Product identification of Handicrafts product using Mobile Radio Frequency Identification (RFID) and Near Field Communication (NFC)

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Abstract.

In this paper we present an approach to guarantee the authenticity and identity of Handicraft Product by using specific types of sensors such as Radio Frequency Identification (RFID) and Near Field Communication (NFC) technology to track the product from the factory to the stores with the objective of protecting Handicraft product brand in Morocco. In this research an effective method is proposed to identify the authenticity status through a smart system based on Internet of things (IoT).

Keywords: Crafts Products, Identification Product, IoT, NFC, RFID, Tag.

1   Introduction

Product identification is becoming an obligation to prevent imitation of Handicraft items in the craft industry in order to guarantee the product's authenticity through the use of several types of sensors.

So that it is required to introduce a comprehensive and appropriate tracking and tracing technology to preserve craft product integrity and develop a technological framework that can support the entire Handicraft supply chain in the aim of creating an intelligent environment where users interact in a natural and intuitive way with Handicraft product.

Internet of Things (IoT) technology has been identified as one of the emerging technologies in information technology (IT), which is widely used in all walks of life in the world. The key technologies of IoT such as Radio frequency identification (RFID), Near Field Communication (NFC) and global positioning system (GPS), had been widely used in monitoring, tracking and traceability of products. The most common type of product identification use NFC tag as the details can be stored within the label.

The purpose of this project is the design of a smart system   based on Internet of Things and inventory tracking using a newer upgraded technology-based NFC technology to transmit data between each other through a short-range wireless connection at low speeds depending on the configurations.

The rest of the paper is organized as follows. In the next section, we introduce the related work. In Section 3, we present the concept of Internet of things and how can integrate it in craft ecosystem. In the section 4 we present our design of the system, and how we can include the   use of   sensors in the system. At last, in Section 6, we conclude our work and address the future work.

2   Related Work

İn order to help consumers to validate the authenticity status of their purchases, the Ministry of Tourism and Handicrafts has introduced a standard label which called the National Moroccan Handicraft Label [1].This label is an official guarantee mark, which certifies that the artisanal product conforms to a set of characteristics fixed by a regulation of use guaranteeing a level of quality. Once manufacturing units achieve these characteristics. They have the rights to put the label logo Figure 1 in their products to ensure the authenticity.

Figure 1:Moroccan Handicraft Label

In relation with authenticity status, a study is introduced on validating of Halal status for food products in Malaysia [2].In this research, an effective method to identify and confirm the food status is proposed through the use of Radio Frequency Identification (RFID) technology instead of SMS and Barcodes .

In relation with the identification them.Several studies are proposed to enable user access to product information through   the use of sensors such as QR   [3] and NFC. The paper [4] suggested a model for safeguarding art products in museum institutions by using NFC sensors and IoT technologies. Consequently, the aim of this work was to address the unmet need for a unified and object-specific sensory and digital data labeling system for fine art products not requiring significant wireless infrastructures. In particular, offering information and awareness on the

condition of an object, and promoting long-term protection through an online record of its environmental exposure.

On the other hand, technology has revolutionized the industry by giving users the ability to contribute in the supply chain and the product lifecycle management [5].

Internet of Things (IoT), as a set of technologies where all the resources that surround us and their associated services are available through any connection (GPRS, Bluetooth, etc.). [6] is an example which use IoT technology to connect all devices and transfer data in libraries by using RFID technologies. For collection management nowadays each item in the library is equipped with an RFID tag containing bibliographic information, transaction logs, and virtual representations. By integrating the library card with RFID tags, collection circulation, overdue, and fines can be connected. Therefore, by using IoT technology, libraries will be able to inform the users about overdue items and pay fines online.

3   The Internet of Things

Internet of things (IoT) technology will bring a new revolution of world information industry after the computer, internet and mobile communication network, which break the traditional ideas and open a new technical field to collect and exchange data.

As identified by Atzori et al [7] they distinguished IoT technology in three paradigms: (A) things oriented layer (sensors), which focuses on the 'objects' and finding a paradigm able to identify and integrate them.(B) internet oriented layer (middleware), which emphasizes on the networking paradigm and exploiting the IP protocol to establish an efficient connection between devices.(C) semantic oriented layer (knowledge), which aims to use semantic technologies, describe objects, manage data, store, interconnect and manage the huge amount of information provided by the increasing number of IoT objects.
IoT uses identification sensors for collecting data from various things or objects. The collected data can be simple or sophisticated and complex. Simple data can be collected through a single sensor, while it needs multiple sensors for collecting complex and sophisticated data. By using networking software, sensors will be able to communicate and transfer data to a cloud infrastructure. This transfer will allow the system to process the existing data, and then a user interface will be able to help to communicate and interact with other devices. The following sections explain how can use IoT to improve authenticity of Handicrafts Product.

4   System Overview

In order to ensure the authenticity and identification of Moroccan Handicraft

products. We propose an intelligent system based on IoT to track items throughout life cycle from the factory to the stores.
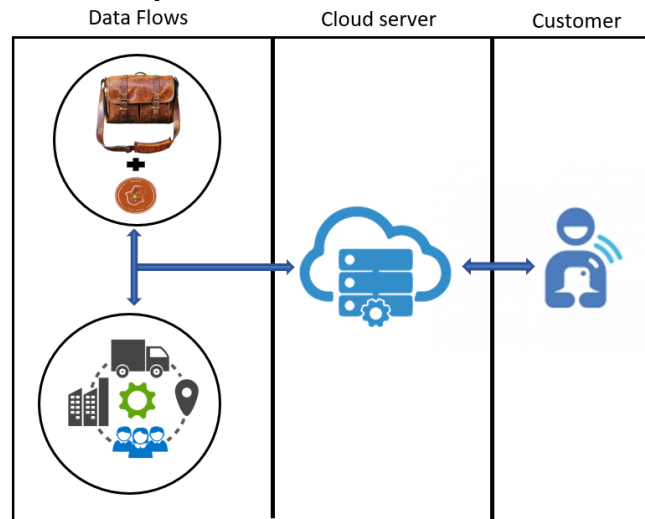

Figure 2:System Overview

The part of system is composed form three layers as showing in Figure 2:

(A) <u>Customer layer</u>: is the point where consumers interact with handicraft to check the authenticity of product by using mobile device with RFID reder   to access the available information and services.

(B) <u>Cloud server layer</u> is the middle layer in the system which is used to analyze the data sent from data flows layer and consumer layer, to extract useful information for users

(C) <u>Data flows</u>: this layer aims to collect data from a multiple source like sensors, products live cycle. Each source collects a particular type of data. Subsequently, these data are sent to the Cloud server to be analyzed.

This proposed system can provide several services such as :Protect the brand with anytime, anywhere with digital authentication ,control the supply chain with digital track, trace, and authentication features ,create deeper customer relationships with personal interactions and exclusive experiences to make better decisions based on real-time data analytics.

This service was provided by the following actions by the interaction between these layers of system:

- Reading data from sensors tag and showing results of readings on Android device.
- Collecting reports from Product or Supply chain lifecycle
- Processing data and uploading it to the Cloud.
- Analyzing data once collected in the Cloud
- Tracking product in different states from the production to consummation

4.1. Tracking Handicraft product

The Traceability is performed throughout life cycle of product since it goes through many states. Their aims are to increase the security of the product, streamline and optimize production planning and distribution systems and processes [5]. In the Craft industry the traceability is ensured during all phases production of items from the Manufacturing to consumer as showing in Figure 3. This allows the possibility of having all details about the product and to ensure of their authenticity before selling.
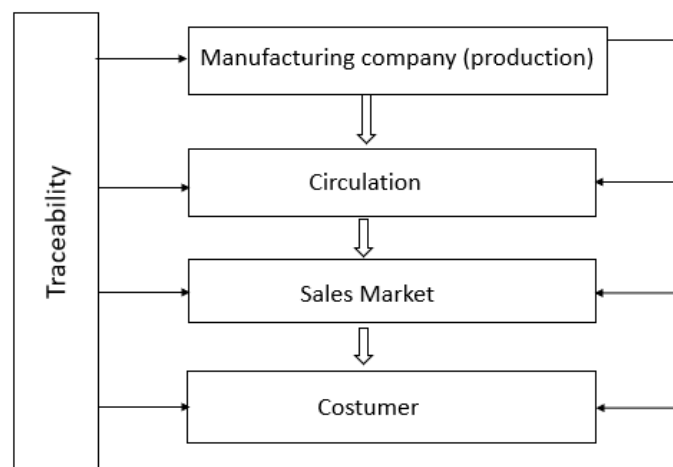

Figure 3:CraftHand Product lifecycle from production to costumer

4.2. The use of sensors

Electronic tags have variously been used by cultural institutions for inventory management [8], authentication and provenance [9] and for enhancing visitor experience within galleries [10].

NFC is a new wireless short distance communication technology with high frequency and low bandwidth. Provided its simplicity of use, flexibility, comfortably and safety will pave the way for many innovative solutions. Another important issue helping to expand its application area is that NFC technology is being developed in integration with mobile phones [11]

Generally, there are 3 modes in which, NFC operates: card emulation mode, reader/writer mode and peer-to-peer mode [12]:

1. **Card Emulation Mode:** This mode enables NFC-enabled device to act like smart cards. It allows users to perform transactions such as purchases, ticketing, and transit access control.
2. **Reader/Writer Mode**: NFC-enabled device is capable to read information stored on NFC tag embedded in smart posters and displays. It allows to retrieve tag information stored in the tag for further uses.
3. **Peer-to-peer Mode:** This mode enables two NFC-enabled devices communicate with each other to exchange information and share files

NFC technology is a combination of the contactless radio frequency identification technology (RFID) and interconnection technologies that allows short-range wireless communication among mobile devices, PCs, and intelligent objects. Compared with previous technologies, such as bar code and two-dimensional code, NFC-RFID tags have several advantages, including unique item/product level identification, no need of line of sight, multiple tags items reading, more data storage and data read/write capabilities[13] [14]

In this paper we use an NFC Near-field communication (NFC) and radio-frequency identification (RFID) tags that will be fixed in the Handicraft Product to provide instant access to an individual object's digital data.

5   Conclusion

This paper has presented an approach and early prototype the ensure the craft Hand identification and authenticity, through using Internet of Things and sensors. The several components of system were described above have specific functionalities in the artisanal ecosystem.
In relation with this subject, the next investigation will be focused on data analyzing that is retrieved from different sources to have a reliable identification and authenticity status.

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