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IoT in the Support of Marketing Actions. Case study: Porto City Park

Y. Bentub
University of Maia, a037461@ismai.pt

J. L. Reis
University of Maia/UNICES/LIACC/UP, CEOS.PP/ISCAP/P.PORTO, jreis@ismai.pt

J. M. C Vieira
University of Maia/UNICES, jvieira@ismai.pt

J. Pratas
University of Maia/UNICES, ISCAP/P.PORTO, GOVCOPP.UA, jmpratas@ismai.pt

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Bentub, Y., University of Maia, Portugal, a037461@ismai.pt

Reis J. L., University of Maia/UNICES/LIACC/UP, CEOS.PP/ISCAP/P.PORTO, Portugal, jreis@ismai.pt

Vieira J. M. C, University of Maia/UNICES, Portugal, jvieira@ismai.pt

Pratas J., University of Maia/UNICES, ISCAP/P.PORTO, GOVCOPP.UA Portugal, jmpratas@ismai.pt

Abstract

This study aims to understand how large databases generated from IoT systems can be used for Marketing and Organizational Management purposes. Through this research work, an attempt was made to highlight the importance of understanding the advantages of using data from an IoT system, especially regarding user behavior and developing well-segmented strategies, which will later translate into competitive advantages. In this work, it was made the study of a case, of a smart counter solution provided by Wavecom, implemented in Porto City Park, capable of sending real-time readings about the occupation of a given space. The theoretical contextualization of this study was based on exploratory research of relevant bibliographic works. In a statement, this work added value to fill gaps in the areas of the themes under study, offering a deeper understanding of the correlation between the large amounts of data generated by IoT systems and their use in Marketing.

Keywords: Marketing, Internet of Things, Big Data, Smart Counters.

1. INTRODUCTION

The large amounts of data generated in the digital world are in connection with the internet and can support managers in decision making. The focus of this study centres on an attempt to understand whether the large amounts of data collected from systems associated with the Internet of Things (IoT) provide usage patterns that can be used for marketing purposes.

Dahlqvist et al. (2019) report that the number of companies using IoT technologies has increased from 13% in 2014 to around 25% in 2019, and predict that by 2023, there will be about 43 billion IoT-connected devices globally.

This study aims to understand what the best way is to use the large amount of data obtained through IoT systems to improve decision-making related to Marketing in the organizational environment.

Based on a literature review, the second part of this paper presents the concepts of Marketing in the Internet era, and in the third part IoT concepts and their importance, and how the analysis of data, and Big Data obtained from the IoT can help Marketing decisions. The fourth part of the paper is dedicated to the study methodology, and the analysis of the case study, which uses the data obtained

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by the sensors installed in the City Park of Porto and serves as a practical component in this work. In the fifth part of the paper, recommendations are made for Marketing actions that can be developed from the data obtained in the system. Finally, the last part focuses on the conclusions reached with this study.

2. MARKETING IN THE INTERNET ERA

According to Grubor & Jaksa (2018), the power and attractiveness of the online environment have transformed the way consumers behave, creating new patterns and lifestyles that must be considered when creating appropriate internet-focused marketing strategies.

Grubor & Jakša (2018) describe that the Internet has become the main business stage and the most popular communication channel, creating new rules and functions on both the supply and demand sides. Thus, the entire marketing discipline must be adapted to the new business climate in the coming years. "Understanding the postulates of Internet marketing and all the possibilities of its channels is the essence of the new age marketing strategy" (Grubor & Jakša, 2018).

Vynogradova & Drokina (2020) convey that the main difference that the Internet presents compared to other media is that online communication allows directing messages aimed at a specific target audience with a certain degree of flexibility.

In Rungta's (2016) work, he points out that online marketing also helps keep track of consumer behaviour, including their preferences, responses to various products, services, and brands, etc. Thus, the company can make, or plan additional marketing strategies based on these observations and can also decide on its future product offering by observing the customer behaviour.

In the process of constant ICT evolution, IoT is slowly being introduced into the business world. Despite being innovative and using state-of-the-art resources, IoT does not replace existing channels and methods, but rather complements and adds value to what already exists.

Kotler et al. (2017) present us some examples of what they consider to be the future of Marketing, "a continuous mix of online and offline experiences" (Kotler et al., 2017, p. 41).

- Amazon.com in a first attempt to apply IoT created the Dash Button (later replaced by the digital assistant Alexa), which was nothing more than a button-shaped device, for immediate purchase that allowed customers to automatically replenish household products such as coffee and detergents. The device connects to the internet via wi-fi, and when pressed, places an order on the company's website. However, as it was still something new at the time, it was necessary to create a physical channel to support and complement the use of this technology.

- Macy's shopBeacon project, uses Apple iBeacon transmitters installed at various locations within a Macy's shop to alert customers with targeted offers as they browse the shop. For example, as they

pass a particular department, customers can be reminded of their shopping list, and receive notifications of discounts, and gift recommendations through a simple mobile app.

- John Lewis' sofa studio allows customers to choose a sofa model from miniatures created by 3-D printers. By positioning that thumbnail and a selection of fabrics in front of a computer screen, customers can visualise on-screen what their sofa will look like. This provides a very playful experience for the customer when choosing the model and fabric of their product.

Internet-based products allow new opportunities for companies, to direct their specific customer relationship efforts, providing individualized experiences, meeting their specific needs, by example, General Electric Aviation (GEA) is directly connected with their customers, eliminating other partner channels (Xinxin, 2022).

It is intended with these examples to understand that the technologies associated with the Internet, contribute more and more to decision making in various functional areas of organizations. Thus, in this work the theoretical concepts associated with IoT, Big Data, Artificial Intelligence and Machine Learning, intend to connect with the case study prepared within this work, which contributes to respond to the question of investigation and define suggested recommendations for marketing.

3. INTERNET OF THINGS

Kevin Ashton (2010) calls himself the originator of the Internet of Things concept in 1999 while preparing a presentation for P&G (Procter & Gamble) on how to link objects to the Internet via a Radio Frequency Identification (RFID) tag. According to Taylor et al (2020), RFID uses electromagnetic fields to identify tags attached to objects. Tags can be passive, whereby they use the energy of radio waves from a nearby reader, or they can be active where they have a local power source such as a battery and can operate over distances of up to hundreds of meters from the RFID reader.

The Internet of Things, generally referred by the acronym IoT, comprises a wide range of devices that can be permanently connected to the Internet, identifying themselves on the network, to collect a large amount of data about their surroundings and communicate with each other. The Internet Society defines IoT broadly as: "the extension of network connectivity and computing capability to objects, devices, sensors and other artefacts that are not normally considered computers" (Internet Society, 2015).

3.1. *Machine Learning in IoT Systems*

Birlog et al. (2020) consider Machine Learning in current technology as the process of eliminating human intervention whenever possible. According to the same authors, Machine Learning is an asset

when a large amount of data exists, but its potential is not capitalized. This happens because of the lack of knowledge about the importance of each variable in decision making (Birlog et al., 2020).

With the significant influence that Big Data started to have on IoT, the need arises for Machine Learning algorithms to begin transforming the stored data into valuable information, which eventually is used to reduce costs, increase efficiency, or even make predictions (Kubat, 2017).

Thus, according to Birlog et al. (2020), datasets resulting from IoT hardware components, which in most cases are sensors, are processed and the information extracted from the algorithm is then interpreted and used for future decisions.

Depending on the style of learning, Birlog et al. (2020) believe that Machine Learning algorithms can be grouped into four categories:

- Unsupervised learning: Algorithms in this category attempt to identify patterns by testing data, and subsequently grouping that data or predicting future values (Kubat, 2017).

- Supervised learning: deals with problems involving regression such as,weather prediction, life experience estimation and population growth prediction, using algorithms such as Linear Regression or Random Forest.

- Semi-supervised learning: this is a combination of the previous two categories. It works mainly like unsupervised but with the improvements that a portion of labelled data can bring (Kubat, 2017).

- Reinforcement Learning: In this learning style, algorithms try to predict outputs for a problem based on a set of tuned parameters. Then, these calculated outputs become parameters of inputs and a new output is calculated until the optimal outcome is found.

3.2. ***Relationship between IoT and Big Data***

IoT allows devices to connect and exchange data over the internet, thus collecting valuable information. Data ultimately proves that it is crucial for companies to delineate sales strategies to improve profitability and business efficiency.

Rajat describes big data as "the explosion in size, quantity, and form of information available about an individual, organization, or event" (Rajat, 2013, p 40). Kotler et al. (2017) point out that companies are beginning to use big databases to their advantage in customer-centric marketing strategies in a 1-to-1 relationship to understand their customers' needs and preferences better.

Erevelles et al. (2016) highlight that big data sources provide a diverse richness that far exceeds traditional data of the past. Taherkordi et al. (2017) understand that traditional big data is less complete than big data coming from IoT, as the latter includes the spatial and temporal context in the data analysis system. Moreover, IoT devices are often associated with a location context and each data group has a date/time stamp.

According to Matt & Lee (2014) the network-connected devices that make up IoT are characterised by having automatic provisioning and management and include intelligent systems and devices, enabling connectivity.

In a report released by International Data Corporation (IDC), worldwide spending on big data and analytics (BDA) solutions is expected to reach $215.7 billion in 2021, increasing 10.1% relative to 2020. The compound annual growth rate for overall DBA spending over the forecast period 2021-2025 will be 12.8% (Needham, 2021).

Chen et al. (2014) reveals that although current data coming from IoT systems is not the dominant part of big data, by 2030, the quantity of sensors is expected to reach one trillion. Thus, data coming from the IoT will be the most essential part of big data. Furthermore, these same authors explain that in a report by Intel it was pointed out that big data coming from IoT has three features that conform to the big data paradigm (Chen et al., 2014):

- Abundant endpoints are generating large amounts of data.
- The data generated by IoT is generally semi-structured or unstructured.
- IoT data is useful only when it is analysed.

Data management is also a central part of a cloud living system. Depending on the purpose of the system, Birlog et al. (2020) argue that one may need different types of database systems and that IoT system requirements from a data perspective cover three main areas (Birlog et al., 2020):

- Data storage must be done consistently and efficiently. When talking about consistency, it usually means that all devices connected to an IoT system should see the same data simultaneously.
- Data retrieval is necessary for devices connected to an IoT system to receive new data that may be needed for a change of state or for other behavioural aspects.
- Data visualization - helps users of an IoT system to observe the state and events of that system. Data visualization components should only get read access to a system's data, and in no way be able to modify it.

Chen et al. (2014) refers that the application of big data in companies can increase their production efficiency and competitiveness in several aspects.

- In marketing, with extensive data correlation analysis, companies can more accurately predict consumer behaviour and find new business models.
- In sales planning, companies can optimise the pricing of their products, after comparing masses of data.
- In operations, companies can improve their operational efficiency and satisfaction, optimise the workforce, accurately predict staffing requirements, avoid excess production capacity and reduce labour costs.

- In supply chain, using big data, companies can conduct inventory optimisations, logistics optimisations and supplier coordination to close the gap between supply and demand, control budgets and improve services.
- In logistics are probably the companies that have had the best experiences with big data from IoT systems. For example, UPS trucks are equipped with sensors, wireless adapters, and GPS so that headquarters can track truck positions and prevent engine failures.

3.3. ***Marketing and IoT Technologies***

In addition to what was mentioned in the previous points, this section of the work aims to articulate IoT technologies and possible marketing actions, which is the object of this study.

Data available through the technologies that support IoT allow potentially to offer companies' opportunity to develop strategies for marketing as well as communication campaigns. If the company's marketing strategies are oriented to customers, companies can perform more interactive and participatory marketing (Tariq et al., 2020), (Javaid, 2021).

As we have seen earlier, IoT technologies are able to collect and provide large amounts of data using advanced communication technologies that can be analysed for decision making. IoT plays an increasingly important role in the improvements of smart cities, namely creating economic municipal services, keeping citizens safe and healthy, reducing energy consumption, and improving monitoring systems (Almalki, 2021).

Behavioural analysis and psychology were able to provide new ideas about the data obtained through IoT. For organizations, the Internet of Behaviour (IoB) can be a marketing and sales tool. Companies can examine previous performance and predict the future using the concept of IoB. IoB is used for promotion and advertising purposes. Companies can organize their marketing operations using data obtained through IoT. For example, sensors associated with IoT can collect data and provide information about consumer's behaviour, desires, and expectations. With certain conditions, send the data to a central dashboard to be analysed to support decision making (Javaid, 2021), (Xinxin, 2022). Behavioural internet is linked to the collection, analysis, and use of evidence about human behaviour, offering opportunities to make unique recommendations directed to a person or sets of people (Javaid, 2021).

4. **METHODOLOGY**

The methodology used in this study is exploratory research to raise relevant information on the subject, increase familiarity with it and proceed to formulate propositions. The research method used is the bibliographic research method, starting from the different bibliographic materials already published, and putting diverse information from different authors into dialogue.

Regarding the practical part, the method chosen to support the study was a case study analysis. It was conducted in the form of semi-structured and semi-directive interviews, direct observations, and data collection. Subsequently, to make the analysis according to the data collected a mixed approach was used.

In Baxter & Jack's (2008) view, establishing boundaries in a qualitative case study design is like developing inclusion and exclusion criteria for sample selection in a quantitative study. The difference is that these boundaries also indicate the breadth and depth of the study and not simply the sample to be included.

The case chosen to be addressed, in partnership with Wavecom, which was willing to collaborate with the study, was a pilot case of a smart meter solution, implemented in the City Park of Porto.

The contacts with the company were made during the month of January 2022, being carried out two interviews to the technicians responsible for the IoT and Marketing areas, having collected some readings of that same smart meter, to better understand how that data can prove interesting to support Marketing decisions.

The interviews were conducted via video call, and audio recorded upon the prior written consent of the interviewees. The readings were provided by the company, through a proprietary platform, and because it is a pilot case in which there is no obtaining sensitive data, they can be treated and disclosed in the academic context. The smart meter readings used in this work correspond to readings recorded from October 14, 2021, until January 14, 2022.

4.1. ***The Wavecom***

Wavecom - Soluções Radio SA is a communications engineering company that focuses on innovation and the creation of its own distinctive products and solutions. Wavecom is present in countries such as Cape Verde, Angola, Mozambique, and Spain, having carried out projects in countries such as Brazil, Jamaica, Romania, Italy, England, Equatorial Guinea, and China, among others. Its positioning is "Wavecom connecting every... things" and has 10 000 Wi-Fi access points already installed, 2500 connections implemented in 4 Continents, and 8500 km in the largest non-licensed bandwidth network in Europe. Wavecom's business areas are RFID and radio localization, IoT, and Wi-Fi coverage (Wavecom, 2022). The company started its activities in 2000 and quickly gained market recognition as specialists in wireless technologies, has its headquarters in Aveiro, and employs about 180 people highly specialized in various ICT technologies (Networking, Wi-Fi, Security, Storage, Computing, CCTV, and Solutions for Industry 4.0) from various manufacturers (Cotecportugal, 2021).

4.2. ***Case Study***

The case study strategy is most appropriate for answering "How" and "Why" questions. The first task of the researcher, therefore, is to make sure that their initial question is in line with this principle (Yin, 2003). The question that charts the course of this research is a "How" type question, more specifically, "How to use the large databases generated from IoT systems to support Marketing strategies?" In this way we can state that the starting question meets the intended requirements.

4.3. ***The IoT Solution - Advanced People Sensor APS - R***

From all the intelligent solutions that Wavecom implements and manages, it became clear that the solution that best fits and that would add most value to this study, would be the case of a smart meter solution, capable of sending real-time readings, implemented at the North entrance of the Porto City Park at the request of a contracting company, which for confidentiality reasons will not be revealed.

The solution is a pilot case, which is still being tested, and sends real-time readings of people entering and leaving the park. It should be noted that Wavecom is only responsible for the installation, management, and data collection of the system, while the data analysis and processing is the entire responsibility of the contracting company.

To give a better context about the solution and how it works, it is important to know its technical components. The device with the technical name Advanced People Sensor APS - R (see Figure 1), is an IoT-based solution capable of detecting people movements in real time to determine the occupation of certain areas, for optimised capacity planning. It should be noted that all the specifications of the device were taken from the device's manual available on the manufacturer's website (HELLA Aglaia, 2020).

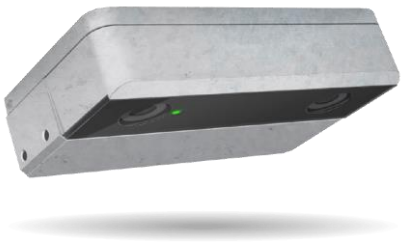

Figure 1 – Advanced People Sensor APS-R, source: (HELLA, 2020)

The following points describe some of the features of the solution.

Multi-directional People Counting

- Counting of incoming and outgoing persons with the highest precision available on the market (precision of at least 99%).
- Up to 10 individual counting lines are possible per device.
- Separate image capture for inside entrances, left and right side and upper and lower decks without the need for additional units.
- Detection and exclusion of returns.

Object Classification

- Separate counting results for adults and children.

- Bicycle and wheelchair detection.

Video recording for count verification

Recording of colour VGA video files together with subtitles of the measurement results.

- Recording can be triggered via digital inputs (door contact).

- Privacy option: individuals are not recognisable in the videos.

Real Time Data

- Very short latency time of 50 ms.

- Start-stop detection using the integrated accelerometer.

- Suitable for solutions that require an instant event triggered activity, e.g., re-opening of a door if a passenger approaches.

Configuration

- Automatic determination of mounting angles.

- Automatic determination of floor profile and ceiling height.

- Intuitive and direct configuration of all other parameters via the web user interface.

- Instant full performance, no calibration required.

- Easy demonstration to the end user using colour videos with synchronised data logging.

Technical data of the device is presented in Table 1.

FEATURE	TECHNICAL DETAILS
Operating voltage	12 V DC to 24 V DC (nom.) Protected against short circuit and reverse polarity
Power Consumption	5W
Operating Temperature	-25°C a +70°C (-13°F a +158°F)
Storage Temperature	-40°C a +85°C (-40°F a +185°F)
Coverage	Ceiling height: 2.00 m to 4.00 m (6.6 ft to 13.1 ft) Covered door width: 1.60 m to 5.60 m (5.2 ft to 18.4 ft) Depends on installation height
Dimensions	141 mm x 98 mm x 35 mm (5,6 pol x 3,9 pol x 1,4 pol)
Weight	440 g (15.5 ounces)

Table 1 – Technical Data of the Advanced People Sensor APS - R

It is possible to observe from these technical characteristics that the device is complex, and aggregates many functionalities, which makes it useful for organisations that are looking for innovative solutions to solve their day-to-day problems. It should be noted that the device is only one part of the system, although it is the central part, it needs to be connected to a network with

internet access, it needs to have a power source, and it also needs to have an online platform that manages it remotely, and to where it sends the readings in real time.

We are facing an IoT tool capable of generating a multitude of data, which if analysed can mean added value in various areas for organisations. In the Marketing area in particular, these readings can be analysed to validate the place or space where the smart counter is installed, to understand if there are enough people flowing to be considered interesting enough to justify an investment in a campaign, strategy, or marketing action. Even these data when analysed allow us to know the times of highest and lowest flow of people.

To better understand the case we are studying, we need to know what specific data that this system provides. These data are daily readings of entries and exits sent every 15 minutes to a proprietary platform that aggregates and normalises these readings.

As this is a pilot case, there is only one entrance with this system implemented, in this case the North entrance, which is in Avenida da Boavista, making it difficult to get an accurate reading of occupancy and the flow of people in a certain time interval. In an ideal scenario, all entrances would have such a device, which would be connected to the same platform, which would then allow to have accurate readings increasing even more the degree of certainty regarding these results.

Another factor limiting the system is the fact that it is solar recharged, in Porto this can be a major obstacle considering the several days in winter when there is no sun. Thus, some days will have a total of zero readings, which as we will see later, correspond to the days when, due to poor weather conditions, the device ended up without power, not registering any readings.

4.4. ***Data sources***

As previously mentioned, the data sources used in this research are the data coming from the IoT system, and the interviews to the company's technicians responsible for that same system.

The data that was accessed, are indiscriminate data, that is, they do not specify whether they are bicycles, wheelchairs, etc. Only the registers of entries and exits. However, for this study we concluded that the data from the exits would not be of useful interest, since all passing places do not have IoT coverage which makes it impossible to calculate the occupancy rate in each time frame.

With the pilot project running for some time now, it was decided to address the readings recorded from 14 October 2021 to 14 January 2022 as these are recent readings which illustrate well what the reality of the site is. A total of 2673 readings were collected, referring to the entries of people in that period. For a better treatment and understanding of these data, these readings were subdivided into 3 time periods during the day, to understand in which of these periods there's a greater flow of people entering.

4.5. ***Data Analysis***

The analysis technique that best fits the study is the explanation construction, considering that here what is intended is to analyse these data and build an explanation of how these can support Marketing strategies (Yin, 2003).

For this study, records were obtained of 34,254 entries of people in the time frame with an average of 368 entries per day, and with a standard deviation of 316.7. As can be seen in the graph in Figure 2, in the given time periods.

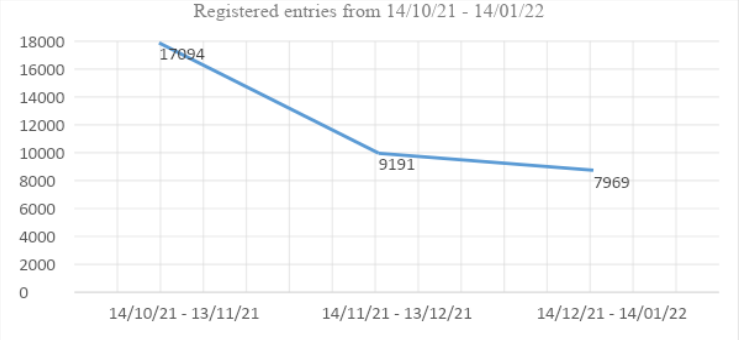

Figure 1 – Registers of entries from 14/10/21 to 14/01/22

From the analysis of the graph in Figure 1, entries decrease over time. In the first period the highest number of entries was recorded, which corresponds almost to the sum of the other two periods of the same time. To better understand how these inputs are distributed, in the following figures the input graphs during these three pre-defined time periods are presented.

By analysing the graph in Figure 2, we can identify that the peak of entries occurred on 24 October (1473), and the day with the fewest entries (excluding 0) was 29 October (105). It can also be seen that this same graph has a descending trend line.

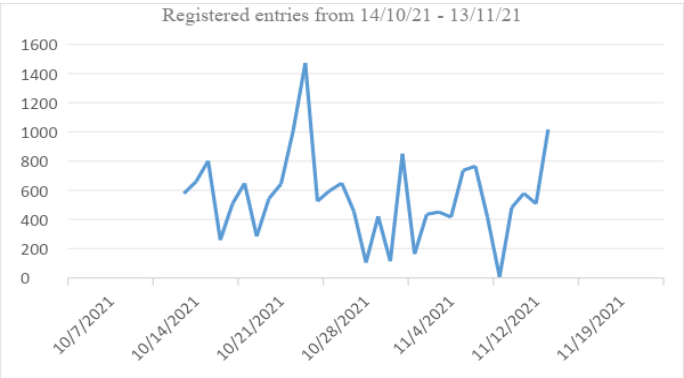

Figure 2 – Registers of entries from 14/10/21 to 13/10/21

For the period from 14/11/21 to 13/12/21 which corresponds to the graph shown in Figure 3, the peak of entries was recorded on 14 November (1232), although similar values are recorded on 21

November (1109). The minimum values (excluding 0) were recorded on 8th December (234) and the trend line of this graph is also descending.

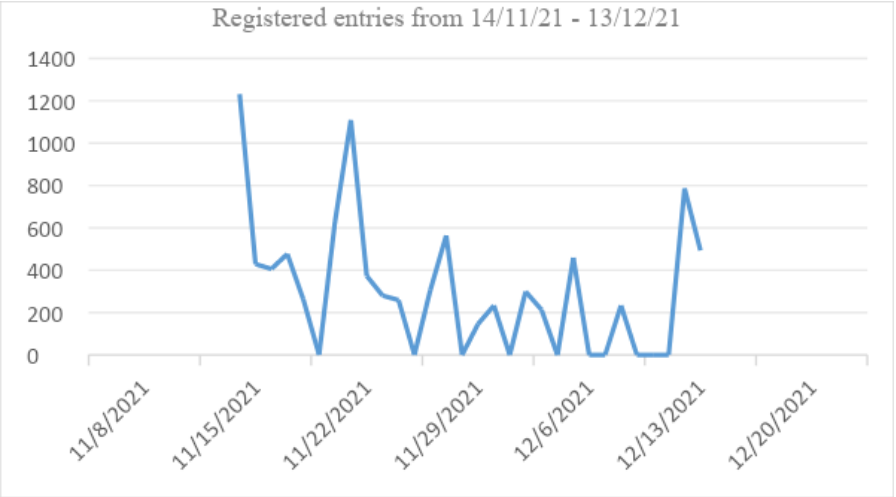

Figure 3 – Registers of entries from 14/11/21 to 13/12/21

In the graphic of Figure 4, which corresponds to the period from 14/12/21 to 14/01/22, two days with very high readings stand out, 31st December (797), and 2nd January (767), still well below the maximum values registered in the other similar time periods. As for the minimum daily values registered (excluding 0), these were observed on January 4th (169), and unlike the other graphs, this one has an ascending trend line.

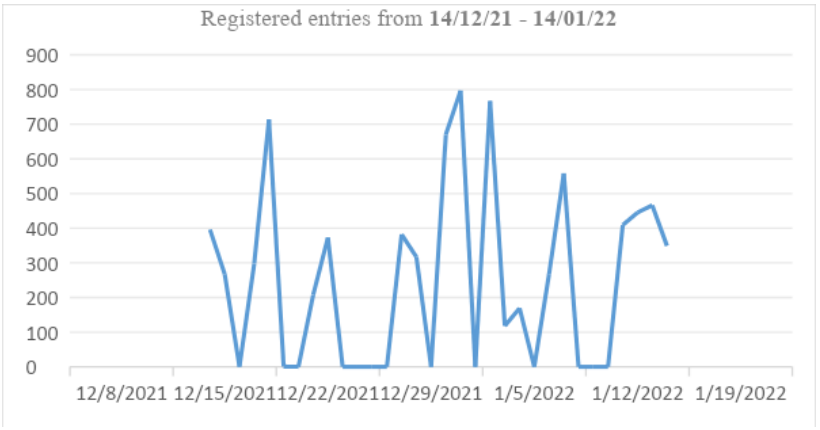

Figure 4 – Registers of entries from 14/12/21 to 14/01/22

Regarding the registration of daily entries, it was decided to group the entries into three time periods, corresponding to the morning period, the afternoon period, and the evening period. In the interval covered, the results obtained in each period of the day are presented in the graph in Figure 5.

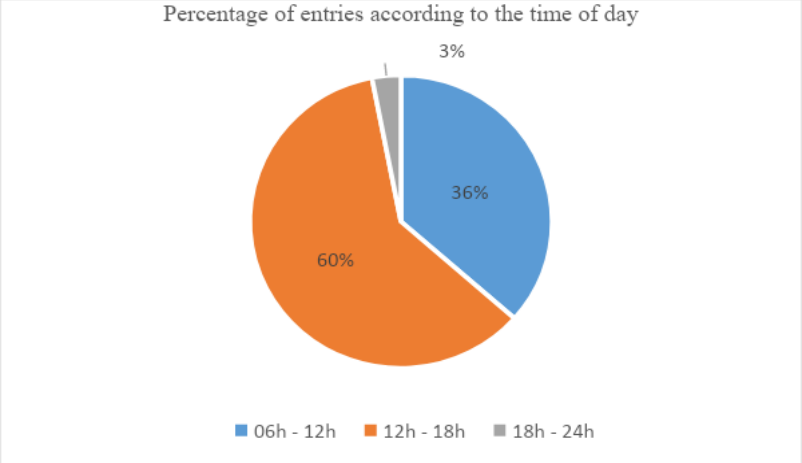

Figure 5 – Percentage of people entering by time of day

From the analysis of the graph presented in Figure 5, in the morning period (6am-12pm) a total of 12,491 entries were registered, which corresponds to 37% of the total value, in the afternoon period a total of 20,706 entries were registered, which corresponds to 60% of the total value, this being the period where there is a greater affluence of people, and in the evening period 1057 entries were registered, so during this period there is not so much flow of people.

In relation to the maximum values of daily entries registered during the different periods of the day, as can be seen in the graphic of Figure 6, the maximum value registered in the afternoon period was of 931 entries (24/10/21), these values being much higher than the maximums of 481 (14/11/21) and 98 (15/10/21) entries, respectively for the morning and evening periods, indicating, once again, that the afternoon period is the period of greatest flow.

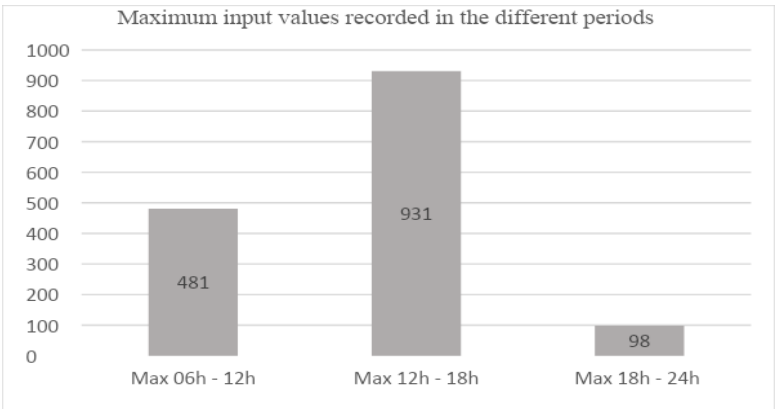

Figure 6 – Maximum input values recorded in the different periods

Finally, an analysis was made of the entries on 24 October (1473) - see Figure 7, which correspond to the maximum number of entries recorded in a single day, to try to understand how the entries are distributed throughout the day.

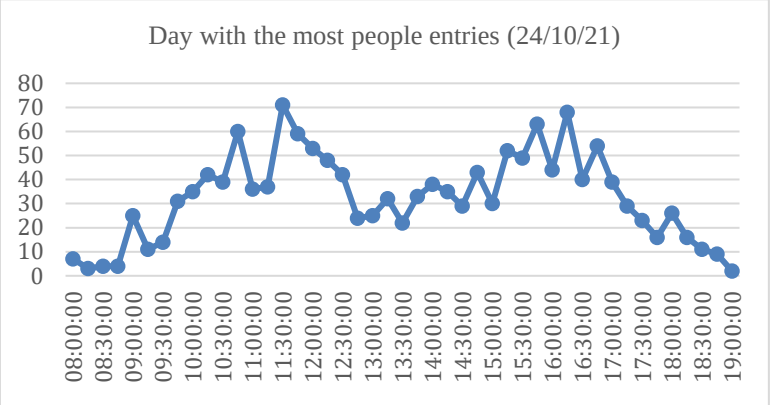

Figure 7 – Day with most entries

According to the analysis of the graph in Figure 7, we can see that, although the maximum readings are still registered in the morning period around 11:30 am, there are more entries in the afternoon period, because in that part of the graph there are fewer breaks, which indicates that there is more regularity in the readings. As for the night-time period, once again there are few readings, meaning little flow of entries.

5. RECOMMENDATIONS FOR MARKETING ACTIONS

From a Marketing perspective, an investment in campaigns and actions is only worth it if there is a target audience where efforts will be directed. Considering the analysis carried out on the data of this work, there is information that can support Marketing actions. The validation of the space, with 34,254 entries registered for 93 days, in just one entry, allowed us to perceive that the space has a large flow of people, thus constituting an interesting place to advance with campaigns. According to the marketing specialist, if all park entrances had IoT coverage, it would be even easier to monitor this flow of people:

"In the City Park, if we had the 4 or 5 entrances monitored with reading for 6 months, we could with a relatively high degree of certainty say that the periods of greatest affluence are the days x and y of each week, with an average affluence of x of people, this is very interesting data to present to a municipality, so that it can see, what can we take from here that is strategic? Now, we have a thematic fair that was located on avenue x, why not move it to here? And we have several marketers who would be very interested in being here and would probably even pay a higher quota if we presented this data to them". The expert presents an interesting solution based on these readings. Since several fairs, theme parks and even festivals are held, which in most cases are in inappropriate places, and which do not have a large flow of people, it is feasible to take advantage of these readings to give context to a possible displacement of these events to the park.

"Here they could monetize it with advertising, probably put on some website or some application the current occupation of spaces, even giving indications here of what would be the best times to be

in the park." Once again, the specialist proposes a solution to monetize the space with advertising, exposing the readings on public platforms, for companies that intend to advance with strategies for this space. In this perspective, other strategies and campaigns can be designed based on these same readings.

Sales promotion

Mondo & Costa (2013) explain that much of sales promotion is focused on promoting an immediate impact. The goal is to make the purchase happen immediately, offering an incentive to stimulate consumption. Taking advantage of the context of this data, it was interesting for brands to have small stands in these spaces, mainly brands in the sports, energy drinks, natural products, etc.

Outdoors

Outdoors are advertising designs applied to fixed content in outdoor areas, dubbed "urban furniture that beautifies cities". Such designs are used for marketing purposes to catch the attention of the audience that is passing through that venue. Outdoor advertising has been making a difference in the way it drives demand for consumer goods and is considered by these same authors as the most efficient advertising method to reach modern society Akören (2015). This would be one of the actions to be carried out in this space once the appropriate spaces were validated by the readings of the IoT system.

Event organization

As already mentioned and proposed by the expert technician in Marketing at Wavecom, there is enormous potential in organizing or moving events to this space.

In addition to the readings making, it possible to determine the best times of the year, month, or day to proceed with these events, the system itself serves later to provide a database on these events to the organizers who would certainly be interested in understanding this dynamic of displacement, occupation, etc. Subsequently, these data could be used as measures of the success of the events.

Distribution of Flyers and Pamphlets

Companies typically use flyers and pamphlets to promote new products, advertise new stores and communicate special prices (Miranda & Kónya, 2007). The IoT system can be used to help measure the success of campaigns. Establishing a relationship between the number of flyers and pamphlets distributed with the number of entries, it is possible to have a clear idea of the success of the campaign and how it is being accepted by the public. These types of actions are the ones that would best suit this location, and may vary according to the type of space, flow of people, data collected, etc.

Convergence of Marketing with New Technologies

According to the ANACOM report (2021), in 2021 only around 23% of companies in Portugal with 10 or more employees resorted to the use of IoT devices or systems, which despite recording an improvement of 10 percentage points compared to the previous year, remains below the European Union average. In this way, experts explain from their point of view the reasons for this slow growth.

The marketing specialist mentions that "… the lack of perception of the potential that these systems have. They are not 100% noticed. In this sense, it is necessary to look at the target, whoever buys these systems from us must be organizations that have the capacity and that have a problem, a pain of crowds." According to this specialist, what has been preventing the spread of these systems in the business environment at a higher rate is the lack of perception of the real potential they have. The person responsible for IT also mentions that "It is a process that still needs to gain maturity, this is because the so-called IoT appears relatively recently, so the technologies associated with IoT do not reach half a dozen years, they are only a few years old, so there is a need here to create maturity, maturity from the sensory point of view, from who collects the information and to have good data sets here, data that are reliable and normalized, and we still don't have, from a historical point of view, great amount of history, the more history, the more value we can extract from these data sets, and then the treatment we are going to give to this history to predict the future. I think the point here at national and international level is to gain maturity."

Woodside & Sood (2017) state that the development and sustainability of IoT in Marketing are highly dependent on the acquisition of new skills by the marketing professional. This includes a mix of skills ranging from design, psychology and cognitive science, with design skills not just about making things "beautiful" but developing ways of thinking that drive a problem-solving culture. problems. Even so, in some cases it will even be necessary to resort to partners with programming and machine learning skills (Woodside & Sood, 2017). In this respect, the analysis of experts in these areas provides a closer view of what can be expected in the future.

The specialist and responsible for the Marketing department at Wavecom, argues that he is currently missing a data scientist and that marketers increasingly need to have analytical skills, that is, the ability to read and interpret data. "As of today, I already miss a person here on my team, but if it were a few years from now, I would certainly have hired a data scientist for marketing, more and more a marketer has to have analytical skills, he has to be able to understand that there are several sources of information and to make use of them, you have to know how to read data and establish logical relationships between them, and design scenarios with creativity". "… we do not need to have more skills in my opinion, we need to understand all the sources of information that we have available, this is the main competence that we will have to have, it is the ability to read data, to read information in the correct sources and know how to make connections."

6. CONCLUSIONS

This work was based on the study of a case of the IoT solution, installed at the North entrance of the Porto City Park, capable of making real-time counts, recording and mapping these counts on an online platform. Regarding the solution addressed in this study, both experts interviewed agree that the main advantages of the solution are the data collected, and the analytics that can be extracted

from them, that is, the insights, which, when well framed in a real context, allow for gains in varied areas.

From the information obtained in the interview with the Marketing specialist of the organization responsible for this IoT solution, it was concluded that one of the main Marketing actions to be carried out in this space would be the organization of new events, and the change of existing events to this space already validated by the readings. These events would then bring great brands and consolidated companies that would certainly be interested in marking their presence in these spaces.

Regarding the skills of marketeers, both experts argue that it is important to have a good technological base to integrate this new highly technological world, but soon it is not exactly necessary to learn new techniques and acquire new skills. It is essential to have good analytical skills and know how to read data.

Answering the initial question that guides this study: How to use the large databases from the IoT system to support Marketing actions. From the analysis of the specific case discussed here, the large databases support Marketing actions in two key moments. First, these large databases obtained from this solution serve to verify and validate whether the space is of potential interest for organizations to advance with these actions.

Regarding the case studied, we can say yes, considering the 34 254 registered in 93 days, only in one entry. When the space is already validated, these large databases, after receiving some treatment, can provide insights into the best and worst periods to move forward with these Marketing actions, in this specific case and as mentioned above, the best period. It would be the afternoon period between 12 pm and 6 pm, which is the period when the greatest number of entries are registered.

With the research carried out within the scope of this study, it was found that the advantages of IoT systems are most used in areas such as logistics, manufacturing, transport, etc. This happens because in these areas the results are direct and immediate, while in Marketing, the data obtained from these systems must be treated to be considered added value. In this way, it would be interesting to direct more studies to understand how to make the most of these innovative technologies, which as mentioned by one of the interviewees, there is already a perception that they are important, it remains to show concretely how, and to present success stories. Another future line of research will be to correlate Marketing with other technologies, such as artificial intelligence or machine learning, and understand how they can be applied in the context of the IoT to create value and competitive advantages.

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