

Utilizing Digital Contents to Enhance Traditional Manufacturing Industry and People's Life

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Abstract

In this study, a model for the value-added applications and services was developed. Hong-gah Museum, as the content holder, provided their valuable digital contents such as oil paintings, water color painting, calligraphy, etc. A licensing company, ArtKey, was responsible for obtaining the commercial authorization of the digital contents from Hong-gah Museum, meanwhile, three manufacturers (PMI, IF, and KYMCO) were responsible for producing merchandises such as art doors or leather products..

The purpose of this project was not only for culture heritage preservation, but also for enhancing traditional manufacturing industry and people's life. In fact, a model of academy-industry cooperation with digital archives is worth developing in Taiwan. Although there is still a room for improvement, with the effort of various groups, the model would become more and more mature. If museums make the maximum use of academy-industry cooperation model, there would be more opportunities for their collections to be known to the public. The more people are familiarized with their artworks, the less distance there would be between the museums and the public. The model, therefore, is worth trying for museums.

Introduction

The purposes of the digital archive programs in Taiwan in the very beginning were only for culture preservation, exchange, and sharing. With the advanced technical development of digitalization, the government then puts more emphases on applications and services of the digitized content. It would be a waste if we do not make the best use of the digitized content, such as turning the digitized raw materials into learning and educational database, publications, and other merchandises.

Art museums usually have the most abundant culture inheritance and have long been considered places for only the elites. Many people do not think art museums as parts of their life, and would not choose to visit an art museum in their leisure time. Artworks inside art museums are also considered inaccessible to the general public because there is a distance between arts and most people's life. In order to be more accessible to the general public, art museums have been seeking new ways to reach a wider audience and to make arts more connected with people's life. With the development of digital technology, museums have more opportunity of reaching out the public through different approaches. The commercial application of digitized artworks is one of the effective approaches.

With the rapid development of technology, the digitization has become part of people's life. Taiwan's Government Information Office has been working on the promotion of "Digital Taiwan," originating from the "Challenge 2008": a 6-Year National Development Plan aiming to preserve the rich cultural

resources of Taiwan through digitization. "Challenge 2008" has two major sub-projects: the National Digital Archives Program (NDAP) from the National Science Council (NSC) of Taiwan and the National Repository of Cultural Heritage (NRCH) from the Council for Cultural Affairs (CCA). The National Digital Archives Program, launched in January 2002, is divided into Content Development Division, Research and Technology Development division, Applications and Services Division, Training and Promotion Division, and Operation Management Division. [1]

This project was subsidized by NSC and entitled "The Promotion of Traditional Production Industry through Archived Artworks (NSC95-2422-H-144-002). It was aimed to actualize the concept of "value-added application of creativity" and utilize the collaboration between traditional manufacturing industries and industries of arts and culture. Professor Yung-Cheng Hsieh, PI of the project, guided the team to accomplish this project through collaborating with Hong-gah Museum and several local manufacturers. Hong-gah Museum, as a significant content holder, has plentiful collections from famous Taiwanese artists, and its collections were then carefully selected for the process of authorization, digitalization, value-added applications, and global marketing of the developed merchandises by this project.

Based on the academy-industry collaboration model, the purposes of this project were twofold: 1) to utilize the digitized contents from a private art museum, Hong-gah Museum, to develop value-added applications and services, and 2) to establish new applications and business models by collaborating with three major traditional manufacturers in Taiwan, Photo Man Image (PMI) Corp., IF Pacific Corp. and KYMCO Riders Corp to develop merchandises such as art doors and female hand bags.

Research Methodology

1. Participants of the Project and Their Responsibilities

Hong-gah Museum, located in Taipei City, is a private art museum established by Chew's Culture Foundation in 1991. Since its establishment, it devotes itself to prepare a satisfactory storage for storing artworks, provide a space for artists to display their works, and promote art and cultural activities in the Taipei community. In other words, it considers itself a museum for the community and tries to reach more people through various exhibitions, lectures, and other cultural activities.

Despite its limited exhibition space, Hong-gah Museum owns an impressive amount of collection which can be divided into four groups: first; western style artworks such as oil paintings, watercolors, drawings, sculptures, and mixed-media works; second; oriental style artworks such as ink paintings, calligraphies, and glue paintings; third; Chinese embroidery; and fourth; Taiwan

documentary drawings including Taiwanese drawings and paintings done before the end of World War II that were often left out from the art history of Taiwan. These artworks are mostly done by artists from the twentieth-century Taiwan. In 2004, a number of selected artworks went through the process of digitization with the support from the Council of Cultural Affairs. More than a thousand of the digitized artworks have been licensed for commercial applications (see Table 1) and the digitization and the licensing of the museum collection is still an on-going process. [2] Other than the collection from Hong-gah Museum, eight artworks from Hi De-jin Foundation were also licensed for commercial applications to the project “The Promotion of Traditional Production Industry through Archived Artworks.” This project tried to create new values for these artworks through value-added applications.

Table 1: Amount of Hong-gah Museum’s Collection Licensed for Business Use in 2006

Code	Category	Amount of Collection	Numbers of Licensed Artworks
A	Oil Painting	444	229
B	Watercolor	57	40
C	Drawing	38	21
D	Mixed-Media	60	16
E	Ink Painting	753	406
F	Calligraphy	472	200
G	Embroidery	396	231
H	Block Print	66	22
I	Acrylics	9	1
M	Sculpture	61	20
O	Crystal	25	
P	Photography	61	
	Crafts	14	
Sum		2,456	1,186

This project was divided into four major areas of value-added applications: Learning and Education, Culture Preservation and Inheritance, Promotion via Activities, and E-commerce and Business Models. The research team, ACT (Arts, Creativity, Technology) Media LAB in the Department of Graphic Communication Arts at National Taiwan University of Arts (NTUA) was responsible for planning and implementing the whole process; Hong-gah Museum was the content provider, and Artkey was responsible for obtaining the artworks authorization from the museum and the artists for business use of their digital images and

the promotion plans for the merchandises developed by this project; meanwhile, PMI, IF, and KYMCO were responsible for manufacturing merchandises such as art door or leather products. The responsibilities of each party are shown in Table 2.

Table 2: Participants and Their Responsibilities

Team Partner	Responsibilities
Hong-gah Museum Xi De-jin Foundation	<ul style="list-style-type: none"> ➢ Providing digital images and the information of the artworks ➢ Communicating with artists
Artkey	<ul style="list-style-type: none"> ➢ Art licensing
NTUA Research Team (ACT media lab)	<ul style="list-style-type: none"> ➢ Designing merchandise, ➢ Conducting marketing research and strategy, ➢ Planning promotion activities, ➢ Designing the project website containing a database and e-commerce platform ➢ Handling overall integration of the team members
PMI · IF · KYMCO	<ul style="list-style-type: none"> ➢ Sampling merchandises ➢ Modeling merchandises ➢ Producing merchandises ➢ Marketing and distribution

II. Process of value-added application

The success of this complicate academy-industry cooperation project was truly dependent on the great effort from all parties involved in the project. The procedure of accomplishing this cooperation is as followed. First, the selection of proper digital images for commercial applications was very critical. This selection process was very time-consuming and it required both effort from the research team and the three manufacturers. Once the team made the decisions of what images to be used for designing merchandises; the licensing, designing, and producing processes were then started. Because what the academic sector considers proper is not always correspondent with the need of the industrial sector, the choice is first made by the design team and then evaluated by PMI, IF, and KYMCO to see if the images are suitable from a marketing point of view. After the images are determined, the ACT team starts its designing and presents the graphics to PMI, IF and KYMCO. The whole process is displayed in Figure 1.

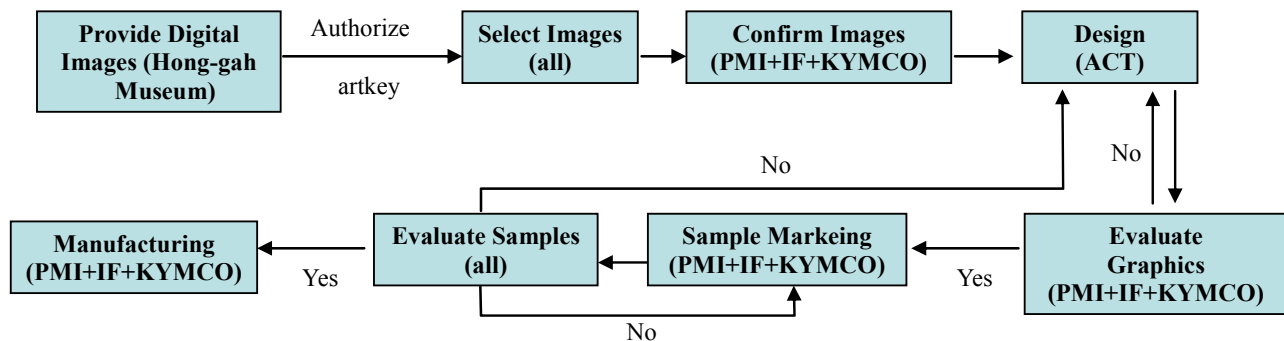


Figure 1. Procedure of Value-added Application

For example, if PMI thinks the products shown on the graphics are worth trying, they would go to the process of sample making. If a sample does not look satisfactory, the designer would redesign it for another sample making. This step may go back and forth several times to meet the requirement of both parties. The modeling and production process would be undertaken if both parties are satisfied with the sample (see Figure 2).

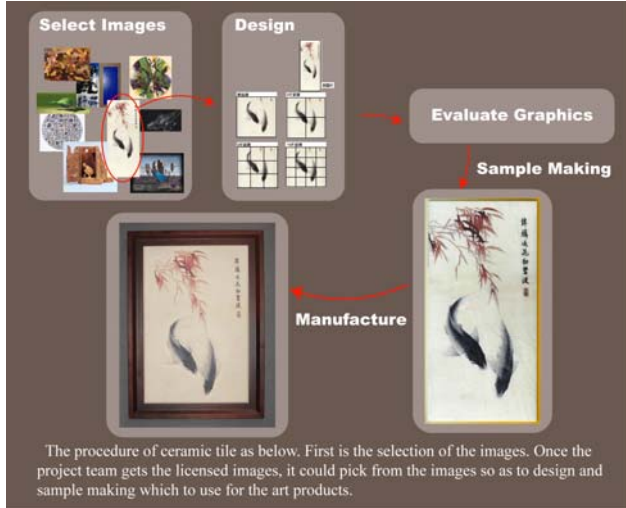


Figure 2. The ceramic tiles from image selection to manufacture

III. The Marketing Strategy of Project

The main purpose of this project was to make the commercial use of the mentioned digitized artworks in a fashion of value-added applications and make known of Taiwanese arts through a series of marketing and promotion. With the digitization and the process of value-added applications, artworks and the merchandise generated from them had more opportunities to be exposed to the public. In marketing strategy aspect, how to make the proper use of those digitized contents and promote art products, then, became a critical assignment for the research team. Thus, through marketing's 4P (product, price, promotion, place) process, the research team hopes that artworks and art products could be exposed to the public not only through museum exhibitions, but also through domestic and global marketing for selling those fine products. The strategy of marketing is shown in Table 3.

Table 3: The marketing strategy of the project

Channel	Content
Domestic Marketing	<ul style="list-style-type: none"> ➤ Promotion via activities: For example, co-held with Hong-gah Museum the forum named 「Playing with Digital Arts」 to promote art products and artists. ➤ Exhibition: 2006/12/29~2007/01/01, participated in the 18th Taipei International Building, Construction & Decorating Exposition. ➤ Mass media: These promotion channels, including newspaper, magazine, broadcast, TV and

Channel	Content
	internet, provided the public more opportunity to get much information about this project through mass media.
International Marketing	<ul style="list-style-type: none"> ➤ International exhibition: participating in a series of related international exhibitions such as Building、Construction or Decoration Exhibition and leather product shows ➤ Expanding channel: Cooperating with decorating and furniture companies so that art products of this project can be exposed to the public and attract more buyers.
Internet Marketing	<ul style="list-style-type: none"> ➤ E-marketing: EDM and internet promotion ➤ E-commerce: Establishing e-commerce platform for Hong-gah Museum to promote and sell the merchandises on line.

IV. A New Business Model (Never-Ending Cycle)

In short, a model for the value-added applications and services were developed in this study. Hong-gah Museum, as the content holder, provided their valuable digital contents such as oil paintings, water color painting, calligraphy, etc. A licensing company, ArtKey, was responsible for obtaining the commercial authorization of the digital contents from Hong-gah Museum. The ACT team of NTUA was responsible for planning, implementing, and monitoring the whole process. Photo Man Image (a digital image printing company), IF Pacific Corp. (a leather company), and KYMCO Riders Corp had collaborated on this one-year project (Figure 4).

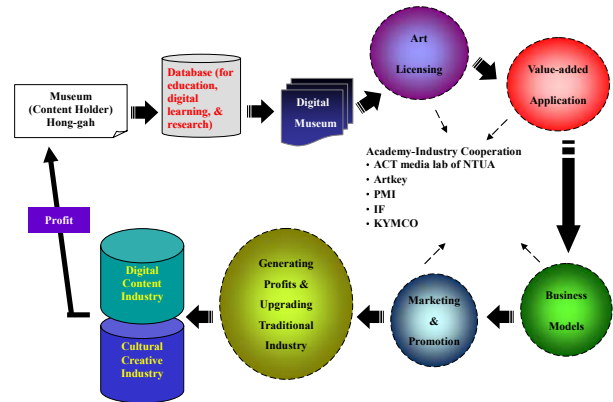


Figure 4. The Model of Value-added Applications and Services of this project

Based on the model shown in Figure 4, it puts a link among artists, art museums, industry, and international art trading platform. The licensed digital artworks were utilized to upgrade the traditional manufacturing industries by the new business model displayed in Figure 4, and to introduce Taiwanese cultural and creative products to the international community. This new model in return creates a new opportunity for Taiwan's art and cultural

industry. Through this model, artworks and their art products could be exposed to the public and then attract more people including foreigner to visit museums and purchase more merchandises in the museums or on-line. In addition, the new model of academy-industry cooperation plan is expected to generate profits that would be returned to each participant of this project, although the ROI (Return on Invest) of the project is not being calculated in detain by the end of this paper submission.

Result of Study

This project was divided into four major groups of value-added applications: Learning and Education, Culture Preservation and Inheritance, Promotion via Activities, and E-commerce and Business Models. As exhibited in Figure 5, a website of this project (<http://www.ntua.edu.tw/~gca/nsc/honggah.html>) was designed to enable Taiwanese art more accessible to the general public, and to

serve as a platform for e-commerce to sell the merchandises developed by this project on line.

I. Learning and Education

In Learning and Education value-added application section, based on the purpose of permanent culture heritage preservation, a digital art information center was created as shown in Figure 6. More than two thousand digitized artworks from Hong-gah Museum were categorized according to the type of media used for creation by the artists, including oil painting, watercolor, drawing, block print, sculpture, acrylics, mixed-media, ink painting, and calligraphy. Each artwork is shown with its metadata such as its title, artist name, size, media, and year of creation. A search function allows users to rummage for what they need to know about the artworks and artists. Moreover, since embroidery is a major part of Hong-gah Museum’s collection, it is especially introduced as “the Beauty of Embroidery,” and an e-book was developed with the same content in nature.

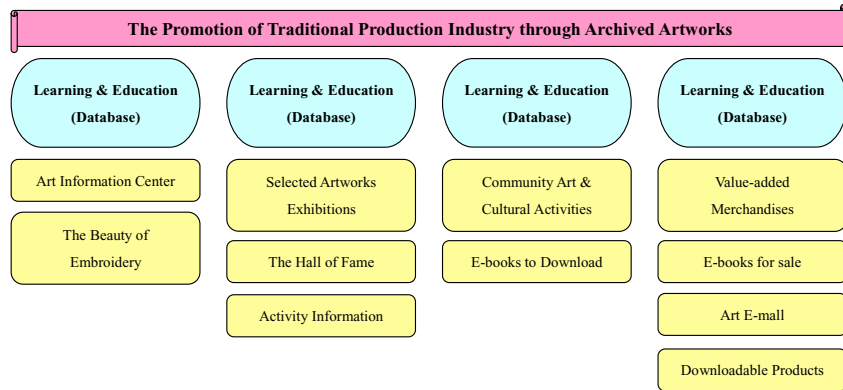


Figure 5. The Structure of the Project Website

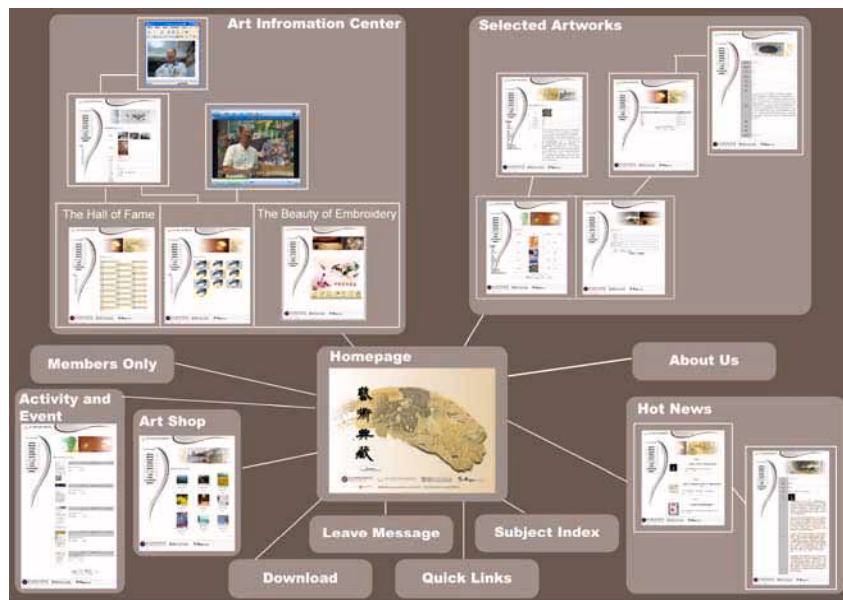


Figure 6. The structure of the project website

II. Preservation and Inheritance

In preservation and Inheritance value-added application section, it was constructed based on a digital art park concept which was divided into “Selected Artworks,” “the Hall of Fame,” and “Activity Information (see Figure 7).” In “Selected Artworks,” 115 artworks created by different media were selected from the collection for detailed introduction. Each artwork is introduced by a 500-word analysis written by the art critic Juey-jen Shih. “The Hall of Fame” was especially constructed to depict twentieth-century Taiwanese artists. Information about the artists was displayed, and twenty representative artists of them were selected for in-depth interviews. The interview videos are also shown in this section. Furthermore, “Activity Information” is the sub-section providing information about art and cultural activities of the museum and the project.

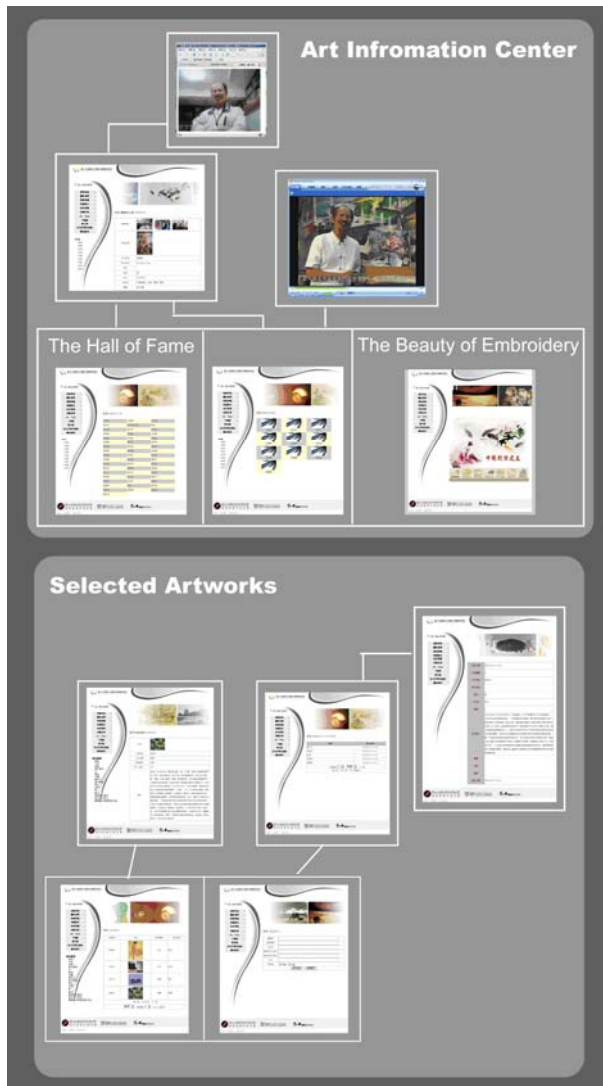


Figure 7. The Content of Preservation and Inheritance

III. Promotion via Activities

The third value-added application “Promotion via Activities” aims to display art and cultural activities which go along with the exhibitions for the community to attract more people to visit the museum. It is also expected that the activities would be an effective approach to promote the latest merchandises developed by the project. Furthermore, several events and activities were held during the first quarter of 2007. All of the promotion activities were recorded and the related news reports for these activities and events are presented in this section. It is important to note that the products and merchandises developed by the project were exhibited in the 18th Taipei International Building, Construction & Decoration Exposition from December 29, 2006 to January 1, 2007. Art doors and ceramic tiles, two series of art products were designed and developed by the ACT team and manufactured by PMI in 2006. These two product lines have moved the traditional building and decoration business to a new era and business model of enriching people’s life by integrating Taiwanese cultural heritage and new technology.

In addition, this project team participated in the Digital Archive Commercial Application Competition [3] held on December 1, 2006 with six pieces of arts products including ceramic tiles, doors, lamps, and purses. The main purpose of competition, held by Digital Archives e-Park from NSC, is to encourage people to creatively design commercial products using digitally archived content authorized from museums or other content holders. All of the six pieces of products developed by this project were not only selected to enter the final list, but also awarded remarkable prize. The art door called 「Mapping Art Door」 even won the first prize of the competition.

「Playing with Digital Arts」, a promotion activity held on December 9 to 10, 2006 by the Department of Graphic Communication Arts at National Taiwan University of Arts and Hong-gah Museum together. It invited several famous artists to discuss about issues of how to maximize the use of digital arts. Those artists used abundant creativity to design four series of creative T-shirts during the event to promote the spirit and conception of applying digital arts to people’s life.

As mentioned above in Promotion via Activities section, a new cooperation and business model, from artwork licensing to the merchandise marketing and promotion, was fully presented in this section. Through a series of promotion activities, this project does not only attract more people to appreciate the beauty of digital artworks, but also promote the new business model of university-industry cooperation, and of course, the merchandises developed by this project.

IV. Value-added application of E-commerce and Business

Value-added application of E-commerce and Business Model, which this project would like to emphasize, intends to promote Taiwanese arts and culture through the marketing of art products. The products developed by this project include architectural materials, leather accessories, e-books, and downloadable products, such as e-cards, e-wallpapers, and screen savers. The business model carried out by this project by incorporating the ACT Media Lab of NTUA (the academic sector) and PMI, IF, KYMCO (the

industry sector), is considered a successful try. PMI, one of the largest digital printing companies in Taiwan manufacturing architectural materials by OEM for other business, does not have its own design team and brand name. It has tried very hard to transform itself into a company having its product lines and own brand name. With participating in this project, PMI now has its own design team and know-how to run the product line of art door and interior decoration products.

In this project, Hong-gah Museum and Artkey provided the licensed images, and both understand and graduate students in the Department of Graphic Communication Arts and the Department of Crafts and Design at NTUA designed the products and the catalogue using those licensed images. PMI undertook the merchandise production of ceramic tiles, art doors, and art gifts. Since the target consumers of these merchandises are people with high income, most of these products are set at high prices. According to PMI, each ceramic tile would be limited to only 500 units in production and set price somewhere between 160~175 US dollar. As to the distribution channel and promotion, PMI has already planned to promote its art products by selecting specific channel such as building material stores, furniture agents, etc. Some of the PMI sample art products are shown in Figure 8.



Figure 8. The ceramic tile from PMI developed by the ACT team

Another company participated in this project is IF, a famous Taiwanese leather product company. In this project, Hong-gah Museum and Artkey also provided the licensed images of the artwork named “Palm-leaf flower” by Wu-Haq and several images of embroideries from Hong-gah Museum. The final outputs of value-added applications of those authorized digital images are female purses. The purses were co-designed by IF and ACT team of NTUA. IF carried out the production of the purses. Two series of purses were developed and manufactured by this project, but limited to 300 pieces only for each series till February of 2007. The target consumers are high income working women. The two series of purses have been sold in the department store nation wide in Taiwan and will be sold oversea soon. It is also estimated that the output value of purses will be approximately 10,000 US dollar for the first year in the market. The IF purses developed by the ACT team are shown in Figure 9.



Figure 9. The purse products developed by the ACT team

The third art product of this project was designed by the ACT team and manufactured by KYMCO, the largest rider manufacturing company in Taiwan (see Figure 10). The image was also licensed from Hong-gah Museum via the agency ArtKey Company. Art faceplates for beach buggies were developed using the licensed image. According to KYMCO, it will produce 50,000 pieces exporting to Europe for next 2 years and generate approximately 76,000 US dollar.

KYMCO Faceplate

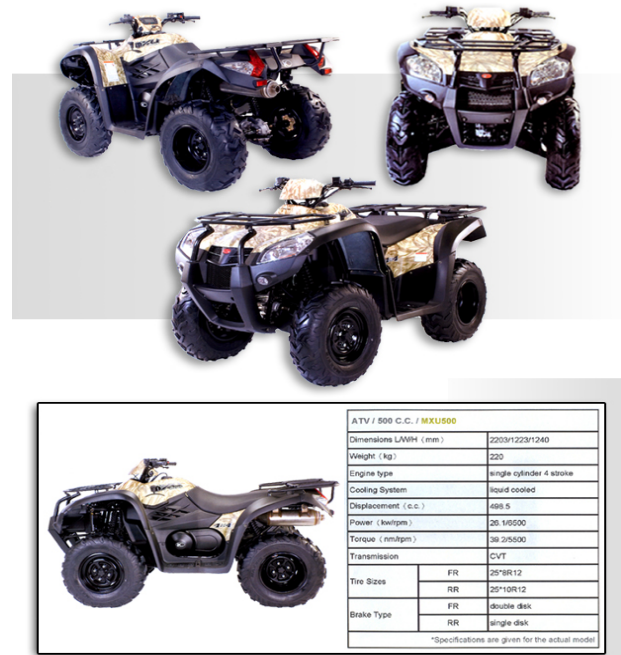


Figure 10. Art faceplate form KYMCO

All products mentioned above would be introduced and sold on the project website. The e-Market section of the website provides users an opportunity to obtain specific information about the products and their original artworks that inspired the designers. Of course, it also allows people to purchase art products of the project on line. Furthermore, this e-Market section provides an online chatting area for users to share information and exchange ideas.

Contribution of the Project

The main purpose of value-added application in this project was not only to create new business opportunities, but also to enhance the value of digitized artworks and upgrade traditional manufacturers through the process of artwork licensing and manufacturing. With the support of NSC, the Department of Graphic Communication Arts at National Taiwan University of Arts, Hong-gah Museum, Artkey, an art licensing company, Photo Man Image (PMI), a digital image printing company, IF Pacific Corp., a leather company, and KYMCO, a rider company, collaborated on this one-year project “The Promotion of Traditional Production Industry through Archived Artworks,” with three emphases:

1. Making arts and culture as a part of life, and making life as a part of arts: producing delicate art products using digitized artworks,
2. Establishing art licensing system: with the help of a licensing agent to integrate different industries to build up an effective collaboration system, and
3. Establishing marketing and global branding: promoting the fine Taiwanese culture and arts via international marketing.

Based upon the three emphases and the model of academy-industry cooperation, this project presents a new model resulting in more international business opportunity and generates profits feedback to the content providers, academy sector, and industry sector (see Table 4).

Table 4: Impact of this Project

	participant	Efficiency/Contribution
Upper stream	artist	<ol style="list-style-type: none"> 1. Enhancing the reputation of artists; 2. Gaining profits for their creativity.

	participant	Efficiency/Contribution
	Content holder	<ol style="list-style-type: none"> 1. Obtaining image licensing revenue; 2. Establishing e-market platform to increase revenue.
Middle stream	Research team	Cultivating research personnel for universities and industries
Lower stream	Industry	<ol style="list-style-type: none"> 1. Inspiring the product designing for the recreational industry, digital learning industry, and cultural creative industry; 2. Enhancing the market competition for traditional manufacturing industry with the improved technology and creativity.
	Channel	Distributing high valued-add products to increase market competition.
Market	Consumer	Having more opportunity to approach the cultural creative products to upgrade the life quality.

V. Conclusions and Recommendations

By digitization, artworks have more opportunities to be exposed to the public; meanwhile, the traditional manufacturing industry has more chances to produce high economic value products. How to maximize the use of those digitized contents and create more output value, then, becomes an important issue for cultural creative industry and traditional manufacturing industry. In this project, the collaboration among NTUA, Hong-gah Museum, Artkey, PMI, IF, and KYMCO introduces a successful model of facilitating valuable digital contents. It is a model that requires the cooperation and effort of every participant, and the creativity and profits generated from the merchandises are shared with each other. Through mutual cooperation, value-added applications, and branding establishment, the model is expected to bring a respectable amount of profits feedback to every participants so that all the participants have more resources to create, design, and produce better products; this is what this article calls “a never-ending cycle”. The more profit the model makes, the more funding resources available for further digitization, value-added applications, product development, and merchandise marketing and promotion. Figure 11 shows the never-ending cycle of this academy-industry cooperation.

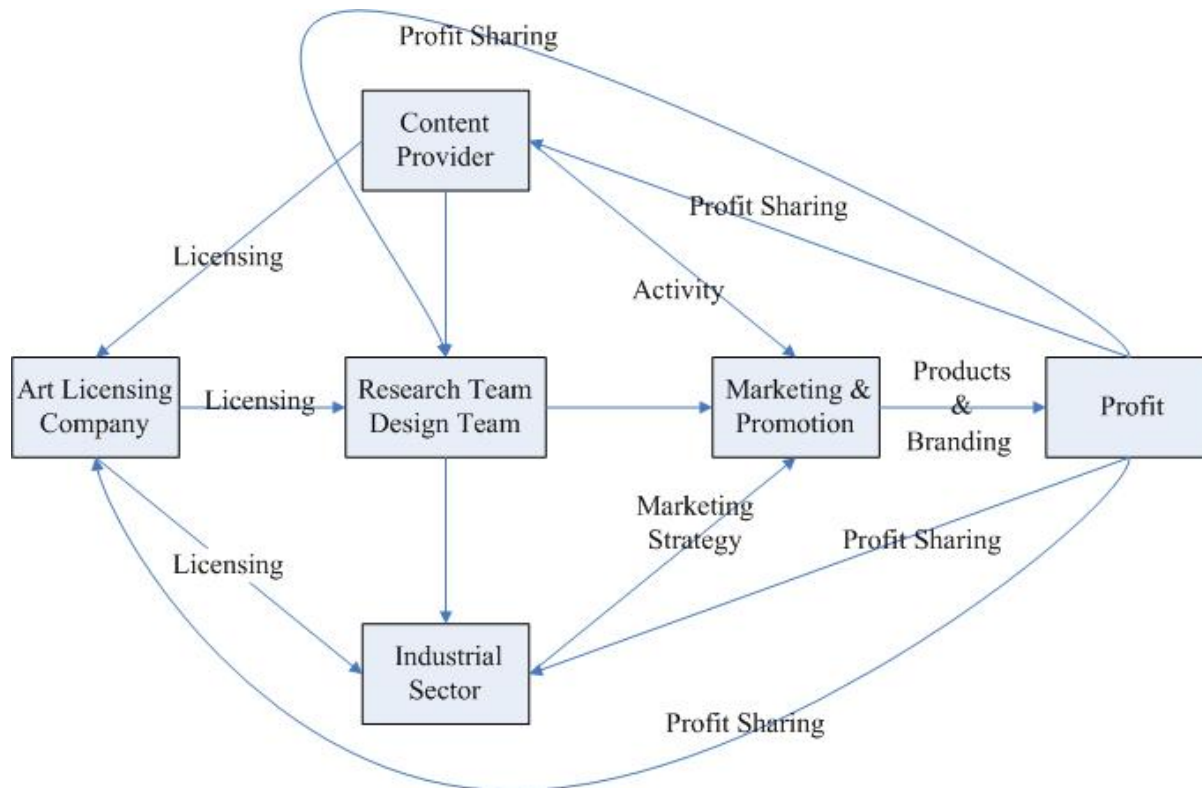


Figure 11. The Never-ending Cycle of the academy-industry cooperation

The model of this academia-industry cooperation is expected to bring benefits to each participant. However, some constraints and barriers inhibit the success of the model, especially the problems regarding to the licensing system and government regulations. These difficulties are summarized in Table 5.

Table 5: Problems related to the licensing system and government regulation.

Problem related to the licensing and government regulation	
1.	Owning the object but not the copyright for museums
2.	No authority regulating digital archive licensing
3.	Lack of content protection system for digital archives
4.	Low licensing motivation for government content holders and organizations
5.	Lack of regulated profit feedback system for digital archive licensing
6.	No pricing rules for digital archive licensing
7.	Lack of content transaction platforms

Based on the one-year experience, there are some recommendations to be made. First, for the copyright of digital content, museums and artists have to open their collection for digitization and applications. According to the experience of the research team, some museums are unwilling to spend time and effort to partake in this kind of academy-industry cooperation project because they are reluctant to get involved with the licensing and commercial issues. In the case of this project, fortunately, the team received large support from Hong-gah Museum, which greatly smooths the operation of the project.

Second, the expectation of the industrial sector is not always correspondent with the academic sector. Because the industrial sector looks at the model from a totally business point of view, therefore, the selection of digital images and the opinions about the products is very likely to be different from those of the academic sector. Once the expectation of both sides does not match, the willingness of cooperation might decrease, and there might often be disagreements. Especially, the model of this academy-industry cooperation as this project presents is rather new in Taiwan; there must be some kind of incentive for companies to join in this type of project, for example, the establishment of their own brand.

The third one is the profit sharing issue, which seems to be the most difficult one to settle. The profit brought by the model supposes to be shared with the content providers, the art licensing company, the academic sector, and the industrial sector. If the profit sharing percentage is not settled, there might be problems in the future. Since there is not yet a well-established profit sharing mechanism in Taiwan, it takes a lot of discussions to get a satisfactory result in this project. This article therefore suggests that a practical mechanism for the profit sharing be established as soon as possible.

The purpose of this project is not only for culture heritage preservation, but also for enhancing traditional manufacturing industry and people's life. The model of academy-industry cooperation on facilitating digital archives is worth developing in Taiwan. Although there is still a room for improvement, with the effort from various groups, the model could become more and more mature. If museums make the best use of academy-industry cooperation model, there would be more opportunities for their

collections to be known to the public. The more people get familiar with their artworks, the less distance there would be between the museums and the public. The model, therefore, is recommended to museums.

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- [1] Hsieh, Yung-Cheng, (2006).A Case Study of Digital Archive and Value-added Application : The Plant Dyeing, Weaving, and Knitting Arts Digital Learning and Value-added Center. IS&T (The Society for Imaging Science and Technology) Archiving 2006, May 23-26, 2006, Ottawa, Canada. Paper Published in the Conference Proceedings, p117-120.
- [2] Data provided by Hong-gah Museum..
- [3] See <http://www.daep.ba.ntu.edu.tw/Gallery/ArtistList.aspx?CTypeID=3> for more information about the competition.

Author's Biography

Dr. Yung-Cheng Hsieh is currently the Professor and Chairperson of the Department of Graphic Communication Arts at National Taiwan University of Arts (NTUA). Dr. Hsieh earned his Ph.D. degree from Iowa State University. He has conducted researches in the areas related to graphic communications technology and digital archives. Dr. Hsieh was awarded "The Outstanding Professor in Industrial Technology" by National Association of Industrial Technology (NAIT) of the United States in the year of 2002, and received "The Research Excellence Award" of NTUA in the year of 2003 and 2006. He has published more than 50 peer-reviewed journal articles and more than 40 conference paper since 1998. He is also the primary author of three books in the area of graphic communications. In addition, Dr. Hsieh established the ACT Media Lab at NTUA in 2006.

Miss. Ju-Chun Chien is a research assistant in the ACT Media Lab in Department of Graphic Communication Arts at National Taiwan University of Arts (NTUA). She received her Master degree from the Graduate School of Southeast Asian Study at the National Chi-Nan University with a major interest in cultural studies. She is currently working on the project "The Promotion of Traditional Production Industry through Archived Artworks" funded by the National Science Council of Taiwan.

Miss. Hui-Wen Cheng is currently a research assistant in the ACT Media Lab and graduate student in the Department of Graphic Communication Arts at National Taiwan University of Arts (NTUA). She has worked with Dr. Yung-Cheng Hsieh in the areas of printability study, color management, and digital archives since the year of 2004. Miss. Cheng has worked with Dr. Hsieh in more than 10 research projects funded by the Government of Taiwan. Although she started her research career at NTUA in 2005 as an undergraduate student, she has published more than five peer-reviewed journal and conference paper. Now she has worked toward her Master of Science degree at NTUA.