Ubiquitous Commerce Business Models Based on Ubiquitous Media

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Abstract. Conventional media, such as newspapers, radio, TV and Internet appeal human cognitive and perceptual organisms such as brain, eyes and ears. The producers of text, image, and video use their cognitive and perception processes and their consumers also receive and interpret the messages using the same two kinds of processes. However, the media in ubiquitous environment not only takes advantage of human biological systems, but also the digital systems of human beings while conventional media appeals only to people's bio-systems. Ubiquitous media creates and consumes content through not only human cognitive and perceptual processes but also through the interactions between surrounding digital systems. U-Media(Ubiquitous media) provides information by generating, collecting, and attaching the content itself and the related information based on the interaction of the bio-systems incorporating digital information and devices embedded in humans, and surrounding objects including external digital devices. This paper investigates the concept of media in ubiquitous environments and proposes a commerce business model based on U-Media.

1 Introduction

Media is affected by the technology that surrounds it during its content production and consumption process. It is evident that advancements in traditional media, such as newspapers and TV were developed alongside printing, editing, and photo and image technologies. The Internet affects many things not only in the content production and consumption processes, but also in the process where producers (senders) transmit content to their consumers (receivers). The Internet creates a prosumer that illustrates the obscure boundary between producers and consumers making it possible to generate and share new content, such as replies to BLOGs and videos on mini-home pages. Furthermore, the World Wide Web and especially the so called Web 2.0 have produced a new concept 'seamlessness' in the production and consumption process of content through links that connect between content and the new content that is derived from the content. One example is Flicker.com, a photo-sharing site that makes it possible to seamlessly link other content to a certain part of a photo. In addition, Beedeo.com provides a Cut & Tag function that opens a seamless link to a still image of a video and supports new content when a user clicks on a certain scene.

The seamless link between content is an important factor in U-Commerce (Ubiquitous Commerce). U-Commerce is commercial activity that creates seamless communication between provider, consumer, product, and service in which seamlessness

means the continuous transmission of information between product, service, space, and economic entities in a commercial process (Lee and Ju, 2005). Several U-Commerce business models, such as U-Comparison Shopping (Lee and Seo, 2006), U-Referral Marketing (Lee and Lee, 2006), U-Recommendation (Kim, Lee, and Kim, 2006) and U-Payment, U-Payment & Receipt (Lee, Jeong, and Ju, 2006; Lee, Ju, and Jeong, 2006) were studied in this paradigm. These business models have the examples of seamless links that make it possible to have links between objects in the actual world and online information. According to the ubiquitous technology and business models, media will be affected in its content generation, consumption, distribution, sharing, and derivation processes thus it is possible to expect the widespread emergence of seamless business models in the media. A new network produces new media, and new media creates new industries and commerce. Ubiquitous environments make it possible to realize U-Media, and a new commerce model is anticipated based on U-Media. This paper investigates the concept of media in ubiquitous environment and proposes a commerce business model based on the U-Media.

2   Definition and Characteristics of U-Media

Before the existence of ubiquitous environments, conventional media, such as newspapers, radio, TV and Internet appeal human cognitive and perceptual organisms such as brain, eyes and ears. The producers of text, image, and video use their cognitive and perception processes and their consumers also receive and interpret the messages using the same two kinds of processes. However, the media in ubiquitous environment not only takes advantage of human biological systems, but also the digital systems of human beings while conventional media appeals only to people's bio-systems. Ubiquitous media is defined as a media where human creates and consumes content through not only human cognitive and perceptual processes but also through the interactions between surrounding digital systems. Hypermedia is a term created by Ted Nelson, and used in his 1965 article (Nelson 1965). It is used as a logical extension of the term hypertext, in which graphics, audio, video, plain text and hyperlinks intertwine to create a generally non-linear medium of information. U-Media is a hypermedia where the hyperlinks are automatically and systematically generated and the hyperlinks can be connected to any objects in real or virtual world.

The definition of U-Media can be easily understood with U-Camera, an example of U-Media, 'a camera that takes photographs of digital links as well as real world image'. Assume that a man takes a picture using a U-Camera. Through wireless networking such as Bluetooth and RFID, he receives digital information or links of objects and the people at the angle that the picture was taken. When it is possible to recognize the digital link in a picture and connects to another content that the link connects to, we can call it as U-Media since people can seamlessly obtain the information using the automatically generated links of the objects or people in the Picture The acquisition and usage processes of the digital links and the related information is far more automatic and systematized than those of Flicker.com and Beedeo.com where users themselves produces tags for every single image or specified section of a video. Fig. 1 illustrates the production and consuming process of conventional media and U-Media.

Conventional Media
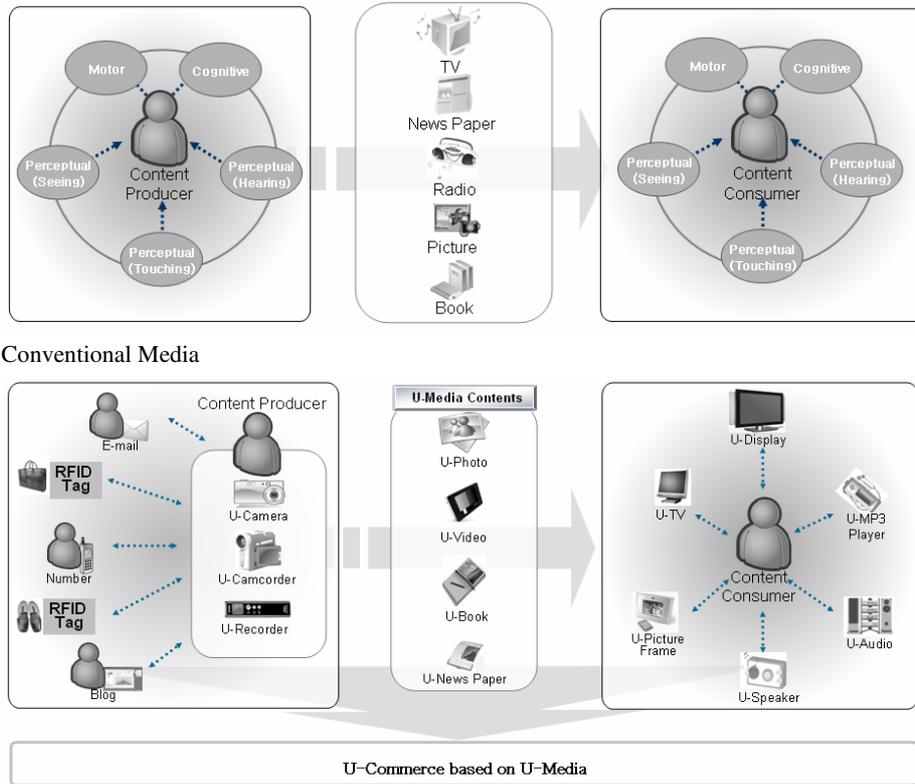
U-Media

Fig. 1. U-Media

The characteristics of U-Media can be analyzed as follows.

U-Media reduces information production. Although it is currently impossible to automatically annotate content-related links to content in traditional media, U-Media aides in the automatic and systematic annotation of surrounding digital information into media files. This is due to the improvement in wireless communication infrastructure, such as RFID and Bluetooth, and the computing power of user devices. As previously mentioned, a method that links to the object existing in image/video of Web 2.0 sites such as Flicker.com or Beedeo.com requiring work forces for every single link is entirely different from that of U-Media. Thus, it is evident that U-Media reduces content production costs. In addition, the automatic and systematic annotation of information and links affects the reduction in commerce costs. It is possible to reduce the costs of searching, sharing, advertising and advertisement effects assessment using the systematic and serialized annotation functionality. Search costs can be reduced using the link annotated in image files. Sharing costs can be reduced when users want to share image files just after taking a picture using the U-Camera. A receiver is able to receive image files using predefined methods such as e-mail and a cell phone with contact points of collected persons when u-photo are generated.

Advertisements and advertisement effect assessment costs can be reduced due to the use of the new media and new advertisement methods.

U-Media brings a new level of content. At present, it is difficult to produce content that includes links regardless of manual or automatic forms except for the text built into web pages. Furthermore, it is impossible to obtain information on objects or people from images or videos. However, U-Media enables high integrity regarding information and open media in information collecting compared with existing media. Moreover, U-Media supports meanings that are more precise by annotating the object links or tag information. U-Media is able to support the precise transmission of meanings due to the annotation of related information because media plays a role in the precise transmission of messages to receivers by producing it as text, picture, and video. Various information annotated in content may be included that introduces the spontaneous and creative involvement of the participant surrounding media.

Using U-Media, producers can track media consumption patterns using a link applied to the real world. In addition, it is possible to present a new advertising business model using U-Media. If businesses want to have links to the same object in U-photos, an advertising business model is possible. Furthermore, U-Media can provide economic incentives to purchasers and providers. Incentive mechanism enabled by the concept of seamlessness is the most important attribute of U-Commerce (Lee & Ju 2006). In U-Media, a business model can be designed that shares the benefits of content producers and senders by providing links to objects and people.

3   U-Media Business Model

This section offers an easier understanding of U-Media using a U-Media scenario from the viewpoint of users and analyzes U-Media business models in detail. Though U-Media scenarios can be produced in a variety of forms according to classification criteria, this paper considers images and videos as basic scenarios for U-Media.

3.1   Scenario 1: U-Camera

Daniel takes some pictures of his friends in front of a gallery using a U-Camera. His friends gather to check the picture using the U-Camera display. Contact information for each friend is included and linked to each picture, and some links are connected to surrounding objects. All friends predefine their contact information to their own UDA in order to send it when requested. In addition, the information of surrounding objects is annotated to the picture by receiving the information from the RFID Tag embedded in surrounding objects. In order to send the picture to his friends, Daniel selects the picture sending function in the U-Camera. Then, the pictures are sent to friends via e-mail or UDA.

That evening, James, who appeared in the pictures and is a friend of Daniel, likes the background image that appears on Daniel's blog. James wants to hang the picture on his wall. Thus, he clicks on the image to obtain detailed information. The web page of the gallery is loaded and displays additional information regarding the price and painter.

3.2 Scenario2: U-Camcorder and U-TV

Daniel watches a drama while waiting for his train at a station. The drama is famous and shown by "A" broadcasting company. In addition to the popularity of this drama, fashion products, such as accessories, dresses, and hairstyles are also popular. Daniel especially loves the bag used by the male actor in the drama. He selects the scene that appeared on TV using his UDA and a list of linked objects appears on the screen. From the list, he clicks on the bag and the product information is fully displayed. Daniel checks the price and selects the bag from the purchasing menu. He completes the purchase.

3.3 Process Analysis

Information included in U-Photo and U-Video if allowed to be open
Location information: GPS information and URL for further information on the location
People/Actor information: contact information such as e-mail address or cell phone number, and URLs for further information on the people or actors
Objects in photos: basic information and URLs for further information on the objects

Major economic subject in commerce
Content producer: Producing images and movies, expecting future incentives
Content distributor: Diffusing uploaded content to their own blogs or other sites
Content consumer: Enjoying the produced images and videos; In the case of commerce, they are able to easily obtain detailed information by linking provided links.

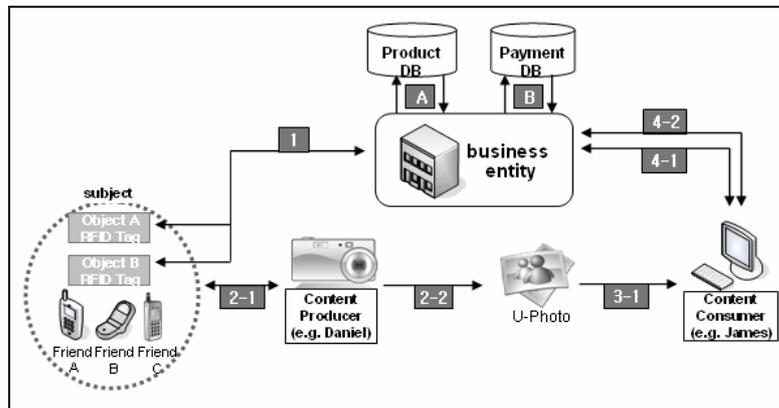#### 3.3.1 U-Camera System Architecture
Process of U-Camera

Fig. 2. Process of U-Camera Scenario

0. Specify the level of openness of contact information
1. RFID Tag: Insert digital information
2. Taking pictures: 2-1) Collecting digital information of people and objects, 2-2) Completing image files (U-Photo)

3. Image file transmission: 3-1) Receiving image files
4. Clicking images: 4-1) Loading additional information, 4-2) Clicking additional information
5. Commerce

In Step 0, each member predefined their contact information before taking pictures. Members who first consider privacy protection configure their e-mail as contact information, and members that are more open-minded configure their blog or mini-homepy page. In addition, members who are not concerned about the exposure of their cell phone number can link their number to the picture. In Step 1, providers and owners input digital information to the RFID Tag of various objects. Then, they link it to their own homepage or detailed information in order to use it for commercial purposes. In Step 2, contact information is collected from the RFID Tag of objects in the background of a picture and annotated to the picture in order to complete the picture (U-Photo). In Step 3, Daniel who took the picture transmits the image file to his friends. In the future, instant transmission of a picture will be possible using the WiBro or Bluetooth or WCDMA module in a camera then sent to a blog, e-mail, messenger, and other forms of communication. In Step 4, James who received the picture, clicks on a certain object in the picture to obtain additional information from the picture. In Step 5, a commerce process is achieved from the information embedded in the picture.

3.3.2 U-Camcorder System Architecture
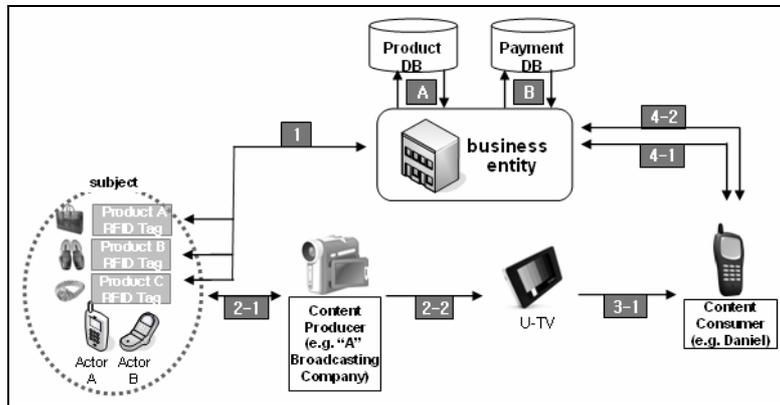### Process of U-Camcorder and U-TV Scenario

Fig. 3. Process of U-Camcorder and U-TV Scenario

0. Specify the level of openness of contact information
1. RFID Tag: Insert digital information
2. Taking movies: 2-1) Collecting digital information of people and objects, 2-2) Completing image files (U-Movie)
3. Video file transmission: 3-1) Receiving movie files, 3-2) Loading the scene in UDA screen

4. Listing of product: 4-1) Loading the additional information 4-2) clicking on the additional information
5. Commerce

In Step 0, each actor in the drama appears with predefined contact information. New actors can link their information to their agency's home page and famous stars may link it to their own home page. Steps 1 and 2 are the same process as the U-Camera. In Step 1, providers and owners insert digital information into the RFID tag of various objects. In Step 2, a U-Camcorder used to shoot the drama collects digital information of people and objects and completes U-Video files. In Step 3, Daniel loads a certain scene into his UDA while he watches the drama in order to know more about the bag that appeared in the drama. The linked product list is displayed on his UDA screen. In Step 4, Daniel clicks on the bag to obtain additional information about the product. In Step 5, a commerce process is achieved from the information embedded in the picture.

3.4   Analysis of a U-Media Business Model

Timmers (1998) defines business model as 1) an architecture for the product, service and information flows, including a description of the various business actors and their roles, 2) A description of the potential benefits for the various business actors, 3) a description of the sources of revenues. Applying the definition to U-Media business model, its participants can be classified as a content creator, distributor, consumer, and advertiser. A content creator first produces images, movies, and other objects, distributor diffuses the produced content to the distributor's blog or other sites, and content consumer enjoys the produced content in web sites or on mobile devices in which consumers are able to obtain more detailed information of content by clicking images in content. An advertiser publishes advertisements which connect the objects in content to the advertiser's site.

Regarding the potential benefits for such participants, Content producers and distributors will receive a proper incentive because they contribute to a commercial transaction to increase connecting points between the advertiser and the consumer. In the case of the content consumer, it is possible to easily obtain detailed information by simply clicking objects in content. An advertiser is able to overcome a ruptured process that has not been connected to a commercial transaction due to the fact that consumers couldn't obtain the information of the object published in photos. Table 1 denotes the role and potential benefit of the participants in this business model.

Table 1. The Values and Incentives of the Participants in U-Media

Subject	Value	Incentive
Content producer	Guaranteeing connecting points between advertiser and consumer by producing and distributing content for consuming the produced content	Self-satisfaction, entertainment, and forthcoming incentives
Content distributor		
Content consumer	-	Easy and convenient information access
Advertiser	Detailed information of the object appeared in the advertisement	Contact points with consumers, increasing sales

The U-Media business model represents a sort of ubiquitous UCC (User Created Content) models. The reason that end users produce their own images or movies is to remember their joyful memories in the life and is due to the easiness of using the recording device. Since the content of U-Media includes location information (e.g. GPS), entity information, and object information that couldn't be included in traditional photos or movies and it can promote various types of participation. Thus, it can be regarded as an open type of content in the production and consumption of information.

The previous two scenarios are significant in that they support seamless commerce that could not be achieved by conventional media. The existing picture file has difficulty in obtaining additional information because objects in the picture have no links making it impossible to lead to commerce. In addition, the dresses and accessories worn by actors in the TV drama have not been easily connected to commerce. Thus, the two scenarios propose greater benefits for the customer using an advanced commerce process compared to conventional methods and provide clues to similar models used in other media.

4   Classification and Design of U-Media

This section investigates the classification of U-Media and analyzes user requirements regarding U-Camera and U-Photo.

4.1   Classification of U-Media for Input/Output Device and Content

Scenarios in U-Media can be classified according to devices and content. U-Camera, U-Camcorder, and U-Recorders are classified as input devices, and U-Display (e.g. U-TV, U-Picture Frame, etc.) and U-Speaker (e.g. U-Audio, U-MP3 Player, etc.) can be regarded as output devices. Furthermore, U-content for these devices can be referred to as U-Photo, U-Image, U-Video, U-Sound, U-Book, and U-News.

Characteristics in each device can be described as follows; U-Camera and U-Camcorder mean an intelligent camera or camcorder not only taking a picture but also annotating digital information (e.g. Hyperlink or Tag) of objects. A U-Voice Recorder records voices including surrounding digital information and provides the collected information through interaction with user or use device when the voice is reproduced. U-TV reproduces video content, including hyperlinks and the U-Picture Frame display pictures including links. U-Audio, U-MP3, U-Speaker, can be used as a sound player that reproduces sound signals including annotated information. U-Photo and U-Image include pictures and photos with links, U-Video includes video with links, U-Sound includes voice signal with links, and U-Book and U-Newspaper include books and newspapers with links. These are all classified as U-Content. Table 2 shows the classification of U-Media.

4.2   U-Media Design

This section demonstrates basic conditions applied to U-Media. These conditions are illustrated using U-Photo and U-Camcorder.

4.2.1 User Requirements of U-Photo

U-Camera should include the information of people and objects within the angle along the direction of the camera when the U-Camera creates U-Photos. If certain objects that are not allocated along the direction of the camera are included in the picture, unwanted information will be included. If the orientation of the camera is neglected, the information of passersby or objects in the background will be included in the picture. This is not desirable in the use of this U-Camera.

Table 2. Classification of U-Media

Input Device		U-Camera/U-Camcorder: an intelligent camera/camcorder that takes pictures of objects including digital information of objects (e.g. Hyperlink or Tag) and annotates it to the picture/video
		U-Recorder: a recorder that records voices including surrounding digital information
Output Device	U-Display	U-TV: a reproduction device of broadcasting content that include hyperlinks
		U-Picture Frame: a picture frame that includes pictures with links
	U-Speaker	U-Audio/U-MP3 Player: a player that reproduces music and voice signals and additional information
U-Content		U-Photo/Image: objects in pictures and photos with links
		U-Video: objects in videos with links
		U-Sound: sound streaming files with links
		U-Book/U-Newspaper: books and newspapers with links

It is recommended that a user decide whether the annotation of digital information should be limited to the object that is correctly focused on the pictures. In a picture with a foggy in the background and focused on a specific object, it is difficult to determine an efficient link between objects that are correctly focused and objects that include both clear and foggy focus. Only the photographer can recognize this situation. Thus, the U-Camera should support a function that enables a photographer to decide on links for the object according to the state of the focus.

The number of objects and people in a picture should be the same as that of the annotated information. If there are four people in the picture, the number of links related to the people should be four. Likewise, 10 objects in a picture should have 10 links. This means that N Tags have N links related to these Tags. However, digital information that includes non-embedded objects or people who do not open their contact information should be excluded.

There is an issue of privacy protection. Privacy that includes information regarding people and objects is the most sensitive when this information is annotated to files using U-Media. Thus, 1) the people appearing in a picture should have the right to determine the level of information and exposure, 2) the people appearing in a picture

should have the right to annotate only the necessary information to a media file, and 3) a function is required for deleting information that should not be accessible after completing media files. In U-Camera, a method that annotates the information of people in a picture may be classified as follows: i) unconditional notification, ii) unconditional non-notification, iii) notification only when requested, and iv) knowing the photographer and whose picture is being taken (e.g. each name is listed in their cell phone). Because privacy is the most sensitive element regarding U-Media, it should be designed precisely.

The interface used in U-Media should be a simple and intuitive design. In addition, U-Media should configure options in the production of media files. In addition, it is necessary that certain settings be in place for the object and people appearing in pictures. Thus, an interface is required that minimizes complexity occurring in the configuration of options. Furthermore, applications are required to edit the information annotated in a file after completing media files.

5 Related Works

Wilhelm et al. (2004) described the system of annotation, such as CellID, User Name, Date, and Time, using a cell phone camera. Annotation of digital information to the image produced by a cell phone camera was attempted by considering a cell phone as a proper platform producing photos that can be applied to a network. Annotated digital information designated MMM (Mobile Media Metadata) was configured into four different steps. In Step 1, a user takes pictures using his/her cell phone. In Step 2, the Cell ID of GSM captures its location, user name, and production time and date of pictures. Step 3 is the transmitting process in a cell phone that transmits pictures and annotated information to the Metadata Repository of a server in which the matching algorithm of the server transmits a list that is most frequently selected by users by comparing the annotated information and metadata stored in the server. In Step 4, a user confirms the appropriate item from the list that is most similar to the pictures.

The difference between our approach and the research of Wilhelm et al. can be summarized in several ways. Our approach collects information using a communication process in the RFID Tag of subjects located along the angle of U-Camera and digital devices. Then, links are applied to the object in pictures. However, they provide the opportunity for users to confirm the most appropriate information by comparing the produced metadata using a server. Pictures produced using the system designed by them does not include individual links for all objects in the picture, but single metadata that is created based on the previous situation of the user using a mobile phone is annotated to a single picture file. They investigated user interfaces and systems in order to design an effective service design for the limited display size of a mobile terminal.

Sarvas (2004) demonstrated some improvements though the main idea was regarded similar to the study performed by Wilhelm et al. MobShare, a type of blog, is a system that immediately publishes pictures on the Internet using a cell phone, and provides album and comment functions. Although MobShare can produce and share

picture content simultaneously, it cannot provide the information of objects appearing in the picture. Furthermore, it does not provide commerce functions.

Finally, Kohtake et al. (2004) employs a similar approach in which U-Photo is produced using the direct interaction between objects located in the real world and a camera. They propose the use of U-Photo as an interface for the remote control of electric home appliances that included a network, computer, and sensors. The U-Photo can be produced using several processes. First, a PDA including a CCD camera applied to a wireless LAN is used to take pictures by attaching an LED transmitter to the object that is being taken. Next, a U-Photo creator recognizes the ID of objects using the color of the LED and detailed information by searching the information applied in the ID from database. Following this process, a user can remotely control objects using the icon on the LED in the U-Photo of a PDA. This research was conducted on remotely controlled objects using the content of photos and demonstrated the differences compared to the goals of our approach, which were to design a commerce model based on U-Media. In addition, the research recognized objects using the color of the attached LED showed a difference in the annotation process of digital information compared to our study. Our approach applied several links to the objects appearing in pictures using the interaction between the RFID and the U-Camera.

6   Conclusion

This paper investigates the concept of media in ubiquitous environments. The media in ubiquitous environment not only takes advantage of human biological systems, but also the digital systems of human beings while conventional media appeals only to people's bio-systems. Ubiquitous media creates and consumes content through not only human cognitive and perceptual processes but also through the interactions between surrounding digital systems. Thus, media consumers can use the content linked to other content to obtain information seamlessly using the link.

We also proposed a commerce model based on U-Media by demonstrating scenarios and processes of a U-Camera/U-Camcorder. The classification of input/output devices and content used in U-Media help understand U-Media scenarios and recognize which models could be applied for commercial purposes according to device and content. In addition, we analyzed the business model using the Timmers' definition to understand the model as a perspective of business entity.

Future research topics which should be investigated include intellectual property rights issues, legal constraints of U-Media, and cost-benefit analysis model of auto-identification infrastructure etc.

Acknowledgments

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