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Participative marketing: extending social media marketing through the identification and interaction capabilities from the Internet of things

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Abstract Internet of things extends the capabilities to identify products with new technologies such as near field communication, radio-frequency identification, quick response code and with existing identification technologies such as barcode. Identification allows to retrieve extended information and knowledge of the products. Thereby, customers are able to retrieve and share knowledge among the different products. This work presents the participative marketing as the evolution from the social media marketing toward the active participation from the prosumers and the empowerment of the marketing with the collective intelligence. Thereby, participative marketing enables new interaction and participation models based on the ubiquitous identification. This has been evaluated in a social platform, which integrates the knowledge and experiences from the customers, and in a mobile platform, which interacts with the products through the mentioned identification technologies.

Keywords Identification technologies · Knowledge retrieving · Knowledge sharing · Internet of things · Participation · Marketing · Identification · NFC · Interaction

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1 Introduction

The cyber–social integration is being promoted through the evolution of the communication mediums and the new capabilities to retrieve and discover knowledge. Some initial proofs of this cyber–social integration can be found in the capabilities from, on the one hand, the *Augmented Reality* technology to integrate virtual information over the real-world vision, and on the other hand, the Internet of things to identify any object around the world and link it with Internet for extending its information in terms of features location, and traceability.

This integration of the communication technologies with the social side is making people more aware and well informed. In addition, this is defining new mechanisms to interact with other people with new communication mediums such as social networks. All these new capabilities for the people with the new Internet capabilities, to connect, inform and interact, are changing their interests, values and needs.

This technological and social evolution is impacting in other related social sciences such as the marketing. Specifically, marketing is evolving to satisfy the interests, values and needs from the people. Marketing is not only focused on the product value, else it is moving toward new product dimensions such as the value, identification and brand reputation.

Brand reputation and identity are built by the customers through their personal interaction with the product, i.e., the experience with the product. This experience is coming from the usage of the product, customer services and other communication mediums offered to interact with the brand such as help desks, suggestions boxes and technical support.

Brand reputation is not only limited to the personal experience, since we are living in a social world, this is also influenced by the experiences from other customers.

This extension from the marketing to the customers experience is being empowered with the communication and interaction capabilities from the social media (e.g., social networks, micro-blogging and online video). Therefore, social media is presenting a very important role, leaving typical marketing mediums in the background with lower credibility, attention from the customers and consequently impact. Therefore, it has been defined a new generation of marketing, the called *Social Media Marketing* [1].

Social media marketing presents a higher attention to the customers through the social networks. From the enterprise point of view, the participation in the social media is carried out by the called "community manager", who is focused on promote the brand, customer support and advertise the brand through new emerging mediums. From the customers point of view, this offers through the social media a new medium to validate, confirm and check the experiences of other customers with the product, the brand reputation, and make sure that this satisfies what is offering. Therefore, it integrating the customers with Internet through the social networks, and now these social virtual environments are presenting a direct consequence over the products with platforms of opinion and experiences such as *Amazon* for general shopping and *TripAdvisor* for hotels and holidays. The mentioned platforms allow to consult and compare a product before to but it, but the real impact of these platforms over the customers for the decision making during the shopping process is yet very low.

Following the results from the World Wide market research company Nielsen [2], and corroborated with the results from the European market research company GFK [3]. These present that world wide the 46 % of the Internet users have used the social networks for the decision making of some product, but this also remarks that they are not only limited to high technology products, or products with a high cost, they are also used for grocery shopping (e.g., food and beverages). In particular for food and beverages has increased 44 % in 2 years from 2010 to 2012.

The results present a positive trend, it is a consequence of social media, online shops and opinion webs, which are more accessible through the different Internet-enabled devices. In numbers, the Internet-enabled devices, such as laptops, smart phones, tablets and smart TVs, have been increased in a 528 % during the last decade [4].

These platforms present limitations to make them suitable for its continuous usage and increase the number of users. The limitations are coming because the difficult usage and time consuming for the interaction, browsing of products and lookup of opinions for a specific product.

Although the mentioned numbers are presenting a positive trend, these numbers are describing some eventual usage, but they are not reflecting the frequency and quantity of products queried. Therefore, it is required new interaction and identification techniques in order to simplify the knowledge gathering, make it faster, and at the end make it more attractive and recurrent to enable an exponential grow of the usage for these solutions and make it extensible for all the products consumed by the customers.

This paper goal is to analyze and discuss the benefits that the Internet of things can provide to the marketing area. For this purpose, this paper evaluates the different identification technologies provided by the Internet of things to simplify and facilitates the interaction between the customers and the products through some mobile platforms such as the smart phones. In addition, mobile platforms allow to access to the information in terms of experiences from other users, brand reputation and opinions to the decision making when shopping.

The result of the integration of the Internet of things in the marketing area is the participative marketing.

This work presents the participative marketing as the new extension of the marketing based on the interaction with the product through the ubiquitous identification to empower the customers to offer their experiences, opinions and to retrieve the knowledge from the customers. Thereby, customers can verify that the features and promises of products correspond with reality through the social media platforms and environments, at the same time that they customers are able to participate and contribute.

The products are enabled with unique identity to provide them the capabilities to be uniquely identified in the Internet. This assumption of power products with an unique identification accessible and verifiable through Internet is what was conceived as an Internet of things. Specifically, the Internet of things concept was conceived in 1999 by Ashton [5] launching the AUTO-ID lab in the Massachusetts Institute Technology (MIT). Internet of things was established inspired by the ability of emerging technologies such as radio-frequency identification (RFID) to link the unique identification of each product in the world with its description. RFID capabilities extend the barcode to a more intelligent, flexible and powerful identification medium, since it can be read without stay in the line of sight, multiple products can be read simultaneously, getting more information in the tag, and the capabilities to extend this with dynamic information through Internet.

The current vision of the Internet of things is being extended with a major integration with the real world with new technologies such as augmented reality and mash-ups, which are mixing real world with virtual data, it is the so-called *Cyber Physical Systems*. For example, a very famous clothing brand [6] uses augmented reality to show extended

information labels of their products and even a fashion show with the particular product.

This paper will discuss the different technologies available for identification and their capabilities to link products with Internet and Web environments, the so-called Web of things [7, 8], to offer to the customers a medium to get more product information and provide feedback.

In definitive, the extension of Internet to the products is now a reality and is not limited to the metaphor from 1999. The main change has been the capabilities of the Future Internet launched in 2011 with IPv6. Internet has grown exponentially in recent years, reaching in 2008–2009 more things or machines connected to Internet than people, i.e., 7 billions, and in 2012 reached 12.5 billions connected devices, estimations made by Cisco Internet Business Solutions Group (IBSG) [9]. The last trend analysis concludes that by 2020, there will be more than 50 billions connected devices [10].

Internet of things has been chosen the focus of this work, since it presents a new vision for the next generation of communications and services. Internet of things integrates the current Internet and to all the parties involved in the business process, i.e., customers, manufacturers and products, ans now also the identification and validation of values, quality, experience, reviews and feedback from previous customers. Therefore, the product offers new dimensions, which currently cannot be easily obtained during the shopping.

Participative marketing components are presented in the Fig. 1. This presents as the feedback from the product to the business starts with the identification and interaction with the product through the identification technologies of Internet of things, which encompass from classical technologies such as the barcode, to next-generation technologies such as radio-frequency identification (RFID). After identification by the customers through different media, such as mobile phones and online platforms, the consumer is able to obtain information about the product and offer their experience and expectations. Finally, this feedback from the proactive consumers, through social media and the capabilities offered by the new generation of internet and mobile platforms, can be analyzed with the objective to carry out the required actions from the business side to reach a positive influence on the consumers. The positive influence on consumers is achieved through the customer services, and the continuous improvement of the products to reach the expectations and needs from the customers. It is considered that the brand reputation is the result of the experiences, feelings and values that a brand represent through its products, services and actions.

This paper is organized as follows to address the mentioned components and interactions. Section 2 describes the participative marketing and how it is contextualized in the evolution of the marketing from the initial marketing,
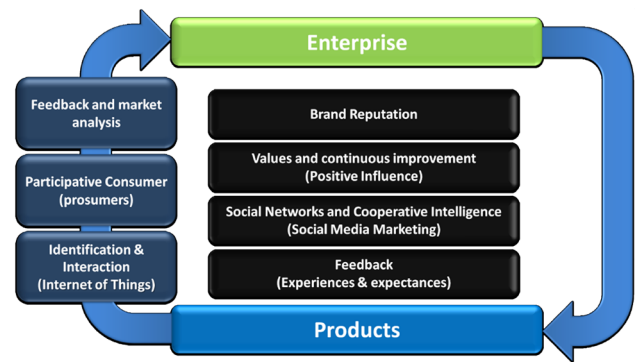
Fig. 1 Flow from the products to the enterprise enabled by the identification and interaction capabilities from the Internet of things

which was focused on the product, to the next marketing focused on consumer interests, and the latest marketing trends have focused on values, which have opened a new generation of considerations in aspects such as reputation, management of brand identity, which are requiring these identification, interaction and analysis mechanisms, to maintain a relationship beyond the product with the customers in order to satisfy their culture, values, experience and expectations. This also presents the new capabilities offered by the Internet of things to make feasible the participative marketing through new technologies to facilitate interaction and identification technologies. These capabilities facilitate the integration into the social computing, social media and community intelligence of the consumers, reaching the participatory consumers, i.e., the prosumers, who have evolved the role of the classic consumer to a more informed, connected and proactive consumers. Section 3 presents the different identification technologies offered by the Internet of things to facilitate the ubiquitous user participation, through interaction with the products. Section 4 presents the collaboration/interaction models, and the Sect. 5 describes the characteristics of the prototype developed that enable the participative marketing through the Internet of things. Finally, Sect. 6 discusses the advantages of the Internet of things identification technologies for the marketing, and Sect. 7 concludes this paper.

2 Participative marketing

The last marketing trend is focused on social media, where the capabilities from Internet and the social networks are being exploited for the marketing purpose. Specifically, social media marketing is enabling the potential for the voluntary participation and interaction with the consumers. These new capabilities allow the co-creation of the brand identity through the value, experience, customers satisfaction and the social recognition.

An example of the impact of participation is nowadays experimented with new tools such as *crowdsourcing*. Crowdsourcing is a social-based funding mechanism that funds many ideas and start ups through the participation of citizens; an example of this kind of platforms is Kickstarter. Other examples of participation in social networks are the biggest encyclopedia around the world, i.e., the Wikipedia.

The following subsections present the current marketing dimensions, and how they are extended through the interaction and experience to define participative marketing.

2.1 Marketing evolution

Figure 2 presents our perspective of the marketing evolution in function of the three different natures. First, the natural world, i.e., forests, animals and virgin environment, second the artificial nature, i.e., cities, and finally the virtual nature, i.e., Internet.

The interconnection and evolution of them are impacting in the evolution of the marketing. First, the industrial revolution impacted with the development of artificial nature composed of factories and cities. That generated the initial marketing focused on sell products.

The industry revolution and overproduction evolves the marketing toward a more customer-centric marketing, where the wants and needs from the customer were taken into account. For example, it was started to define a higher diversity of the same product.

But, several years of industrial revolution brought a lot of pollution and environmental impact, for that reason, it was generated a marketing focused on the sustainability and values, i.e., the marketing 3.0 or the so-called value-driven marketing [14].

After this marketing era based on the artificial nature, started a marketing more motivated by the virtual nature, i.e., Internet. Internet in conjunction with the social networks has developed new approach for the marketing in the recent years such as the social media marketing, where the customers are influenced by the opinion and information introduced by other customers.

Internet continues evolving and consequently the marketing. Specifically, Internet is moving toward an Internet of things, this last evolution has enabled the presented participative marketing.

Participative marketing is driven by the identification and interaction capabilities which are being integrated into the smart devices such as smart phone and tablets. Participative marketing trends to a more interactive world where the virtual and artificial world are more integrated defining solutions such as augmented reality, smart cities and cyber physical systems.

The next subsections present in more details the features from the participative marketing and its evolution.

2.2 Participative marketing dimensions

Such as previously described, participative marketing extends the conventional marketing dimensions with the capabilities from the Internet of things to interact with the products and retrieve information about them and the customers experience.
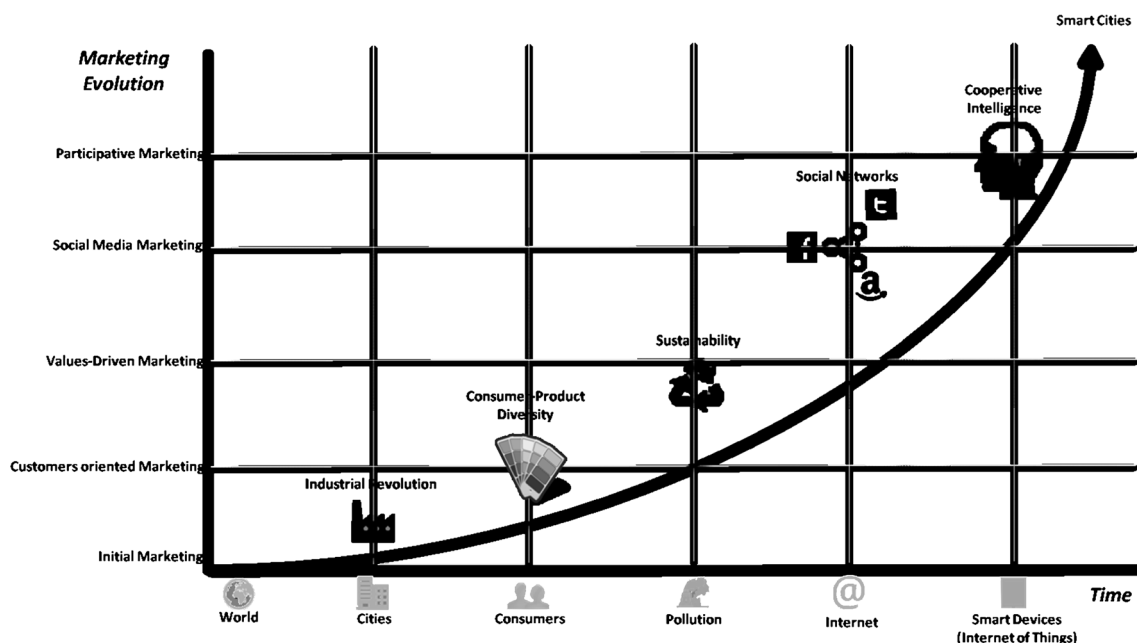

Fig. 2 Marketing evolution

Fig. 3 Positioning-differentiation-brand triangle

Fig. 4 Participative marketing matrix

Figure 3 presents the current dimensions of the marketing. They are as follows:

– *Brand identity*: The brand identity is the positioning of the brand in the mind of every consumer [11]. Companies make their efforts through marketing activities to position their brand above the rest in the minds of the consumers. Brand identity is not limited to identify the type of products and industry, such as described in "The Brand Gap" [12], a brand is not a product, a logo, nor an identity, it is what consumers think about the brand and its products.

– *Brand image*: Brand image is the way that an enterprise get into the mind of the people and get their recognition. Brand value should appeal to consumer emotional needs and wants beyond product functions and features. For that reason, the experiences from other customers and the value-driven actions from a brand will be part of the image from the brand [13, 14].

– *Brand integrity and reputation*: Brand Integrity or brand reputation is about fulfilling what is claimed through the positioning and brand value through solid differentiation.

It is about being credible to your promise and establishing the trust of the consumers to your brand. The target of brand integrity and reputation is the positioning of the brand over time, showing consistent values, and a strong market differentiation.

The brand needs to keep this reputation and integrity for reaching the brand loyalty, buying regularly their products and establishing it as a reference.

The participative marketing adds a new dimension focused on the customer experience, see Fig. 4.

– *Brand experience:* The experience should be viewed as feelings, satisfaction and the opinion from the consumers after that they have used the products or services of a particular brand. Experience is not limited to the interaction with the product, else it is also influenced by other factors surrounding a product and a brand.

The experience dimension is based on:

1. Enable the interaction between customers and products.
2. Capability to verify that a product satisfies the customers needs and wants.
3. Capability to know the experiences from others costumers.
4. Co-creation of the brand integrity and reputation through the experience from the customers.

This new dimension takes into account both the value-driven marketing and the social media marketing. First, the positive influence from the value-driven marketing and second the ability of social media to create a social experience are the key elements to enable a new marketing focused on the participation.

The proposed participative marketing is built over the experience from the customers and co-creation of the social value, i.e., cooperative intelligence, where the consumer can check, confirm, validate and get awareness about the social brand reputation.

Finally, the social brand reputation depends on the commitment in product quality, fidelity between reality, advertising and finally the value of social actions [15], and the quality of social experience since the experience is the brand, such as described in the "The Future of Competition" [16].

2.3 Prosumers and collective intelligence

Prosumer concept is the result of the combination of *producer* + *consumer*. Prosumers are proactive consumers, who present a higher interest to stay connected, informed

and participate, i.e., produce opinions, experiences, feelings and information. This voluntarily participation is motivated by being part of the co-creation of value [17].

Since the creation of value is co-created with consumers [16], the value is no longer a single value creation from the enterprise, else that the prosumers participate in the process of creating value through interaction with other customers and the enterprise. The motivation to participate in a prosumer seems utopian and utterly opposed to marketing motivation. The marketing is the main motivation to earn profits through increased demand and that is why companies invest in it. But from the consumer side, there is a direct benefit quantitative, but in fact, the power to overcome the barriers of consumers to participate by a stranger to the quantitative motivation is something that the world of values, the Internet world [18] and the social world [19].

World of values is characterized by collaboration, contribution and participation without the higher interest of helping, we can see this in non-governmental organizations and volunteer groups.

Internet world is characterized by participation and altruism. Internet users create content online without interest. It can be found several courses, tips and video tutorials in the network of non-profit users. It can be also found the power of collaboration between multiple users for creating even greater resources. For example, the world's largest encyclopedia, Wikipedia, with high quality and virtually no centralized control, developed only through altruistic and selfless contribution. The Wikipedia has accomplished what no publisher would ever achieved, and this is possibly the best example to date of the potential of collaborative intelligence and voluntary participation.

Following the principles of Thomas W. Malone, director of the MIT Collective Intelligence, "you can understand the potential of these social skills to build great things like Wikipedia, or all the videos and tutorials out there today on platforms like Youtube and see as it can be used to gain competitive advantage of these capabilities" [20].

Therefore, following this context, this paper analyses how to create a solution such as Wikipedia to retrieve knowledge from the customers and enterprises, in terms of opinions, social experience and expectations. But this media is not limited to customers, else the brand itself can use it as a medium to offer information.

The ultimate goal is that the consumer is considered part of the value creation of a product, participating, providing expertise for the company. Thereby, consumer will be much more identified with the products, since they have been involved in part of the result. An example of co-creation of value in a commercial product has been the case of the movie "The Lord of the Rings". Peter Jackson tracked more than 10 million readers of the novels had JRR Tolkien, these fans were expectant that the movie does not

affect to the vision that each one obtained of the fantasy. For that reason, Peter Jackson followed up the opinions and ideas from the fans a basis development of the movie. In addition, they offered an online platform (http://www. LordoftheRings.net), where they were presenting the costumes, and some of the notes that were considered for the development of the movie, as well as other exclusive content. Million of fans visited the platform and offered their opinion. The result, one of the most appreciated movies in history, and above all they got the respect for the fans [21].

Finally, Fig. 5 presents how the participative marketing is the result from the social media and the collective intelligence in conjunction with the identification capabilities from the Internet of things. The next section presents the identification mechanisms enabled by the Internet of things.

3 Identification and integration through the Internet of things

Internet of things concept was initially conceived as the capability to identify an object around the world in an universal and uniqueness way. This new capability brings a new generation of services powered by the identification capabilities, and several advantages for the products localization, traceability of drugs [22] and perishable goods [23]. For example, this universal identification capability makes feasible the integral traceability from the farm to the fork (F2F) [24], i.e., a traceability from the moment when the product is collected or produced until that the product is consumed.

The identification capability is enabled by a set of legacy technologies such as the barcode and also new technologies such as the radio-frequency identification (RFID) and matrix barcode such as Quick Response (QR) codes.
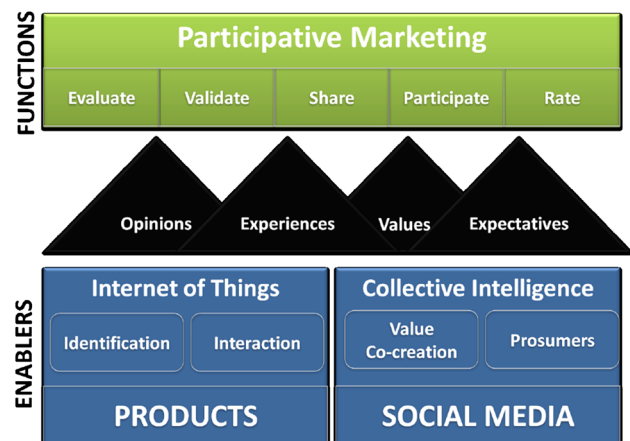

Fig. 5 Participative marketing enablers and functions

Barcode is nowadays integrated in all the products, while QR code and RFID tags are starting to be integrated since they provide new advantages such as a higher data storage, more usability, simple interaction in terms such not is required set the reader in the line of sight and this can read multiple tags simultaneously.

The following subsections describe each one of these technologies and conclude with a comparative among them.

3.1 Barcode

The majority of the products integrate barcode following the global standard GS1. GS1 defines the identifiers for legacy barcode and also for RFID/NFC. Barcode was designed to be read with laser readers, but it can be also read with the cameras integrated in the new generation of smart phones. Specifically, the code commonly defined for the consumer products is the European Article Number (EAN-13). This is composed of 12 bytes and a verification byte. The 2 initial bytes define the country code, the following 5 bytes the manufacturer and the last 5 bytes is the product identifier.

Several additional codifications are available with different length, size and semantic description, which are used in other sectors such as logistic for the tracking of parcels and batches. An example of this tracking solution can be found in [23] which is focused on tracking on trucks with integrated RFID readers, and one solution based on Internet of things with sensors and Web Services access in [25].

3.2 Quick response code (QR)

Bi-dimensional code extends to two dimensions the legacy barcode. Thereby, this increases the capacity from a vector to a matrix. Several solutions have been defined based on the bi-dimensional approach, but the most extended are the QR codes.

This enhancement in the capacity allows to store the product description, Universal Resource Locator (URL), Universal Resource Identifier (URI) and any other required data of the product. Figure 6 presents an example of QR code linking a product with the URL where is stored its extended description.

QR codes can be also printed in advertisement, newspapers and anyplace. Another relevant feature from the QR codes from the marketing perspective is the interest from the consumer to discover what information is codified in one code, which cannot be interpreted directly by the consumers. For that reason, QR code is printed on cars, banners and flypapers without any additional detail.

Other companies are using the QR code to offer additional services or details from the advertisement. For

Fig. 6 URL stored in a QR code printed on a product

example, Wonderbra links each product from a paper catalog with an online video [28].

This capacity for linking a physical product with a QR code and a QR code with an URL in Internet enables to link between physical products and Internet, offering thereby an Internet of things.

QR codes can be read in the smart phone via the camera, at the same way that the barcode, thereby making it more accessible and usable for the consumers.

QR codes are composed of a matrix defining a pattern which stores numerical, binary or alpha-numerical data type. The capacity depends on the data type, version and size. The size goes from 1 to 40 rows and columns, the maximum capacity is 7,089 characters.

3.3 Radio-frequency identification (RFID) and near field communication (NFC)

Radio-frequency identification is the main identification technology from the Internet of things. RFID motivated the "Internet of things" in 1999, when Ashton [5] used it as a metaphor to explain the capabilities from RFID to identify any object around the world.

RFID allows to identify a product by radio. This offers several advantages with respect to the barcodes and QR codes, first, RFID allows to read a tag without stay in the line of sight, second, this increases the coverage to several meters, and finally, this allows to read multiple tags simultaneously.

RFID defines solutions in three different range of frequencies, which are presented different features. The lower frequency from RFID, i.e., low frequency (LF), is between 125 and 134 Khz. This offers a read coverage limited to millimeters and very small size tags. For that reason, it is applied for implants and applications that require low size chips. The second is high frequency (HF), 13.56 Mhz, which offers a read coverage of centimeters. Finally, Ultra High Frequency (UHF), 868 Mhz, which offers a coverage of until 8 m and require bigger tags.

3.3.1 UHF

The UHF standard more extended is the ISO/IEC 18000-6. This is used for tracking and tracing solutions. This offers a high size tag to be used at item level, but a suitable size for pallet and batch level. The main advantage is the read coverage; therefore, it is integrated in arcs, forklifts and trucks.

3.3.2 HF

High frequency tags and readers present a lower size and consequently a smaller antenna. This reduction in the size for the tags and the reader have made feasible its integration in smart phones and credit cards terminals.

The most extended standards based on HF are:

– ISO/IEC 14443: It is the most extended standard for the access control cards in security solutions, transport cards and tags. Specifically, this standard is integrated in the MiFare cards from NXP (Philips). MiFare can be read very quick in distance from 4 to 10 cm.
– ISO/IEC 15693: It extends the distance to 1–1.5 m.
– ISO/IEC 18000-3: It is also offering a high distance. It is the most extended for logistic, tracking and tracing.

Regarding the capacity and identification capabilities, such as described, barcode are limited to 13 bytes, QR codes allow several Kilobytes and finally RFID is offering a higher capacity in a lower space, since the size is not directly related with the capacity.

RFID offers two identification spaces, on the one hand, GS1 defines the Electronic Product Code (EPC) of 128 bits, which extends the existing barcode identification to an item level. Therefore, EPC extends the Global Trade Item Number (GTIN) with the item identifier (e.g., serial number). On the other hand, a free space is available denominated Universal ID (UID), which offers a flexible length and each manufacturer manages following their own policies. This lack of global regulation such as the defined by GS1 makes that the uniqueness of each identifier can be ensured. For that reason, EPC is the most supported, extended and used for consumer products. Finally, RFID cards allow to store additional data ancillary to the identification code.

3.3.3 NFC

Near field communication belong to the HF category. NFC presents the integration of HF reader and cards into the Smart Phone.

Near field communication is a proximity technology, i.e., it is contactless but with a coverage limited to a few centimeters (4–10 cm). The tags enclosed to the objects do not require batteries, since it is based on the passive family from RFID, i.e., energy is harvested through electromagnetic induction. The speed is until 424 Kbits/s and the maximum card size is equal to 16,384 bytes, although the most extended sizes are 512 and 1,024 bytes.

The main advantage from RFID/NFC with respect to the QR code is the higher capacity, lower size, and quicker reading without requirements such as a good level of light or set the reader in the line of sight.

Nowadays, NFC is integrated in several smart phones such as Google Nexus family, Blackberry and Nokia.

The main motivation for the mobile companies to integrate NFC is coming because NFC will be used for mobile payment, transport cards and interaction between smart phones (P2P).

Some of the existing products and solutions with NFC by the students card of the Saint Antonio Catholic University of Murcia (UCAM) are the attendance control to the lecturers, access control to the gym and finally the public transport system (bus and train).

A more extended solution is the deployed by VISA and MasterCard for mobile payment with the *PayWave* and *PayPass* systems, which integrate NFC in the ATMs and credit cards.

Near field communication is also being used in mobile health such as the presented in the previous works for drugs adherence [22], diabetes [26] and the interaction with clinical devices [27]. Specifically, this allows to verify if a drug is presenting some adverse reaction with other products, interact with clinical devices such as glucometers with only approaching the smart phone to the clinical device, etc.

Finally, regarding the marketing point of view, NFC offers to the manufacturer advantages in terms of traceability, authenticity and the capability to offer to the clients extra details. For example, Fig. 7 presents a RFID tag adhered to a wine bottle. This allows to know about its origin, traceability, process followed up for its fermentation and additional information [29].

4 Interaction model

The interaction model of the participative marketing is based on the identification mediums presented in the previous section. The aims of identification through the Internet of things are to support the customers for the decision making during the shopping.

The information stored in the tags can be linked with Internet. Thereby, it can be dynamic and updated, which is one of the major differences with respect to the information printed in the conventional paper tags. This information in the participative marketing is related with the experiences, use cases, receipts and reputation of the product in the network.

The interaction between the customers and the product is carried out through a set of devices that allows to read the tag

Fig. 7 Wine bottle with a RFID tag

of the products. Figure 8 presents the ecosystem where the costumers are able to interact with the products through a terminal in the shopping center (A), personal devices such as Smart Phones (B) and finally through Internet (C).

- Shop terminals: Terminals for checking products in terms of cost are available in shopping centers. These terminals can be extended for the identification of products enabled with RFID tags or QR. Thereby, a costumer is able to obtain the additional information, social experience and reputation of a product without the requirement of any personal device.
- Mobile and personal devices: The current society is considered the "smart phone" generation since the high impact and integration of personal and mobile devices such as tablets and phones. Therefore, the interaction can be carried out with the smart phone through the barcode or QR code (camera) or the RFID tags (NFC reader).
- Online platform (Internet): Several online platforms are available for the analysis, evaluation and shopping of products such as Amazon. Online platforms are accessible from everywhere, thereby enabling to the customers to create new details about one product and consult existing information.

The following section presents the developed platform based on Internet of things for the participative marketing.

5 Participative marketing platform

The previous sections have presented the identification and interaction mediums enabled by the Internet of things. This section presents the participative marketing platform. This

platform offers to the consumers the capacity to interact with the products and social media via the identification based on barcode, QR code and RFID/NFC tag.

5.1 Platform components

The platform offers to the customers the product description, rates, opinions and experiences from other customers. In addition, this allows to the customers to participate adding and sharing their experiences. Finally, this allows to share it with other social media platforms such as Twitter, Facebook, Google Plus and Twitter.

Figure 9 presents the Web page for a specific product. This page is reached through the identification of the product or the lookup through the search engine.

This shows inside the main screen the reputation of the product, see Fig. 10, through a rating in terms of quality, experience, popularity (this is established based on the quantity of feedbacks received) and cost.

This also shows comments and experiences from the consumers, see Fig. 11. Thereby, they are able to express their evaluation and experience in a more expressive way.

The most important advantage from the participative marketing is its link with the social media marketing. For that reason, this allows to share the information or experience in personal spaces such as Myspace, Facebook, RSS and Twitter (see Fig. 12). Thereby, a costumer is able to share with its friends the experience with a product or recommend it to some friend. This social dimension from the Internet makes more accessible and visible this information. This capacities from the social media as a communication channel are exploited through the viral marketing.

Finally, it is presented how to introduce the comments and experience through a form, such as presented in Fig. 13.

5.2 Interacting with the products

Participative marketing foundation is the participation and interaction between the consumer and the products. The following subsections present the interaction with the platform through the described identification mediums.

5.2.1 Barcode-based access

Barcode offers the identifier of the product. The mobile application of the participative marketing scans the barcodes with the integrated camera. Figure 14 presents how the barcode is read, the identifier is obtained and finally how the details of the product are loaded.

Internet of things allows to link the identifier with its virtual representation. In particular, this links with the

Fig. 8 Identification and interaction ecosystem

Fig. 9 Participative marketing online platform

Fig. 10 Reputation of a product

developed platform. Thereby, the customer can access directly to the platform without the requirement of introducing any detail manually.

5.2.2 QR-based access

At the same way, it can be also accessed through the QR code for products such as the orange juice previously presented in the Fig. 6.

Figure 15 presents how the QR code is read, identified and finally this links to the platform. The main difference with respect to the barcode solution is that it can offer a

Fig. 11 Comments about a product

Fig. 12 Social media link through the platform

Fig. 13 Feedback form

description of the product without any Internet connectivity, since this has storage capabilities.

5.2.3 RFID/NFC-based access

Finally, it can be also accessed through the NFC reader for products such as the wine bottle previously presented in the Fig. 7.

Figure 16 presents how the RFID tag is identified with the Samsung Galaxy S3. This also allows to store
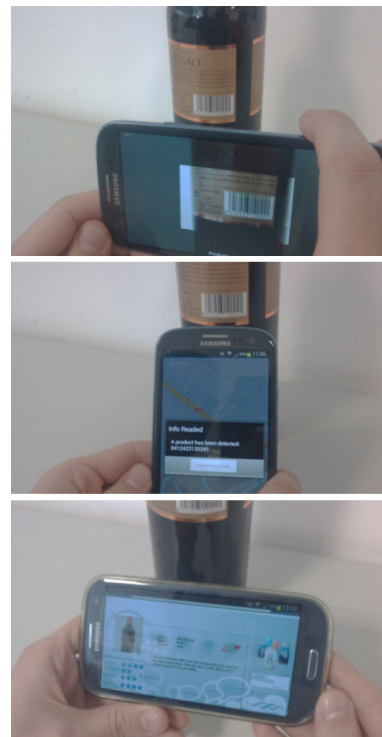

Fig. 14 Scanning, identifying and accessing to the description of the product via barcode

additional information and offer an easier interaction, since this reduces the scanning step in simply approach the smart phone to the product.

5.3 Analysis of experiences and opinions

The gathered data feedback, i.e., experiences, opinions and expectation of the user, can be exploited in with other technologies such as *Big Data* in terms of machine learning, data mining and context awareness. Thanks to this post-analysis, there is an even greater potential for immersive and participative marketing.

The gathered data usage is not limited to the data presented in the platform. This collection of huge quantities of data from the so-called *Collective Intelligence* can be used to build theories. These theories are able to predict behaviors, and finally, it could be feasible to control these behaviors and incentive them in function of the interests from a corporation.

Analysis of data from humans beings will be one of the major revolutions in the following years in terms of knowledge generation and services enhancement. There are multiple research lines focused on the data analysis to build complex networks that address political, economic and social behavior. These research lines are called with many names such as *Big Data* from the perspective of the large amount of data to be analyzed. Big Data is focuses on the development
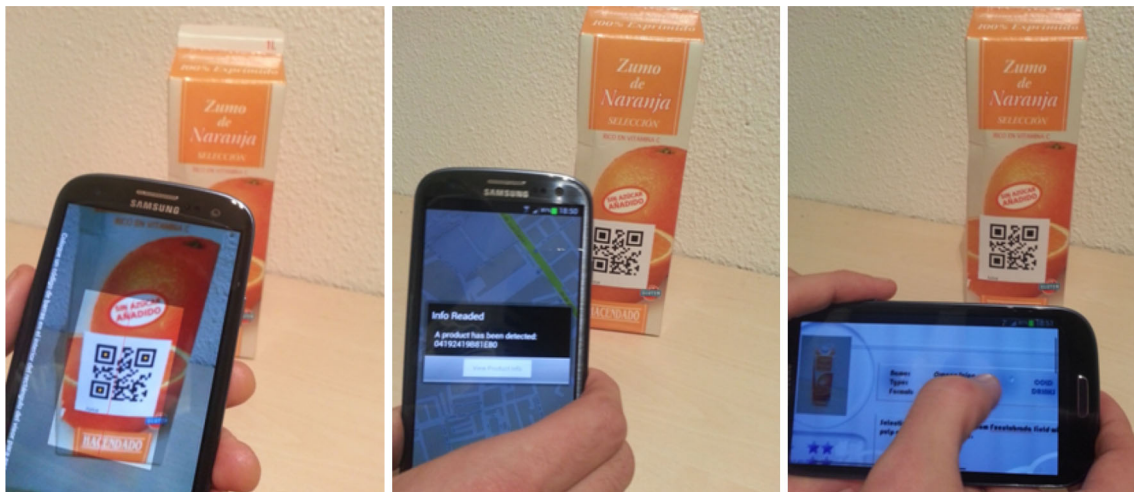
Fig. 15 Scanning, identifying and accessing to the description of the product via QR
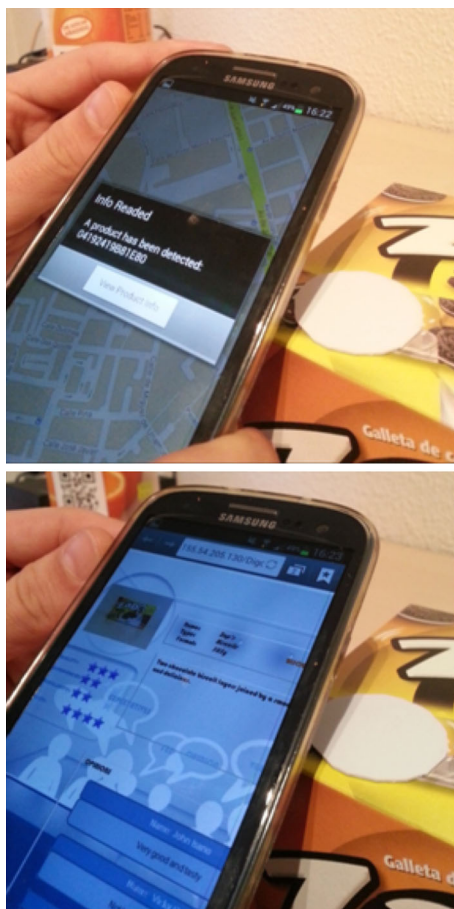
Fig. 16 Identifying and accessing to the description of the product via NFC

emerging information technology solutions, as mentioned by Professor Albert-Laszlo Barabasi, director of the research center on complex networks at Northeastern University [30]: "If you mathematically formulate it, then you gain predictive power. If you gain predictive power, eventually you get to the point to be able to control it".

The main challenge is to get the data and that is the main motivation to build this kind of social platforms. The existing social networks such as Linkedin, Facebook and Twitter are nowadays the most powerful tools for the data collection.

The value of social platforms is their users. For that reason, the product of a social network is the user data A quote that sums up this statement is: "If you are not paying for it, you are not the customer; you are the product being sold".

Finally, one of the most important advantages from this platforms is that the process to gather the data is simplified. Classically, the marketing campaigns obtains the feedback from the customers for conducting interviews and workshops where all opinions, actions and behaviors of people are observed.

But this evaluation limited to reduced groups has been extended thanks to the smart phones, its integration with social networks and its capacity to record all the activities, opinions and interactions from the users. Therefore, it is not longer needed a pilot study or an experiment to observe and record data. The data are now there by default, and now ,it is our duty to use it, learn from it and figure out new ways to enhance the economy, society, knowledge and in the case of marketing, brand reputation, product quality and consumer satisfaction.

Once the data are gathered the analysis can be carried out with several tools of Big Data such as Hadoop, Vertica and Autonomy by companies such as viBrain Solutions.[1]

of tools to handle the massive amount of data. This also is defined with social names such as *Human Dynamics*, which investigates human being behaviors. Human dynamics is extending the social sciences with the potential from the

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[1] viBrain Solutions—http://www.viBrainsolutions.com.

6 Discussion

Participative marketing extends the identification and interaction with the product with the integration, transfer and analysis of the experiences into knowledge platforms. Therefore, the customer is able to participative and share experiences through the presented platform after the product has been identified.

The potential of mathematics foundations and computer sciences tools, when they are applied to the social sciences, is to offer answers to specific questions. Thereby, it is feasible to predict and control of the future economic, social and political, when the collected social information is enough to quantify and describe numerically and model the social behaviors.

Thereby, the main challenge is to collect the data required. For that purpose, it is being developed multiple social networks such as Facebook for social relationships, Linkedin for professional relationships and the presented in the previous section for customer–product relationships.

Social networks are currently the most powerful mechanism for the data collection. Social media is offering a set of capabilities for conducting interviews, questionnaires, observe trends, opinions, actions and behaviors of people in a way that has never before been possible.

The recent years are presenting new technologies such as the smart phone are enabling all the social media and the identification mechanisms for the participative marketing.

Smart phones are one of the most important enablers since the primary barrier to wider, faster, more profitable adoption of the Internet of things solutions in the previous years has been the overhead costs for operating those systems in terms of required devices, personnel training and infrastructure. Therefore, the main difference nowadays with respect to the initial of the Internet of things in 1999, is that the required devices are available everywhere. Therefore, it is not limited to a pilot study or an isolated experiment, now it is continuously being carried out. In definitive, the potential is amazing, and our duty is learn from them and find ways to apply it to improve the economy, society, knowledge and in the case of marketing, brand reputation, product quality and consumer satisfaction.

Internet of things offers a new generation of capabilities. The origins of the Internet of things have been the identification capabilities for anything in anywhere, but the Internet of things is not limited to identification, since in the future, all the things (i.e., everything) will be connected as well, not only just tagged. Thereby, the things also can communicate with each other and actually share information among themselves. The potential of the Internet of things and Big Data for several sectors is just starting, and this work has presented the initial analysis and solutions for the exploitation of its potential in the marketing.

Several works needs to be yet carried out in order to define interoperable linked data, semantic technologies and social mining which allows through the Big Data exploits all the data gathered through platforms such as the presented participative marketing platform.

7 Conclusions

The future is unpredictable, but this is already benefiting from a new generation of technologies for product identification, Internet access from mobile devices and the ability to integrate our information, experiences and opinions in social networks.

This paper has presented the potential from the Internet of things to the extend the current social media marketing and the value-driven marketing toward a more interactive relationship with the customers through participation. Participation is now possible as a result of the identification mediums integrated in the products and mobile phones.

The main objective of Internet of things is to reduce the distance between the physical objects and the platforms available on the Internet. At the same way that the integration into Internet of the smart phones has been improved during the last years, it will be integrated the products with the goal to facilitate and simplify the customers interaction with the products.

The identification of the products presented has covered from basic technologies such as barcode and QR code, to more complex technologies such as smart tags based on radio-frequency identification (RFID/NFC).

QR codes and RFID/NFC tags have demonstrated its ability to link products with Internet. Finally, in Internet can be deployed online platforms such as Amazon or from other manufacturers, where the information about a product is extended in terms of values, social commitment and the experiences from other customers.

In definitive, participative marketing offers a new dimension of functionality to the products, in order to allow verification of the brand values, product quality and brand reputation globally.

The reputation and brand identity are the result of the customer experience. For that reason, the foundation of the participatory marketing is the value of the experience and feedback from the customers, since feedback enables a continuous improvement through the co-creation of value, such as mentioned by Bruno Latour: "There is no innovation without participation" [31, 32].

Participatory marketing offers a more reliable version of the veracity of the information contained in the products, since it combines the information of consumers with the information from the manufacturer. Thereby, both parties have the opportunity to present the quality and properties

of the products. Consumers can use that information for decision making for the purchase of products.

This paper has presented a proof of concept where consumers can interact with a mobile platform with products across the three systems described identification (barcodes, QR codes and RFID/NFC tags).

The steps for companies to implement participatory marketing are, first, collect data and experiences of customers. Once collected, apply a data analysis tool, such as new solutions based on the analysis of large amounts of data that are emerging in the so-called Big Data. These techniques will build complex networks of human behavior, of the political, social and economical.

The actions from the enterprises to keep brand identity and reputation will be based on a higher awareness of the experiences and opinions from the consumers.

Finally, participative marketing is feasible since the voluntary participation has increased through social networking and the ease of participation offered for interaction with users through the smart phones. Also being given an exponential growth of the amount of content being created online by private users and the capabilities to obtain information from millions of users through social media. These capabilities provide data of social media, are capabilities than ever before have been given, and it is clear that their potential will build new services and marketing mechanism. In definitive, it is not yet known all the potential to model, predict behaviors and to satisfy the emerging customers needs, but what it is clear is that the Internet of things, cooperative intelligence and big data are enablers for a future where the data potential will be exploited for the continuous and collective improvement, reaching thereby an Internet of things empowered by an Internet of People [33].

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