

# A Study of Promoting Method a traditional market by implementing RFID technology and 6W1H context awareness

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## RFID 기술과 6W1H 상황인식 구현을 통한 전통시장 홍보 방법에 대한 연구

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**Abstract** With the distribution modernization policy advanced by the government and consumers preference toward it, the so called "modern market" has undergone rapid growth. Conversely, traditional market is losing popularity with consumers as a result of inadequate modern structures, small market size, convoluted relationships, inefficient operation and disordered transactions, among others. Therefore, this study seeks to utilize ubiquitous computing, that is, the upgrade of context aware information to 6W1H and promote the market through the interface with Smartphone and provide advanced information through the augmented reality technology. For the construction of context-aware system using user context, the results may significantly differ according to how reference rules are applied to and implemented on knowledge base. In light of above, through the use of RFID technology and 6W1H context awareness, we seek to promote traditional markets.

**Key Words** : RFID, Context Awareness, Traditional Market, Promoting, Trade Analysis

**요약** 소비자가 선호하는 유통의 현대화를 위한 정부의 유통 현대화 정책에 따라 현대 시장이 급속히 성장했다. 이에 반해 전통적인 시장은 작은 시장규모, 시장 내 복잡한 관계 및 부적절한 공간, 유통 구조, 비효율적인 운영 및 무질서한 거래 등으로 인해 소비자에게 인기를 잃고 있다. 따라서 본 연구에서는 유비쿼터스 컴퓨팅, 즉 컨텍스트 인식 정보를 6W1H로 업그레이드하고 스마트 폰과의 인터페이스를 통해 시장을 활성화하고 증강 현실 기술을 통해 고급 정보를 제공하고자한다. 사용자 문맥을 이용한 상황인지 시스템의 구축은 지식 기반에 참조 규칙을 적용하고 구현하는 방법에 따라 결과가 크게 다르게 나타난다. 이를 통해서 제안하는 방법은 RFID 기술과 6W1H 문맥 인식을 통해 전통 시장을 홍보하는데 목적을 가지고 있다.

**주제어** : RFID, 상황인식, 전통 시장, 홍보, 상거래 분석

### 1. Introduction

With the distribution modernization policy advanced by the government and consumer's preference toward it, so called "modern market"

has undergone rapid growth. Conversely, the traditional market is losing popularity with consumers as a result of inadequate modern structures, small market size, convoluted

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relationships, inefficient operation, and disordered transactions, among others. Inadequate parking spaces, unappealing display of products, poor customer service, and lack of know-how in functions of the market are a few of the problems traditional markets face presently. Additionally, a lack of understanding of consumers' buying patterns and in taking aggressive measures to diversify high-quality products have also pushed away consumers to shop in the modern market. Consequently, for traditional markets to recapture the previous market presence and add vitality and boost the local economy, they need to identify the diversified needs of consumers and provide services accordingly. Thus it is important to offer diverse and high-quality products and services based on customer-centric, rather than merchant-centric, to recapture the lost consumers[1,2]. In light of the above problems, traditional markets need to reinvent themselves by identifying the inherent problems and develop a new business process to remain competitive and play once again the traditional role of fostering a close relationship with merchants and customers and promoting the local economy.

## 2. Ubiquitous and RFID

Based on the research of Mark Weiser[3], the four characteristics of ubiquitous computing are as follow :

First, through the integration of computer and physical space, ubiquitous computing enables users to use computer anytime, anywhere;

Second, All computers are always connected to and accessed through the network;

Third, the consequence of a "user-friendly" interface, users are not even aware that they are using a computer.

Fourth, through a natural interface, it

provides user-specific information following the user's context (location, ID, device, time, temperature, weather, etc.)

Through the ubiquitous space, every user and related everyday objects are accessed via a network and without clear instruction, it will interact as required and support the activities of humans as an always context-aware being.

RFID technology means a technology that enables storing, processing, tracking, and exchanging of information ID and environment information after collecting them from the tag attached to an object by means of radio waves. Especially, the RFID tag can be classified according to various features such as shape, size, usage, whether it voluntarily transmits radio waves with a built-in power supply (passive, active), or whether data reading/writing is available. The RFID technology, as a next-generation technology that will substitute for bar code, can be applied to diverse fields including logistics, distribution, traffic, environment as well as information communication. RFID technology consists of three components, which are tag that saves identification information, the reader that can read, send, and receive tags and applications consisting of a host (server, middleware) and application program. The middleware, out of these three, is important in the sense that it serves as a medium for practical use of information obtained by means of RFID information in companies. Recently, USN (Ubiquitous Sensor Network)[4] which is a broader concept than RFID refers to the type where sensing function is added to RFID providing simple perception information, networking takes place between them and real-time communication is achieved.

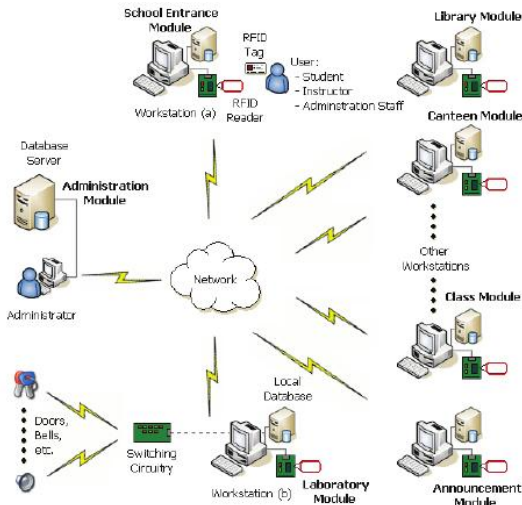


Fig.1. USN structure

At the beginning of the rise of RFID technology, it was only used at an experimental level due to the size, high price and its limited functions. However, with the recent advance of information and network technology and realization of miniaturization, low pricing and multi-function, meeting diverse applications and purposes for use became technically possible.

### 3. Context-awareness and 5W1H

With the rise of ubiquitous computing, the requirements for software have been changing. In particular, As shown in the following Fig .2 are technical problems with the design and implementation of software considering how well the large-scaled ubiquitous software is adapted to a dynamically changing environment[5].



Fig. 2. The overall principle of the RDS

Unlike the existing computing environment, the real world with ubiquitous computing applied is dynamically changing. That is, the software that supports ubiquitous computing has to naturally adapt to the dynamically changing situation, and developing technology that enables this feature is required. The capability to change software behavior according to the context information, which is called context awareness, is needed. Since context awareness is more likely to be changing in ubiquitous computing, it is an important condition of ubiquitous computing. Although the ubiquitous software can be accessed from context-awareness software, context information that has to be processed in the existing context awareness software is included inside the context-awareness software. Generally, the context awareness software is written in a rule-based system and the context information is included inside the rules. Applicable behaviors are expressed in one software [6].

```
<?xml version="1.0" encoding="UTF-8"?>
- <fdl:individual xmlns:rdf="http://www.w3.org/2000/01/rdf-schema#" xmlns:fdl="http://iis.korea.ac.kr/2012/fdl"
  fdl:name="fire">
- <fdl:membershipOf>
  - <fdl:Restriction>
    <fdl:onProperty rdf:resource="#homeContext"/>
    - <fdl:someValuesFrom>
      - <fdl:Class>
        - <fdl:unionOf rdf:parseType="Collection">
          <fdl:Class
            rdf:about="#homeTemperature"/>
          <fdl:moreOrEquivalent fdl:value="0.8"/>
          <fdl:Class rdf:about="#airPolluteLevel"/>
          <fdl:moreOrEquivalent fdl:value="0.9"/>
        </fdl:unionOf>
      </fdl:Class>
    </fdl:someValuesFrom>
  </fdl:Restriction>
</fdl:membershipOf>
</fdl:individual>
```

Fig. 3. Fuzzy OWL context-awareness example code

Expression of context information is one of the components which are required for the design of context-awareness architecture. AS showing in Fig 3., the 5W1H method is a structured format to express context information by asking questions such as who, when, where, what, how, and why. The 5W1H method provides context

information that is suitable for the stereotyped context awareness application model from a user-centered view. This method can express the user's condition detected from a sensor by structuring collected information according to the 5W1H principle[7,8].

To automatically perceive the context in a ubiquitous computing environment, the description of conditions for every perceivable object by computer must be considered as a priority. All information describing features about the condition of objects such as person, thing, place, logic, and physical object is called 'context'. When expressing context, existence or non-existence can be expressed as a crisp set, however, it is difficult to explain the context to convey the degree of danger or speed as a crisp set, which just can be explained as an ambiguous set. Under the ubiquitous computing environment, the main keyword for context perception is 'context awareness'. The context means all information that describes the features of the object's conditions, and the object includes a user and application software as well as an interaction between them. Besides, the context expands the scope of computing from the virtual world to the real world under the ubiquitous environment. The context can be broadly classified into computing context, user context, and physical context; or context in logical space, context about the person, and the context in physical space in the conceptual order. User context and physical context, while having the features of conditions of the user and surrounding environment, are providing the foundation by which currently existing situation can be inferred[9].

#### 4. u-Traditional market and 6W1H-based Context-awareness

The larger the scale of the ubiquitous

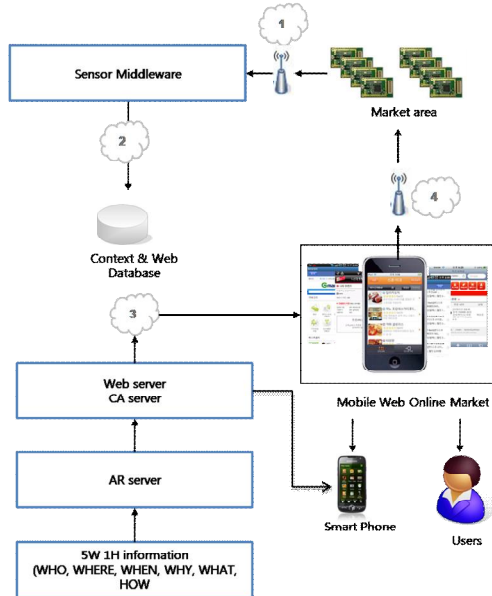
computing environment becomes, the more the context information is supplied. Therefore, a technology is required that automatically perceives and processes the context. Ontology technology is designed for computers to process semantic information about an object directly. The purpose of the ontology language was to describe objects. However, the computer processing of all knowledge only with the expression of objects was inadequate. For the construction of a context-aware system using user context, the results may significantly differ according to how reference rules are applied to and implemented on the knowledge base[10-12].

Unlike existing context-aware 5W1H, the system in this paper suggests 6W1H. Context, as shown in Table 1 is defined following the 6W1H. That is, through the recognition and analysis of basic information: Who, When, Where, What, Whom, How, and additional information via RFID tag and through Smartphone, augmented reality technology is shown. Specifically, by adding Whom, context-awareness becomes more apparent and accurate. It supplements uncertain Who and What to add accuracy. Hypothetic information on 6W1H is shown as follows in Table 1.

**Table 1. Hypothetic information on 6W1H(Who, Where, What, When, Why, Whom, How)**

Who	User Information	Classification of consumers
Where	User location information	Resident and location of target
When	Time information	Residents' entry time
Why	Information on user's intention	Residents' gesture and intention
Whom	Information on target	Consumer's objective and target
What	Information on applicable object	Awareness of target
How	Information on user's action	Generation method

The structure of u-Traditional Market model is as shown in Figure 4.



**Fig.4. u-Traditional Market Model**

The problems of the traditional market will be addressed by applying ubiquitous technology, which is RFID and 6W1H context-awareness. The process is as follows:

① Context information that can be obtained from a heterogeneous sensor and RFID tag of the RFID/USN environment in each store is collected, using sensor middleware.

② Definite and correct information is perceived out of the collected context information, using the 6w1h-based algorithm. It will be changed according to the DB data format in sensor middleware and saved.

③ Final information is gained with additional information that is provided from 6W1H-based context awareness and augmented reality. Besides, an integrated information solution is provided after the information is integrated into middleware, and location information is obtained through GPS.

④ The web server consisting of every kind of smartphone and context awareness service module will handle, process, and the reason the context information data saved in DB, and provide customized information and service via web/mobile/online market to which the consumers directly access.

⑤ The consumers can use mobile/web/online market whenever and wherever they want through mobile devices, and experience various dynamic services including discount event and navigation service, using a sensor network which is built in the traditional market.

### 5. Conclusion

Recently, with the distribution modernization policy forwarded by the government and increasing consumers' preference toward it, the so-called "modern market" has undergone rapid growth. Conversely, the traditional market is losing its market share as a result of inadequate modern structures, small market size, convoluted relationships, inefficient operation, and disordered transactions, among others.

Thus, this study seeks to utilize ubiquitous computing, that is, the upgrade of context-aware information to 6W1H, and promote the market through the interface with smartphones, and provide advanced information through the augmented reality technology.

Following the increasingly large scale of a ubiquitous computing environment, the need for context has increased as well. Therefore, a technology is required that automatically perceives and processes the context. Ontology technology is designed for computers to process semantic information about an object directly. The purpose of the ontology language was to describe objects. However, the computer processing of all knowledge only with the

expression of objects was inadequate. For the construction of a context-aware system using user context, the results may significantly differ according to how reference rules are applied to and implemented on the knowledge base. With this in mind, through the use of aforesaid technology, we seek to promote traditional markets.

## REFERENCES

- [1] J. Zhang. (2019). Problems and Countermeasures of Studying Abroad for Chinese Self-Sponsors in the 21st Century. *ICATPE 2019* (pp. 1457-1461) DOI : 10.25236/icatpe.2019.294
- [2] J. S. Yoon & J. H. Lee. (2018). The effect of the Interest of Cosmetics on Middle School Girl's Purchase Satisfaction-Purchasing Behavior and Informatization Level as Control Variables. *Journal of Convergence for Information Technology*, 8(2), 121-131. DOI : 10.22156/CS4SMB.2018.8.2.121
- [3] J. K. Kim, I. Y. Choi, K. H. Chae, H. K. Kim, Y. G. Ji & H. J. Jung. (2008). Design and Development of a u-Market System for Traditional Market Revitalization. *Journal of Intelligence and Information Systems*, 14(2), 103-119.
- [4] M. W. Lee, H. P. Park, E. Y. Shin, K. H. Kim, K. S. Lee & T. K. Kang. (2006). A basic study on the application possibility of the RFID system in re-bar work. *Journal of Architectural Institute of Korea*, *Architectural Institute of Korea*, 22(10), 129-136.
- [5] V. M. Sharpe. (2004). Issues and Challenges in Ubiquitous Computing. *Technical Communication*, 51(2), 332-333.
- [6] B. Suhardi, N. Anisa & P. W. Laksono. (2019). Minimizing waste using lean manufacturing and ECRS principle in Indonesian furniture industry. *Cogent Engineering*, 6(1), 1567019.
- [7] F. Ghorbel, F. Hamdi, E. Métais, N. Ellouze & F. Gargouri. (2019). Ontology-based representation and reasoning about precise and imprecise temporal data: A fuzzy-based view. *Data & Knowledge Engineering*, 124, 101719.
- [8] S. R. KimR. (2018). Design of the Personalized User Authentication Systems. *Journal of Convergence for Information Technology*, 8(6), 143-148.
- [9] J. H. Lim & S. S. Kim. (2009). Design of Context-Aware based u-CMIS System for Revitalization of Conventional Market. In Proceedings of the KAIS Fall Conference (pp. 57-60). *The Korea Academia-Industrial cooperation Society*.
- [10] S. Takeuchi & S. Okuda. (2019). Knowledge base toward understanding actionable alterations and realizing precision oncology. *International journal of clinical oncology*, 24(2), 123-130.
- [11] H. Kim & Y. S. Jeong. (2019). Social Issue Analysis Based on Sentiment of Twitter Users. *Journal of Convergence for Information Technology*, 9(11), 81-91.
- [12] B. Gunjal. (2019). *Knowledge management: Why do we need it for corporates*. Malaysian Journal of Library & Information Science

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