How Psychology engaged with information systems: The case study of using GIS as instrument for preserving Javanese culture in a traditional coastal batik, Indonesia

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Article · March 2015

DOI: 10.1109/ICACSIS.2014.7065899

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How Psychology engaged with Information Systems: The Case Study of Using GIS as Instrument for Preserving Javanese Culture in a Traditional Coastal Batik, Indonesia

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Abstract--**Psychology is the science of human behavior and mental processes. Meanwhile, Information Systems is the implementation of application-based digital communications and computing technologies. Studies in the field of Information Systems can be of an application development in the specific areas that are not always necessarily related to the ICT discipline. This study aims to describe a relationship between the Information System and Psychology in a case study of cultural preservation efforts in traditional batik at Lasem, Central Java. Research methods and data analysis were developed through an integrated approach from two different fields of disciplines. Data collection involved geo-tagging, observation, and in-depth interviews with 15 participants at six Lasem batik houses. Data processing carried out by combining the concept of Information Systems specifically about Geographical Information System (GIS) and Psychology in particular about educational psychology. The results showed the way it is done with this approach produced more comprehensive elucidation of how cultural preservation efforts happened in Lasem's batik. The model of this approach is recommended as one of the research method in the discipline of Information Systems.**

I. INTRODUCTION

Psychology is a science of behavior and mental processes [1] within human beings. One of the objectives of psychology is to describe and explain the phenomenon, which occurs in humans (individuals and groups) in a particular context. Educational psychology is a branch of psychology that applies in the context of educational psychology. One of the important theoretical foundations in Educational Psychology associated with the concept of "learning".

Learning is a process that is relatively permanent change in behavior caused by experience or training [2]. The learning process can be explained by a variety of approaches, including but not limited to social cognitive approach [3]. Social cognitive learning can be explain by the phenomenon of individuals and groups of people with the effect of reciprocal determinism,

namely a phenomenon of combined mutual interaction of behavioral factors, environment, and people (self, cognitive). Environment may cause a person to learn certain behaviors through observation of other people who are in their environment. In the social cognitive approach, essentially an individual is considered to have an active role in the formation of behavior, and affected the environment. Bandura uses the concept of "agent" to describe the factors that enable a culture can develop; he illustrated that a culture can be seen as the result of a simultaneous combination between personal agents, proxy, and collectivities. In psychological theories, the explanation for the phenomenon is often only consider the human factors, and did not consider the non-human factors such as goods or technology. Environmental factors in the of Bandura's [3],[4],[5] explanation also refers to the actions performed by humans. Meanwhile, one approach that is widely used in Information Systems, the Actor-Network Theory [6], Humans are considered one of the aspects that play a role in the formation of a phenomenon. In this case, the integration of the reciprocal determinism [3],[4],[5] with Actor-Network Theory (ANT) [6] is considered sensibly able to explain the phenomenon more comprehensively.

Information System (IS) and Actor Network Theory (ANT):

Information Systems is the implementation of application-based digital communications and computing technologies in organizations or societies [7]. ANT is a product of critical social theory developed by Latour [6], Callon and Law [8]. ANT acknowledges the similarity of the core concepts of the role of human actors entities, non-human objects or merging mixture both of which can affect the action or purpose of the human actors. According to Abrahall, Kautz, and Cecez-Kecmanovic [9], actor-network is a heterogeneous network that aims at similar goal. Underwood [10], [11] has a different opinion about ANT, he is aware of the entrepreneurs "actors" who have built this network, at the same time it has created and established a variety of network. According to Walsham [12] the concept of ANT information systems includes the elements of actor, actor-network, enrolment and translation, delegates and inscription, irreversibility, black box, and the immutable mobile.

Walsham examines the case of application of Geographical Information System using ANT that has a remarkable ability to adapt and explain the various phenomena of the problems faced by GIS researchers in the field [12].

Geographic Information System (GIS) and Cultural Preservation Effort (CPE):

Information systems that are specifically used in the geographical area is a concept called Geographic Information System (GIS). GIS has the ability to manage databases, map location, image processing, and analyze statistical data [14]. There are many problems that can be assisted with the GIS applications.

One benefit of this application is that it can be used as an instrument for mapping a cultural heritage [15]. GIS functions, in this case, as a system that can be used in collecting, organizing, searching, and inventory maintenance of a culture that supports the Cultural Resource Management (CRM), which in this case functionned as Cultural Preservation Effort (CPE). According to Sidonrusmee [16]:

"[CPE] is a process of cultural heritage resource inventory, which includes activities such as the following: Conduct surveys and store (inventory) document of cultural resources, history, and physical environment; organize and evaluate cultural heritage resources; analyzing and researching the material, historical and in a contemporary context; develop strategies for short-term programs and long-term conservation management and to anticipate future changes; implement, monitor, and review (if necessary) to revise the program to be developed".

These activities are carried out repeatedly, so as to form a cycle of CPE activities that can be seen in Figure 1. Thus, the main objective of CPE is the protection, preservation, and development of cultural resources. According to Haryono [17], CPE could be used as a preservation and conservation of the various prehistory, history, and current remnants.

Based on the characteristics of each of the disciplines in Psychology and Information Systems (GIS in particular and ANT) from the study of literatures, and from personal research experiences, this study seeks to examine the possibility of linkage between the two areas of science in explaining a phenomenon of CPE.

Batik Lasem:

Batik is one of Indonesia's original cultural heritage as inscribed in 2009 UNESCO Representative List of the Intangible Cultural Heritage of Humanity. Batik is a textile product from a wide range of cultures in the Indonesia archipelago; it is the result of creative acculturation and utilization of local resources. Furthermore, Batik products always have certain unique characteristics, usually called batik pattern using the name of the places, such as *batik Solo, batik Pekalongan, batik Lasem*, and *batik Madura*.
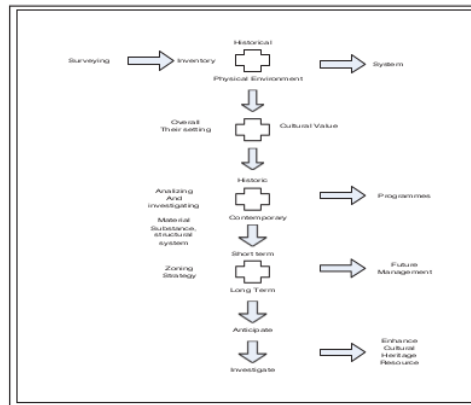

Figure 1. Cultural Preservation Effort [13]

Batik is a fabric painting techniques with the use of wax in dyeing process color. All of these processes using a manual or hand [18], [19].

One of the places that has been traditionally producing batik in Indonesia is Lasem. Lasem is a small town on the northern coast of Central Java, which is a sub region of the county Rembang. Although it has long became a center for producing unique *batik Lasem*, not many people know *batik Lasem*. Just a few years back, *batik Lasem* became famous for its specific characteristic of patterns, motifs, and color, mostly due to the influence of Java & Chinese culture. Lasem is also believed to be an old town of the earliest cross-cultured between Javanese and Chinese Indonesian at the island of Java [20].

Research literatures on *batik Lasem* is very hard to find. Therefore, this research is expected to contribute to the study of *batik Lasem* in general and specifically, on the Geographic Information System (GIS) application in cultural side of *batik Lasem*. The application of CPE in *batik Lasem* results in the need for cultural conservation, specifically on the access to up to date data location of intangible cultural heritage resources. In this case, a GIS prototype can be used to facilitate the management, assessment, storage resources, and intangible cultural resource data collection. In a more detailed expected outcome, this research aims to develop a GIS prototype of batik Lasem's culture that can describe: (a) the production process, (b) formation process batik typical through creativity and the creation of new ideas, (c) the process of the formation of collective knowledge, and (d) the maintenance process of batik culture, all of which are discussed from the standpoint of psychology. In addition to being the development of theoretical models to explain the phenomenon of cultural protection *batik Lasem*, GIS prototype is expected to be utilized for supporting the preservation of the pattern, design, color, batik other characteristics, and cultural development of batik Lasem.

The decision to do this topic of research is based on the consideration that, firstly, the theoretical model of cultural preservation of *batik Lasem*, can be explicated by different causes of phenomena. This description would then become a source of insight for policy makers to increase their efforts related to the cultural preservations. Secondly, the research model is expected to be one source of awareness for researchers of social phenomena associated to the intangible culture in Indonesia.

II.   METHOD

Research Setting:

The research was conducted at Lasem and the surrounding areas, which were concentrated to *batik* industries and *batik* shops. The base map used for Lasem aerial view was from Google Earth (version August, 2010), as in figure 2, which illustrate the location of the Lasem research site. These maps were used in the field to determine the site condition and facilitate the process of the collection for spatial data with the GPS.

Figure 2. Lasem areal map (Google Map, August 2010)

This research was a part of a series study regarding the preservation of intangible culture, including batik. The research team consisted of researchers from educational psychologist and information systems specialist. The collaboration of these two fields emerged from the common interest in studying the formation processes of learning and cultural influences with the supporting of information systems. Studies that have been developed, for example related to Javanese culture in connection with batik [13], Javanese culture in relation to CSR in a company [14], Javanese culture in relation to learning of gymnastics for Resilience [22]. Research on batik were originated from curiosities about the origins and development of batik in Indonesia and able to achieve current social and economic status. Researchers have visited several areas in Central Java batik centers such as Surakarta, Pekalongan, and Lasem.

Data Collection:

This research used an interpretive qualitative approach. Newman [23], Yin [24], and Berg [25] suggested that data should be collected from interviews, field observations, print documents, photos,

articles, diaries, correspondence and documents. In the research sites, the data was collected by field observations, deep interviews with the major participants in batik industries, and the geo-tagging batik houses. Furthermore, the secondary data were collected from the collection of printed documents, photographs, articles, diaries, correspondence and other source of media documents.

In line with the process, the CPE processes were analyzed with the leaning theory in psychology. Originally, CPE consists of five main activities. But, in this research the aims was to develop the prototype of a GIS as the process of describing a phenomenon. Thus it was only conducted up to the first three activities, including: (a) conducting surveys and storing documents, (b) organize and evaluate the cultural heritage resources; (c) analyzing and evaluating the material, historical, and in a contemporary context.

Participants:

Fifteen participants at six Lasem Batik Houses were observed and interviewed which is a typical sample size in an interpretive-qualitative research [12], [26]. There are eight men and seven women, age ranged between 20-70 years old. The fifteen participants were: (a) director as well as homeowner of batik houses (five people: Mr. Wj; Mrs. K; Mr. B; Mr. Pr; Mr. P); (b) family of the owner of batik houses (two people: Mother of Mrs. K; brother of Mr. B); (c) workers at the batik house (four people); (d) a shopkeeper of government batik showroom; (e) the headman of the area; (f) a mosque caretaker; and (g) a Chinese temple caretaker.

Data Analysis:

The analysis by ANT was used to determine and develop the prototype of GIS for *batik Lasem*. The ANT goal is to test the motives and actions of actors in heterogeneous networks, with the following actors (and the work they do) through the network actors [12]; also, the interests of actors in the network as the key to reveal the association in making of a GIS model that links social influence, business, political, technical and contextual situations as suggested by Underwood [11].

Transcript of interviews were analyzed by interpretive approach and followed the principle of repetitive hermeneutic circle [27]. The purpose of data analysis using ANT approach is to get the relationship between the actors that influence the presence of *batik Lasem* through the network formed by the actors. Thus, the prototype GIS will be developed based on the role of these actors.

Initial process of the identification of cultural resources and the determination of various components of the data produced a conceptual model of CPE at the house of *batik Lasem*. Prototyping GIS was done according to Deursen [28] principle, which is structured based on the characteristics of the model data to be stored. Furthermore, Goodchild (1992) concept of objects and features using satellite imagery of Lasem from Google Earth was used. Lastly, the manipulation and analysis of geographic database obtained from the

field research at Lasem were used. By combining these data, a new geographic information database prototype were created. ArcView software were used for creating the GIS prototype.

III. FINDINGS

Various forms of data acquired (including interviews and observations) on cultural preservation of *batik Lasem* were carefully studied primarily from the point of view of learning psychology, and aims to obtain an overall picture of the phenomenon of cultural preservation of *batik Lasem*. Analysis associated with the four research objectives, and finally to obtain the results that the four components can form a theoretical model of the phenomenon of cultural preservation of *batik Lasem*. In general, the research findings indicate that the cultural preservation of *batik Lasem* that occurred happened naturally. There were interaction between people, the environment and behavior [4], which were in this case the behavior of batik's cultures occurred naturally. This were all going along with the principles of learning psychology. The principles that occur, for example, (a) that humans learn by observing the behavior of others [5], (b) that man is essentially an active agent who makes a plan, act, monitor, and evaluate actions, for survival or progress in life [31] .

In detail, there are four data components that can be incorporated into the development of a prototype GIS in Lasem. The data components consist of: (a) technologies of production in the manufacturing process; (b) the emergence of creativity and creation of new ideas; (c) the learning processes that make up the collective knowledge; (d) cultural preservation for *batik Lasem*. These four components of theoretical model for *batik Lasem* cultural protection are described below.

Technologies of production in the batik manufacturing process:

The technology used in the production process of batik includes technology covered by the six stages of batik making. The six stages are: (a) Scrape, (b) *Lorod*, (c) *Idak*, (d) Washing, (e) Drying, (f) *Kemplong*. Figure 3 is a prototype screen of GIS which described the peculiarities of batik production process which takes place in one setting, one room, and one time. Again, referring to the ANT-based analysis, the actors (human and non-human) that may affect the process of making batik are: batik house homeowner attitudes, skills of workers, worker health, worker motivation, job attitudes of workers, traditional equipment, weather, and conditions of work space. Actors are connected to each other, and the process of making batik can be disrupted if one of the actors was not functioning properly. Of the various actors, it appears that the workers hold an important role in the whole process of production. To be able to learn, and then execute the appropriate batik processing, workers require particular cognitive states, optimal emotional condition to

achieve the expected results. In addition, the workers also learn from each other through mutually reciprocal observations. This finding is consistent with the theory proposed Bandura [5], which is the active agent that acts to sustain life.

Fig 3. The Use of Technology at *Pusaka Beruang Batik House*, Lasem

Emergence of creativity and creation of new ideas:

The emergence of creativity and creation of new ideas is generally only experienced by the homeowners of batik house. The workers often do not have the experiences of the creation of such a new idea, but just following the idea that was ordered by the homeowners of batik houses. It was covered by the used of actor network theory, actors who played an important role in the creation process of a new idea are: The experiences (prior knowledge) of the homeowners of batik house, input from outside parties, the availability of batik dyes, the availability of the technology used to achieve specific results, the availability of time, and most importantly the emotional atmosphere to create new ideas.

These six actors interact to form an effort to create new ideas. Once again, the theory of Bandura [4],[5] and humans as agents that can drive changes, would be able to explain how an ordinary working day comes up with new ideas. Furthermore, a construct of self-efficacy [3] explained the emergence of new ideas. Self-efficacy (sense of confident self) appears to be one determinant factor of whether or not a new idea of batik's motifs was created. Without self-efficacy, the ability to produce new ideas will be hampered.

Learning processes that make up the collective knowledge:

The process of learning the skills of batik process occurs through personal agents, proxy, and collective influences. As a personal agent, homeowners and workers of batik making process. As a proxy agent, the workers at the house of batik can relate to and affect workers or other batik houses. As a collective agent, the batik workers as a community have influenced the behavior of members and others outside the community. This finding also correspond to Bandura's [3] Social Learning Theory in which people of Lasem learned from one another, via observation, imitation, and modeling, as one of the young batik artist

mentioned that she learned the skill from her mother, her mother learned from grand mother and neighbour. This conditional learning has been happening for generations. These phenomena which include the needs of attention, memory, and motivation were correspond to Lave and Wenger's Situated Learning [29].

Figure 4 shows a prototype GIS that can describe how a child can acquire batik skills from their parents. Children are not merely observing that process run by his mother, but also work directly working on the process.

Cultural Preservation for *batik Lasem*:

As with reciprocal determinism approach [30], the formation of batik designers and traditional batik workers cultural behavior were formed due to the continuous interaction within them, that was the environmental factors.
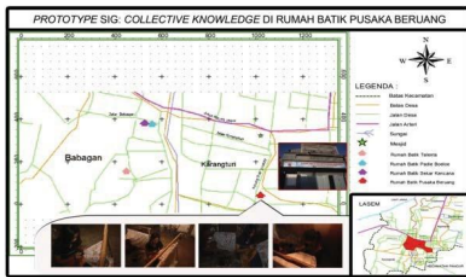
Fig 4. Collective Knowledge at *Pusaka Beruang Batik House*, Lasem

In the case of preservation of *batik Lasem*, for hundreds of years there was not any deliberate effort of the designers and workers to organized training specifically designed as in a modern organization. All the designers and workers learned and preserved the process of batik-making by observation of their working and living environment, by the development of confidence in their abilities to carry out these batik-making activities, and practices the batik-making know-how. Seeing the fact that geographically, batik houses are located in a fairly isolated location, and then all the culture of know-how in batik making can be studied in full by the personnel involved in these process. The leaning process occurs both in the home and in the community thoroughly. Isolation of the location, as well as the relationships between people that take place either at the level of the workers as well as the designers, became one of tradition preserved for hundreds of years. Thus, this case study proofed, that the preservation of a culture can occurred through a learning process that allows the creation of tacit knowledge repository in a particular region. Figure 5 shows a screen of prototype of GIS which illustrates that the production of batik involved some scattered places in certain locations.

Fig 5. The Spreading Sites at Pusaka Beruang Batik House, Lasem

Alternative Research Model:

Beside the findings regarding the case study, this research showed that the close collaboration from the very beginning of a research could lead to a more comprehensive study regarding phenomena from multi-disciplinary view. Figure 6 shows the model of this research, compared to the two alternatives.
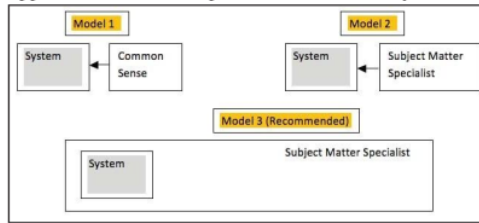
Figure 6. Model of close collaboration research in IS

IV. CONCLUSION

There are two conclusions from this study, the first is the conclusion of a case study, and the second relates to the approach used in the study. The findings of the case study show that: (1) ANT is a powerful tool to identify the actors at Lasem *batik* houses' four intangible cultural factors that preserved the existent of *batik Lasem; (2)* GIS and CPE has showed the potential of mapping intangible conservation of culture of *batik Lasem;* (3) GIS prototype design can be developed with the results of data collection and analysis of data components for the *batik Lasem* cultural preservation GIS; and (4) the GIS contributed to the deeper understanding about intangible phenomena, and need to be explained by psychological constructs (that is theoretical concept that could not be observed directly). Another conclusion is the approach used in this study. This study may indicate that the engagement of pscyhology and information system from the very beginning of a research could possibly produce a comprehensive elucidation of the preservation efforts of Lasem's batik. Therefore, the approach in this study, which is collaboration between the two fields of discipline since the beginning of the research preparation, as one of the recommended research approaches in the discipline of Information Systems.

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