MOBILE CULTURAL HERITAGE APPS FOR THE DIGITAL LITERACY OF THE DAYAK TRIBE, BORNEO, INDONESIA

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1. Introduction

Indonesia, as a multicultural nation has a variety of cultures, arts, tribes, unique traditions and other local knowledge that differs from other countries in the world. Unfortunately, its cultural diversity is still not being optimized in the field of cultural heritage literacy and is neither promoted nor utilized properly, even though it has great potential in developing and strengthening local lore. Besides, Indonesia is one of the countries with the largest number of internet users in the world. According to the results of digital reports [1], the total number of Internet users as of the beginning of 2019 was 143.3 million people (Internet World Stats), around 86.60 million according to the International Telecommunication Union and world banks, with this growth being reported as +13% in one year.

Indonesia's readiness as a nation with diverse cultures has been tested for its resilience through the current of globalization and rapid technological development. Strong currents began in 2015 with the implementation of the ASEAN Free Trade Zone (AFTA). Related to the impact of globalization on Indonesian culture, according to Y. Effendi [2], Indonesia as a developing country does not yet have a high level of competitive power or an equal bargaining position with developed countries, therefore the use of technology in cultural literacy is still low and poses a serious threat to cultural identity.

In the past, before the advancement of communication and information technology, the value of Indonesia's cultural heritage was still strongly felt by the community, but now, foreign cultural values easily and quickly enter people's homes through an overzealous use of the web and communication systems (internet-based information, social-media, etc.), transforming and eroding the long-established values of Indonesia's cultural heritage.

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According to Wilhelm [3], the erosion of culture began with the age of information technology, such as the development of satellite communication systems and the internet. Since then, the consumption of information has become infinite. People in Indonesia are able to obtain all kinds of information without restriction and tend to absorb it without considering the positive and negative effects on their cultural identity.

Among the positive effects is that information technology can advance culture. The growing diffusion of Indonesian culture by other countries deriving from the various ways of promoting it through online media is, of course, principally in the interest of tourism. Information technology makes it easy to communicate and acquire information about the existence of other cultural values that are different from the cultural heritage that is one's own; it is therefore not easily adopted by other countries, its characteristics are insular, etc.

On the other hand, negative effects exist. Indonesian culture that was once friendly, polite and one of mutual cooperation, has been replaced by features which are altogether foreign, such as promiscuity. In the use of language and dress code, teenagers have rarely mastered and used regional languages or adopted local fashions in their daily life. They prefer to dress in a style using the materials and colors of a global fashion rather than those of their own culture in which the local materials traditionally employed include *batik, ulap doyo* and others. The clothing culture adopted from films and social media through the internet, has also facilitated the spread of pornographic works, etc.

The mode and scale of globalization today has indeed changed. The world is experiencing a 4T Revolution (Technology, Telecommunications, Transportation, Tourism) which has a dominant global driving effect so that boundaries between regions are increasingly blurred, and in the end, leads to the creation of a global village [4]. Therefore, in order to preserve Indonesian culture, management, documentation and information dissemination are needed together with knowledge about utilizing information and communication technology within the context of the noble values of local and national cultures.

The management of cultural heritage information is a complex process [5] which involves methods, techniques and technology, cultural diversity, file form and format, properties, data classification and resources, database integration, accessibility, knowledge exchange, and other processes.

In this study [6]such as: unintegrated database, incomprehensive inventory, limited access to public, and so forth. Various data, applications, and technologies of cultural heritage and natural history are scattered and built with different formats and platforms. In order to overcome such problems and challenges, we proposed a framework, called eCultural Heritage and Natural History (eCHNH, a framework is proposed, called e-Cultural Heritage and Natural History (e-CHNH). This framework was developed based on the Zachman architectural framework and uses it as a basis and guide for digital preservation, accessibility and sharing of information on cultural heritage and natural history in the public and non-public domains. Furthermore, the classification of the cultural heritage, according to the Indonesian Archipelago Culture Initiative (IACI) organization [7], lists 12 categories, i.e. traditional clothing, tribal maps, performing arts, weapons and armaments, music and songs, architectural products, food and beverage, motifs and ornaments, traditional games, manuscripts and inscriptions, folklore legends, mu-

sical instruments, and ritual and treatment. Nowadays, the question is not whether information, data, and documents about cultural heritage should be digitized, but how to think towards developing content, releasing or displaying, data visualization, accessibility, and exchange of knowledge, etc. It is not just a question of information.

The paper aims to develop Mobile Cultural Heritage for the Digital Literacy of the Dayak Tribe on the island of Borneo as an effort to preserve their local and national culture and identity. The framework used refers to the 5R Architecture Framework: concepts, systems, and learning scenario [8], [9]. This paper explains how the 5R architecture framework and the use of IACI content can be adapted to complement cultural heritage pedagogy and be implemented correctly as the right digital literacy media to be used within the 5R concept (Right time, Right location, Right device, Right user and Right content).

2. Materials and Methods

The rationale that has driven us to develop this framework lies in the effort to preserve the local cultural heritage through digital literacy which is now being eroded and is fading, due to the influence of modern globalization. Globalization has changed the values of the nationalism and culture that exist in Indonesia and in particular the cultural heritage of the Dayak tribe in Borneo. There is a loss of indigenous cultures, the erosion of cultural values, a decline in nationalism and patriotism, a loss of kinship and mutual cooperation, loss of self-confidence, a lifestyle that is not in accordance with its culture. In addition, there is often a gap arising from incidents, conflicts, or claims of cultural ownership rights for the same cultural, as often occurs between two countries in one region that have the same ethnic group or culture. One such example is that of the Dayak people. Where the distribution of their tribes covers four countries on the mainland and the Borneo islands, i.e. the Dayak tribe who inhabit the Indonesian mainland in Kalimantan, the Dayak tribe in mainland Sabah and Sarawak Malaysia, the Dayak tribe in Brunei and the Dayak tribe in the Northern Borneo archipelago, the Philippines [10] [11].

2.1. Dayak Tribe Borneo

Dayak or "*Daya*" are the names given by coastal occupants to the inland inhabitants living on the island of Borneo [12], which includes Brunei and Malaysia, the latter consisting of Sabah and Sarawak and Indonesia, which consists of West Kalimantan, East Kalimantan, Central Kalimantan, South Kalimantan, and North Kalimantan. The culture of the Dayak community is a nautical or maritime culture. Almost all Dayak names have a meaning related to the terms 'upstream' or 'river', especially found in the names of sub-tribes and clans [13].

Figure 1. Tribal distribution map

The Dayak tribe of Borneo island is divided into 7 groups called "*STAMMENRAS*" with a total of 405 sub-tribes [14], the division is formed based on clumps, the area of habitation and its origin and they are scattered in various regions in Borneo. Although it is one ethnic group (Dayak), each indigenous sub-tribe has cultural characteristics and local traditions that vary according to the region or nature where they live [15]. The names of the clumps and tribes are shown in Table 1, with the map in Figure 1 indicating the position occupied by the different tribes.

Table 1. The seven groups of the Dayak tribe in Borneo.

Group name	Sub-groups (total)	Distribution area
Dayak Ngaju (Biaju)	Ngaju (53) Maanyan (7) Lawangan (21) Dusun (8)	Central Kalimantan South Kalimantan East Kalimantan
Apo Kayan	Kenya (24) Kayan (10) Bakau (26)	Northern East Kalimantan Brunei Sabah-Sarawak East Malaysia
Iban (Dayak Sea)	Heban (11)	West Kalimantan, Sarawak, Brunei Tawau Sabah Malaysia
Klemantan (Dayak Land)	Klemantan (47) Ketunggau (39)	West Kalimantan Sarawak, East Malaysia

Murut	Murut (28) Idaan (6) Tidung (10)	Northern East Kalimantan Brunei Sabah-Sarawak, East Malaysia
Punan	Basap (20) Punan (24) At (5)	West Kalimantan Central Kalimantan East Kalimantan
Danun (Ot Danum)	Ot Danum (66)	Central Kalimantan South Kalimantan Southern East Kalimantan Southeastern West Kalimantan.

2.2. The Cultural Heritage Domain

UNESCO [16] divides cultural heritage into two categories: tangible and intangible cultural heritage. These two cultural elements do not stand-alone but are interrelated and influence all elements of culture, both tangible and intangible. In the process of cultural development, there are three inseparable things, i.e.: education and training, archiving and preserving, equipment and supporting materials. Then, as stated earlier, that culture does not stand-alone, the mapping of e-Culture domains also includes fields other than cultural elements that are directly or indirectly related, i.e. tourism (e-Tourism), sports and recreation (e-Sport), business (e-Business), government (e-Government), environment (e-Environment) and education (e-Learning). These fields are included in the ecosystem of developing e-Culture so that it cannot be separated, for example in the field of tourism, cultural attractions are promoted or marketed through e-Tourism content, or cultural products are sold and promoted through e-Business systems, etc.

3. Results and Discussion

To achieve the stated goals, i.e. to develop mobile cultural heritage for the digital literacy of the Dayak Tribe in Borneo, this study was characterized by library research, case studies, and practice-based research. Data collection methods included: literature studies, such as history books, research results on Dayak culture, etc.; observation, i.e. field visits to locations of data sources such as the office of the Education and Culture institution, the office of the Tourism institution, the Office of Library and Archive Services, the office of the Cultural Preservation Institution, the Cultural Village, the Museum, and various other sources.

3.1. Mobile Culture Heritage Domain for Dayak Tribe Borneo

Using the IACI (Indonesian Archipelago Cultural Initiatives) as a reference point, the mobile cultural heritage domain was built for digital literacy, which consists of 12 tangible cultural elements, as shown in Figure 2.

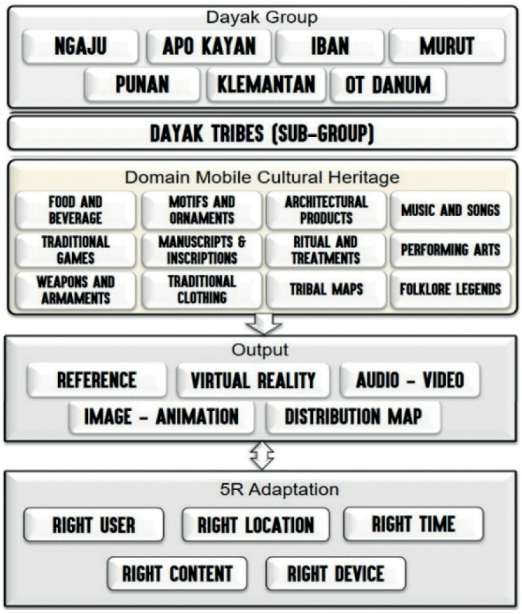

Figure 2. Mobile cultural heritage domain for the Dayak tribe, Borneo

3.2. The 5R Adaptation Framework Concept for Mobile Cultural Heritage

The concept of the 5R adaptation framework was proposed by Tan, Qing, *et al.* [8], [17] and was aimed at enriching adaptive and personalized mobile learning through the integration of context information to build context-aware mobile computing architectures. The 5R framework concept as a reference in building a mobile cultural heritage with components of adaptation is shown in Figure 3: the right time, the right location, the right device, the right user and the right content. The intention of introducing a 5R cultural heritage adaptation framework is to create a standard structure for mobile cultural heritage application systems to obtain a wider range of adaptation in the mobile culture domain.

Right Contents: the "right contents" include information objects, cultural activities, and information literacy that suit the particular user, at a particular time and location, as well as the device. The knowledge management system, firstly, has to be able to generate the 5R sensible information contents in the repository. Secondly, it has to be able to deliver the 5R adaptive information contents to users. The information contents contain all the attributes of time, location, device, and user.

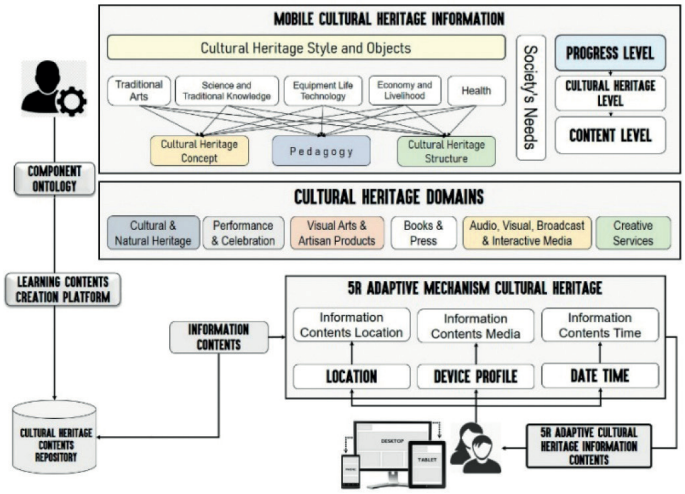

Figure 3. The 5R Adaptation framework for mobile cultural heritage

Right Device: the "right device" refers to the user's device used to access cultural information. The device constraint is associated with information contents to provide users with the best possible knowledge, information or experience through their devices. The mobile devices are heterogeneous with multiple operating platforms and the devices have different and limited device interaction capabilities.

Right Time: The time in the adaptation framework indicates two factors, the date-time and visitor (access, traffic) progress. It provides up-to-date information contents to the user.

Right Location: the location in the adaptation framework indicates the user's current geographic location. In a cultural heritage mobile environment, the location-based information contents can be implemented to enhance the contextual interaction for users. Location-based information contents are those cultural objects that are tied to particular locations.

Right User: the "right user" is the person who uses the device to access information through the cultural heritage application. The right user means that the information provided for the objects, the information activities assigned, and the pedagogy used by the knowledge management system matches the user's profile and style.

The 5R Adaptation Mechanism: The adaptation mechanism consists of adaptive controls to process the inputs and to generate the 5R adapted information contents for the user in the mobile culture domains.

3.3. The Mobile Cultural Heritage Application

The development of the 5R architecture framework for mobile cultural heritage should be framed within the traditional knowledge management system as an informal learning tool in supporting cultural digital literacy to help build a compre-

hensive picture of a nation's identity. Information contained in the legacy domain integrates cultural context information including time, user, location, device, and content into the adaptation process. The development of cellular technology over the past few decades has enabled the application of new ways to interact with people and smartphones. Advances in digital information also significantly influence the evolution of cultural heritage dissemination.

The mobile cultural heritage application for Dayak tribe digital literacy provides information about the cultural diversity of each Dayak ethnic group. The built application consists of three main sections, i.e. the cultural heritage menu, the Dayak groups and the tribal maps shown in Figure 4.

Figure 4. Screenshot of 3 main sections in the mobile cultural heritage app for the Dayak tribe, Borneo.

The cultural heritage menu contains cultural domain data consisting of the 12 categories of cultural heritage in accordance with the classification of the cultural heritage by IACI already mentioned in the previous section. The Dayak Group menu contains a list of seven Dayak group names that make it easy for users to search for information on 405 tribes and their cultural heritage. Instead, the tribal map menu contains information on the distribution location of each Dayak tribe on the mainland of Borneo.

Content visualization in the application integrates cultural heritage context information including user, location, time, device, and information content into the adaptation process. In cellular cultural heritage, media structures require rich metadata about their creations and content to support access to various types of users. In addition, this application provides domain and location information for various cultures connected to it according to user needs. This means that information objects with specific information purposes can be linked to the same location. Information and inheritance content can be added in a variety of formats, including video, audio, maps, animations, images or text (see Figure 5) to support adaptation functions for different devices.

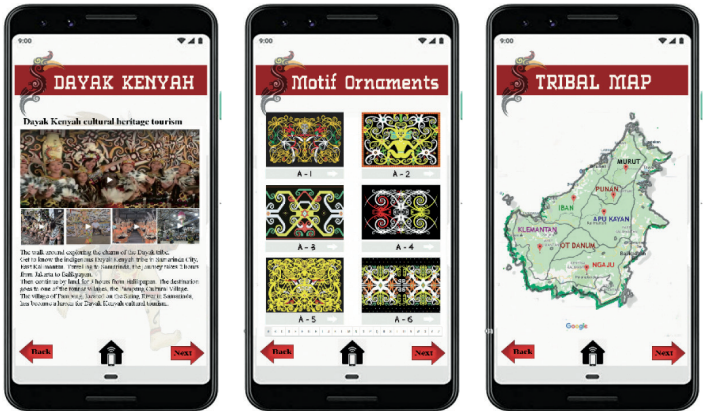

Figure 5. Screenshot of the mobile cultural heritage app of the Dayak tribe in Borneo.

The Dayak people in Borneo, with their diversity of culture and local knowledge from various tribes, are now experiencing challenges in preserving their existence. Lack of community interest, especially for the younger generation in understanding and knowing the tribes in Borneo's tropical forest areas, is one obstacle in its development. This is due to the difficulty of obtaining information about the diversity of Dayak tribes on the island of Borneo and having limited access or media in exploring information on cultural heritage. In addition, the use of information technology for things other than cultural diversity contents is more advanced, so that information about the cultural diversity of the Dayak tribe will steadily disappear.

In order for the Dayak tribe to continue to exist as a tribe that is rich in diverse culture, the use of information and communication technology (ICT) must be optimized for managing, documenting and implementing digital literacy of the cultural heritage knowledge possessed by each ethnic group in Borneo. The utilization of ICT in the context of efforts to preserve the local culture and knowledge is one approach, which can, in part be achieved through the mobile cultural heritage app of the Dayak tribe Borneo.

Applying technologies to cultural heritage has become one of the resources used in digital learning, and we use it as a teaching media in our institution, as well as a supporting tool in cultural science courses for learning. Contents information and knowledge in the mobile cultural heritage of the Dayak tribe is one of the digital-based learning resources that provide cultural information, especially the Cultural Heritage of the Dayak tribe in Borneo.

To date, information about the number and names of the existing Dayak sub-tribes, as many as 405 sub-groups, are apparently not yet known to the wider community, including the younger generation of Dayaks themselves. Moreover, knowledge of the cultural diversity possessed by each sub-tribe is difficult to distinguish between sub-ethnic cultures and other Dayak sub-tribes and culture in one village with another Dayak village culture. The presence of this application provides information about the profile of each Dayak group, tribe, sub-tribe, cultural village, location, and other cultural heritage information that is digitally framed referring to the cultural domain of IACI and UNESCO.

4. Conclusion

The rationale that has driven us to develop this mobile cultural heritage app is an effort to preserve the fading local cultural heritage through digital literacy and so attenuate the impact of modern globalization. Globalization has changed the values of nationalism and culture that have existed in Indonesia and in particular the cultural heritage of the Dayak tribe in Borneo. Digital technology is widespread, but there are still many people who are unable to use technology positively and productively. The misuse (misapplication) of digital technology can also have a negative impact on personal and social life. Therefore, digital literacy needs to be developed to help build a national identity. The dimensions of digital literacy include tools and systems, information and data, sharing and creation, historical and cultural contexts and many other elements. Through understanding this dimension, we can develop cellular cultural heritage as materials and methods for teaching digital cultural literacy in formal and non-formal education.

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References

[1] Kemp S., 2019. “Digital 2019: Global internet use accelerates,” We are social & Hootsuites.
[2] Wilhelm A. G., 2003.Demokrasi di era digital: tantangan kehidupan politik di ruang cyber. Pustaka Pelajar.
[3] Effendi Y., 2014. “Asean Free Trade Agreement Implementation for Indonesian Trading Performance: a Gravity Model Approach,” Buletin Ilimiah Litbang Perdagangan.
[4] Mubah A. S., 2011. “Revitalisasi Identitas Kultural Indonesia di Tengah Upaya Homogenisasi Global,” Jurnal Global dan strategis.
[5] Baker K., 2013.Information Literacy and Cultural Heritage.
[6] Kurniawan H., Salim A., Suhartanto H., Hasibuan Z. A., 2011. “E-Cultural Heritage And Natural History Framework : An Integrated Approach To Digital,” in 2011 International Conference on Telecommunication Technology and Applications.
[7] IIndonesian Archipelago Culture Initiative (IACI) 2019. Organization,” https://budaya-indonesia.org/IACI, [Accessed: 22-Apr-2019].

[8] Tan Q., Zhang X., Pivot F. C., Evans J., Kinshuk, McGreal R., 2016. “The 5R adaptation framework: Concepts, systems, and learning scenarios,” Journal of Internet Technology, vol. 17, no. 5, pp. 971–980.
[9] Budiman E., Haeruddin H., Hairah U., Alameka F. 2018. “Mobile learning: Visualizing contents media of data structures course in mobile networks.” Journal of Telecommunication, Electronic and Computer Engineering (JTEC), vol 10, no. 1-9, pp. 81-86.
[10] MacKinnon K., Hatta G., Halim H., Mangalik A., 1997. The ecology of Kalimantan.
[11] Haeruddin, Johan H., Hairah U. Budiman E., 2017. “Ethnobotany database: Exploring diversity medicinal plants of Dayak tribe Borneo,” 2017 4th International Conference on Electrical Engineering, Computer Science and Informatics (EECSI), Yogyakarta, pp. 1-6,
[12] Borneo D. I. B., Darmadi H., 2016. “Dayak Asal-Usul Dan Penyebarannya,” vol. 3, no. 2, pp. 322–340,
[13] Dengen N., Budiman E., Widians J. A., Wati M., Hairah U., Ugiarto M., 2018. “Biodiversity information system: Tropical rainforest borneo and traditional knowledge ethnic of dayak. Journal of Telecommunication, Electronic and Computer Engineering (JTEC), vol. 10(1-9), pp. 59-64,
[14] Riwut T., 2007. Kalimantan Membangun, Alam dan Kebudayaan, 2nd ed. Yogyakarta: NR Publishing
[15] Lontaan J. U., 1975.Sejarah, hukum adat dan adat istiadat Kalimantan-Barat. Pontianak: Pemda Tingkat I KalBar
[16] UNESCO, 2019 “Kit of the Convention for the Safeguarding of the Intangible Cultural Heritage.” [Online]. Available: https://ich.unesco.org/en/kit#8. [Accessed: 01-Sep-2019].
[17] Budiman E., Hairah U., Haeruddin H., Saudek A., 2018. Mobile networks for mobile learning tools. Journal of Telecommunication, Electronic and Computer Engineering (JTEC), vol. 10(1-4), pp.47-52.

Biographical notes

Edy Budiman graduated with a Bachelor of Education (S1) at Makassar State University (UNM) in South Sulawesi, Indonesia in 2003; graduated (S2) in the Informatics Maters Program, Hasanuddin University (UNHAS) in 2010. He is currently a regular lecturer in the Department of Informatics Engineering, Faculty of Computer Science and Information Technology, Mulawarman University, Samarinda, East Borneo, Indonesia. He is a lecturer in mobile programming and network courses. His research focuses on the area of Transformation of Computational Technology on local wisdom around the environment of tropical rain forests. He has written and presented papers in national and international conferences and various computer science and information technology journals and has acted as presenter in seminars and training on Programming. His work in writing and developing systems on the Borneo Biodiversity Information System (BBIS) has been published.

Masna Wati is a lecturer in the Department of Informatics, Mulawarman University. She completed her undergraduate education at Hasanuddin University, Makas-

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Norhidayat completed the undergraduate program (S-1) in the History Education Department of Lambung Mangkurat University, Banjarmasin, South Borneo in 2014, subsequently finishing his postgraduate course (S-2) at the Post Graduate School of History Education in Sebelas Maret University, Surakarta, West Java in 2016.

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Summary

Digital mobile devices and cultural heritage should be framed within the traditional knowledge management system as an informal learning tool in supporting cultural digital literacy to help build a comprehensive picture of a nation's identity. To this end, the paper develops a mobile cultural heritage application for the traditional knowledge management system of the Dayak tribe in Borneo. The method for its development refers to the 5R Architecture Framework. Information contents for the knowledge management system refer to the cultural heritage domain in UNESCO and the domain of the Indonesian Archipelago Culture Initiatives (IACI) organization. The result was the development of a prototype of a mobile cultural heritage app. It was presented to demonstrate how the use of a cultural framework can offer insight into how 5R adaptation features and IACI content are able to complement traditional cultural heritage pedagogies by providing mobile learning at the Right Time, in the Right Location, to the Right Users, with the right Device and the Right Content.

Riassunto

L'unione tra dispositivi mobili digitali e beni culturali dovrebbe essere inquadrata in un sistema per la gestione di conoscenze tradizionali, utilizzandolo come mezzo di apprendimento informale a sostegno dell'alfabetizzazione digitale culturale per costruire un quadro completo dell'identità di una nazione. A questo scopo, il lavoro tratta una applicazione mobile riguardante il sistema di gestione per la conoscenza delle tradizioni

della tribù Dayak in Borneo. Il metodo per il suo sviluppo si riferisce al 5R Architecture Framework. I contenuti informativi per la gestione del sistema delle conoscenze si riferiscono al dominio UNESCO del patrimonio culturale e al dominio dell'organizzazione del Indonesian Archipelago Culture Initiatives (IACI). È quindi stata messa a punto il prototipo di un app mobile per il patrimonio culturale. Esso è stato presentato per dimostrare come l'uso di un quadro culturale possa offrire un modo di capire come le caratteristiche di adattamento 5R e il contenuto IACI siano capaci di integrare al meglio le tradizionali pedagogie usate nel settore dei beni culturale fornendo un dispositivo mobile di apprendimento *at the Right Time* (al momento giusto), *in the Right Location* (nel posto giusto), *to the Right Users* (ai fruittori giusti), *with the Right Device* (con il dispositivo giusto) e *the Right Content* (il contenuto giusto).