Gakuin Universtiy’s graduation thesis, 2011.

[9] Y. Kono, and N. Muranaka, Estimation of brain activity area on sensitivity evaluation by mesuring EEG, Technical Committee on Nurocomputing by IEICE, 110, 2008, 69-72.

[10] R. Akaiwa, R. Maekawa, K. Amasaka, Creating Attractive Digital Signage Content at Universities, The 15th Asia Pacific Industrial Engineering and Management Systems Conference, 2014, (Proceedings).