A PRODUCT PLANNING OF E-SPORTS HEADPHONE BY BLENDING REPLICATION ZMET WITH QFD

Wang, Hung-Hsiang
National Taipei University of Technology, Taiwan, Republic of China

Abstract

In the drastic competition in the e-sports games marketplaces, many manufacturers make efforts on the visual qualities of products in its use context as a differentiation strategy. Industrial designers need useful visualization tools to listen to the Voice of the Consumer (VOC), and to capture the product's visual features. Several tools are available, but isolated. This article introduces a case study that blended two methods for product planning of e-sports headphone. The first method was a modified Zaltman Metaphor Elicitation Technique (called Replication ZMET) for "seeing" VOC, and the second one was House of Quality (HOQ) for identifying verbal and visual design specification. Results included a set of visual metaphors and verbal consensus constructs about the e-sports headphones, which then were transformed into priorities of a set of verbal and visual design features. Major advantage of the integrated approach is not only to expand Replication ZMET to product planning, but also to complement the non-visual preconception of QFD. This visualized approach helps industrial designers see the VOC and the design features at earlier stages of product planning.

Keywords: Industrial design, Design methods, Zaltman Metaphor Elicitation Technique, Quality Function Deployment, e-sports

Contact:
Dr. Hung-Hsiang Wang
National Taipei University of Technology
Department of Industrial Design
Taiwan, Republic of China
wanghh@ntut.edu.tw

Please cite this paper as:
Surnames, Initials: *Title of paper*. In: Proceedings of the 20th International Conference on Engineering Design (ICED15), Vol. nn: Title of Volume, Milan, Italy, 27.-30.07.2015

1 INTRODUCTION

Rising in 1980s with the rapid growth of online games, e-sports games have become a blooming entertainment industry. In some countries, such as South Korea, Japan, USA and France, e-sports games industry occupies an important position in their national economy (Ye, Kang and Yang, 2011; Kim, 2013). With the keen competition in the e-sports games marketplaces, many manufacturers make efforts on the symbolic qualities of products in its use context as a differentiation strategy; see (Krippendorff and Butter, 1984).

For example, Thermaltake company cooperates with *BMW Group Designworks*, USA to develop a full tower case for e-sports, which is recognized by *IDEA, Good Design, iF*, and *reddot* awards. According to its advertising slogan (Thermaltake, 2011/Dec. 1, 2014), the product conveys a unique massage to everyone with modern, innovative, and stunningly elegant style. The design concept comes up with the attention of gamers to expensive, top performance components and their inherent architectural aesthetics. In a sense, it delivers exciting and fascinating user experience shared by everyone by means of its architecture metaphor. We can observe metaphor in many innovative product designs; however, its appropriate use requires a good understanding of what users feel and think in mind. Thus, it is important to listen to the *Voice of the Consumer* (VOC) and translating it into product appearance.

This paper introduces a case study (Hsu, 2013) of applying modified *Zaltman Metaphor Elicitation Technique* (ZMET) (Zaltman and Coulter, 1995; Zaltman, 2004) to *seeing* VOC, and *House of Quality* (HOQ) (Wasserman, 1993; Akao, 1972, 1990, 2004) to building VOC. By doing so, the needs and desires of e-sports headphones users' are identified and transformed into design specifications.

2 VISUALIZING DEEP METAPHORS WITH REPLICATION ZMET

As a young genre of computers and peripherals, e-sports gaming products have to convey something significantly different from other genres. Acoustics of headphones is very important, because it helps e-sports gamers distinguish the enemy's position, the number of enemy players, and the types of weapons. Compared with common-type overhead headphones in market place, e-sports gaming headphones are usually designed to express stylistic appearance with lighting effects, weave cable, and anti-noise function, in order to reveal a stronger personality. However, consumers' needs concerning about product semantics are very implicit and changing frequently.

Among many quantitative and qualitative techniques to understand the needs, ZMET helps eliciting latent and emerging needs using non-verbal data to provide deeper understanding about consumers (Zaltman and Coulter, 1995). ZMET is useful for industrial designers because of its human-centred-design premises, mapping framework of sensory perceptions onto concepts, and visual-oriented approach (Zaltman, 2004).

Nevertheless, ZMET® is a patented market research tool, whose intellectual property right belongs to Olson Zaltman Associates. To avoid the commercial limitations, this study modified the standard ZMET® techniques into a "Replication ZMET". Ten leading gamers of e-sports were recruited to participate in the headphone project. They were given a set of instructions with guidelines about the headphone design. The interviewer of the Replication ZMET was a design researcher with 6-year experience on visual metaphor studies. Figure 1 illustrates the 10 steps of the Replication ZMET, typically completed within two hours.

Let us take a participant, Tony, for example. At the first step, he was asked to bring 10 photographs to describe how they related to e-sport headphones. One of his photographs was of a tunnel consisting of the number "0" and "1". He said that this picture represented the dynamics of new digital age. At the next step, he described any issues for which he could not find a picture, and to describe a picture that would illustrate the issue. Tony said that he would have liked to take a picture of "a beautiful tattoo" to represent the unique sub-culture of e-sports players. At the third step, he sorted his pictures into meaningful piles with labels for building the major constructs relevant to himself. Tony sorted his photographs into three piles reflecting both positive and negative feelings: *reliable, comfortable, exciting, strong, aggressive, of data, desired, noisy*, and *transitive*.

At the fourth step, a modified version of the Kelly Repertory Grid technique (Kelly, 1963; Valette-Florence and Rapacchi, 1991) was used to identify how any two of three stimuli were similar but different from the third stimulus. The purpose was to elicit Tony's constructs. The laddering technique (Reynolds and Gutman, 1988) then was employed to induce constructs that people used to organize their world. The technique is a set of thought probes to determine a set of casually connected

constructs in a means-end chain consisting of attributes, consequences, and values. During the Kelly Grid, Tony picked up three photographs, shown in Figure 2. He said that the photographs (*a*) and (*b*) shared the feelings of *comfortable* and *harmonic*, while the photograph (*c*) represents *exciting* and *of data*. In the laddering procedure, Tony indicated that some e-sports headphones made him uncomfortable which in turn made him felt *discordant* while playing e-sports. The tunnel consisting of numbers "0" and "1" represented an exciting information flow transmitted during gaming.

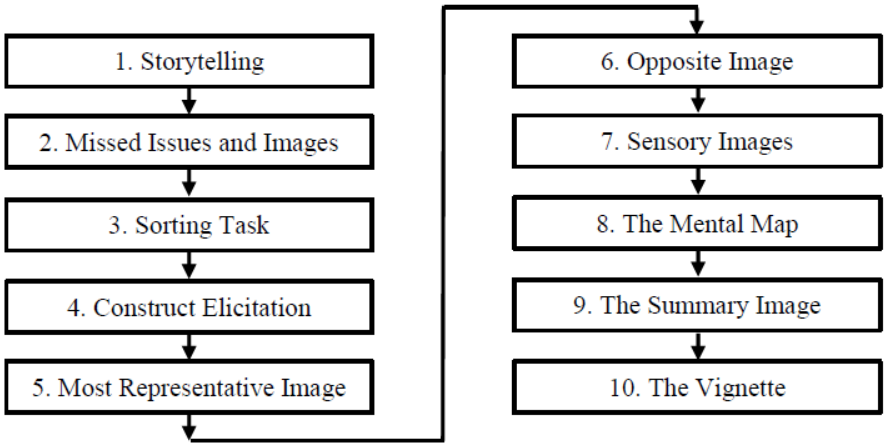


Figure 1. The 10 steps of the Replication ZMET

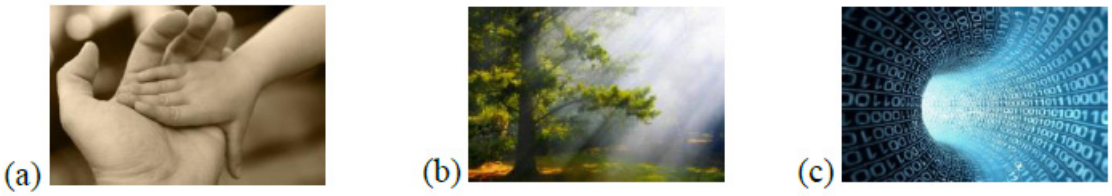


Figure 2. Example photographs in the Kelly Grid Technique

At the fifth step, Tony reported that the photograph (*c*) most represented his feelings in terms of positively *exciting, aggressive, of data* and *transitive*, and negatively *reliable* and *comfortable*. At the sixth step, Tony indicated that the photograph of a girl putting her hands on ears with unhappy face represented his desire to avoid uncomfortable noise. At the seventh step, Tony used his other senses, i.e., taste, touch, smell, colour, sound and emotional feeling, to represent what does and does not represent the concept being explored. Tony's non-visual sensory images included the sense of sandpaper and silk, but not of cream; the sound of wave, but not that of machines; the smell of clothes under the Sun, but not of metal; the colour red and black, but not brown or yellow; the feeling of battle, but not of friendliness. All of the constructs discussed were reviewed at the eighth step. Tony was asked if the constructs accurately represented his intentions, and if any important ideas were missing.

Figure 3 depicts a concise version of Tony's map, in which the original constructs, denoted by circle symbols, referred to the adjectives Tony used for describing the e-sports headphones he desired. The original constructs that shared the same concept were sorted together. Such concepts are called *connector constructs*, denoted by a diamond symbol linked by dashed arrows from original constructs. For example, the two original constructs, *Silent* and *Happy*, congregated to the connector construct *Comfortable*. The connector constructs were grouped into few goals, called *destination constructs*, denoted by box symbol linked by arrows from connector constructs. For instance, the connector constructs, *Comfortable*, *Reliable*, *Transitive*, *Aggressive*, and *Exciting* are for the destination construct, *Emotional Pleasure*.

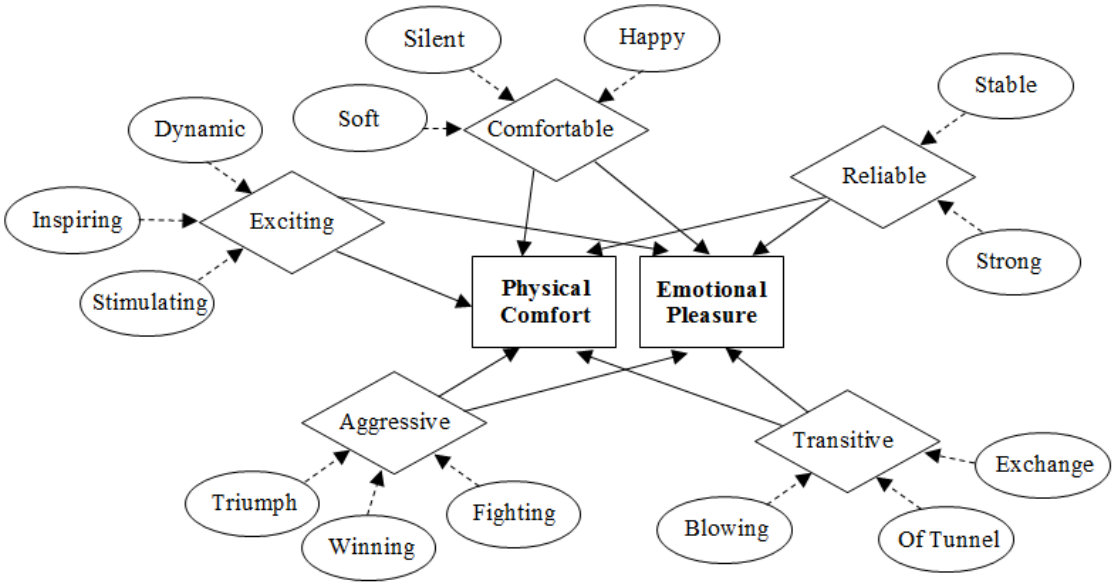


Figure 3. A mental map of e-sports headphones

Figure 4. An example summary image of e-sports headphones

At step 9, Tony proposed a summary image using his own photographs. He used *Illustrator*® to create his summary image, shown in Figure 4. He reported that the blue area of *0-and-1* patterns at the upper right corner, which connects with a hand at the upper-left corner, indicated the transmission of digital information. The NBA basketball player under the information flow represented both physical and emotional exciting of e-sports. The female at the bottom represented the comfort of wearing e-sports headphones.

At the final step, Tony was asked to create a vignette that helped communicate important issues related to the symbolic quality of e-sports headphone. Tony's vignette about wearing e-sport headphones expressed his desire to experience emotional harmony through the physical manipulation over information transmission. Figure 5 indicates a brief version of the consensus map based on the ten

participants. In this study, if at least three participants mentioned a construct or relationship, then it would be included on the consensus map. As a result, the key constructs related to headphone design included six destination constructs: *Physical Comfort*, *Emotional Harmony*, *Motor/Body Manipulation, Passion, Attention*, and *Cooperation*. These constructs, as well as the relationships between constructs, illustrated what the participants' needs, i.e., VOC.

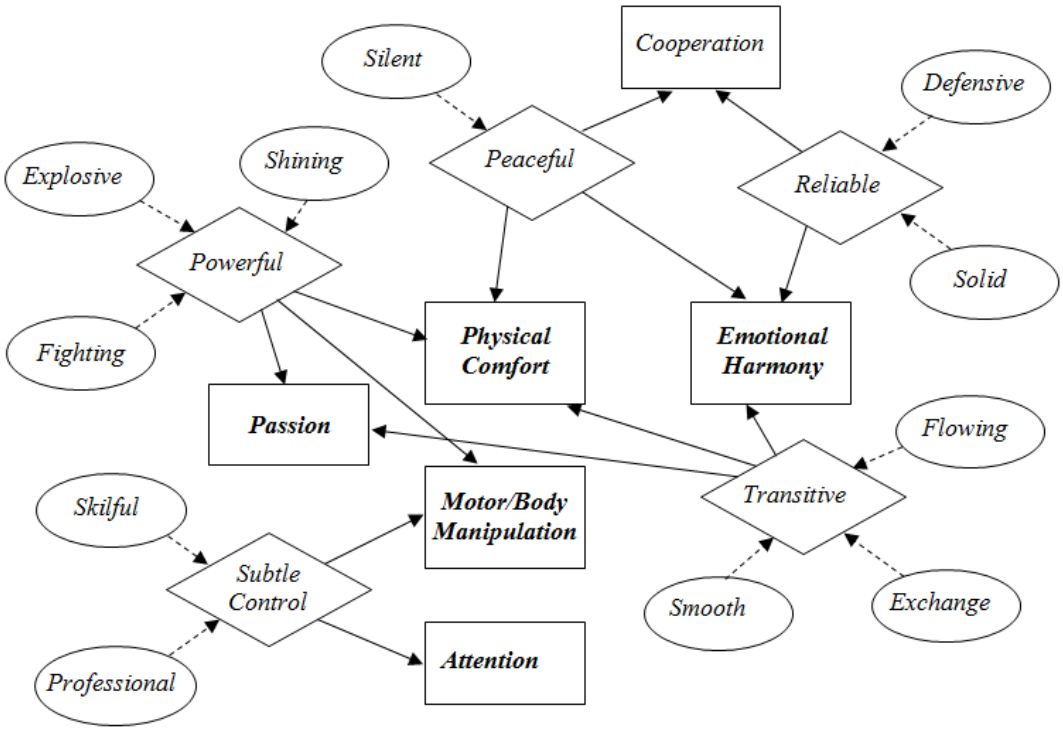


Figure 5. Example mental map of e-sports headphones

3 TRANSFORMING TO PRODUCT PLANNING WITH MODIFIED HOQ

When the visualized consensus VOC was completed, the next stage was to prioritize and translate its constructs and relationships into design features. Typical product architecture of e-sports overhead headphones consists of six major components:

- Headband, made of metal, plastics, or leather, for providing comfortable lateral pressure.
- Slider, easily resized to suit the shape of the wearer's head for adjusting headband length.
- Housing, comprising an outer covering for the baffles on headphone units, and a wall for the air chamber behind these units.
- Ear pad, fitting against or enclosing the wearer's ears, made of rubber, nipple sponge, or protein. Ear pad material and hardness affects sound quality.
- Microphone, with features of adjustable angles or attachable joints.
- Cable, with plastic, rubber, or woven protective coverings, and with a plug into the headphone jack of AV equipment or portable audio players. Various thicknesses and lengths are available to suit different listening needs.

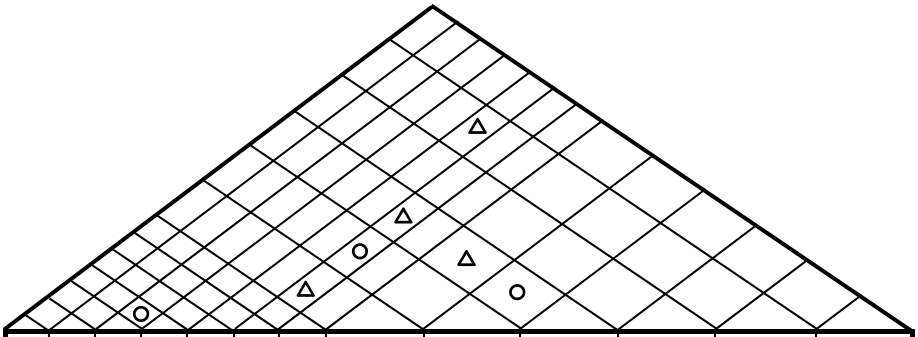
Ideally, the structure can represent all the constructs on the consensus map. However, it might be economically or technically difficult to meet all the consumer needs. To deal with the possible trade-offs, HOQ in *Quality Function Deployment* (QFD) is a useful method for such a product planning challenge. HOQ provides a visual connective process to help designers translate the VOC into appropriate technical requirements (Wasserman, 1993; Akao, 1972, 1994). A design group consisting of the Replication ZMET interviewer, one senior industrial designer, and two engineers co-conducted the process of building HOQ as follows.

- Step 1. The VOC. This step in fact had already been finished when the consensus map was completed. The five destinations constructs and the six original constructs of the consensus map were listed on the far-left column in Figure 6.
- Step 2. Relative Importance of the VOC. The ten leading gamers were asked again to rate the relative importance of each consumer need using 5-point Likert's scale (the highest = 5 and the lowest = 1), as shown on the far right column in Figure 6.
- Step 3. Design Features. The step was to specify the consumer needs based on the VOC and the design characteristics that must be achieved to satisfy these needs. For the features about product architecture, the design group selected the major components with certain alternative attributes from the product architecture of typical e-sports headphones. Exploring some more creative features, the design group also proposed Lighting Effect Housing as a new alternative. This idea came up with the lighting feature played an important role in the e-sports gaming, especially for the original construct, Shining, Explosive, Fighting, Professional, and the destination construct, Passion and Manipulation. In contrast, for the features about visual metaphors, the design group selected six photographs as metaphor sources to represent the VOC. As shown in Figure 6, the photographs include Submarine, Armoured Warrior, Modern Armoured Soldier, Light Beams, Woman Playing Cello, and Boxer.
- Step 4. Inner Dependence among the Design Features. The HOQ's Roof Matrix, as shown in Figure 6, was to specify the various design features that had to be improved collaterally, providing a basis to calculate to what extent a change in one feature would affect other features. The inner dependence was rated by Strong (+9 points, denoted by solid black circles), Medium (+3 points, denoted by blank circles), and Weak (+1 points, denoted by triangles).
- Step 5. Relationships between the VOC and the Design Features. The relationships between the VOC and the components were rated in the same way as the above inner dependence. The result was the Relationship Matrix, the main body of Figure 6.
- Step 6. Priority of Design Features. Once the above relationships were determined, the absolute importance of each design feature could be calculated by summing its multiple of relationship and relative importance, denoted by the following formula.

$$d_j = \sum_{i=1}^{n} R_{ij} r_i \tag{1}$$

where R is Relationship Matrix, r is Relative Importance.
Finally, the overall priorities of the design features were obtained. For example, the summation importance of Attachable Microphone was calculated by the equation: (3*4)+(9*3)+(3*4) = 51. Its percentage of importance is 10.1% (=51/505) with the third priority among all the design features.

The first priority of non-visual design features was *Metal Headband/Slider* (16.2%), while the second priority contained *Protein Ear Pads* (10.3%), *Attachable Ear Pads/Housing* (10.1%) and *Attachable Microphone* (10.1%), which were equally important. Among the visual design features, the *Armoured Warrior* (9.9%) was the first priority, and the *Modern Armoured Soldier* (9.3%) the second. As illustrated in the Roof Matrix, these two photographs maintained a medium inner relationship (+3). In addition, *Protein Ear Pads* and *Attachable Ear Pads/Housing* had a medium inner relationship. Sharing medium inner relationship, visual elements of the *Armoured Warrior* were useful metaphors sources for the *Metal Headband/Slider* feature. Notice that *Light Beams* (1.8%) and *Lighting Effect Housing* (4.1%) were the last two priorities, though the former was a creative idea coming up at the step 3, and the later was one of significant photographs in the Replication ZMET.
Results of the HOQ, as illustrated in Figure 6, provide useful information for the industrial designer to rank both the functional features and the visual features in a simple, but systematic way. Since industrial design is a visual professional, rather than a verbal or mathematic one. In many cases, visual metaphor is very useful for the designer to create appropriate form for representing the functions and meanings that e-sports headphones user's needs and desires when using the product. Insights obtained in the HOQ help the designer prepare for design specifications.



	Attachable Microphone	*Nipple Sponge Ear Pads*	*Attachable Ear ads/Housing*	*Protein Ear Pads*	*Weave Cable*	*Metal Headband/Slider*	*Lighting Effect Housing*							Relative Importance	
Comfort	○	●		△				△						4	
Harmony			△	●										4	
Manipulate					●							△		3	
Passion			●	○										4	
Attention			△			●								4	
Light	●		△			○			△	△		`		3	
Soft							●							2	
Smooth												●		3	
Silent								●	△	△				2	
Fighting	○		△				△		○	●			△	4	
Shining							●	△	●					3	
Solid							○	△	○	○			●	2	
Explosive											●			1	
Sum of Importance	51	36	51	52	27	82	21	27	50	47	9	30	22	505	
Percent. (%)	10.1	7.1	10.1	10.3	5.3	16.2	4.1	5.3	9.9	9.3	1.8	5.9	4.3	100	
Priority	3	7	3	2	9	1	12	9	5	6	13	8	11		

Figure 6. HOQ of e-sports headphones

4 CONCLUSIONS

For e-sports industry, the image qualities of related products are very important to convey core values and meanings in the use contexts. Industrial designers need useful visual tools to listen to the VOC, for their primary activity is to create appropriate form for products. Several tools are available, but isolated. This study integrated the Replication ZMET with QFD together to capture what the e-sports gamer wanted and needed by a sequence of visual-oriented steps. Product planning of an e-sports headphone was demonstrated as an example. The results were a set of the e-sports gamers' verbal consensus constructs about the e-sports headphones, which were then transformed into HOQ to prioritize the design features. Major advantage of the integrated process is not only to expand Replication ZMET to product planning in practical way, but also to complement the non-visual preconception of QFD. This visualized approach is helpful for industrial designers to seeing the VOC.

REFERENCES

Akao, Y. (1972) New product development and quality assurance: system of QFD, standardisation and quality control. Japan Standards Association, Vol. 25 No. 4, pp. 9-14.

Akao, Y. (1990), QFD: Integrating Customer Requirements into Product Design, Productivity Press, Cambridge, MA.

Akao, Y. (2004) Quality Function Deployment: Integrating Customer Requirements into Product Design. Productivity Press.

Hsu, W. C. (2013) Interpreting the Underlying of Gaming Headphone through Visual Metaphor and Quality Function Deployment. Unpublished master thesis, National Taipei University of Technology.

Kim, Y. (2013) A Study of Wellness Core Technology and E-Sports. 2013 International Conference IT Convergence and Security, ICITCS 2013 6717786

Krippendorff, K., & Butter, R (1984). Product semantics: Exploring the symbolic qualities of form. Innovation. Vol. 3, No. 2, pp. 4-9.

Reynolds, T. J. and Gutman, J. (1988) Laddering Theory, Method, Analysis, and Interpretation. Journal of Advertising Research Vol. 28, No. 1, pp. 11-31.

Thermaltake (2011/Dec. 1, 2014) Level 10 Titanium Edition. http://www.thermaltake.com/Chassis/Full_Tower_/Level_10/C_00002458/Level_10_Titanium_Edition/design.htmon

Ye, X., Kang D. and Yang D. (2011) The Present Situation and Development Trend of E-sports Games in China. 2011 International Conference on Future Computer Science and Education, 384-386.

Zaltman, G., and Coulter, R. H. (1995) Seeing the Voice of the Customer: Metaphor-based Advertising Research. Journal of Advertising Research, Vol. 35, No. 4, pp. 35-51.

Zaltman, G. (2004) How Customers Think：Essential Insights into the Mind of the Market. Boston, MA: Harvard Business School Press.

ACKNOWLEDGMENTS

The authors would like to thank the Ministry of Science and Technology, Taiwan, R.O.C. for financially supporting this research under Contract No. MOST 103-2221-E-027 -097.