The life-history of objects: memories for a history of computer science (1968-2008)

A vida-história dos objetos: memórias para uma história da informática (1968-2008)

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Abstract: This article presents the results of a musealization project at the Computer Engineering Department of the Faculty of Engineering of the University of Porto (FEUP), which aimed to bring together the history of computing in the academic context of the city, between the 1960s and the first decade of the 21st century. This research was based on the subjective and naturally fallible memory (Pollack 1992) of the key people interviewed who, with their testimony, described the effect of technological transformations in their professional and personal experience. During the investigation we did not try to find the history of great moments and their "heroes," but rather small, fragmented, and diverse narratives of key persons. Thus, our aim was to create a narrative rich in deviations, flaws, and imperfections that distinguish Man from Machine. We accumulated stories (Kopytoff 1988) through objects that we used as memory triggers (Simon 2010) to set a social history of computing in University of Porto. Upon realizing that we were also interested in recording the "procedural memory," participants then began to enthusiastically describe striking moments, mimicking the sound of machines, and identifying friends and colleagues in documents and photographs. However, the most frequent reaction was the access to "episodic" and "historical" memory (Manier & Hirst 2010). We may say that this is a male-written story annotated by women. The immaterial heritage that this project recorded in the form of interviews, supports and attributes values to the material heritage (objects, machines, utensils, books, and documents) existing at FEUP museum, and attests to the plurality of its contexts of use and agents.

Keywords: History; Memory; Museum; Technology; Material culture.

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Introduction

This research met one of the missions of the Faculty of Engineering of the University of Porto (FEUP) museum aims to raise the awareness for the preservation of technological heritage. However, informatics is a domain

where technology is born (it is conceived) and dies (becomes obsolete) very quickly, hindering the museologist's work. In this scenario, the same object can be used for several purposes and therefore be overvalued, undervalued or totally valueless. The notion of value becomes volatile, leading museologists to question which criteria they should follow to decide what to preserve and, even more, how to proceed in doing so.

Although we identified the main computer brands that arrived in Portugal from the 1960s onwards and the dissemination of computational models in the Portuguese territory, the main objective was not to conduct a survey of characteristics and functionality of the computer equipment. Instead, we payed special attention to the social dimension of technological change, highlighting the way in which the relationship between man and technology has changed over time, and how certain people, places, moments, and discoveries have contributed to this change.

During the research process it became necessary to devise a methodology that emphasized the "sensitivity" of the collected material (Pollack 1992) and, by doing so, give a voice to a set of memories of events and objects previously dispersed throughout the academic community of FEUP with the final goal of telling a story for the creation of the FEUP Museum. We collected stories or episodes originated from moments of memory sharing that, assumed as "versions of reality" (Pink 2009), are nothing more than fragile narrative constructions subject to natural selection brought about by the passage of time (Pollack 1992).

The methodological approach of research followed Jean Davallon (1999), who considers that it is necessary that the events remembered find their liveliness and, above all, must be reconstructed from data and notions common to the different members of the social community (*apud* Morigi, Rocha & Semensatto 2012). To this end, we created a common account to all the participants in the research, in which we requested the identification of a set of variables (people, places, objects, and moments) considered as determinants for the emergence and development of computing in the academic context of the University of Porto.

Since the early studies on the social dimensions of memory (eg. Halbwachs 1990) we know that individual memory is limited in time and space and it is largely dependant on historical events and, therefore, on what Halbwachs called "collective memory." At the same time, such collective entity is itself a social construction, based on relationships, values, and experiences that people gather in their lives, which outcomes undergo transformations and reassessments. Updating Halbwachs but building on his original ideas, Manier & Hirst (2008) have argued that we can subdivide collective memory into episodic (based on events and gathering of experiences and spatio-temporal information), semantic (based on historical facts), and procedural (based on traditions, practices, and rituals of a particular community). The episodic memories last only a generation. Semantic memories can be transmitted, but they are relatively fragile, unless they are embodied in texts or cultural artifacts. Procedural memory is more accessible over a longer period of time and more easily transmitted in an intact manner throughout generations. With Aleida Assman we can say that memories are "metaphors of time and space" (2011).

In this project we were particularly attentive to the entanglements between individual and collective memory, but also to how such entanglement is mediated by the objectual surrounding. One cannot write the biography of people and the biography of objects in an isolated way, so we tried to capture both simultaneously and see how one feeds back on the other. Recognizing objects as bearers of context-dependent biographies (Gosden & Marshall 1999) and that their meaning changes through time, we adopt the concept of "life-history" of objects (Tringham 1995 *apud* Gosden & Marshall 1999) to define the relationship or social interaction between the objects and the context. Objects are triggers to memories, they can spark a conversation and have common qualities (Simon 2010). According to Nina Simon objects can be personal, as they establish a relationship with the individual and have an immediate story to tell; they can be active, directly and physically

inserting themselves into the spaces between strangers and they can serve as shared reference points for discussion. Objects can also be provocative considering that certain objects do not need to insert themselves physically into a social environment to become a topic of discussion; finally, they can be relational considering that objects explicitly invite interpersonal use (Simon 2010). Also interested in analyzing the social effect of objects, Appadurai in his edited book *The Social Life of Things: Commodities in Cultural Perspective* interprets objects as commodities, a "thoroughly socialized thing." He understands them as consumer goods, endowed with an economic value acquired by exchange. This relation between exchange and value is interpreted by the author as a political action that defines the social life of the object (Appadurai 1988). In the same publication, Kopytoff (1988) tells us that, in addition to the existence of cycles of production, exchange and consumption, objects accumulate stories that relate them to people and past events.

In the next section we will describe the methodology developed during the musealization project.

Methodology

The collection, analysis, and treatment of data were conducted in a collaborative spirit. We invited FEUP and University of Porto (UP) scholars and students to participate. This project used an open and permeable methodology, to show the diversity of realities and voices in the same context. The methods proposed in the first phase of the research were: (1) a longitudinal survey of the FEUP community (online); (2) participant observation; (3) interviews with key informants, informal conversations: (4) analysis of primary sources such as institutional records and identification of objects that were dispersed in several departments and private collections of the interviewed.

The study of the informatization of FEUP and the UP was object of a previous research, published in 2004, in a book edited by Eduardo

Beira and Manuel Heitor, entitled *Memory of Technologies and Information Systems in Portugal* (author's translation). This study – also based on the collection of oral history – resulted in an exhibition that sought to highlight the appearance and evolution of Information Technology (IT) throughout Portugal. The reading of this publication (Beira & Heitor 2004) enabled a first identification of the moments and key people located in the north of Portugal where the UP is located. The data collected by Beira & Heitor (2004) were organized chronologically – enabling a global view of the main ruptures occurred in this context at the national level since the 1960s.

The research was then divided into four main areas: (1) identification of spaces (circulation, work); (2) key people (individual or collective); (3) objects (associated with computer evolution); (4) moments (research work, education reforms). This division by categories enabled the conception of an inquiry disseminated in digital and physical format by the Department of Informatics Engineering (DEI). However, we did not obtain a significant sampling, leading us to abandon this research technique. The second moment coincided with the arrival of a Master's student in graphic design and editorial projects of the Faculty of Fine Arts of the University of Porto (FBAUP), who from that moment on took on the graphic dimension of the project.

Subsequently, the key actors were grouped according to period of professional activity, moments they witnessed, places they attended, and objects they had contact. This systematization was carried out aiming to the creation of semi-structured interview scripts, made from the biographical analysis of each participants and their respective framing in the broader action of FEUP and UP.

During this project we videotaped[1] the testimonies of 14 UP teachers and technicians. This group represented approximately 50% of the key individuals we communicated. The lack of adherence to the project can perhaps be explained by the fact that the request for

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1   Interviews available at: <https://bit.ly/35hDZ7o>.

interview was mostly sent to academic emails of this group of professionals and many of them were retired teachers. When contacted by email, each respondent was challenged to bring to the interview one or more objects from their personal archive, somehow related to the story we wanted to reconstruct. In this way, we had access to photographs, drawings, perforated tapes, comic books, research works, and even doctoral theses that belonged to the interviewees' private domain.

In the next section, we will deepen the relationship between people and technological evolution from stories recorded in interviews. All interviews occurred in the same white room and they followed a script. They describe the sociocultural and scientific context of the city of Porto, starting from small episodes, dating from the late 1960s to the early 2000s and they seek to reconstruct the arrival and proliferation of computing in the University. Note that the narratives presented here focus on a set of key moments considered relevant by the interviewees – teachers and technicians of the university – who were asked to report their experiences based on the direct contact with documents, photographs, and even drawings (FIGURE 1).

Fig. 1. Author interviewing a key-informant. Faculty of Engineering, University of Porto.
Source: Photograph by Marildo Montenegro (2017).

The following episodes are based on a set of interviews and informal conversations carried out by the author between December 2016 and November 2017. In them, the history is told by accumulation of stories (Kopytoff 1988) narrated by the several interviewees, describing the life of various spaces and objects/equipment and the moments lived in them and with them. Thus, we attempted, as far as possible, to construct a cohesive narrative presenting a possible history from facts that had hitherto been scattered and whose memories would soon be lost. This narrative tried to be faithful to the set of testimonies recorded in video and it translates the first steps taken in this knowledge domain in Porto. These episodes present and describe the first computers used in teaching and research (NCR Elliot 4100, NCR Elliott 803B, HP2114B, Microcomputer, TRS 80, Intellec MDS 80 and IBM PC, Wang VS 80, Macintosh) until the 1980s. From then onwards the attention goes to the process of institutionalization of informatics on teaching (e.g. with the creation of the Degree in Computer Engineering and Computing and the Department of Informatics Engineering), on research centers (Center of Informatics Correia de Araújo and Center of Informatics of the University of Porto) and on services (SiFEUP information system, the computer network FEUPnet and the Sigarra Information System). The comments on gender issues were all obtained in informal conversations that followed the interviews recorded on video and they have been integrated in the narrative for they are able to illustrate the gender bias and the power relations in the domain of informatics. Notably, among the 14 interviewees, only four were women.

Remembering the life-history of objects and institutions

1946: NCR Elliott 803B

Porto, located in the north of the country, is the second largest city in Portugal, but it has always been placed on the margins of political power, especially during the so-called *Estado Novo* period (1933-1974). The first contact of the students from the Faculty of Engineering

and probably of all the University of Porto with perforated tapes occurred in the country's capital, Lisbon, during study visits to the National Laboratory of Civil Engineering (LNEC) created in 1946. This institution was the first "home" of the NCR Elliott 803B computer. In LNEC, this machine was used by the researchers to estimate structures with 100 equations and 100 unknowns that would be solved in 20 minutes. Data loading was carried out in a 5-channel perforated tape. To use it, it was necessary to wrap the tape, which, after being read on the computer, remained on a pile waiting to be rewound. Sometimes, when the mistake on estimation created an unexpected hole in the tape, the problem was solved with a bit of recovered paper from the basket of already cut papers. The result was awaited, seating and listening the descending sound of the machine: "3, 2, 1...." With the calculation in hand, the ritual "raise – roll the tape – sit – wait – lift," which today is reduced to static seconds in front of a screen, finally ended.

1968: NCR Elliot 4100

The NCR Elliot 4100 was the first computer bought by the University of Porto. It arrived at the Faculty of Science in 1968, in boxes filled with puzzle-like pieces and did not bring almost any software. The computer occupied a room and arrived at the Faculty by the Professor and Mathematician Rogério Nunes. Elliot 4100 was bought by the Faculty of Sciences to be installed in the Laboratory of Automatic Calculation (LACA), organism created to receive the computer that, then, started to be used by the whole University. The gender division – that characterized the use of this machine – was visible and demarcated by a glass present in the center of the room: at one side, by the machine was a woman, at the other, a man. To program the machine, the man typed in the teletype, punching the pink tape then handed to the woman who inserted it into the machine, slowly reading it. These operations took days and, in case of a mistake, the whole process had to be repeated. Upon arrival,

Elliot 4100 was of free access. Later, its use became restricted to two scheduled-shifts. The computer was used in automatic estimation by students and teachers and by hydroelectric companies that were used to use computers to solve civil engineering problems (especially for estimating dams). The arrival of the 4100 represented a very large qualitative leap: "1,000 equations took five minutes to calculate!" In 1974, a fire broke out in the University of Porto's rectory building. LACA and the computer (which survived the fire) were moved to Rua das Taipas where the computer remained until 1982 (FIGURE 2).

Fig. 2. Perforated tapes used on the NCR Elliott 4100 computer, Porto, Laboratory of Automatic Calculation (LACA-FCUP), c. 1968.
Source: Personal archive of Francisco Calheiros.

1970: NCR Elliott 803B

In 1970, the computer Elliott 803 B arrived at the calculation center of the Department of Civil Engineering at the Faculty of Engineering of Porto and stayed there for six years. It came from Lisbon donated by the LNEC, which replaced it with a newer model (the Elliot 4100), the same machine that was bought at the same time to equip the Calouste Gulbenkian Foundation. "This computer was in the fashion...!" The arrival of the 803B at FEUP was arranged between Professor Correia de Araújo and Professor Ferry Borges and it only involved

the costs of transportation, assembly of air conditioning and wooden floors, and a payment to the National Cash Register (NCR) company for maintenance (equivalent to 600€ per year). The installation of the computer lasted about three to four months. The computer had a control console and a set of peripherals. This civil engineering lab had a thermographer where the "operator" – a woman employee responsible for the daily maintenance of the computer – controlled the temperature and humidity of the room every morning to avoid malfunctions. Elliott 803B was programmed to detect errors through musical notes and even played the national anthem! Later on, Banco Pinto Magalhães in Porto dispensed one computer of the same model with a unit of magnetic film that allowed the estimation of a greater volume of data. This magnetic film unit ended up installed at FEUP. "The tape had exactly the perforations of a 45-millimeter movie film...."

1970: HP2114B

Also, in 1970, the computer HP2114B was purchased, specifically for the Calculation Center of FEUP by Professor Correia de Araújo. Although it was smaller, this computer was much more advanced than the previous ones. As happened with Elliott 4100 at the Faculty of Sciences, the HP2114B was available to the entire Faculty of Engineering. It was used by all fields of engineering for work and recreation. Known as "minicomputer" or "the box" this was an impressive machine. It had a panel with switches and lights and, because it had no memory, all data disappeared when the electric current was turned off. This meant that every morning it was necessary to restart the entire process: the computer had to be opened and the cable connected to the other components – the IBM typewriter, the teletype, and other peripherals. It was an equipment

in constant mutation, result of the different investigations in which it became involved.

1970: Calculation Center

The Calculation Center was created in 1970 in the Department of Civil Engineering of FEUP to host the computer NCR Elliott 803 B. At that time, the calculation center was an informal structure, not institutionalized. It was caged to a room with some resources, being the air conditioning the essential, because it guaranteed the "survival" of the computers. The great explorer was the engineer Pedro Regueiras who, having not followed a teaching career, created what was known between the students as an "informal school for the self-taught exploration of the computer world." The center was headed by Professor Velez Grilo, who was also chosen informally, and a woman programmer, Dona Clotilde, who did a little of everything: operated the machines, managed the center, acquired materials... The center worked on Saturdays and Sundays and often at night, when the rolls of perforated tape were changed to avoid stopping the computer and restarting all work the next day. In order to use the computer, the students presented a scheme, which they filled in sheets with the coordinates "x, y and z" then given to Dona Clotilde (the operator) to be inserted in the machine. In the center, there was a large room with two computers (the Elliot 803 and the HP2114B), two or three cabinets, and a cabinet for the director. The center also had a meeting room, used for classes and small courses, and a room with computer terminals that students and teachers could use. The center was a space of experiences, where it was possible to open the computers and study their interior...! As time went on, small calculation centers were created in the different departments of the faculty to meet their specific needs. In 1979, the calculation center was named after Professor Correia de Araújo (FIGURE 3).

Fig. 3. Computers Room. Porto: FEUP Calculation Center, c. 1970.
Source: Clotilde Leite's personal archive.

1976-1977: Microcomputer

Six years after the acquisition of NCR Elliott 803 B, the first computer with a didactic purpose was created at FEUP. The microcomputer was originated in an academic project under the discipline Digital Systems and Computers of the Bachelor degree of Electrical Engineering in 1976-1977. It was carried out jointly by three professors (Fernando Nunes Ferreira, António Porto, and Armando Matos), a technician (engineer Pedro Regueiras) and a group of enthusiastic students who build it from scratch; the result was possible because of the revolution introduced by the miniaturization of computer pieces and the emergence of integrated circuits. The microcomputer was used in classes and allowed students to understand the internal functioning of a computer. The Intel 8080 microprocessor advent facilitated the microcomputer development and it was inspired by the HP2114B – allowing the introduction of programs executed "instruction by instruction" and "from instruction phase to instruction phase".

1978: TRS 80

Two years later, in 1978, Professor Carlos Madureira, a mining Engineer, purchased a TRS 80 computer for the FEUP calculation center by the American distributor RadioShack. Shortly afterwards, in a publicity booklet, he discovered a peripheral – a voice synthesizer – that, based on the reading of an English text, projected a voice into four or five different pronunciations (e.g., American, British). The synthesizer arrived at FEUP in the late afternoon and it was stored in the back of the calculation classroom.
The technician of the center – engineer Pedro Regueiras – took the instructions home that night to study the operation of the device. The next day, a professor appeared in the calculation center, furious. The TRS had interrupted his class with

a protest in Portuguese language: I'm tired of this class… What a bummer of class! This caught the professor and the students off guard, as it was thought that the computer could only "speak" in English. The machine had been programmed during the night to speak at that moment. The class stopped and the students looked at each other. The teachers and technicians were questioned but all of them denied the authorship of such programming exercise.

1979-1980: Intellec MDS 80 and IBM PC

One year later, during the academic year 1979-1980, the Intellec MDS 80 was used by the first group of students that attended the discipline of "Digital Systems" offered by the Department of Electrical Engineering of FEUP. At that time, some programming exercises were already carried out in the computer, but most were still done on paper. This machine, used in the final project of this group of 16 students (the first group that included women), was installed in a room of the calculation center to which only they had access. It was a small computer, but still, it was very significant for the first generation of students who already had a "formal" training in computer science. From this group a nucleus was born, which later gave rise to the Informatics Section, and later to the Informatics Department. This period was also marked by the arrival in Portugal, in 1980, of the first personal desktop computer IBM PC. This computer allowed the execution of computer tasks at home. Thus, computing had exceeded the frontier of collective experience – exclusively occurring in the public-shared space – into the individual space of private sphere.

1980-1993: Wang VS 80

Between 1980 and 1993, the Faculty of Engineering had two examples of the Wang VS 80 computer, one in the Chemical Engineering Department and the other in the calculation center. It was a small machine with an associated printer. *Tatatatatan*, could be

heard, when the computer determined the axes and marked the graphs. It was still very much a "handmade" computer but the only one that, in the Department of Chemical Engineering, was intended for research. It had 8kb of memory capacity (in catalog), which engineer Regueiras managed to duplicate with a semiconductor device. Innovative for that time, this system already allowed several simultaneous users unlike, for example, the HP2114B.

1982-1983: CIUP and CDC Cyber 170-720

In 1982-1983, with the discharge of the Elliott 4100, LACA was rehoused in Rua das Taipas, and renamed Center of Informatics of the University of Porto (CIUP). This resulted in the reequipment of the LACA with a CDC Cyber 170-720, owned by the University of Porto. The reasons behind the purchase of this new equipment are unclear: on the one hand, it may have been inspired by the existing machines (Cybers) at the calculation center of the United Kingdom (Manchester) where many Portuguese researchers had studied; on the other hand, the existence of a Control Data Corporation (CDC) facility in Portugal that at that moment started to sell Cyber computers might also have contributed to the choice. It was at the CIUP, namely by Cyber, that the University of Porto was connected to the network of National Scientific Calculation. Cyber already had "15 or 20 terminals" available to teachers and students. The University created "computer-assisted teaching" courses in order to learn how to use the computer, since the few programs that existed were not for generic teaching but for the execution of specific tasks.

1985: Macintosh

The 1980s were also marked by the arrival of the first Macintosh in FEUP, purchased for the Institute of Computer and Systems Engineering (INESC), created in 1980. It was with Macintosh, a computer just released in the USA, that many FEUP students had their first computer experience in 1985.

1990: FEUPnet

FEUP created its first network (FEUPnet) that connected the six small computer centers existing at the Faculty of Engineering (one in each department). Created with indoor fiber optics applied in the exterior, the network was installed with the help of city firefighter and allowed to interconnect the various buildings of the Faculty and facilitate the access to electronic mail, nonexistent until then. The network had a star topology: there was a yellow network cable in the central building that was distributed to the remaining buildings. The few servers that existed in the departments provided resources to the whole Faculty. The first servers that provided communications in the faculty belonged to the Department of Electrical Engineering and they were named after comic-books characters (Mickey, Lucky Luke, Snoopy). Later on, the first faculty server was called Garfield (a name also inspired by comic-books), which was later followed by another named Obelix, a medium-large vector computer that also provided services to the departments of electrotechnology, chemistry, and mechanics. In chemical engineering, the servers were named after chemical elements such as Helium.

1990: CICA

The Informatics Center Correia de Araújo (CICA) was created at FEUP in 1990 as an "act of revival" of the Correia de Araújo Calculation Center. Progressively, the computer services were gathered at CICA and the other departmental computing centers start losing the significance they used to have. CICA had an Information Systems Unit, a User Support Unit and a Computer Network Support Office. In the early days, CICA had very few machines connected to the network. There were essentially terminals (just over 30 at the beginning) that were connected to terminal servers, which were then connected to the network. When CICA was institutionalized it started to fulfill all the computer needs of the Faculty. The first internet connection

was established in December 1991 through a line linking FEUP to the University of Porto Informatics Center. The first web page was created three years later, in 1995.

1994: LEIC

The first step towards the independence of informatics in FEUP occurred with the reform in the Degree in Electrotechnical Engineering that, in 1987, became Degree in Electrotechnical Engineering and Computers. This reform opened the way to computation in the Faculty. Despite this, the importance attributed to the field of Informatics in FEUP was still small and only explored in the discipline of Digital Systems and Computers in which both software and hardware were studied. At that time, computing was always associated with electrotechnical engineering. This solution did not facilitate the specialization that was becoming unavoidable, at a time when computing grew substantially worldwide. Finally, in 1994, the Degree in Informatics and Computing Engineering was created independent from any department, but no branches of specialization were created yet. The first "broadband" course of FEUP was born.

1996: SiFEUP

Two years later, the Department of Electrical Engineering created the System of Information SiFEUP to interconnect the several departments and services of FEUP. This information system – extremely innovative at the time – was designed directly for the web with no other way to access it. The system was first created by a group composed of one teacher and two students, within the framework of an academic project, and later developed with a professional structure provided by CICA. SiFEUP was created as a platform for consultation, registration, and promotion of interaction between users. This was an area little explored, even internationally, until then. Progressively, this information system

was integrated and adapted to the needs of all faculties of the University of Porto.

2000: Asprela Polo

During the construction of the new Faculty of Engineering in 2000, the main concern was centered on the installation of the computer network in the Asprela center. 6,000 network points were created throughout the faculty. The major challenge of this process was to move the entire academic community from the old facilities to the new ones, interrupting the service for less than 24 hours. Everything was packaged and identified by labels that indicated building, floor, room, and the person responsible for packing and transporting the materials and the move happened with success.

2003: Sigarra

The SIGARRA – and acronym for *Sistema de Informação para a Gestão Agregada dos Recursos e dos Registos Académicos* (Information System for Aggregate Management of Academic Resources and Registers) – was created in 2003 and consisted of an adaptation of the SiFEUP information system. It was created by FEUP in response to the needs of the different faculties of the entire University. However, this new and extensive system has maintained the structure of SiFEUP: a component of academic management, a component of human resources management and a web layer of user interaction. The name SIGARRA (an acronym but also a word meaning "cicada" in Portuguese) was conceived during the holidays by Professor José Marques dos Santos, involved in the project.

2008: DEI

Finally, the last step for the "consecration" of computation technology in FEUP and the UP in the early 2000s was the creation of the Informatics Engineering Department in 2008. One year earlier, the Integrated Master in Computer Engineering and Computing (MIEIC) was created, and this Faculty became the single one in Portugal with a Master's degree in computer science. This measure made it inevitable to create a department to boost an area that until then was alive, but always in association with the Department of Electrical Engineering. The department quickly evolved and served as a springboard for the creation of other courses (a M.Sc. in Multimedia, a M.Sc. in Information Management, a Bachelor in Information Sciences), all of which are nowadays courses of great affluence in the University of Porto.

Memory and object: metaphor of time and space

This research was based on the subjective and naturally fallible memory (Pollack 1992) of the key people interviewed who, with their testimony, described the effect of technological transformations on their professional and personal experience. The significance of the objects in the researchers' lives has thus determined the scale of the stories about the computers that compose the University of Porto computing scene. As we have previously mentioned, we had access to "versions of reality" (Pink 2009), which illustrate the paradigm shift in this field of knowledge between the second half of the 20th century and the first decade of the 21st century.

During the investigation we did not try to find the history of the great moments and their "heroes," but rather the small, fragmented, and diverse narratives of key persons. Nonetheless, we may say that this is a male-written story annotated by women (not very present in this context until today), a fact that may have determined the result. When confronted with issues related to the female sex, most male interviewee answered in a seemingly neutral way, not acknowledging the power relations implicit in their statements. However, gender relations had never been neutral in this environment. For many years, women only assisted the investigations conducted by men. Men developed the

intellectual work, while women controlled the mechanical work (FIGURE 4). Even in clothing, the difference was notorious: men wore pants and women wore skirts (preferably above the knees...). In this sense, it may be also relevant to reflect on the materials used and produced by the first computers. The perforated tapes used in the operations of the NCR Elliot 4100, for example, were strong

pink and the only collection of perforated tapes that we had access, was made available/known to us by one male interviewee who emphasized that they had been stored in an old card box for bra cup B. During leisure time the machine could also be programmed to "draw" the female body, delighting the groups of young men who gathered around it to admire the results (FIGURE 5).

Fig. 4. *As aventuras de Anselmo Curioso: a magia da informática*, by Jean-Pierre Petit, Lisbon: Don Quixote, 1982.
Source: Francisco Calheiros personal archive.
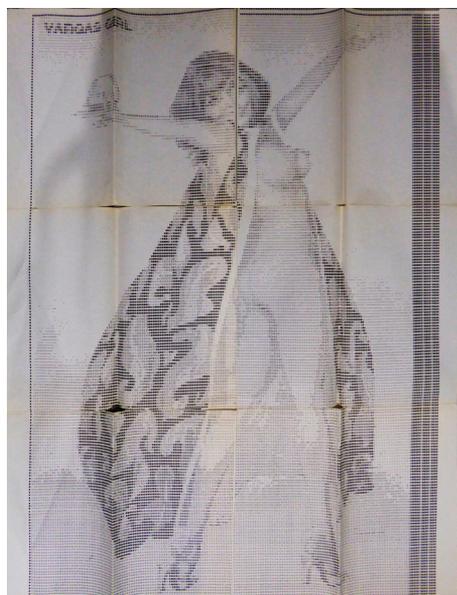
Fig. 5. Vargas Girl. Porto: Automatic Calculation Laboratory (LACA-FCUP), c. 1980.
Source: Francisco Calheiros personal archive.

The relation of proximity (and successive separation) between the work of Man and Machine can also be explored with the description of computers and infrastructures. If, in the past, the computation was done locally and required the collaboration of several individuals working together to operate the machine and to achieve a result, today this collective and physical relationship with computer has disappeared, being replaced by the virtual and individual research spread easily worldwide.

The use of this methodology confused the interviewed (none of them familiar with social sciences research techniques and analysis). They entered the room expectantly and prepared

to tell us that the "x" machine had served the investigation "y" and processed the data at speed "z," considering that they are acquainted to the description of knowledge in a more instrumental way. Realizing that we were also interested in capturing the "procedural memory" (Manier & Hirst 2010), the participants started to enthusiastically describe striking moments, mimicking the sound of machines, and identifying friends and colleagues in documents and photographs. However, the most frequent reaction was the access to episodic and sometimes even historical memory of the great achievements and milestones (Manier & Hirst 2010). Thus, our aim was to create a narrative rich in deviations, flaws,

and imperfections that distinguish Man from Machine. We accumulated stories (Kopytoff 1988) by objects that we used as memory triggers (Simon 2010) to set a social history of computing in Porto. The immaterial heritage that this project recorded in the form of interviews supports and attributes values to the material heritage (objects, machines, utensils, books, and documents) existing at FEUP museum, and it attests to the plurality of its contexts of use and agents.

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Resumo: Este artigo apresenta os resultados de um projeto de musealização no Departamento de Engenharia da Computação da Faculdade de Engenharia da Universidade do Porto (FEUP), que teve como objetivo reunir a história da computação no contexto acadêmico da cidade do Porto, entre os anos 1960 e a primeira década do século XXI. Esta pesquisa partiu da memória subjetiva, e naturalmente falível, (Pollack 1992) das pessoas-chave entrevistadas que, através de seu testemunho, descreveram o impacto das transformações tecnológicas na sua experiência profissional e pessoal. Durante a investigação, não tentamos encontrar a história dos grandes momentos e seus "heróis", mas as pequenas narrativas, fragmentadas e diversas desses indivíduos. O objetivo foi criar uma narrativa rica nos desvios, falhas e imperfeições que distinguem o homem da máquina. Acumulamos histórias (Kopytoff 1988) através de objetos que usamos como gatilhos de memória (Simon 2010) para estabelecer uma história social da computação no Porto. Ao perceber que também estávamos interessados em capturar a "memória processual", os participantes começaram a descrever com entusiasmo momentos marcantes, imitando o som de máquinas e identificando amigos e colegas em documentos e fotografias. No entanto, o mais recorrente foi aceder à memória "episódica" e "histórica" (Manier & Hirst 2010). Podemos dizer que esta é uma estória escrita por homens e anotada por mulheres. O património imaterial que este projeto registou na forma de entrevistas apoia e atribui valor ao património material (objetos, máquinas, utensílios, livros e documentos) existentes no museu da FEUP e atesta a pluralidade dos seus contextos de uso e agentes.

Palavras-chave: História; Memória; Museu; Tecnologia; Cultura material.

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