BRAZILIAN COMPUTERS? DEFINITELY, A STRANGE IDEA!

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Abstract

The Brazilian trajectory in the development of information technology shows an abundance of examples of creativity, innovation, success and development. Many of these examples are not published, and can only be known through informal reports. In this paper we report some efforts towards the dissemination of the Brazilian history of computers development.

Introduction

When it comes to computers, internet and technology, Brazilian minds immediately turn to large international companies responsible for designing the technological products that we, Brazilians, excitedly, desire, consume, distribute, and as a result, strengthen. However, the history of the development of information technology in Brazil shows an abundance of examples of a different picture: "We wanted to do something else! It was the state of the art in microcomputers, and none of us realized it!"[1], excitedly reported the manager of a national company that dominated the microcomputer technology in 1970. He was referring to the achievements at a time when local demands guided the development of a domestic industry. At this time this industry was still preserved of the foreign model of consumption and development: "See, our dominators are teaching us how we develop! Will we only be advanced when we are equal to them?" complained indignantly, a great entrepreneur about to receive the award "Engineer of the Year" in

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[1] In the original text in Portuguese: "Queríamos fazer algo mais!", diz Sergio Machado Bordini, gerente de Desenvolvimento da Edisa, numa frase que bem exprime a mentalidade dominante entre os projetistas no fim da década 70. Mas a falta de uma referência internacional numa época em que os nossos projetistas mediam seus passos pelas fronteiras tecnológicas estabelecidas lá fora, impediu-os de perceber o quanto avançaram: "Era o estado-da-arte em microcomputadores! E nós nem nos demos conta. E nem a empresa." (Dantas, M.,1985,p25)

1980. Paradoxically, this story of excitement and achievement remains unknown to the general Brazilian public, for whom "Brazilian computers" is something decidedly odd[2]. Nowadays, many of the actors that participated in the history of construction of Brazilian computers technology reside in Rio de Janeiro. The Federal University of Rio de Janeiro (UFRJ) was one of the cradles of the development of information technology in Brazil. We can still find there several pieces of equipment developed in the seventies and meet some of these actors.

During the year of 2013 the Graduate Program of History of Science and Techniques and Epistemology (HCTE) of the Federal University of Rio de Janeiro (UFRJ) promoted a set of events[3] that gathered people concerned about the lack of awareness of the history of computers development in Brazil. As a result, the annual conference Scientiarum Historia (http://www.scientiarumhistoria.ufrj.br/) offered a two afternoons workshop section devoted to this. One of the issues commented was the damage in not learning from previous experience, as many current situations concerning Brazilian development efforts bring similarities with the conjuncture of the seventies. The interest in the history of Brazilian computers and the endeavor of learning with the history of sciences and technologies as well as local experience gave rise to a project of construction of a Museum of Computing, in cooperation with the Institute Tércio Pacitti, of UFRJ. This institute was, since the sixties, one of the units responsible for research and development in computing, a place that housed several Brazilian initiatives towards the construction of an autonomous technological development.

People, narratives and artifacts

A major television network in Brazil showed in 2003 a report where Waldir, a Computer Science student in UFRJ, faces a *Smart Terminal* (http://youtu.be/PMSLnNyMDlQ). This was the first 8 bits microcomputer completely developed in Brazil, in the seventies. It is an

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[2] 'The idea of Brazilians manufacturing computers sounded decidedly strange' reports Dantas (1985,p20), talking about the disbelieve of the bankers regarding the possibility of forming a national computer industry in the 70s.

[3] These events included master and doctoral degrees about the development of Brazilian technology in computers. We present the references for these events at the end of this paper.

artifact equipped with keyboard, video terminal, card reader, floppy drive and tape, currently on display at the Institute Tércio Pacitti.

 "I don't know how it works" said the student Waldir, while pressing the old-fashioned buttons and trying to discover how to start. "What is it for? You don't know even what it is for?" insisted the interviewer. Distressed and nervous, Waldir answered: "I don't know…. it is a smart terminal…it should teach me how to use. I feel lost!"

Waldir directed his approach to a single piece of technological device. For this, all his knowledge as a last year student of one of the most respected Brazilian graduation courses in Computer Science, seemed insufficient. Political decisions, cultural identities, economic reasons, among many other factors usually considered "non-technical" remained aside in this rapid incursion into the Brazilian technology of the seventies. A technical report or a user manual could have helped to advance some steps. Nevertheless, it seems that he could not have gone too further in a broad understanding of that technology without the consideration of situated constraints. This means taking into account the local conjuncture that translated ways of life into technological needs, thus, inevitably collaborated in shaping the device. In opposition, taking into account solely the so-called "technical aspects" tends to reinforce a supposed universality of the hegemonic culture. This means abdicating the possibilities of constructions of local solutions to local problems to follow steps of the hegemonic culture. Under the domain of the naturalized technology, any attempt of local development sounds *definitely as a strange idea*.

A way to reverse this path is to show the construction process of technology, even those naturalized, assumed as universal. Along the construction steps, one can follow personal choices, political commitments, commercial advantages, pressures and alignments. The construction of technology, under a historical viewpoint, shows the local problems addressed by it. These problems that are certainly different from the local problems that originated the "universally accepted" and commercially imposed technology, demand for situated solutions.

In order to emphasize the historical (situated) character of technological devices we propose a museum where life histories are as important as material devices. We gather spoken or written stories of life that shows commitments, tendencies, experienced episodes that help to give a broad understanding of the Brazilian Technology.

As examples, we present in the following two of these stories.

The (now) weird experience of the *keyboard concentrator*

(by Benedito Ferreira de Oliveira)

For a present day observer, the narrative about a new development of the public Brazilian company SERPRO[4] in the early seventies would certainly seem something weird. The student Waldir would not understand (or would not accept) that a public data-processing company, with a problem concerning its own mission, tried to solve this problem by itself, qualifying its own human resources, developing its own software and, amazingly, manufacturing its own equipment.

The current economic logic and rationality often requires that public companies solve their challenges by acquiring the solution from the private sector. Such purchases are usually made without any concern to the public appropriation of technological development and even less to the nationality of the private company contracted. There is also a tacit and widely accepted principle: "if it is possible to import something, why should one develop it?" But it has not always been like this in Brazil.

In the early 1970s, SERPRO faced a major challenge. Due to changes in tax legislation, the number of people that should declare income tax increased manifold and this created a huge demand for transcripts far beyond of what the company was able to meet. Worsening this scene, IBM was going to stop the production of the card punches used by SERPRO. It resulted from this scene the combination of two problems: obsolescence of the installed park and technological dependence.

The IBGE[5] also faced a similar problem with the 1970 census. Much of the delay in processing the census resulted from the difficulty of transcription of many thousands of collected forms. The administration of IBGE had decided that the results of that census should not take as long to be produced, as occurred in previous censuses.

Thus, both SERPRO and IBGE started to seek for solutions that did not use punched cards, and also that were able to do some critical analysis of data and to record directly on

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magnetic media, tape or hard drive. IBGE undertook a major effort, and by itself, successfully delivered the first results of the 1970 Census in six months, an amazing feat in the face of prevailing expectation that it could take up to ten years. SERPRO, in turn, masterfully solve the problem with the *Keyboard Concentrator*, a new technology of which new versions and further improvements would be adopted across the government, including by IBGE.

SERPRO's solution used a Hewlett-Packard minicomputer to process data from 32 keyboards via an interface (hence the name *Keyboard Concentrator*). The minicomputer HP *Keyboard Concentrator* entered into production in 1972. This initial solution quickly evolved into more sophisticated versions whose technical details will not be detailed here. What is important to note is that SERPRO not only designed and developed the *Keyboard Concentrator* but also advanced to a manufacturing step. Several copies of the first prototype and further versions were distributed to all operating units of the company spread throughout Brazil.

In 1974 SERPRO created in Rio de Janeiro the DFA (Divisão de Fabricação) a division of manufacturing which went on to produce equipment not only for internal use but also for use by several other government agencies. With *Keyboard Concentrator* SERPRO became the largest transcription park of Latin America, resulting a huge leap in quality and productivity in their input data systems that did not use cards punching anymore.

The DFA was a milestone in the history of SERPRO. It was originated from the GPE (Special Project Group) who had developed the first version of *Keyboard Concentrator*. At that time courses in Computing, including Masters and Doctorate, had just started to form specialized personnel, thus companies had to train their own teams taking advantage from the excellent training of staff of the most diverse areas. So was with the DFA, where it was possible to find a physicist or engineer from PUC-RJ[6] or ITA[7] developing a new OS or handling boards and integrated circuits in search of a feature or a hitherto unpublished equipment. The ability, creativity and technical boldness, made the technical staff of the DFA a true dream team that any technology company always wanted to have. After the *Keyboard Concentrator* DFA continued to develop other products such as modem, keyboard and serial interfaces for printers and data terminals. New versions of

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[6] PUC-RJ is a Brazilian catholic University located in Rio de Janeiro city.

[7] ITA is a technological and teaching institute of Brazilian Air Force.

the *Keyboard Concentrator* were developed making it more advanced, flexible and open, and freeing it from its original ties to handle Income Tax and other SERPRO's systems. The *Keyboard Concentrator* had become a potential computer system for general use with a highly promising market. But SERPRO was prevented by law from being an equipment manufacturer.

In 1974 COBRA – Computadores e Sistemas Brasileiros S/A was founded, a company that inherited the experience, the majority of products and the best part of the DFA SERPRO team. This transfer of technology from DFA to COBRA (which also happened in other enterprises) was formally implemented in 1977 and COBRA started to be the company that actually developed a national technology, and became a key element in an attempt to create a Brazilian computer industry. The remaining of DFA was directed to take care of the maintenance of the equipment park used in data entry of SERPRO's systems and survived until 1979 when it was formally abolished.

The aim here is to highlight how the development of a project (such as *Keyboard Concentrator*) performed by a technical center of excellence (such as DFA) housed in a public company (such as SERPRO) was able to trigger during the 1970s one remarkable and virtuous cycle of technological achievements that have profoundly marked the Brazilian experience to build a scientific, technological and industrial autonomy that came sadly to end in the early 1990s. The question that remains for a general consideration is whether the currently prevailing economic and technological rationality in Brazil would allow the repetition of such an experience.

From the dream of a computer industry to a very specialized education

(By Miguel Jonathan)

When the first attempts were taken by Brazilian researchers, in the early 70's, to design and build prototypes of digital equipment, there were only a few universities which offered undergraduate education related to computers, mostly on electronic engineering and some on business data processing and programming. What had triggered the research effort was not only academic interest, but a growing feeling among researchers that computers were becoming a key factor for economic development, and that only those

countries that managed to dominate this technology would be truly independent in the future.

The military regime that ruled the country since 1964 privileged modernization and technological development. New graduate programs in science and technology were created, and an intensive program of scholarships allowed young engineers to obtain their Ph.D.'s abroad, many in Computing. These young researchers, upon their return to Brazil, helped organize the Computer Science and Computer Engineering departments inside the main Brazilian universities and started research projects. It was not long before they began to meet regularly in national conferences and workshops to discuss not only technology but also the need for a strong science and technology policy to develop computing in Brazil. Government officials were invited and participated in the discussions and researchers joined government agencies responsible for regulations in the computer field. By the mid 70's they were successful in obtaining government support for the development of a local computer industry, under national control, which included a complete a ban on imports of mini computers - only those manufactured in Brazil by companies controlled by Brazilian nationals would be allowed to be marketed in the country.

These measures spurred the creation of a large number of computer companies - some had their own design, as was the case of COBRA, a state owned company, some were joint-ventures with foreign ones, while others were spin-offs of university departments to produce the results of their research and development projects. There were companies for software production, maintenance and support, and also to manufacture peripheral equipment, such as terminals and keyboards. Banks started their own companies to design and implement Automated Teller Machines (ATM's) and other banking applications, with enormous success.

By the end of the 70's computer education had already been affected by these developments. The main universities were investing heavily in R&D in computing, there was an expanding industry eager to absorb computer engineers, and students were applying in increasing numbers for computer degrees. The focus of their computer courses reflected this trend - the emphasis was in computer science and technology, not in the end user of this technology. Computer curricula were designed by computer

department's faculty and consisted almost 100% of maths, physics and computer subjects. No room for humanities, no need for the students to learn about "people" or "society", be it law, history, sociology, economics, culture or politics, even less to develop critical thinking, or discuss the connections between technology and these other areas.

The foundation of the Brazilian Computing Society (SBC) in 1978 was a turning point in the process of engaging the computing academic community in broader political action. Besides actively supporting the new regulations for the computer industry, SBC directed its attention to the proliferation of new computer courses, many of them offered by small ill-equipped universities, with inexperienced faculty. The challenge now was how to guarantee a minimum of (technical) quality to the growing number of undergraduate courses spread all over the country. SBC released its first "Reference Computer Curriculum" in 1991 as a guide for the smaller universities, which reflected the specialized background of its members and their little concern for the humanities and social sciences.

The Brazilian university system is regulated by the Ministry of Education. By 1994, after the restoration of democracy, the Ministry established a specific normative commission for each area of knowledge, known as Teaching Specialist Commissions, composed by appointed university researchers, to help design what was called "Quality Patterns", a set of regulations including curriculum composition, material support and faculty profiles that every course should comply in order to get the Ministry's license to operate.

SBC soon realized that to be truly influential required it to control the Teaching Specialist Commission on Computing and Informatics, which had become an "obligatory passage point", in the sense given by Michel Callon (1986), for all universities willing to introduce courses in computing. SBC has been very successful in achieving this goal, and for the past 20 years its members have consistently influenced all regulations that concern the education on computing in Brazilian universities.

These developments have led specialized departments to design course curricula based on regulations issued by specialized committees. The net result is a narrow and specialized education, which may not be effective enough in communicating to our students the knowledge and skills necessary to address the challenges of the widespread use of computer technology within our society.

In the route of researches… a museum!

Next we present references to some of the works produced in HCTE/UFRJ, related to the History of Computation in Brasil. The events such as defenses of theses, and workshops, triggered the way to the construction of a museum of computation. At the present moment, a group of HCTE, in partnership with the Institute Tércio Pacitti, is working in a project to design the installations of the museum.

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