

# Chapter 12

## PINATA: Taking E-Health a Step Forward

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### ABSTRACT

*Owing to growing population health needs, the proportion of medical staff to patients keeps diminishing; yet, the quality in healthcare services is likely to increase. Through the amalgamation of Ambient Intelligence (AmI) and Semantic Web technologies, PINATA seeks to deal with this issue. To perk up the quality of healthcare services, PINATA utilises pervasive devices to help doctors and nurses to concentrate on the patient. The movement of medical staff and patients is tracked by means of Wi-Fi sensors whilst an automated camera system monitors the interaction of people within their environment. The system operates autonomously in response to particular situations by guiding medical staff towards emergencies in a timely manner and providing them with the information they require on their handheld devices. This assures that patients are given the best possible attention on a 24/7 basis especially when the medical staff is not nearby.*

### INTRODUCTION

The world's population is growing old at an astonishing rate. According to a United Nations report, the percentage of elderly people (over 60 years old) is set to ascend from 10% in 2000 to 21% in 2050 (United Nations, 2002). Disturbingly, this propensity is emphasised in Malta, where 2005's

estimate of an 18% elderly population is expected to augment to 35% by 2050 (United Nations, 2006).

This common incidence will have key consequences in many facets of life. Inevitably, this longevity will have an effect on healthcare, family care, family arrangements and living arrangements. One of the consequences will be a bigger requirement for long-standing care. The basic outcome of this will be a definite drop in the ratio of medical staff to patients.

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In order to react to these challenges, new technological solutions are necessary. For this reason, scholars have been suggestive of the employment of Ambient Intelligence (AmI) techniques to assist the medical staff in their work (Rodriguez, Favelaa, Preciado, & Vizcaino, 2005), in addition to supporting the idea of ageing in place (Nehmer, Karshmer, Becker, & Lamm, 2006; Friedewald, Da Costa, Punie, Alahuhta, & Heinonen, 2004).

The IST Advisory Group maintains that in an Ambient Intelligent (AmI) Environment, people will be surrounded by intelligent interfaces that are supported by networking technology and computing that is embedded in everyday objects (IST Advisory Group (ISTAG), 2005). In addition, they argue that an AmI environment is one that is reactive to the specific characteristics of human presence and personalities by changing in line with the requirements of the users. They state that such an environment must be capable of acting in response to gestured or spoken requests and perhaps even engage in an intelligent conversation at the same time as being inconspicuous. Moreover, they affirm that the interface should be comfortable and enjoyable for the users with no intense learning curves required.

Doctors and nurses often share available resources and are very mobile. Since their work's focal point is the physical health of patients, digital content should offer support in decision processes (Kummer, Bick, & Gururajan, 2009). Ambient intelligence is complementary to supporting medical practitioners in several areas. In conjunction with mobile technologies it can enhance patient identification processes, for instance by using RFID tags holding limited information about the patient and so avert mistreatments because of mistakes at some stage in treatment (Andersen & Bardram, 2007).

The Pervasive, Nursing and Doctoral Assistant (PINATA) is a system which employs AmI to help medical staff in maintaining high levels of service (Dingli & Abela, 2008). This is attained by means of a mixture of Wi-Fi enabled tags

which are related to, and worn by doctors, nurses and patients and Wi-Fi software tags, which are software clients installed on handhelds so as to achieve the identical functionality as the physical tags. A distinct type of tag that reports location and temperature readings is utilised in the store's refrigerator to observe its ambient. Passive RFID tags affixed to pharmaceutical boxes are tracked via RFID handheld readers. The Kinect<sup>1</sup> camera, which is a 3D camera, is utilised as a substitute to conventional video cameras, which create a flat image. These are installed in patients' rooms, with the intention of monitoring and ensuring patients' welfare. Handhelds are used by the medical staff to manage patients' records and to receive alerts when necessary. Keychain sized and shaped RFID readers handle the interactivity with the various tagged items together with the handhelds.

The chapter will tackle Pervasive Devices, RFID, Electronic Health Records and Ontologies through a case study. It will tackle the recurring problem being faced in the healthcare domain, that of the ratio of medical staff to patients decreasing while the population health needs increase, together with the expectancy of high quality services. The case study will present PINATA, a system that tries to tackle this matter by merging Ambient Intelligence and semantic web technologies. It uses pervasive devices to aid medical staff focus more on the patient and consequently improving the quality of the service provided. Background information will be given regarding the use of AmI in healthcare. A description of AmI systems will be given in the form of a literature review, and similar systems to PINATA will be referenced and compared. A detailed case description will be provided, together with a number of scenarios upon which the design of the system was based. Some of the scenarios included checks being made to ensure that, for instance, the right patient is in an operating theatre, that the right blood is going to be used on a patient, that the right drugs are going to be administered, or that the patient is not in the vicinity of any incompatible drugs. The idea

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