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New Medical Technology and Greek Society:
A History of Issues in the Scientific, Technical and Daily Press

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Abstract

This thesis presents my study of aspects of the history of the introduction of selected new medical technologies in the Greek healthcare system and the Greek society in general. I focus, first, on the diffusion of medical imaging technologies, second, on experiments with telemedicine in Greece, and, third, on the introduction of computing in Greek medical/hospital practice and elsewhere (organization of dental clinics, private practice professionals' offices and pharmacies). The emphasis of the thesis is placed on dimensions of the public discussion of these technologies during their introduction in Greece. For primary sources, I use articles that I found in the Greek scientific periodicals *Health Review* (*Επιθεώρηση Υγείας*) and *Mastologia (Μαστολογία)*, in the technical journal *Computer for All* (*Computer για Όλους*), and in two daily newspapers, *Eleftherotypia* (*Ελευθεροτυπία*) and *Kathimerini* (*Καθημερινή*). For my secondary literature, I mainly use articles from STS journals like *Science, Technology and Human Values, Social Studies of Science,* and *Science as Culture* and from STS journals specializing in medical issues, like *Social History of Medicine* and *Medical Anthropology Quarterly*.

Keywords: medical technologies, medical imaging technologies, medical computing, telemedicine, Greek society

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Acronyms

CT	Computed Tomography
MRI	Magnetic Resonance Imaging
PET	Positron Emission Tomography
ESY	Greek National Healthcare System (Εθνικό Σύστημα Υγείας, ΕΣΥ)
IKA	Social Insurance Institute (Ίδρυμα Κοινωνικών Ασφαλίσεων, ΙΚΑ)
OGA	Agricultural Insurance Association (Οργανισμός Γεωργικών Ασφαλίσεων, ΟΓΑ)
OPAD	Civil Servants' Sickness Insurance Funds (Οργανισμός Περίθαλψης Ασφαλισμένων Δημοσίου, ΟΠΑΔ)
EKAV	National Instant Aid Center (Εθνικό Κέντρο Άμεσης Βοήθειας, ΕΚΑΒ)
OECD	Organization for Economic Cooperation and Development

Chapter 1

Introduction

1.1 Introduction

Medical technologies hold a special place in our life. From a mere visit to a private physician to a hospitalization due to a serious accident, medicine is now synonymous to the use of technology. Alex Faulkner (2009, 13) put it nicely by writing that "contemporary healthcare is healthcare technology".

The massive introduction of technology in medicine did not start in the 20th century. It dates back to the 19th century and is closely connected to a new approach regarding diagnosis (Reiser 1977). This is actually when the term "medical technology" emerged (Reiser 1977; Inlander et al. 1988). The term medical technology refers here to every technology that was developed in the field of health (Παλληκαράκης 1989). More specifically, I rely on a definition of medical technologies as something that includes, "various devices, instruments and therapies used for diagnostic, therapeutic, rehabilitative, preventive or experimental purposes, as well as the practices and procedures associated with them" (Hogle 2007, 841).

During the 20th century, the development of data processing and other computers and their introduction to medicine brought about a major change in medical technology. Lawrence Foss and Kenneth Rothenberg (1987) refer to the introduction of informatics into medicine as a second revolution in the history of medicine, during which there was a shift from biomedicine to infomedicine (Foss and

Rothenberg 1987). In almost every branch of medicine, the use of computers is by now considered essential. In the diagnosis and therapy of a disease, as well as in the administrative department of hospitals, their usage is perceived as invaluable.

From the available literature we know that state-of-the-art medical technology has been very important historically. The most studied, probably, case is that of x-rays. X-rays had an unprecedented characteristic, which attracted broad societal interest, namely the ability to see the interior of the human body. X-rays were discovered during the period marked by the concern that technology in general may was responsible for unemployment (Kevles 1997). Yet, the development of x-rays was not impeded by this concern. This technology quickly spread all over the world. Historians and sociologists of medical technology have placed the emphasis on the localization processes that take place during the adaptation-appropriation of technology in concrete use.[1]

The relationship between medical technology and society - like the relationship between any technology and society- is crucially shaped by institutions that shape the public image of technology, most notably by the various media that intervene between scientific, technological and medical communities and society.[2] Newspapers and other media play an important role in the formation of the public's view regarding changes in science and technology. As Media Studies and STS scholars

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1 For more aspects on the localization process during the adaptation-appropriation of medical technology by historians and sociologists of medical technology, see: De la Pena, C. Th. (2006). 'Bleaching the Ethiopian': Desegregating race and technology through early x-ray experiments. *Technology and Culture*, 47(1), 27-55; Dommann, M. (2006). From danger to risk: The perception and regulation of x-rays in Switzerland, 1896-1970. In Th. Schlich and Ul. Tröhler (eds.) *The risks of medical innovation: Risk perception and assessment in historical context* (pp. 93-115). London and New York: Routledge; Golan, T. (2004). The emergence of the silent witness: The legal and medical reception of x-rays in the USA. *Social Studies of Science*, 34(4): 469-499; Stein, J. et al. (1991). The influence of ethnicity socioeconomic status, and psychological barriers on use of mammography. *Journal of Health and Social Behavior*, 32(2), 101-113.

have shown, mass media do not just represent medical technology neutrally but play a normative role in regards to the shaping of science and technology. They do so in many ways, including the way that they choose topics to cover and the way they cover the topics chosen.[3]

1.2 Aim and Objectives

My general objective is to offer a first historical study of the introduction of selected new medical technologies into the Greek healthcare system. I specifically focus on the way this introduction was communicated to the Greek society as well as on the way it was perceived by certain groups of this society. The groups that I mostly discuss in this thesis are general journalists who happen to write on medical or technology issues, journalists specializing in science, technology or medicine, and various health professionals, including physicians who write on healthcare issues. As for who communicates with whom, health professionals communicate mostly with the scientific community. Journalists specializing in science, technology and medicine communicate with the scientific community and the public, and general journalists communicate with the public**.**

The basic research question of this thesis concerns the way the introduction

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2 For more aspects on the presentation of medical technologies by the media see, for example: Philips, D. (1991). Importance of the lay press in the transmission of the medical knowledge to the scientific community. *The New England Journal of Medicine*, 325(16), 1180-1183; Schwartz, L. & Woloshin, St. (2004). The media matter: A call for straightforward medical reporting. *Annals of Internal Medicine*, 140(3), 226-228; Van Dijck, J. (2005). *The transparent body: A cultural analysis of medical imaging.* Seattle: University of Washington Press; Friedman, L. (2004). *Cultural sutures: Medicine and media*. Durham and London: Duke University Press.

3 For more aspects about the role of newspapers, as an important tool of information about scientific and technological topics, see for example: Wells, J. et al. (2001). Newspaper reporting of screening mammography. *Annals of Internal Medicine.* 135, 1029-1037; Woloshin, St. & Schwartz, L. (2002). Press releases: Translating research into news. *Journal of American Medical Association*, 287(21), 2856-2858; Smith, R. (2006). Medical Journals and the mass media: moving from love and hate to love. *Journal of the Royal Society of Medicine,* 99, 347-352; Jordan, D.L. (1993). Newspapers effects on policy preferences*. Public Opinion Quarterly*, 57, 191-204; Wright, W.R. (1975). Mass Media as Sources of Medical Information. *Journal of Communication*, 25, 171-173.

and use of key medical technologies was presented in Greece through some representative media.

By analysing and comparing various media presentations of these technologies, I sought to identify and interpret aspects of the relationship between new medical technology and Greek society.

1.3 STS Studies and Medical Technology

STS scholars who specialize in the STS study of medical technologies tend to focus on issues of relevance to the body, the social construction of health and illness, the social construction of medical expertise, genders issues, and the media presentation of medical technology. They do so by trying and extending some of the standard STS theories, like Social Construction of Technology (SCOT) and Actor-Network Theory (ANT).

To understand the co-shaping of society and technology, SCOT relies on four basic concepts: i) interpretative flexibility: it is a concept used in order to argue that artifacts have different meanings and interpretations for the various social groups that use them, ii) relevant social groups: according to the proponents of this theory, we can better understand the shaping of a technological artifact by retrieving the social groups that had an interest in reconfiguring this artifact in use (Pinch & Bijker 1987), iii) closure and stabilization: due to the different meanings and interpretations of artifacts by various relevant social groups, there can be tensions. Stabilization and closure starts when tensions among the relevant social groups end, and, iv) the wider context: this concept is used to refer to the wider social, political and cultural environment that offers the context for the emergence of an artifact (Klein & Kleinman 2002).

In her book *The Transparent Body: A cultural analysis of medical imaging technologies* (2005), Jose van Dijck uses the SCOT approach in order to study the influence of medical imaging technologies in the 'new' definition of human body. For example, Van Dijck discusses the case of ultrasound. More specifically, she discusses the use of ultrasound during the pregnancy. According to her, the use of ultrasound has played a crucial role in the way that the fetus has been perceived from society. Van Dijck describes the 'fetus' as a social construction, due to the fact that the fetus, through the use of ultrasound, is being perceived as an entity that can have characteristics and express emotions. However, these characteristics and emotions can be noticed only through the image which produced from ultrasound (van Dijck 2005).

Actor-Network Theory (ANT) has also been used to study medical technologies. This theory is placing the emphasis on the role of networks as what sustains the transmission of scientific, technical and medical knowledge. Michel Callon presents the networks as a mechanism that shapes both the natural and the social world (Callon 1986). ANT also places emphasis on the role of actors, who create networks and inspire others to extend and modify them by using them. The actors that define the networks are both humans and non-humans, (e.g. artifacts and organizations).

Over the course of the thesis I make use of several ANT studies of medical technologies. I specifically refer to Amit Prasad's study on the introduction of MRI in India (2007) and the Maggie Mort, Carl May, Tracy Finch and Frances Mair study on the introduction of telemedicine in the British healthcare system. While discussing the introduction of MRI in India in the 1980s, Amit Prasad zooms on the scarcity of

networks that connect the country's various scientific and medical communities. For example, he discusses the lack of proper contact between physicians (like radiologists) who used MRI with physicists who were undertaking research aiming at the technical development of MRI (Prasad 2006).

The study by Mort et al. discusses the introduction and use of telemedicine in the UK healthcare system, by focusing on two different networks. These networks were advancing different, and in fact competing, views regarding the integration of telemedicine in the healthcare system. The first network consisted of policy makers, which were strongly in favor of this technology. The members of the second network had more critical stand against telemedicine. This second network was formed, mostly, by clinical researchers. The difference between these two networks has to do with how each of them perceived this technology. Policy makers were perceiving it rather efficiently technology. By contrast, clinical researchers had doubts about the quality of the information that this technology could provide (Mort et al. 2004).

I initially consider using the SCOT approach for my thesis by focusing on the use of the concept of the 'relevant social group'. Due, however, to the difference of the various relevant social groups that I found in the three technologies that I considered, this theory did not seem to be able to offer to me a basis of comparison. I therefore settled for something more modest, which refers to an STS area known as 'the public image of science and technology'.

The 'public image of science and technology' is a concept on the way the public and science, technology and medicine are co-constructed. A basic component of the 'public image of science and technology' field is the one described as 'science

communication'.[4] T.W. Burns, D.J. O'Connor and S.M. Stocklmayer (2003) give the following definition in order to define science communication. According to them:

> "Science communication may be defined as the use of appropriate skills, media, activities, and dialogue to produce one or more of the following personal responses to science: **A**wareness, including familiarity with new aspects of science, **E**njoyment or other affective responses, e.g. appreciating science as entertainment or art, **I**nterest, as evidenced by voluntary involvement with science or its communication, **O**pinions, the forming, reforming, or conforming of science-related attitudes, **U**nderstanding of science, its contests, processes, and social factors (pp. 191)"

A standard critique to science communication is that it implies that the public is a passive recipient of the science to be communicated by the media.[5] In general, this communication can take the following forms, depending on who communicates with whom:

> " • Groups within the scientific community, including those in academia and industry,
> • The scientific community and the media,
> • The scientific community and the public,
> • The scientific community and government, or others in positions of power and/or authority,
> • The scientific community and government, or others who influence policy,
> • Industry and the public,
> • The media (including museums and science centres) and the public,
> • The government and the public (Burns et al. 2003, pp. 190-191)"

Last ten years there have been very few but suggestive studies on the

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4 For more information about aspects in science communication, see: Bauer, M. & Ragnarsdottir, A. (1996). A new resource for science communication studies. *Public Understanding of Science*, 5(1), 55-57; Catapano, P. (2001). Report: Trends in Science Communication. Today bridging the gap between theory and practice. *Science Communication*, 22(4), 438-441; Logan, R. (2001). Science mass communication: A survey of science communicators. *Science Communication*, 23(2), 135-163; Stocklmayer S., Goe, M. & Bryabt C. (2001). *Science Communication in Theory and Practice*. The Netherlands: Kluwer Academic Publishers; Treise, D. & Weigold, M. (2002). Advancing science communication: A survey of science communicators. *Science Communication*, 23(3), 310-322; Turney, J. (1994). Teaching science communication: courses, curricula, theory and practice. *Public Understanding of Science*, 3(4), 435-443; van Dijck, J. (2003). After "Two Cultures": Toward a "(multi)cultural" practice. *Science Communication*, 25(2), 177-190.

5 To show that media and technology are co-constructed and that media is not simply a means to science communication Eirini Mergoupi-Savaidou, Faidra Papanelopoulou and Spyros Tzokas prefer to write about 'public image of science and technology' rather than 'science communication': Savaidou, E., Papanelopoulou, F. & Tzokas, Sp. (2009). The public image(s) of science and technology in the Greek daily press, 1908-1910. *Centaurus*, 51(2), 116-142.

normative mediation of media in shaping the Greek public on issues relevant to science, technology and medicine.

Kostas Dimopoulos and Vasilis Koulaidis in "The socio-epistemic constitution of science and technology in the Greek press: an analysis of its presentation" (2002), they study the coverage of scientific and technological issues by the Greek press. Their major finding is that a good number of the media articles studied contained no references to: i) the way science works, ii) the way scientific knowledge change, and, iii) the epistemological image of science and technology. On the contrary, a great percentage of the articles were exhausted in a general talk about the science-technology relationship with society, without becoming specific about possible causes for the certain use (or lack of use) of science and technology in Greece (Dimopoulos and Koulaidis 2002).

Eleni Gogorosi, in an article entitled "Untying the Gordian knot of creation: metaphors for the Human Genome Project in Greek newspapers" (2005) studies the presentation of Human Genome Project (HGP) to the Greek public in the late 1990s, by focusing on Greek journals. Her study interested in the use of metaphors by the newspapers, which she discusses as a very powerful normative tool for the appropriation of commonly held views to the understanding of a new scientific projects, like the Human Genome Project. According to her findings, Greek journalists turn to use metaphors to create a positive climate for science, technology and medicine (Gogorosi 2005).

1.4 Method

I discuss the three different cases in three different chapters. Every chapter has two parts. In the first part, I am going to present a short history of these new

technologies and some suggested observations from the relevant secondary literature so as to identify and register useful approaches to the medical technology and society relationship**.** In the second part, I am focusing on the Greek case by introducing to the presentation of these medical technologies to the Greek society.

For primary sources, I used articles that I found in the Greek scientific periodicals *Health Review* (*Επιθεώρηση Υγείας*) and *Mastologia (Μαστολογία)*, the technical journal *Computer for All* (*Computer για Όλους*), and, two daily newspapers *Eleftherotypia* (*Ελευθεροτυπία*) and *Kathimerini* (*Καθημερινή*).

Health Review (*Επιθεώρηση Υγείας*) is a bimonthly scientific periodical that was first published in 1989 by MediForce.gr.[6] It is an interdisciplinary scientific periodical, unique in the field of health in Greece. Its contents have ranged from articles about health issues to healthcare policy and health–society issues. This is the key reason behind of my choice of this journal of other Greek medical journals. It is written for health administration staff, physicians, dentists, pharmacists, and nurses. The fact that professionals in the medical field where authors of articles in this journal maybe very appealing for my purposes. This journal was additionally useful because it position itself in between purely medical-scientific articles and popular medical articles on health and medicine in Greece. Given that it covered issues of health policy, it is a journal that was additionally useful for my purposes.

Mastologia (*Μαστολογία*) is a scientific quarterly periodical that was first published in 2005 by the Senelogic Hellenic Society[7]. It intends to inform Greeks,

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6 Mediforce.gr is a firm that specializes in the offering of healthcare policy and management services to medical state authorities, medical institutions (private and public hospitals), insurance agencies, scientific societies and health professionals. For more information for Mediforce, see: http://www.mediforce.gr/, (last checked 21/12/2010).

7 The Senologic Hellenic Society was founded in 1979 to coordinate the initiatives of Greek physicians

physicians and others, about breast cancer. It is written for everyone who has an interest in this topic. One of the advantages of *Mastologia* is that it hosts articles that are written by professionals in the field that covered articles both on the state of the art researches of relevance to breast cancer but, also, articles that try to sensitize Greek women about the importance of screening. *Mastologia*, like Health Review, is placed in between purely scientific journal on breast cancer and a publication designed exclusively for a lay audience.

Computer for All (*Computer για Όλους*) is a monthly home computing journal with high circulation. It was first published in 1983 by Compupress A.E.[8] It offers a good record of change in computing technology. *Computer for All* bases on presentations, trials, market researches and news about computers and peripherals, as well as computing software. It is read by computer professionals as well as anyone who has some developed interest in computers. I was especially interesting in one of the most suggestive columns of this journal which was the one called "Computers and Medicine". This column covered medical issues in connection to the use of computers, hardware and software, in medicine. The presentation of software for the medical community was connected to trials that the journalists of these publications were undertaking themselves in order to assets the advantages and disadvantages of each new software product. One disadvantage of this particular publication may come from the fact that was a home-computing journal, which meant that it was

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who specialize in breast medicine. Informing about breast cancer and its diagnosis has been a central task of this medical society. For more information about the Senologic Hellenic Society, see: http://mastologia.gr/ (last checked: 21/12/2010).

8 Compupress was founded in 1928 as a Greek company that specializes in computer-related publications. It gradually became interested in offering several computing services, some of them web-based. For more information about Compupress, see: http://www.compupress.gr/index_en.asp# (last checked: 21/12/2010).

written by computing technology experts. I was not able to find articles written by physicians with an interest in computing technology.

From the daily press, I chose two newspapers, *Eleftherotypia* (*Ελευθεροτυπία*) and *Kathimerini* (Καθημερινή). I chose these two because they have the largest circulation in Greece,[9] and, also, they are representative of the political spectrum. More specifically, *Eleftherotypia* is a center-left daily newspaper that is published in Athens, Greece. It is one of the most widely circulated newspapers in a country. It was first published in 1975. *Kathimerini* is a center-right daily newspaper, also published in Athens. It was published for the first time in 1902. For the purpose of this thesis, I studied articles from the digitized archive of these newspapers. I cover the years 2001 to 2010.[10] The advantage of relying on newspapers is that the articles published in them have reached a broader audience. On the other hand, there is a major disadvantage, which has to do with the high degree of bias that one can find in newspaper articles.

Having decided the area that I wanted to focus on, I directed my research to primary sources (articles) that were connected to medical imaging technology, telemedicine and medical computing. I did this through hand-searching review (searching a journal page by page to identify relevant articles) of the journals that I have chosen (*Health Review*, *Mastologia* and *Computer for All).* My research to *Computer for All* covered the period from the beginning of its publication (1983) to the present. I also researched *Health Review* from the beginning of its publication to

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9 The average circulation of *Eleftherotypia* in Greece in year 2001 was 79296. At the same year *Kathimerini* was selling 40431. In 2010 *Eleftherotypia* was selling an average of 35457 whereas *Kathimerini* an average of 43850 (source: Athens Daily Newspaper Publishers Association, Ένωση Ιδιοκτητών Ημερήσιων Εφημερίδων Αθήνας, EIHEA. http://www.eihea.gr (last checked: 04/01/2011).

10 Newspaper *Kathimerini* is available at http://search.kathimerini.gr/ (last checked: 04/01/2011) and newspaper *Eleftherotypia* is available at http://archive.enet.gr/online/ss2 (last checked: 04/01/2011).

the present (1989-2010) and I did the same for *Mastologia* (2005-2010). Regarding the newspapers *Eleftherotypia* and *Kathimerini*, I covered the period 2001-2010, which is the period that can be accessed through the digitized archive of these two newspapers. I used keywords like medical imaging technologies (απεικονιστικές ιατρικές τεχνολογίες), x-rays (ακτίνες χ), computed tomography (αξονική τομογραφία), magnetic resonance imaging (μαγνητική τομογραφία), positron emission tomography (τομογραφία εκπομπής ποζιτρονίων), mammography and mammogram (μαστογράφος και μαστογραφία), telemedicine (τηλεϊατρική), medical computing (υπολογιστές στην ιατρική) etc.

Within the STS umbrella, my thesis focuses on HSS/HST (History, Science, Society / History, Science, Technology) approach. I also used articles from the following STS-related books and journals: *Science, Technology and Human Values*, *Social Studies of Science, Science as Culture, Social History of Medicine, Medical Anthropology Quarterly*, *ICON, Comparative Technology Transfer and Society, Family Perspectives, Health Informatics Journal, Journal of the American Medical Informatics Association, Space Policy, Radiographics, IEEE Engineering in Medicine and Biology, , Canadian Bulling Medicine History, The Handbook of Science and Technology Studies, Living and Working with the New Medical Technologies: Intersections of Inquiry, Handbook of Telemedicine (Studies in Health Technology and Informatics), Medicine and the reign of technology, Naked to the bone: Medical imaging in the 20th century and, Technology in the hospital: Transforming patient care in the early twentieth century.*

After the presentation of these three case studies, I analyze and compare my findings so as to create a more synthetic picture concerning the presentation and the

perception of medical technologies in Greece.

1.5 Structure of the thesis

I discuss three related medical technologies in three different chapters. Every chapter contains a part that introduces to secondary literature (historiographical and STS more generally) regarding these technologies. In the other parts, I pay attention to the presentation of these medical technologies into the Greek society, by introducing to my findings from primary research in Greek scientific, technical and daily press.

Of all medical technologies, I chose to study three of them, which all rely, directly or indirectly, on the use of computers. My choice was determined by the importance of these technologies for the Greek healthcare system, as this is indicated by their extensive coverage by the media. The three medical technologies that I select to study are medical imaging technologies, telemedicine, and, the introduction of computers in Greek medical/hospital practice.

Medical imaging technologies are considered to be the most developed field in the area of medical diagnosis. I chose to study them because, in Greece, they are connected to an extreme paradox: According to OECD, Greece has the highest number of CT, MRI and mammography installation per habitant in Europe. Yet, at the same time, as can be confirmed by my study, Greeks are very dissatisfied by the lack of proper access to them. In Chapter 2, I introduce to some dimensions of the way medical imaging technologies are discussed in general media and special medical media.

Telemedicine may be best described as a mix of computing/telecommunication and various medical technologies. Experiments with

it in Greece go back to the early 1980s. Telemedicine appeared to be very suitable to Greece due to the country's unique geography (e.g. many isolated islands and several remote mountain regions). There was considerable experimentation with telemedicine in Greece up until the 1990s but things, perhaps also paradoxically, came to a halt in the last ten years (which is when telecommunications and computing culminated in the mass use of the web and information/communication technology more generally). Chapter 3 is focused on presenting aspects of the media discussion of this technology during this last decade.

In the 1980s, users of computers in Greece were facing many difficulties, especially due to the lack of proper software. For example, there was a constant problem with writing or printing in Greek due to the little attention that IBM and other corporations paid to supporting the needs of non-English users. As has been shown by a group of Greek colleagues, the problem was not simply linguistic because it affected all kinds of computers uses.[11] As such, it could not find a simple remedy. Many Greek software houses were instituted in order to address it. They were specializing in addressing the problem at the general level (operating system, screen, printer that could support Greek) and/or solving it at the level of special uses, including medical uses. In Chapter 4, I discuss aspects of the presentation of this issue in medical and computing periodicals.

In the last chapter, Chapter 5, I register a first round of concluding observations based on a comparative and analysis of the three case-studies covered.

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11 For the difficulties that users of computers in Greece were facing during the decades of the 1980s and 1990s, see: Tympas, A., Tsaglioti, F. and Lekkas, Th. (2008). Universal Machines vs. National Languages: Computerization as Production of New Localities. In Reiner Anderl et al. (eds.) *Proceedings of Technologies of Globalization*, TU Darmstadt, Darmstadt (pp. 223-234).

Chapter 2

"What is missing from a country with the highest number of CT scanners?"

2.1 Introduction

In this chapter I am focusing on the presentation of medical technologies in Greece and more specifically on medical imaging technologies. To explain this focus, I may mention the title of an article that I found in the Greek scientific periodical '*Health Review'.* The title was "*What is missing from a country with the highest number of CT scanners?"* (Στάθης 1998). Greece is the country with the highest number of CT scanners per habitant in Europe, at least according to the 1998 estimate of George Stathis (Στάθης 1998). Stathis based his estimation on university surveys that took place in the decade between 1980s and 1990s.[12]

I split this chapter into six parts. In the first part, 2.2, I present a short history of medical imaging technologies. In the following part, 2.3, I pay attention to relevant (to medical imaging technologies) approaches by STS scholars. They are concerned with issues such as the physician-patient relationship and how the introduction of new medical technology affects this relationship, the role of localization during the adoption of medical technology, and, safety and risk issues regarding the use of these technologies. In part 2.4, I give a brief sketch of the Greek healthcare system in order

12 This situation remains the same until today, see: Στοιχεία-Σοκ στη Βουλή: Πρωταθλητές σε μαγνητικούς τομογράφους. (2010, Φεβρουάριος 24). *Ελευθεροτυπία*; Καρπούζου, Λ. & Αποστολίδης, Χ. (2009). *Βιοϊατρική τεχνολογία: Θεσμικές και λειτουργικές διαστάσεις*. Αθήνα: MediForce, pp. 108-113.

to offer a context to the following two parts, which concern my findings regarding the presentation of medical imaging technologies in Greece. More specifically, in part 2.5, I am focusing on the introduction of medical imaging technologies to the Greek healthcare system and responses to this introduction, and, in part 2.6, I pay attention to the case of mammography. The last part, 2.7, offers a conclusion to this chapter.

2.2 A short history of medical imaging technologies

The history of medical imaging technologies starts at the end of the 19th century, when Wilhelm Roentgen introduced the x-rays. Before then, the interior of the human body was an unexplored territory. The development of technologies that could offer access to the interior of the human body without involving surgical procedures appeared very attractive to physicians.[13]

The history of the development of medical imaging technologies in recent decades was affected by the introduction of the electronic computer into medical practice since the 1970s. Computed tomography (CT) was the first medical imaging technology to combine the use of x-rays and computers. The 'invention' of a CT is attributed to Godfrey Newbold Hounsfield. The idea of CT is, however, attributed to four different scientists, who were undertaking research independently from each other's. It seems that they had different motivations and purposes. These scientists

13 On the development of x-rays in the following decades, see: Kevles, B. H. (1997). *Naked to the bone: Medical imaging in the 20th Century*. New Brunswick, NJ: Rutgers University Press; knight, N. (1986). 'The New Light': X-rays and medical futurism. In J. Corn (ed.) *Imaging tomorrow: History, technology, and the American future* (pp. 10-33). Cambridge, MA: The MIT Press; Kufheld, A.W. (1991). From whom Bell toils: Medical imaging by telephone. *IEEE Engineering in Medicine and Biology*, 10, 88-89; Pasveer, B. (1989). Knowledge of shadows: The introduction of x-ray images in medicine. *Sociology of Health and Illness*, 11(4), 360-381; Reiser, St. J. (1977). *Medicine and the reign of technology*. Cambridge: Cambridge University Press; Woolbast, A. B. (1999). *Looking within: How x-ray, CT, MRI, Ultrasound and other medical imaging are created and how they help physicians save lives*. Berkeley: University of California Press.

were the Australian astronomer Ronald Bracewell, the American physician William Oldendorf, the South-African physicist Alan Cormack, and the American radiologist David Kuhl. Hounsfield and the company that he worked for, Electrical & Musical Industries Limited (EMI), played a crucial role in the development of CT. Hounsfield got involved in this development through his previous experience developing a computer for EMI. He was after a technology that could offer more information than the one available through x-rays, through a scanner that could offer cross-sectional cuts. The aggregate of all of these cross-sectional cuts would look like a three-dimensional picture (Kevles 1997). Founding out that EMI was hesitant on investing to his idea, he asked the Department of Health and Social Security (DHSS) of the United Kingdom to support him. To attract interest, he presented his device as one that offers the opportunity to look at the interior of the brain.

Magnetic Resonance Imaging (MRI) was also developed during the 1970s. It was introduced to the domain of medical practice in the following decade. MRI is based on the utilization of the phenomenon of magnetic coordination and the utilization of electronic computers. Too many, this is the best medical imaging technology, because the images produced are of a very good quality, and, also, because there is yet no research to prove that it can be harmful. Raymond Damadian (a physician), Paul Lauterbur (a chemist) and Peter Mansfield (a physicist) are considered to be pioneers of this technology. They come from different scientific fields. They too have been working independently from each other. MRI is considered to be an outcome of Nuclear Magnetic Resonance (NMR), which was known since the 1930s. NMR takes advantage of the absorption of the fact that the atoms initially absorb and then emit energy when they entered the various frequencies of magnetic

field (Damadian 1997; Joyce 2006).

Positron Emission Tomography (PET) is one more medical imaging technology. It differs from the rest in that it requires that radioactive molecules are inserted into the organism so as to allow the perception of a picture of the entire of the body. Bettyann Kevles notes that PET is an emission technology because the radioactive element to be inserted to the organism is the one that gives the information. By contrast, the rest of the medical imaging technologies are transmission technologies. PET belongs to the field of nuclear medicine because it is based on the use of positrons. It requires the employment of radioisotopes and certain radioactive drugs. The first effort at advancing PET took place in 1951, at the University of California, by physicist Benedict Cassen (Kevles 1997).

Mammography also belongs to the group of medical imaging technologies. Its distinct characteristic is its use, exclusively, for the examination of the breast. It is specifically used for the diagnosis of cancer tumors at breast area. As a result, it has been perceived as a technology for women. Breast cancer is a serious disease that usually hits women. Following the introduction of x-rays into medicine, physicians tried to study the way the disease evolves, through the examination of samples coming from mastectomy. The first physician to use x-ray for the study of these samples was the German Albert Salomon. A crucial step in the development of the visualization of the breast cancer was that undertaking by Raul Leborgne, in 1949 at Uruguay. What Leborgne did was to show the significance of high resolutions images.

The last medical imaging technology used widely is ultrasound, which offers the paradox of “seeing through sound” (Yoxen 1989). Ultrasound is widely used throughout medicine, from cardiology (to observe the operation of the heart in real

time) to endocrinology (to observe the thyroid gland). However, the best known use of ultrasound has to do with the obstetrics and gynecology. In fact, the use of ultrasound has played a decisive role in the formation of contemporary obstetrics and gynecology. The public perception of ultrasound comes, to a great extent, from experiences related to pregnancy. As with the rest of medical imaging technologies, ultrasound was not develop in the context of medicine but ended up being used widely in medicine. The first use of ultrasound in medicine goes back to the late 1920s. In 1937, the Austrians Karl and Friedrich Dussik used ultrasound to examine the head of the patients. Evidently, several physicians experimented with the use of ultrasound for the observation and examination of the human brain. The suggestion to use them in the context of gynecology is attributed to the Scottish Ian Donald (1950s). Donald's idea was to use a one dimensional form (A-mode type of sounds) in order to measure the size of the embryo.

2.3 Approaches to the medical imaging technology and society relationship

Medical imaging technologies have attracted considerable attention by the STS scholarly community because they offer a privilege ground to study the technology society relationship. The physician-patient-technology relationship constitutes a prime object of study for STS scholars. In the past, a medical examination was canonically based solely on what the patient could report to the physician. In other words, the physician-patient relationship depended on the direct communication between physician and patient. The introduction of medical technologies brought about a change in this relationship, since it changed the mode of contact between these two groups (Casper 1995).

According to Joel Howell, who has studied the introduction of technology at

American hospitals between the years 1900 to 1925, patients felt very disappointed by this development. They were not comfortable with the idea that a machine could provide reliable information about their health. They afraid that this could open an alienating distance between them and their physicians (Howell 1995).

Monica Büscher and Gloria Jensen have recently studied the changes introduced in the physician-patient relationship due to the introduction of ultrasound. For them, this technology actually enhanced this relationship. Pregnant women in particular felt more certain for their health and the state of the fetus due to the fact that the obstetrician-gynecologist had the ability to have better reports about the progress of their pregnancy (Bűscher & Jensen 2007).

Most physicians thought that they gained an advantage from the development of medical imaging technologies since they had the opportunity to have a more complete knowledge for their patient health. But, they first had to learn how to use these technologies properly. The familiarization of physicians with these technologies was not something easy. As Regula Valerie Burri pointed out regarding the case of computed tomography, this technology was more complicated in comparison to x-rays. They had to learn how to use this technology and they were also obliged to learn new ways for the interpretation of the image produced (Burri 2008).

Mammography offers one more suggestive case to study the issue patient-physician-technology relationship. According to Patricia Kaufert, mammography can be used in two ways: as a screening technique directly connected to the prevention of breast cancer, and, as a diagnostic technique, used to confirm the presence of breast cancer. A woman undergoing mammogram as a screening technique does not

necessarily have prior symptoms to prove/suggest the presence of cancer. But, when mammogram is used as a diagnostic technique, there is a suspicion or knowledge of a presence of an anomaly at her breast. The two techniques -screening and diagnostic- share something crucial, namely a change in the way the woman starts dealing with her body (Kaufert 2000).

The physicians who use these type of exams follow the two dimensional model of diagnosis and simple exam. During diagnosis they simply confirm the suspicion of their patients, where during the simple exam they check if everything is normal or they can observe a tumor, which will be impossible to observe through other means (e.g. palpation) (Kaufert 2000). Radiologists think that screening is the most important part of the breast exam because it can detect cancer at very early stage and so as to cure it quickly. The emphasis on simple screening is a matter of debate between physicians as epidemiologists. The emphasis on screening is based on the position that early stage disease is easier to handle to cure. As a result, radiologists prefer the use of this exam as early as possible. On the other hand, epidemiologists do not quite agree with this consideration. Some of them argue that this practice can traumatize the emotions and the body of the woman without offering clear benefits. They further add that over-examining is a practice that could lead to falls findings and corresponding therapies. Moreover, physicians argue that the increased use of such exams also increases women anxiety and the unnecessary use of medical services (Holland 1993; Russell 1994).

The acceptance and the use of a new medical imaging technology were determined by the place where this technology was going to be used. The role of localization-adoption of medical technologies has been studied (among others) by

Amit Prasad, who wanted to know how the Indian society accepted the Magnetic Resonance Imaging (MRI) (Prasad 2005). Prasad's analysis of the use of MRI emphasized the differences between cultures in the East and the West. According to him, non-Western countries showed a remarkable resistance regarding the adoption of many new technologies. That was due to the lack of familiarization with them, and, also, to the lack of the considerable capital that one ought to invest in order to acquire one of them. Prasad's study further shows that the acceptance of a new medical technology depends on the proper corporation between institutions and physicians from various disciplines. He finds that in India there were no proper networks between radiologists and scientists working for the development of MRI. As a result, Indian physicians were more occupied with trying to handle the economic prerequisites of the presage and use of MRI. This left them with little room to work on research for the development of MRI (Prasad 2006).

Safety, risk and fear issues were very common in connection to medical imaging technologies. After the discovery of x-rays and their excessive use, questions were raised about the safety of this technology. On the one hand, almost everyone was fascinated by the prospect of having a picture that represented the inside of their body. But, on the other hand, the death rate of radiologists who died from leukemia had increased. According to Kevles, when the medical community realized how dangerous this technology could be for the human body, it tried to find solutions so as to change this situation. But society had already developed a fear for the use of this medical technology (Kevles 1997).

Safety issues were raised also in connection to mammography scanning. There was concern that this technology was unsafe due to the fact that its operation

was based on the use of x-rays. The study by Kevles regarding this issue is very suggestive. She quoted the perspective of an activist surgeon who argued that "a mammogram in 1993 exposed a woman to about the same amount of radiation as she would have gotten walking bare-breasted along the beach for ten minutes at noon" (Kevles 1997, 255). Accordingly, Kevles argued that the benefits that a mammography scan offered to a woman were rather important, and accordingly, a woman should choose to undergo mammography scanning.

Patricia Kaufert's approach to the use of mammography scan for women is also suggestive. Kaufert focused mostly on the feelings that a woman had when she had to undergo a mammogram. According to her, the feeling of fear was dominant while a woman decided to do so. This related directly to the possibility of the woman having cancer, which meant an attack at her identity as a woman. Thus, the decision to take a mammogram scan made her feel that she put her life in danger in case that the scan results were positive. This is why many women prefer to avoid having such a scan (Kaufert 2000).

I chose to briefly introduce to these STS approaches in order to have a minimum of a context to introduce the way medical imaging technologies have been presenting to the Greek society. From these approaches we can in fact confirm that patient-physician-technology relationship is important to the way a technology becomes accepted by society. I want to single out the importance of localization for the way a certain culture adapts or ejects a medical imaging technology. Last but not least, let us note the importance of feelings against the use of these technologies as one more important factor of direct relevance to the way a technology is perceived by a certain society.

2.4 Introduction to the Greek healthcare system

The Greek healthcare system is a mixed system, with the public sector participating heavily in the funding of health care services, but, also, with the private sector being quite developed. Initially, the development of the national healthcare system was based on the copying of the Bismarck model[14] and on the principle of social insurance. The basic idea was the coverage of the health needs of the various professions through the insurance agencies. However, it now resembles more the Beveridge model.[15] According to this model, the funding of the health care system should primarily rely on the state budget, with the mediation of the insurance agencies being less important (Υφαντόπουλος 2003).

The Greek healthcare system contains three sub-systems, which operate almost independently from each other. The first of them is the National Healthcare System ESY (ΕΣΥ), which contains city hospitals, and smaller health care units (κέντρα υγείας) and the National Instant Aid Centre EKAV (EKAB). The second one is formed by the Social Insurance Institute IKA (IKA)[16] and various state-run insurance agencies like the one available to farmers (OGA, ΟΓΑ)[17] and the one for state employees

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14 The Bismarck model (1883) took its name from Prussian chancellor Otto von Bismarck. Its main parts are: 1) the offering of full medical and drug coverage, 2) the payment through the employers and the employees, 3) the obligatory coverage of the population by non-profit insurance institutions and 4) the control of the system by the state holders (employees). This is the model used in France and German.

15 The Beveridge model (1948) takes its name from the William Beveridge a British economist and social reformer, who designed the British healthcare system. Its basics features are: 1) the full coverage of the population, 2) the funding of healthcare system through the state budget (in other words, to taxation), and 3) the control of the system by the state.

16 Social Insurance Institute (IKA) was founded in 1934 as a state institution of health insurance in Greece. The obligatory insurance of all salary people was established in 1935. According to IKA's website, this organization offers healthcare services to 5500000 workers and employees and provides 845000 pensioners with retirement pension. For more information about this institution, see: http://www.ika.gr/ (last checked 20/07/2010).

17 The Agricultural Insurance Association (OGA) was founded on 1961 for the purpose of offering health care and insurance services and pension to farmers. For more information about OGA, see: http://www.oga.gr (last checked 20/07/2010).

(OPAD, ΟΠΑΔ)[18]. The third is build around the private sector. It consists of a rather large number of small diagnostic centers, private hospitals, private maternity hospitals, laboratories, individual private practitioners and privately practicing dentists.

As a result, the funding of healthcare system comes from three sources: i) the state budget, through taxation, ii) social insurance through the payments that the insured pay to their social insurance agency, and, iii) private payments by patients-clients. The outcome is a system that includes many different actors and ministries (ministry of health, ministry of labor, ministry of interior) all involved in the formation of health policy. The national healthcare system is suffering from fragmentation and the big number of institutions involved. In 2002 there were no less than 170 institutions. This creates a big problem of control and coordination.[19]

The National Healthcare System, ESY, (Εθνικό Σύστημα Υγείας, ΕΣΥ in Greek) was instituted in 1983 in order to advance the principles of the quality and efficiency in the domain of health care services.[20] It was explicitly designed so as to offer free medical services to the whole of the country's population. Its funding comes from the state budget, which also covers the payment of the physicians, the nurses and the administration staff who work for ESY. It also covers all expanses have to do with

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18 The Civil Servants' Sickness Insurance Fund, (OPAD), was instituted in 2001 and is focused on insurance and healthcare services to state employers. For more information about OPAD, see: http://www.opad.gr/ (last checked 20/07/2010).

19 To get an idea of the number of the institutions have been involved in Greek healthcare system we may mention that in year 2003 ESY supervised by the Ministry of Health and Social Solidarity, the supervision of social insurance by the Ministry of Employment and Social Security, the Ministry of National Defense supervised the healthcare services offered by the army, the Ministry of Rural Development and Food was responsible for healthcare issues related to the agricultural population of a country, the Ministry of Merchant Marine was responsible for sailors and their families and the Ministry of Finance controls OPAD.

20 For the first steps of the institution of the Greek national healthcare system, see: Τράκα, Ντ. (2007). Η ιατρική στη σύγχρονη Ελλάδα. *Αρχαιολογία & Τέχνες*, 105, pp. 6-10.

the buildings, drugs, and hospital equipment. Only a small part of the total ESY budget is covered by the money paid by the insurance agencies its time an insured person is being treated at ESY.

The Greek healthcare system contains, supposedly, three stages: i) first stage (primary) healthcare, ii) second stage healthcare and iii) third stage healthcare. The first stage healthcare has to do with treatment outside hospital. It mostly refers to prevention and diagnosis of diseases that do not require the hospitalization of the patient. It includes private and public like diagnostic centers, outpatients' clinics of public and private hospitals, labs, and private practitioners. The second stage healthcare has to do with patients who need hospitalization at private or public hospitals. Finally, the third stage healthcare has to do with larger hospitals that have all the necessary equipment for handling all cases, including those requiring specialize treatment.

The explosive introduction of expensive medical technology to Greece in the 1990s overlapped with a considerable concentration of high-tech biomedical technologies in the private sector. State hospital fell behind so that the private sector came to play an increasingly larger role. In Greece, the private sector ended up being especially dominant in regards to the introduction of medical imaging technologies. By contrast, the public sector took the lead in the area of transplantations (Καρπούζου & Αποστολίδης 2009).

2.5 Medical imaging technology and Greek society

New medical imaging technology is extensively used in Greece. In fact, the use of new medical imaging technology is marked by extremities. According to the 2008 OECD statistics, Greece has the highest number of CT and MRI per habitant in Europe (Καρπούζου & Αποστολίδης 2009). As of 2010, there are 381 CT. 124 belong to ESY and 257 to the private sector (Φούρα 2010). This is also the case with MRI. Out of 244 units, 33 belong to the public sector and 211 to the private sector ("Στοιχεία-Σοκ στη Βουλή: Πρωταθλητές σε μαγνητικούς τομογράφους" 2010).

The number of installations is large by all international standards. Yet, at the same time, quite paradoxically, there have been widespread journalistic and public complaints that medical imaging technology is not very accessible. In 1998, in his article "What is missing from a country with the highest number of CT scanners?", George Stathis reported that "Greeks are disappointed by the national healthcare system" (Στάθης 1998). To elaborate on this paradox, I will focus on the situation that prevails at Greek state hospitals during the last decade, based on the presentation of this situation by the Greek media.

As a team of Greek researches has shown, the hospital constituted the main place where all these technologies were introduced and tried (Κουμπή et al. 1993, Μάκος 2003). The main assumption was that medical technology had the power to offer incredible solutions to many problems that physicians are facing and, also, it was so powerful that it could undoubtedly raise substantially the reliability and the prestige of the hospital. Yet, Greek hospitals have suffered from a difficulty in handling new technologies and especially new medical imaging technologies.

The daily press constantly mentioned instances of absence of CT and MRI

scanners from Greek state hospitals. According to the journalists who specialize in writing about the condition of the Greek healthcare system in newspapers, the Greek state hospital system has lost its credibility because it could not offer high-tech medical imaging services. Journalists frequently referred to the equipment of public hospitals as insufficient because it did not include computed tomography (CT) scanners (Αποστολάκης 2006a). For instance, an episode at the 'Ippokrateio' hospital in Athens, one of the biggest and largest Greek state hospitals, was reported as indicative of the situation. Evidently, it took fourteen years between planning the purchase of a CT scanner, handling the bureaucracy involved in purchase it, and setting up the proper hospital environment to host it, e.g. preparing the proper building structure (Ευθυμιάδου 2007). In the case of the hospital of the University of Thessaly in Larissa (the largest city in central Greece), it took three years between ordering and obtaining an MRI scanner, due to bureaucratic issues ("Τρία Χρόνια Αναμονή για Μαγνητικό Τομογράφο" 2008).[21]

A frequent theme in the media coverage of medical imaging technologies is the damages that take place at the public hospitals. Journalists frequently offered stories about the improper operation of medical imaging technologies at various Greek hospitals. M. Nodarou reported the case of a CT scanner at a hospital located at a provisional town of western Greece (Pyrgos), which was out of order eleven days per month (Νοδάρου 2008). In the case of a hospital in Northern Greece (at

21 Like all high-tech biomedical technologies, medical imaging technologies are costly. Already in debt, Greek hospitals cannot buy them by themselves; they have to ask the Ministry for funds to buy such equipment. This results in long delays between the submission of request for the purchasing of a medical imaging technology and successful installation. In many cases, after the end of this long process, additional problems surfaces typically here are the problems of the lack of proper place to install such technologies, and the lack of proper personnel to run it. For more information for the issue, see: Καρπούζου, Λ. & Αποστολίδης, Χ. (2009). *Βιοϊατρική τεχνολογία: Θεσμικές και λειτουργικές διαστάσεις*. Αθήνα: MediForce, pp. 87-100.

Salonica), the CT scanner was available in an unpredictable manner due to operational and mechanical problems. This unpredictability led to the disorganization of health care system, because patients had to be moved from one hospital to another. In other words, the adequate operation of the CT scanner was putting a pressure on the system of ambulance vehicles (EKAV) that were used to transport patients (Λασκαρέλιας 2007).

Several journalists implied that the malfunctioning of CT scanners and other medical imaging technologies at state hospitals was due to inappropriate servicing by the companies that imported these medical imaging technologies to Greece. They further implied that those servicing the medical imaging machinery at state hospitals were pushing the people to private medical imaging technology diagnostic centers and clinics (Λασκαρέλιας 2007). The journalists also emphasized delays in the acquisition of medical imaging technologies by the state hospital sector, which gave private diagnostic centers and clinics an advantage.

Physicians and medical technology technicians have been placing the emphasis on problems surfacing during the micro-use of medical imaging technology at the environment of the state hospital laboratory. For them, there were three key points regarding the improper use of these technologies: i) a lack of trained personnel to make the best use of these technologies, ii) a lack of planning regarding the architecturally proper space to host medical imaging technologies, and iii) an inadequate attention to the overall safety requirements regarding the installation and use of these technologies at state hospitals.

It was also reported that there was a shortage of trained personnel to utilize these new technologies, once they become available. As Nafsika Karagiannidi

reported in a 2009 *Eleftherotypia* article, at a hospital in Northern Greece (Didimotixo) the new CT scanner did not work for two years because trained personnel did not exist in order to operate it (Καραγιαννίδη 2009). At the Rhodes hospital, which covers the whole of the island complex known as Dodecanese, there is an MRI but it has not been used because there is no specialized physician to interpret the images (Μπουλούτζα 2009). This suggests that even when expensive new medical technology makes it to the hospital, it cannot be properly utilized because there are no properly educated personnel to run them (Κουμπή et al. 1993).

As for the architectural design, this group argued that there was insufficient use of the new medical technologies (once introduced into the hospital) because the setting and the supporting infrastructure was inappropriate (Λάσπα et al. 2001). For example, the improper isolation of medical imaging technology installations from the rest of hospital environment was considered a problem because it could result in the emission of radiation ("Τα Ακτινολογικά Εργαστήρια των Κέντρων Υγείας" 1994).[22] In several cases, expensive equipment was stored at state hospitals without being used because of the lack of a safe way to use it. For example, at the hospital of Agios Pavlos (located at the second largest city of Greece, Salonika), a CT scanner was purchased in order to be added to the existed x-ray laboratory. But, because of the improper isolation of the x-ray laboratory, this expensive scanner was rusting at the hospital storage rooms. The citizens of Salonika "hear about a CT scanner but see no such scanner" reported *Eleftherotypia* (Αξονικό Τομογράφο Ακούν, Αλλά δεν ... Βλέπουν στον "Άγιο Παύλο" 2008).

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22 For extensive information on the relation between architectural Greek hospitals see: Λάσπα, Σ., & Λάσπα, Χ. (2001). Τεχνοδομικές Παρεμβάσεις και Μεταβολές των Κτιριακών Εγκαταστάσεων των Νοσοκομείων: Περιπτώσεις που Αντίκεινται των Κτιριο-δομικών και Πολεοδομικών Διατάξεων. *Επιθεώρηση Υγείας, 12*(70), 17-22.

According to this group, the relationship between medical technology and hospital from the perspective of the safety requirements of these technologies was another key point for the proper use of these technologies. Its argument was, in the words of George Xatzipoulidis, that "the correct and systematic manage of technology was responsible to ensure effectiveness, efficiency, security, applicability and availability of scientific equipment and facilities in order to cover the right of patients to quality and security in their health care" (Χατζηπουλίδης 2003, 26). For the members of this group, the continuous development and introduction of new medical technologies could increase the risk and danger of hospital practice. As new medical technologies were considerably more complicated than the preceding ones, the need for a system that was responsible to control and fix a possible problem was absolutely necessary (Χατζηπουλίδης 2003).

Due to all these problems, the proper operation of medical imaging technologies at Greek state hospitals has been generally limited (Ευθυμιάδου et al. 2006; Παππά-Σουλούνια 2002). This is why many Greeks had to travel far away from their residencies in order to find a proper functioning medical imaging installation Μπουλούτζα 2009). It also explains the formation of long list of patients who waited to have an examination. For example, it was very common for a woman in Greece to have to wait two to six months in order to take a mammogram or any kind of scan more generally (Μπουλούτζα 2006; Ευθυμιάδου 2008).

All these problems had pushed Greeks to private diagnostic centres and clinics, which have mushroomed in recent decades. In order to avoid long waiting lists, Greeks go to them (Πετροπούλου 2007; Ευθυμιάδου 2008; Λιακοπούλου 2008). This practice contributed substantially to the overall increase of the amount of

money that the Greek society gives to the private sector. In her 2002 *Kathimerini* article, Galini Foura reported that according to the 2001 OECD statistics, Greece holds one of the first places (after the USA and Switzerland) regarding private health expanses. Noticeably, as much as 43.8% of the money the Greek society spends for healthcare goes to the private sector. This is a uniquely high percentage for a country that has a state healthcare system (Φούρα 2002).[23]

An OECD study revealed the inability of the Greek healthcare insurance system to cover the increase expenses stemming from the introduction of new medical technologies (Φούρα 2002). According to journalist Sakis Apostolakis, the state insurance agencies in Greece have stayed at the situation prevailing in the 1980s because they have been slow in moving on so as to offer the same diagnostic exams offered by private diagnostic centers. As a result, the employees have to pay by themselves in order to have access to such exams at private centers. A usual alternative is for physicians to approve other exams, which are not needed and never actually take place, so as to come up with the money required in order to cover the medical imaging exams (Αποστολάκης 2006b). The case of PET (the most recent medical imaging technology) is suggestive. The physicians argue that an exam made on PET can save thousands of life of cancer patients. According to journalist Penny Mpouloutza, the pricing of this exam has already taken four years of disagreements

23 The cost of a CT scan at state hospital is 45€ and at the private diagnostic centres is 70€. For an MRI scan the insurance agency has to pay 235€ at state hospitals and at the private diagnostic centers the amount exceeds 500€. In the case of mammogram, when the insured take a simple mammogram the cost at private diagnostic clinics is 60 to 80€, in comparison to state hospitals where a simple mammogram costs 8€! When there is a need for a digital mammogram the cost at state hospital is 250€ and at private diagnostic centers is approximately 500€. These costs are based on estimation drawn from the following sources: Μας ενθαρρύνουν να… αρρωσταίνουμε. (2006, Νοέμβριος 26). *Έθνος*; Χωρίς μαγνητικό τομογράφο έμειναν δύο από τα μεγαλύτερα νοσοκομεία. (2007, Ιούνιος 15). *Ελεύθερος Τύπος*; Ο πόλεμος του αξονικού: Τα νοσοκομεία 'Ευαγγελισμός' και 'Κοργιαλένειο' ψάχνουν απεγνωσμένα λύσεις. (2009). *Διάγνωση*, 134 (18-24 Μαρτίου), pp. 6.

between some central state health committee and the private laboratories offer these exams (Μπουλούτζα 2009b). This four year delay has forced many patients to pay this exam out of their own pocket.

2.6 The case of mammography

The case of mammography is especially important because breast cancer is the most frequent source of cancer death among Greek women of the ages between 45 and 60 (Μπουλούτζα 2001; Στύλου 2001). Unlike CT and MRI, the use of mammography has to do with prevention rather than diagnosis. As I mentioned earlier, it is more a screening rather than a diagnostic technique (Kaufert 2000). Each year, 4500 Greek women learn that they suffer from breast cancer. About fifteen to eighteen hundred of them end up losing the fight against breast cancer (Ευθυμίου 2001).

According to the 2007 OECD statistics, Greece occupied the third place in regards to the numbers of mammography installation per habitant in Europe. More specifically, there are 36.5 installations per million habitant (Καρπούζου & Αποστολίδης 2009). Most of these installations belong to the private sector and only a very small number belongs to ESY. According to journalist Sofia Neta, only 52 of the 323 available 2006 installations belong to ESY (Νέτα 2008). Against this, the percentage of Greek women who undergo mammography is comparative small. In a 2001 article, Sonia Efthimiou reported studies that found that the percentage of Greek women who had only one mammogram while suffering from first stage cancer is only 15%, which is much lower than the percentage of American woman of the same category (56%) or women in other European countries (e.g. In Sweden the percentage is almost 60%). It seems that the detection of breast cancer in Greek

women takes place after palpation (Παππάς 2007).

Based on my study of the Greek media, I would argue that journalists have employed two lines of explanation regarding this phenomenon. According to the first, Greek women are discouraged by the situation regarding the mammography machines available at the Greek healthcare system. More specifically, it has been argued that the limited number of machines available at public hospitals, coupled by the lack of a rational distribution of such machines around Greece, prevent Greek women from undertaking a mammogram. According to the journalist Sonia Efthimiou, in 2007 there were only fifty three mammography machines in ESY while to offer to whole population about a thousand would be needed. She specifically mentioned that there existed only eight mammography scanners in the countryside and only ten available at IKA, the largest insurance agency in Greece (which covers 5500000 insured).[24] In other words, the available scanners were disproportionately concentrated on very few urban centers. For example, at the two hospitals of the Messinia prefecture in the Peloponnese, which cover the medical needs of about two thousand hundred people, there is no mammography machine available (Μπουλούτζα 2009b). In Epirus, at the University hospital of the city of Ioannina, there is a mammography machine but cannot be used properly because there is only one technician to operate it. In Rhodes, there is a mammography machine that is not being used because of lack of proper conditions for safe installation (Παππά-Σουλούνια 2002). This had resulted in the creation of long waiting lists. Women frequently had to wait between two to six months in order to take the scan (Μπουλούτζα 2004). For instance, at the hospital Agios Savvas, which is the only

24 Two in Epirus, two in Thessaly, three in Peloponnese and one in Central Greece.

hospital in Greece with an organized breast cancer department, a woman had to wait for two and half months before taking the mammogram ("Μαστογραφία στον Αγίο Σάββα: 2,5 μήνες η αναμονή αλλά αξίζει τον κόπο" 2005). According to Lydia Mouzaka, Assistant Professor at the Medicine Department of National and Kapodistrian University of Athens and president of the Senologic Hellenic Society, the long waiting lists can turn out to be fatal on several periods because the size of the tumor after three to six months can be large enough to be unmanageable (Ευθυμίου 2001).

According to the journalistic community, there is a bias in the way information about mammogram has been communicated. Women in Athens had much better access to such information than women in the countryside (Νέτα 2007). Sofia Neta reported in a 2008 Eleftherotypia article that only 22.4% of Greek women knew that mammogram is free in the state health system. The lack of information and proper organization of insurance agencies is a significant factor for the lack of interest (on behalf of Greek women) when it comes to having a mammogram. According to the journalist Marina Petropoulou, about 60% of women who are insured at OGA never had a mammogram and the same is percentage for those insured at IKA. The percentage is little better (55%) for those insured at OPAD. The lack of proper organization at the state insurance organizations/agencies has much to do with this problem. To undertake a routine breast exam, Greek women who worked at the countryside would have to miss work or travel to a distance place. Insurance agencies are not helping them to cover the expenses (Παπάς 2007). Consequently, according to this approach, the long waiting lists and the lack of information about mammogram discouraged women from taking the scan.

The second explanation is placing the emphasis on culture. Studies undertaking by the Senologic Hellenic Society, the Greek Association of Susan G. Komen for the Cure, the Network for Breast Care, and the Hellenic Cancer Society have used words like 'fear', 'indifference', 'careless', 'prejudice' in order to describe the relation between the Greek women and breast cancer (Μπουλατζά 2002b; Παπασταθοπούλου 2005; Νέτα 2007a; Νέτα 2007b; Μπουλατζά 2007b; Ταγαρά 2008). I may here quote the confession of a Greek woman who has been informed that she was suffering from breast cancer: "when I heard my physician stated that the little tumor taken out of my breast was cancerous I felt that the earth disappearing beneath my feet… I do not have the courage to cry, to react, to get angry, to ask. To ask what?... I felt very disappointment, unfortunate, hopeless…" (P. K. as quoted in the article "Εμπειρίες Ζωής" 2006). The attitude of many Greek women was that "breast cancer is not something that affects me now" (Μπουλούτζα 2007b) and "cancer is a hereditary disease and for this reason it concerns only women with family history" (Νέτα 2007a). It seems that there two parameters involved in attitudes of this type. On the one hand, like women elsewhere in the world, Greek women generally perceived their breast as a defining part of their body, which is loaded with meanings (Νέτα 2007a). But this attitude does not seem to me to be very peculiarly Greek. Like women elsewhere in the world, Greek women are afraid of taking a mammogram because the breast is loaded for them with meanings regarding feminity, sexuality and maternity.

But, Greek women are additionally hesitant regarding mammograms because of the mixing up of two reasons. First, like all Greeks, Greek women tend to downplay the importance of the systematic checking of their health. As noted by the

Associate Professor of Social Medicine Yiannis Tountas, “Greeks are not educated to have a right relation with their body, and are not used to the notion that their health is above all their own responsibility” (Τούντας 2007). As a result, the Greek women’s attitude, in the words of Penny Mpouloutza, is that “when something does not bother you, then do not bother with it” (Μπουλούτζα 2007b) or “I have more important things to do instead of getting a mammogram” (Μπουλούτζα 2002c). Second, this is interacting with a culture that is historically sexist, so that, accordingly, it places much heavier load on the meaning of the breast. In 2007, the Senologic Hellenic Society took a research entitled “Breast: Picture and Health” in order to understand better the public opinion of the Greek society regarding the opinion of the breast. According to this study, both men and women strongly associate the concept of breast with female sex. The title of the article that reported the results of the research is suggestive: “Men focus on it, women do not take a good care of its health” (“Οι άνδρες το ‘προσέχουν’, οι γυναίκες το παραμελούν” 2007).

2.7 Conclusion

I started this chapter by reproducing the question by George Stathis at the *Health Review* “What is missing from a country with the highest number of CT scanners?”. Based on the evidence that Stathis reported I would argue that the journalistic community had tried to respond to this question by focusing on the following points.

While agreeing that the number of scanners has been uniquely large, journalists point to its uneven geographical distribution. There are cases of state hospitals that cover large areas and do not have medical imaging machines. There are also cases were these machines exist at state hospitals but stay at depositing

areas and they are never being used because no proper care was exhibited during the ordering or the installation or the operation of these machines.

In short, there is a lack of proper organization to centrally support the ordering and installation of such machines and to assist with their rational distribution across the country. The journalistic community has also stayed at the uncontrolled development of the private sector over the public sector and on the lack of the proper legal and regular framework that could control the placement of such machines at the private sector.

Given the lack and uneven distribution of medical imaging machines at the public sector, many Greeks have to resort to the private sector, thereby paying by themselves a significant amount of money to have a medical imaging exam. This goes against the basic principle of the Greek healthcare system, which is founded on the idea that the base health needs of the Greeks citizens are to be covered either by the state or by the state insurance agencies, not by themselves. All of the above become more evident in the case of mammography, where systemic inadequacies are combined with cultural factors so as to block the development of preventive medicine.

Chapter 3

Experimenting with telemedicine in Greece

3.1 Introduction

The technology that I discuss in this chapter is telemedicine. Given that Greece is a country that includes many remote islands with very small population, telemedicine has been generally described as a very promising technology. Several of those who tried to evaluate the course of telemedicine in Greece described this country as an initial pioneer in the use of this technology (Σωτηρίου 2004). To be sure, in the case of telemedicine we are not dealing with a medical technology proper, but with a communication/information/computing technology mix that promised to become an internal component of medical technology.[25]

I here cover the full period, from the first attempts at introducing telemedicine to Greece to the present. Instead of addressing all aspects of the history of telemedicine in Greece, I focus on the media presentation and coverage of this technology throughout this period. This chapter has six parts. In 3.2, I seek to define what telemedicine is and to present its aims. In the following part (3.3), I present a short international history of telemedicine. In 3.4, I pay attention at relevant (to telemedicine) approaches by STS scholars, who seem to be mostly concerned with issues such as the physician-patient relationship and how the introduction of this

[25] As V. Garshnek, L. Harrison Hassell, and James S. Logan pointed out "telemedicine is a process, not a technology and shifts the paradigm of transporting the patient to the site of the expert care giver to transporting expert knowledge to the health care provider closest to the patient (e.g. Move the information, not the patient.)" (Garshnek et al. 1997).

medical technology affects this relationship, and, labor issues of relevance to the development of this medical technology. In the next two parts, I will refer to the Greek case. First, I briefly introduce to the history of telemedicine in Greece (3.5), and then, I focus on the perception of this technology in Greece from two different social groups. The first group is populated by journalists who covered telemedicine for daily newspapers. The journalist community was rather enthusiastic about the prospects of telemedicine in Greece. The second group contains actors with more critical attitudes towards telemedicine. I consider the opinions of the medical community and the community of medical informatics. As I argue, the difference between these two groups touches on the very definition of telemedicine. The last part, 3.7, is a conclusion to this chapter.

3.2 What is telemedicine? Definition and aims

As it is well known, over the second half of the 20th century there was a rapid development of technologies of informatics and telecommunications. These technologies were gradually introduced to various scientific and other fields, including that of medicine. Telemedicine is the exemplar outcome of the integration of informatics and telecommunications into medical practice. There are many available definitions of telemedicine.[26] The definition of Jim Reid (1996), a director of telemedicine at Mercy Hospital in Iowa, maybe the more inclusive of those available. According to Reid, telemedicine is the use of telecommunication technologies so as

[26] For more definitions about telemedicine see: Brown, N. (1996), Telemedicine coming of age. [On-Line]. Available: http://tie.telemed.org/telemed101/understand/ (last see: 09/07/2010); Darkins, A. W. & Cary, M. A. (2000). Definitions of telemedicine and telehealth and a history of the remote management of disease. In A. Darkins & M. Cary (eds.) *Telemedicine and telehealth: Principles, policies, performance and pitfall* (pp.1-24). New York: Springer; Linkous, J. D. (2000). Toward a rapidly evolving definition of telemedicine. *American Telemedicine Association*; Garshnek, V., Logan, J. S. & Hassel, L. H. (1997). The telemedicine frontier: going the extra mile. *Space Policy*, 13(1), 37-46.

to provide health services without geographic, chronic, social and cultural barriers (Reid 1996). The purpose of telemedicine was to provide medical services from distance.[27] More specifically, telemedicine aims at: 1) to reduce the time that takes to transfer patients at health centers of big urban cities as well as the cost of doing so, 2) to offer equal access to health services to all members of a society, 3) to improve the quality of health services offered by the local-distant medical units, 4) to usher in the cooperation between physicians who participate in research against problems due to being far away to each other, 5) to assist the education of physicians who live in the countryside by taking advantage of cooperation between them and experienced physicians who live in major cities, and, finally, 6) to induce new business initiatives for the development of telemedicine (Brown 1996).

Telemedicine has been generally described and celebrated as especially appropriate to countries that have geographies that are marked by the existence of remote and isolated localities. Moreover, telemedicine has been described as being appropriate not only for big and developed countries, but, also, for small and less developed countries.[28] Indeed, a considerable number of developing countries base on the significant interest in telemedicine.[29]

3.3 A short history of telemedicine

While telemedicine is associated with efforts of the very recent decades, its history seems to be much deeper. We find references to telemedicine methods in the

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27 Tele-medicine derived from the Greek word 'tele-'means distance and medicine, medicine at distance.

28 Among the developed countries that have developed telemedicine initiatives are: United States of America, Australia, Canada, France, Italy, Germany, United Kingdom, Greece, Japan, the Netherlands, Norway, Finland, Sweden, and Switzerland.

29 In developing countries, telemedicine is offered as a solution to problems of difficult lack of capital, inappropriate transportation and other infrastructures.

1924 issue of the American journal *Radio News*. More specifically, at the April 1924 issue of journal there was a picture that showed a physician who was trying to examine a patient through the use of a desired device that looked like a telephone and TV hybrid. The cover title was "*The Radio Doctor – Maybe!*".[30]

A few years later, in 1936, the Greek medicine Professor Paraskevas Zervos, developed a method to examine patients from a distance. Supposedly, his method could allow a physician to count a patient's pulse at a distance while the data could be transmitted anywhere on earth. There was a fortune to be made if this method could be used at the ocean liners connecting the ports of Piraeus and New York. But, because of the incredible cost of such connection, this Zervos 'invention' was never used (Sotiriou 1999).

According to Chul-Young Roh (2008), the first medical reference to telemedicine goes back to 1950 and has to do with the transfer of images between the US states Pennsylvania and Philadelphia. Since then, there has been an intense interest (in the USA) regarding the design and development of telemedicine programs. It seems that this interest still exist, making the USA a leader on the development of such programs (Brown 1996).

The National Aeronautics and Space Administration (NASA) played an important role in the first efforts for the development of telemedicine. As it is well known, during the 1960s started the first man mission to the space. In this context, it was considered necessary to have proper measurement of various body parameters of the astronauts during their space trips and their staying in space. A special

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30 See the following picture at the portal: http://www.nlm.nih.gov/onceandfutureweb/database/secd/case3-artifacts/photoslg/photo1.jpg, (last checked 25/06/2010)

telemedicine program, IMBLMS (Integrated Medical Behavioral Laboratory Measurement System), was developed so as to cover the whole nation. Telemedicine was mentioned as one of the reasons behind the 1966 launching of the satellite ATS-1, the first satellite that could be used for civilian purposes. This was one of the first telemedicine satellite programs that NASA would participate in. It inaugurated tradition that kept going in the following fifty years (Brown 1996; Garshnek et al. 1997).

According to George Demiris, an Associate Professor of Biobehavioral Nursing and Health Systems at the School of Medicine at the University of Washington, there were three reasons to explain the 1980s change regarding the USA interest in telemedicine. The first has to do with uncertainty regarding the existing technology, the second with the lack of long term investments at various institutions, and, the third with the lack of a proper plan for the development of such programs. However, Demeris argues that there has recently been a renewal interest in the use of telemedicine because of technological improvements that have made the transferring of data at reasonable cost more possible. He also argues that this renewed interest has to do with the preparedness of insurance agencies to support such programs (Demeris 2003).

In Europe, there was an interest in telemedicine during the 1980s, with the European Union arguing in favor of it. It supported several research and development programs regarding the integration of communications technologies into medicine (Sosa-Iudicissa et al. 1999). France, Norway and Italy are among the European countries who have experimented with telemedicine.

In France, the use of telemedicine services goes back to 1945. This is when

the Centre of Maritime Health Care started to offer such services. In 1968, the Service d' Aide Medical d' Urgence (SAMU) and the Service Mobile d' Urgence et Reanimation (SAMUR) were established. These were a landmark of telemedicine in the country. In 1989 a European Institute of Telemedicine was introduced in Toulouse. A large number of European and International telemedicine programs were placed under this institution (Lareng & Sosa-Iudicissa 1999).

The first telemedicine programs in Norway go back to the 1920s. There were developed in the context of trying to offer medical services to those onboard through the use of radio signals. More recently, telemedicine was developed at the University Hospital of Tromsø in 1980. In 1993, the Ministry of Health and Social Affairs designed the University hospital of Tromsø as the International reference center for telemedicine. In 1996, Norway became the first country to apply for a multinational telemedicine plans for the telemedicine (Pederson 2007).

We find attempts at telemedicine in Italy as early as 1935, in the context of the activities of the International Radio Medical Center (CIRM), which sought to support programs to offer health services to boats and islands. In 1987, there was an effort for the development of Picture Archiving and Communication System (PACS), especially in connection to radiology. Italy was considered to be the country with the largest number of PACS. The first telemedicine study took place in Florence and the first telemedicine use in Trieste. The introduction of telemedicine to Italy was sparked by the establishment of research programs during the third European Framework Program. Important here was the Advanced Informatics in Medicine (AIM) program (Ruggiero et al. 1999).

Telemedicine has been developed in the context of several distinct disciplines.

The list of more popular uses of telemedicine includes the following: i) teleradiology, which offers the transfer of x-rays, medical texts and medical imaging exams to the radiologists, ii) telepathology, which allows the use of telecommunications technology to facilitate the transfer of image-rich pathology data between remote locations for the purposes of diagnosis, education, and research, iii) teledermatology, which certain diagnosis of skin diseases, and, finally, iv) telesurgery, with special surgeons guiding other surgeons at a distance or using robotics that is next to the patients (Παναγιώτου & Παναγιώτου 2002). To be sure, teleradiology is rather developed, in contrast to telesurgery (Drews 2009).

3.4 Approaches to telemedicine and society relationship

Victoria Garshnek, L. Harrison Hassell, and James Logan point out that telemedicine has to do with the transfer of information about the patient, not the patient himself/herself (Garshnek et al. 1997). Telemedicine is based on providing information in a manner that affects both the patient and the physician. Regarding the patient, telemedicine promises to offer specialize pre-medical healthcare as well as better aid services. Physicians seem to the end have better communication with other colleagues (Καρπούζου & Αποστολίδης 2009). Several STS scholars focus on the patient-physician relationship after the introduction of telemedicine. Maggie Mort, Carl May, and Tracy Williams have studied the way the use of telemedicine change the patient-physician relationship. They have focused on the use of teledermatology in the United Kingdom, which was proposed as a solution to the problems to the long waiting lists that were facing the UK citizens when they wanted to see a dermatologist. According to this program, patients would be first seen only by nurses. They would be responsible to record the patient history to an electronic

archive and to take photos from the skin area that had the problem, so as to transmit them to physicians. Physicians would then decide if they needed to meet these patients or not. The application seemed ideal because it was promising to reduce the work of physicians just as it would reduce the waiting of the patients. Physicians were not directly enthusiastic about this prospect because they preferred the personal contact with their patients. As Mort, May and Williams write "they prefer to see patients, to touch them, to talk them, to discuss the problem with them" (Mort et al. 2003). For this group of STS scholars, the interpersonal relation between physician and patient is decisive when it comes to understand the patient's emotional situation. This understanding is not possible through a patient history recorded in an electronic archive or a photo from the patient skin. Mort, May and Williams interpret the notion of distance involved in telemedicine in three different ways: 1) it can be a spatial separation between patients and physicians, 2) it can be a socioeconomic distance between the groups use the telemedicine, and 3) it can be a distance that has to do with time, as in the case of waiting lists in hospitals.

STS scholars have also studied the connection between the introduction of telemedicine and labor issues. Paul Drews (2008) has studied the way ICT innovations affect the concept of labor in telemedicine. One of the cases that he is interested in is teleradiology, which is based on the transfer of images to India so as to be interpreted by an Indian radiologist in order to avoid having to pay the cost required to have an interpretation by radiologists in America. After studying various cases of use of telemedicine in various fields –like teleradiology, intensive care unit, telepathology, telecardiology, teledermatology telesurgery- he differentiates between nine categories of labor involved the various fields of telemedicine. These

categories are: *telemedicine centers as new actors, offshoring due to lower wages or time difference, outsourcing as nearshoring due to shortage of staff and costs, second opinion, knowledge transfer, expert help for other physicians, patient as co-worker, and cooperation in space projects* (Drews 2008).

3.5 A short history of telemedicine in Greece[31]

The introduction of telemedicine in Greece took place at the end of the 1980s and the beginning of the 1990s. During this period, telemedicine was perceived as an indispensable medical 'application'. Greece was frequently described as a country that ought to be a pioneer in this area (Σωτηρίου 2004). The geographical structure of the country, in conjunction with the insufficient medical infrastructure available at many remote areas, helped in presenting telemedicine as especially appropriate to Greece.

Greece is a country with several remote mountains regions and islands with spare population. Several of these areas did not have more than a country doctor. Graduates of medicine in Greece are required to yearlong services at some remote location. In many cases country doctors were such graduates. These graduates did their country-doctor service between finishing medical school and starting their medical specialization. In other words, these doctors are not specialists but go there after basic training in medicine. There are actually remote areas where there is no country doctor. In many remote areas, even when there is a country doctor, or a small team of doctors, the medical equipment available is kept to minimum. Physicians at these remote areas could certainly use more help from experience

[31] For an analytical history of telemedicine in Greece see: http://panacea.med.uoa.gr/topic.aspx?id=510 (last checked: 10/07/2010).

colleagues from central mainland location (Προυκάκης et al. 1990).

Efforts to develop telemedicine in Greece go back to initiatives undertaken at the Medical Physics Laboratory of the University of Athens in 1989. Already in 1988, Dimitrios Sotiriou, in charge of Medical Physics Laboratory at the University of Athens, suggested the development of new telematics technologies in order to support the development of primary healthcare in Greece. His explicit purpose was to have Greece included in the list of countries that could apply for relevant European Union funds. Over the course of 1989, the 'Sismanogleio' General Hospital in Athens agreed to become the central hospital for providing telemedicine services. During the same year, several trials involving Health Center Spata, Health Center Paros and 'Sismanogleio' took place. Initial success generated a climate of optimism regarding the future of telemedicine in Greece.

In the following year, 1990, Medical Physics Laboratory proposed to the Greek Ministry of Health to develop a framework for the operation of telemedicine services in primary healthcare. The Laboratory also agreed on educating the ministry employees so as to develop the necessary know-how on telemedicine issues. A Hellenic Society of Telemedicine was founded in October 1990. Greek Red Cross also made same initial attempts at developing telemedicine in Greece. During 1990, the explicit purpose of Red Cross was to support some secluded islands in the Aegean Sea.

The following years witnessed the same enthusiasm from telemedicine pioneers. As a result, the Ministry of Health decided to allocate a fund for the formation of a telemedicine network, which started operating in 1991. There were intense negotiations so as to have the state-run Greek Telecommunication

Organization participate in the network. The quality of the phone lines during this period was inappropriate to mediocre. The lack of specialize personnel at the health centers of the Greek countryside was acknowledged. It was also known that country physicians had limited experience when it came to handle various instances locally. Their standard response was to recommend the transfer of the patients to the big (third stage healthcare) Greek state hospitals. In 1994, the Laboratory won several European programs. One of them, the "VSAT", was designed to so as to support the offering of telemedicine through the use of satellite communication that could be used to transfer electronic files.[32] In 1995, the program "TALOS" (ΤΑΛΩΣ) was set up so as to provide telecardiology services to some of the islands of the Aegean Sea.[33]

The Medical Physics Laboratory kept winning European programs. One of them, "HERMES", aimed at the creation of a European platform for the development of high quality telemedicine services.[34] In Crete, through the program "HYGEIAnet",

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32 The VSAT (1994-1996) was a three year telemedicine project. It was funding by the Ministry of Health, NATO and the University of Athens. This project used satellite technology for the confrontation of cardiovascular incidents in Naxos, Milos and Karpathos. It started in 1994 and was coordinated by the Medical Physics Laboratory at the University of Athens and Dimitrios Sotiriou was the scientist responsible for the project. For more information about research program VSAT see: http://panacea.med.uoa.gr/topic.aspx?id=500&red=true&kn=0&un=1&un1=VSAT (last checked: 10/07/2010).

33 The TALOS project (1997- ….) was based on the results of the European Program FEST (Framework for European Services in Telemedicine) funded by the European Commission in 1992-1994. It supports seven primary healthcare units of the Aegean islands (Mykonos, Skiathos, Santorini, Naxos, Milos, Lesvos, and Amorgos). Each island has a digital cardiographer and a computer and ECG transmission to the Onasseion Cardiac Surgery Center in Athens. For more information about research program TALOS see: http://panacea.med.uoa.gr/topic.aspx?id=601 (last checked 10/07/2010).

34 HERMES (1996 - 1998) was a three year pilot research telemedicine or teleinformatics program. It was funded by the European Union in the context of the Fourth Framework program. It started in 1996 and was coordinated by the University of Edinburgh, in cooperation with physicians, technicians, and researches from Germany, Belgium, Portugal, Greece and the United Kingdom. Regarding the Greek participation was focused on providing maternity services at various Aegean islands and on supporting through connections with obstetrics and gynecology clinics in Athens and Edinburgh. For more information about HERMES project see: http://panacea.med.uoa.gr/topic.aspx?id=584 (last checked: 10/07/2010).

the local health centres were connected to the University Hospital of Crete.[35] To be sure, in the case of Crete, we have a telemedicine connection within an island. In the private sector, an interesting experiment was undertaken at the Medical Center of Athens. This private hospital started advertising the supply of teleradiology services as early as in 1991 (Αποστολάκης et al. 2007).

As early as a 1998, after a decade with intense interest in the development and application of telemedicine services in Greece, the interest in telemedicine started to decrease. Telemedicine had not fulfilled the expectations. A telling episode in the history of telemedicine is the one reported by Lina Giannarou in the daily newspaper *Kathimerini* in 2001. During that year, the president of the Greek democracy Kostis Stefanopoulos visited the island of Gavdos in order to inaugurate the commandment of telemedicine system. As Giannarou reported, when the president left, the electricity generators were unplugged and the system went out of service (Γιάνναρου 2001).

3.6 Telemedicine and Greek society

As already explained, in contrast to the 1990s, the following decade witnessed the decrease of an interest in the development of telemedicine programs in Greece. This change is captured by reading the writings of two social groups, each of which tried to give its own version of the reason of the failure of telemedicine in Greece.

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35 The HYGEIAnet program (1998 - 2001) was funding by the Greek Ministry of Economics. It lasted four years. Its precise title was "Institution of telematics center, information highway for the inter-connection of Institutions from Crete, Cyprus, and countries of the North-Eastern Mediterranean" (Δημιουργία Κέντρου Τηλεματικής, Πληροφοριακή λεωφόρος διασύνδεσης οργανισμών Κρήτης, Κύπρου και χωρών Ν.Α. Μεσογείου). It aimed at turning rate into a motto of development of peripheral telemedicine networks, culture, public administration, tourism, etc. For more information about HYGEIAnet project see: http://www.ics.forth.gr/publicity/ics_representation/hygeia-net.pdf and http://www.gsrt.gr/default.asp?V_ITEM_ID=2678 (last checked: 10/07/2010).

The first social group consisted mostly of journalists who were supporters of the use of telemedicine in Greece and were expecting that telemedicine could work anywhere in the country. The second social group had more serious doubts about the very possibility of the properly developing telemedicine in Greece. It was formed by the members of medical and technical community.

Journalists argued that the failure of telemedicine was due to inadequate funding. They did not challenge -not to say that they themselves promoted- the idea that telemedicine could produce a miraculous change in the Greek healthcare system. Many of these journalists covered changes in telemedicine in Greek daily newspapers. Some of them, more than once, wrote pieces that described telemedicine as being possible of offering state-of-the-art surgeries and other highly complex medical procedures to those needing them at remote locations in Greece. For example, the small population of some remote islands in the Dodecanese or the Cyclades could, supposedly, have the same access to medical services as those living in downtown Athens or any other metropolitan center on earth. That is without having to move of their island. The members of this group wrote as if telemedicine could give solutions to most (if not all) problems that the national healthcare system had to cope with.

In a 2007 article in *Kathimerini*, Penny Mpouloutza reported an interview that she took from Michalis Tsagkaris, the person responsible for the telemedicine unit at the "Sismanogleio" hospital of Athens. According to her report, the application of telemedicine could convert a small health center of a remote area into a big city hospital (Μπουλούτζα 2007a). This implied that telemedicine would put a stop to the problem of internal immigration of patients within Greece (Πετροπούλου 2001) and

to the problem of having to transport patients by air to big city hospital (Μπουλούτζα 2002a). This air transportation was a much debated issue, because it represented a considerable cost to the state. The debate involved the decision-making mechanism/procedures for an air transport for medical reasons. The press had frequently reported cases of both waste of money to carry patients when it was completely unnecessary, and, cases when needed patients had not been carried to the city. With telemedicine, the need for the air transportation of patients would be eliminated all together. Several journalists suggested that the development of telemedicine in Greece would increase the status of remote island doctors because they would no longer be something like "traffic policemen", that is physicians who basically directed the traffic of patients from remote areas to city hospitals (Μπουλούτζα 2007a).

It was believed that the introduction of telemedicine to the islands could have important economic side effects. For example, tourism would increase because tourists could now decide to visit remote locations without being concerned about medical coverage in case of an emergency (Μπαρδούνιας 2002; Μπουλούτζα 2007a).

The journalistic community has also covered the eventual failure of telemedicine experiments. Instead, however, of questioning the appropriateness of telemedicine in the first place, it assumed that failure was due to inadequate funding by the state budget.[36]

Under the second social group, I placed those who defended more critical perspectives. We here find members of the medical community and the informatics

[36] The history of exaggeration by Greek journalist in the case of telemedicine was covered analytically at the master thesis of Graduate program in History and Philosophy of Science and Technology at the NKUA/NTUA by Marilena Koukou in 2008 (Advisor: A. Tympas).

community. Early critical views were mentioned in an interview that Manolis Voulgaris, a writer at the *Computer for All*, took in 1990 from Vasiliki Karounou, who was a system analyst. Going back to 1988, Karounou had collaborated with the department of the Ministry of Public Administration for the development of informatics in Greece (Βούλγαρης 1990). According to Karounou, the application of a telemedicine system was certainly uniquely useful in the case of Greece. But, at the same time, Greece had to cope with quite a lot of obstacles. Karounou mentioned that the insufficient Greek telecommunication infrastructure was an important factor for the improper use of telemedicine in Greece. For example, she referred to the difficulties in telecommunication between several secluded islands of Greece and Athens. The reaction of society to telemedicine was another factor that Karounou pointed to as important for the acceptance of telemedicine. As she explained, telemedicine introduced a new method for the examination of patients, which was completely different from the existing methods. Finally, she stated that the introduction of telemedicine could represent a challenge to a healthcare system that was not all that flexible (Βούλγαρης 1990, 79-80).

An evaluation of the history of telemedicine has been offered by Dimitrios Sotiriou in 2004, in a *Health Review* article. Sotiriou is a professor of medicine at the Medical School of the University of Athens. According to his opinion, the delay at the development of telemedicine in Greece was due to the hesitancy of public sector. Sotiriou explained that even though the European Union offered generous financing and pushed the country to follow the European rates for the use of telematic services, the Greek public sector seemed to resist (Σωτηρίου 2004). But, Sotiriou underlined that there were also some objective reasons for the delay. For him, the

proper use of telemedicine pre-required a specific environment. For example, it required team work, the creation of digital archives, familiarization with telematic technologies, and, systematic scientific control and evaluation. According to Sotiriou, the national healthcare system was inflexible enough to offer these prerequisites. Also, health professionals were not all that willing to adapt to this environment. As Sotiriou stated, "there was a lack of coordination between health units, inflexibility when it came to ongoing training, shortage of encouragement to participate in innovative approaches, and a tendency to work individually rather than in a team" (Σωτηρίου 2004, 40).

In a 2007 *Health Review* article, Yiannis Apostolakis, Periklis Valsamos and Iraklis Varlamis offered one more evaluation of the outcome of attempts at telemedicine in Greece (Αποστολάκης et al. 2007). Apostolakis is a medical informatician and coordinator of the program "Informatics" at the National School of Public Health in Athens. Valsamos is an informatician who works at the Ministry of Health and Social Solidarity. Varlamis, also an informatician, is a Lecturer at the Harokopio University of Athens. In their 2007 *Health Review* article, Apostolakis and his co-authors challenged several of the assumptions about telemedicine. Noticeably, they challenged the assumption that telemedicine was possible through a communication between the existing central hospitals and remote locations. Instead, they proposed the development of a regional telemedicine center that would be responsible for the "support and improvement of the existing system efficiency" (Αποστολάκης et al. 2007).

It seems to me that Apostolakis and his colleagues offered a picture of

telemedicine that is much more complex than the one assumed by the first of the social group. According to them, telemedicine could offer important help at the national healthcare system, but, at the same time, there were serious reasons that deterred the proper use of telemedicine in Greece.

3.7 Conclusion

Generally speaking, the perception of telemedicine in Greece has varied between extreme enthusiasm and extensive scepticism. Journalists tended to understand telemedicine as ready-made technology that could be immediately used, assuming proper financing by the state. By contrast, there were other actors who expressed doubts about the possibility of a technological solution to the problems of providing remote islands with adequate healthcare. In other words, this second group challenged the very idea of telemedicine as this was portrayed by the popular media. Following the rhetoric of most politicians, journalists tended to portray telemedicine as a substitute for conventional medicine. Reading their articles leaves one with the impression that telemedicine could eliminate the need for physicians who would be willing to go to work in an isolated island. The same articles also argued the push that telemedicine could give to the development of primary healthcare throughout the Greek healthcare system.

Noticeably, the private sector did not invest on the development of telemedicine in Greece, at least not nearly as much as it invested on medical imaging technologies. As for the public sector, while it verbally supported the development of telemedicine, it never moved on to endorse telemedicine decisively.

Chapter 4

The introduction of computers in the Greek healthcare system

4.1 Introduction

In this chapter, I present my third case study about the introduction of new medical technologies into the Greek society. My focus here is placed on the initial period of attempts at introducing computers into medicine. More specifically, I am focusing on the decade between 1984 and 1993. For the purposes of this study, I rely on material that I found in two different periodicals, one technical and one medical. The technical journal is *Computer for All,* a home computing journal that as early as in 1984 set up a column entitled "Medicine and Computers". The aim of this column was to support and promote the use of computers by physicians and healthcare professionals. For the opinions of the medical community, I chose the periodical *Health Review*, a periodical publication that hosts the views of physicians and healthcare professionals. It was first published in 1989.

This chapter is composed of five parts. First, I am going to refer to a short history about the introduction of computers in health care systems (4.2). Then, I focus on relevant (to the use of computers in health care systems) approaches by STS scholars. In 4.4 I refer to how technicians discussed the use of computers to medicine between 1984 and 1989. Finally, in 4.5 I discuss opinions offered by physicians in the period between 1989 and 1993. I am aware of the fact that the two social groups that I discuss actually come from two different periods. I would defend my decision to do so based on the fact that the period between 1984 and 1989 was formative for

the technology under consideration, which means that the society relied substantially on computer experts. *Computer for All* kept on hosting articles on the medicine-computing relationship after 1989, but not with the same frequency. From 1989 to the present, *Computer for All* has been publishing as little as about one article per year. The last part (4.6) will provide a conclusion to this chapter.

4.2 A short history of the introduction of computers in healthcare systems

Following the post war World War II development of computers, there was a general optimism regarding the possible use of computers in general and in medicine in particular. According to Bonnie Kaplan (1995) "it was thought that they could place medicine on a more scientific basis and provide 'indispensable' assistance in the rapid retrieval of current medical knowledge; they were considered a 'necessity' for working out the quantitative knowledge of disease-diagnosis correlations" (Kaplan 1995, 8).

Kaplan differentiates between four periods in the introduction of computers into medicine. The first period starts in 1950s and reaches the 1960s. It was focused on the use of computers on basic research and in diagnosis. The second period starts at about the mid-1960s. During this period, the use of computers was expanded so as to include the handling of medical records and patient care. The third period, which overlaps in 1970s, emphasized on the use of computers in "the rationalization and social optimization of them" (Howell 2004, 344). Finally, the fourth period, which started in 1980s, has experienced the development of a distinct relevant field, known as 'medical informatics' (Kaplan 1995).

Going back to the 1950s, scientists working in the field of biomedicine started to use computers to carry out complex experiments. Computers were mostly used

for the analysis of the results. At the same time, many physicians were not aware for the use of computers in medicine. However, during the 1950s, physicians had to face up the problem of handling the growing amount of knowledge that was necessary for an accurate medical diagnosis. At the same time, the public demand for a diagnosis of a disease in the first stage of it created a pressure to physicians. Gradually, some physicians started to get engaged in the use of computers in clinical practice (Reiser 1978; Kaplan 1995). According to Reiser, two features of computers were very attractive to physicians. These two features were "the capacity to store a prodigious amount of data in a little space and to search for and to establish complicated associations that existed within data" (Reiser 1978, 203).

The first efforts for the use of computers into medicine focused on the basic research and the diagnosis of a disease (Kaplan 1995). The computing experts who were working in this field aimed at constructing a computer that would replace physicians in the diagnosis of a disease. Following this context, "two schools of thought" developed in America. As Reiser wrote, "the first school attempted to duplicate with a computer program the mental steps that physicians used to reach the diagnosis, the other developed diagnostic strategies particularly suited to the strengths of the computer without the requirement that they mimic human logic" (Reiser 1978, 211). But, the use of computers in medical diagnosis was not as easy of a process as it was imagined to be because during the diagnosis the physician had to deal with two problems. These problems are the collection of data (which information presented by the patient could be used for a correct diagnosis), and the "differential diagnosis" (which referred to the construction of a list of diseases that could explain the patient symptoms) (Reiser 1978).

In the second period, the interest in the use of computers moved from "basic research and diagnosis" to "patient care and medical record" (Kaplan 1995, 7). More specifically, medical computing experts realized the importance of medical record as a research and clinical tool. To this end, they wanted to construct a computer program that could afford physicians the opportunity to handle medical records in a more efficient way. In parallel, this medical record would be used not only for research purposes but for patient care and administration needs (Kaplan 1995, 12). As Kaplan pointed, "[e]xperts now considered computers as a means of communicating medical information about individual patients through an institution-wide medical information system, rather than only as a means of aggregating information to promote understanding of disease and diagnosis" (Kaplan 1995, 11-12) During this period, the first medical information system was developed, which combined the three basic areas of medical computing: research, patient care, and administration.[37]

In the 1970s, the third period of the introduction of computing into medicine, medical computing experts continued to work on existing projects. However, their interest now moved on to the administration field and mainly to the development of a computer system that had the ability "to lower costs, and to coordinate services on a broader institutional and interinstitutional level" (Kaplan 1995, 17). The main point of view of medical computing experts was that "these projects would alleviate problems of skyrocketing costs, increasing number of patients, and a continued explosion of medical knowledge" (Kaplan 1995, 17).

[37] Medical Information System is a set of formal arrangements by which facts concerning the health or health care of individual patients are stored and processed in computers (Lindberg 1979, 9).

Finally, during the fourth period (1980s), the use of computers focused on "how to aggregate hospital data and make them available for planning and resource allocation and how to use already existing databases to improve medical care" (Kaplan 1995, 20). Also, in this period their role became more necessary, and, at the same time, more complicated than before since "it was time to stop using simply for doing a little better what was already being done manually, and to start using them in ways that would change the academic medical center by providing the tools for its simplification and ultimately its control through information management" (Kaplan 1995, 21). Moreover, the term 'medical informatics' started to be used so as to describe "the interface between the subject domain of medicine and the science, and technology of computing" (Kaplan 1995, 22).

4.3 Approaches to the use of computers in healthcare systems and society relationship

While the introduction of computers to medicine promised to offer a lot in connection to the management of a mass amount of data, physicians were generally hesitant. Because they show a negative impact in regards to the patients-physician relationship. According to Reiser, the reason that many physicians resisted to the use of computers into medical practice was the fear that the use of them could affect the personal relationship between physicians and patients. As Reiser pointed out, physicians believed that the use of computers "would undermine the physician's authoritative role in evaluating the facts in an illness and in making final judgements about what action was to be taken" (Reiser 1978. 223).

Reiser has also studied the relationship between the medical community and the technical community. He specifically studied the way that these two communities

understood the use of computers in medicine. According to him, there was a lack of common language between the two communities. Physicians understood the medical vocabulary, in contrast to computing experts who understood the mathematics and physics vocabulary. Moreover, the two communities evaluated the problems in different ways, as a result of their different background. The outcome was a lack of understanding of the basic needs of each other's community (Reiser 1978, 222).

Physicians seem to be very cautious and hesitant as users of computers. They believe that the use of them could affect their autonomy, prestige and institutional power. According to Melissa Succi and Zhiping Walter (1999), information technology has slow acceptance by physicians, in contrast to other scientific fields, because they fear that the use of this technology could affect their professional status. More specifically, there are two explanations of this attitude. The first focuses on hierarchies existing in health care units, where the physicians are at the top of this hierarchy. The use of computers may transfer the knowledge to lower levels of this hierarchy. The second concerns the codification of knowledge, which could be distributed to everyone and not only to physicians. Succi and Walter pointed that these reasons affect the professional autonomy of physicians and this is why they are very hesitant to use it (Succi & Walter 1999).

Health policy is a very crucial instrument for the introduction of computers in national healthcare systems. In her study of the introduction of computers in American medicine, Bonnie Kaplan emphasized the role of public policy in the introduction of computers at American hospitals. Public policies highlighted the crucial role that the introduction of computers could have by showing that

computers could be used widely, well beyond the sphere of diagnosis. For example, computers could be used not only in research and patient care, but, also, in the administration of hospitals. This introduced the concept of a 'medical information system' (Kaplan 1995).

4.4 Computers in the Greek healthcare system – Perspectives of the technical community

In 1984, the Greek informatics and home computing journal *Computer for All* set up a new column entitled 'Medicine and Computers'. Those writing in this column sought to promote and support the use of computers by physicians and the rest of the medical community. "Computers and Physicians: A friendship is born..." started the first piece of this column in 1984 ("Υπολογιστές και Γιατροί: Μια Φιλία Γεννιέται..." 1984). It explained that the purpose of this column was to demythologize the use of computers by the medical community by showing that they were not "mysterious and hard to use tools" ("Υπολογιστές και Γιατροί: Μια Φιλία Γεννιέται..." 1984, 171).

A good number of articles in *Computer for All* were presenting software that was developed by Greek software houses in order to be used by Greek physicians. The articles were offering instructions on how to use this software in hospitals, dental clinics and pharmacies. A good part of this software had to do with tools for managing the work of the physicians, the pharmacists or the medical professions, rather than with assisting physicians or pharmacists in their more creative work.

The use of computers in the administration of hospitals was uniformly perceived as extremely important because it involved the smooth operation of hospitals. The *Computer for All* columnists were very supportive of the introduction

of computers in Greek hospitals. In 1985, Christos Chaldaiopoulos presented the 'AORTICS' software, which was tailored to the needs of the 1st Surgical Clinic of the University of Athens (Χαλδαιόπουλος 1985). It was designed to handle the increased data that this hospital department had to deal with, especially in connection to medical records. Chaldaiopoulos noted that the interesting characteristic of this software was that it has been developed by the physicians of this clinic. According to him, this was the first fully functioning software used in hospital successfully. He explained that this software was the product of an initiative by a "man with a vision", namely the director of this clinic, Panayiotis Mpallas (Χαλδαιόπουλος 1985, 141).

In his 1987 article, Kostas Stefanou described the ALFA A.B.E.E. software that was designed for the largest healthcare units of the Greek health system, which are the state hospitals (Στεφάνου 1987). This software was produced in Greece by a local software house (ALFA A.B.E.E.). Stefanou contrasted the software requirements of these larger units to those of small private health clinics or offices of individual private practitioners. As he explained, being designed for large hospitals, this software was much more complex. Interestingly, instead of actually evaluating the ALFA A.B.E.E software, Stefanou stated that those responsible to offer a meaningful evaluation were actually only those who would use it at hospital settings. As for himself, Stefanou stated that "since the firm that produced this software has undoubtedly the ability to modify the program based on the criticisms that it will receive, I will not review its pluses and minuses" (Στεφάνου 1987, 167). This quote shows how eager writers like Stefanou were to endorse this technology.

An article that was published in the *Computer for All* two years later (1989) discussed software that was designed by the software house Sting in Greece. This

software could help to work with tasks like holding and updating a patient archive and holding a drug archive. According to Christos Chaldaiopoulos, this software has been designed alongside the active participation of physicians, which made it friendly and easier to use. It was called 'Hospital Assistant's'. It was not software to be used by one hospital physician but by the hospital physicians' community as a whole (Χαλδαιόπουλος 1989).

The *Computer for All* columnists focused, also, on software for individuals private practitioners. In his 1985 article, entitled 'Physicians Helping Programs', Christos Chaldaiopoulos described some Greek software that had been developed by the firm H. Theodosis and Associates. This software was adapted to the needs of an obstetrician-gynaecologist. Chaldaiopoulos explained that the purpose of the analyst who had developed this software was to design a tool that would be useful to physicians due to being easy to use and capable of offering quick access to patient records. He further explained that this software was developed on the grounds of a close cooperation between analyst and physicians. According to Chaldaiopoulos, the use of this software could afford physicians a more complete view of their patients' health in a very short time in comparison to the traditional way. Chaldaiopoulos thought that this software could turn out to be a valuable tool for an obstetrician–gynaecologist. Yet, he had some doubts about the willingness of Greek physicians to try it in their daily practice.

In his 1986 *Computer for All* article, D. Stefanou presented medical software that was called 'Galinos' (Galen). It has been developed by the Greek firm Medicasoft, after the cooperation of medical and computing specialists. This software was to be used by all kind of physicians. According to him, it was easy to

use, it worked quickly, and it was user-friendly. Stefanou appeared impressed with this software, even though he admitted it that “the first edition has some gaps” (Στεφάνου 1986, 154).

In 1989, in another *Computer for All* article, Yiannis Vithinos described software called ‘Doctor’. It was produced by the Greek software house Larco EPE (Βιθυνός 1989). This software too was for all medical specializations. It could be used to keep and update an archive of patients, to undertake statistical analysis of available data, and to inform physicians about the upcoming appointments. Vithinos paid special attention to the icons used in this software. For him, this was a feature that made it especially easy to use. Like all the authors considered so far, Vithinos was rather excited about the potential of this software. In his opinion, it was software that was “effective, easy to use, quite simple for all routine works, quick, and reliable” (Βιθυνός 1989, 173-174).

The ‘Supermic’ software, developed by Computer Control Systems in Greece, was tailored to the needs of a microbiologist laboratory (“Supermic” 1989). It was presented in a 1989 *Computer for All* article. The *Computer for All* columnist argued that this software could offer solutions to many microbiologists because it could be used without having special computing skills. The anonymous author of the piece on ‘Supermic’ was very optimistic about the prospects of medical software in Greece.

After the presentations of software that was addressed to individual private practitioners, we discern that the writers of *Computer for All* held a positive attitude for the introduction of that software in medical practice. Trying to promote this software, they focused on those characteristics that could change the physicians past habits and would contribute to the evolution of medical practice, since physicians

would not have to waste their time at the managing part of their work, but, instead, they could focus on its more creative part.

In all the *Computer for All* articles on medical software that I was able to locate, the tone was overwhelming supportive regarding the introduction of software into the Greek medicine. It was widely expected that the introduction of software into medical practice would automate the routine parts of a physician work (like data handling) so as to allow physicians to spend more time with their patients and to offer them the opportunity to more scientific-creative work.

The *Computer for All* columnists were also interested in software products for other segments for dental clinics and pharmacies. In his 1985 *Computer for All* article, Spyros Peristeris described software developed by the firm Microbytes which was called 'Dentist's Application' (Περιστέρης 1985). He explained that this software could offer solutions regarding dental work management, like holding and updating record of patients-clients and/or informing about the payment record of a client. 'Dentist's Application' could supposedly be adapted to the special needs of individual dentist through the collaboration between him/her and Microbytes. Peristeris was endorsing this software even though he had detective several problems. These problems mostly had to do with the fact that this software could properly run only by a hardware that was rather costly.

In his 1986 article, Panagiotis Spiliopoulos described the software 'ODOUS' by Melte A.E., a firm with considerable experience in the development of medical software. It was designed for dentists who wanted to spend less time on routine tasks and more on the creative-challenging components of their work. "The ODOUS by Melte," wrote Spiliopoulos, "promises to easily tame the wild animal of

bureaucratic and routine work that overwhelms every dental clinic" (Σπηλιόπουλος 1986, 222). Spiliopoulos expressed his enthusiasm through several more similar expressions. "The dentist will completely eliminate the headache of maintaining medical records", he wrote. And, also, "this software is more than perfect for the needy dentist" (Σπηλιόπουλος 1986, 227). Spiliopoulos was one of the most passionate supporters of medical software

While not being as passionate as Spiliopoulos, Alexis Christodoulopoulos was also optimistic about the prospects of medical software. In his 1987 *Computer for All* article, he introduced the dental software called 'Denta', which had been developed by Acodata (Χριστοδουλόπουλος 1987). Unlike the software discussed so far Acodata was supposed to help dentist not only with managing the routine part of their work, but, also, with the scientific part of it. Evidently, 'Denta' included a sub-menu that could contain information on the kind of therapy applied to a patient-client (e.g. filling, pulling out or cleaning). This could give the dentist a better overall picture of the operation to be performed and the therapies tried. Interested dentist could cooperate with Acodata to have their software further adjusted to their special needs. Christodoulopoulos admitted that he was initially very hesitant about the usability of this software. After, however, running it he had changed his mind.

Between 1984 and 1989, several *Computer for All* articles covered the possible use of special software in pharmacies for the proper management of executions of drug prescriptions. In his 1985 article, Dimitris Zervos presented 'Pharmacom', software produced through the cooperation between Computer Logic A.E. and ΑΤΚΟ Computer Systems (Ζερβός 1985). This was actually a special purpose software-hardware configuration, with Computer Logic contributing on the software

side and focus on ΑΤΚΟ making available the matching hardware. According to Zervos, this configuration was a “mature fruit of the collaboration between the two firms” (Ζερβός 1985, 175). He acknowledged that the system appeared to be complicated. Zervos argued that this was not actually the case. ‘Pharmacom’ was actually more appropriate for large drug store facilities than for a small pharmacy.

A software product for small pharmacies was discussed in 1989 article by Aphrodite Papagianopoulou. It was called ‘Super Drug’ and it was available by the firm Info Design (Παπαγιαννοπούλου 1989). According to Papagianopoulou, computerizing the records of the products that were available at a pharmacy could result important improvement in pharmacy work. With ‘Super Drug’, pharmacists could know exactly what kind of products they had available. This could help them service their customers faster. Papagianopoulou enthusiastically wrote that “‘Super Drug’ was software to simplify, and, at the same time, accelerate even the most cumbersome and time consuming processors at pharmacy environment” (Papagianapoulou 1989, 207).

4.5 Computers in the Greek healthcare system – Perspectives of the medical community

Health Review is an inter-disciplinary periodical that was first published in 1989. It relates changes in medicine to policy issues for audiences that include physicians, nurses, dentists, pharmacists, medical technicians and healthcare administrators and professionals in general.

The introduction of computers into medicine was one of the subjects that those writing in this periodical gave considerable attention to in the years between 1989 and 1993. Several articles were giving overviews of the range of possible uses of

computers in the medical field.[38] In what follows, I chose to discuss three articles that were authored by teams of physicians from various Greek hospitals. The authors of the three articles were concerned with specifying how exactly computers would be best used in the Greek hospital.

In 1990, a team of Greek and Swedish physicians and other scientists published an article in *Health Review* that was focused on presenting the 'EGINO-DOIT' computerized system (Κούτης et al. 1990). This system has already being used in Sweden since the 1960s. In 1987, a Greek version was developed, through the cooperation between the Medical School of the University of Crete and Lund University. The *Health Review* article reported on the context of this development. According to the Greek and Swedish team of its authors, this program could be used not only to organize medical records, but, also, to provide physicians with statistical information that was crucial to the scientific research. This was especially the case with epidemiological studies and medical studies that took into account social parameters. According this 1990 *Health Review* article, the availability of this software made possible research that was previously unthinkable. The Greek-Swedish research team emphasized the importance of collaboration between various research groups from different areas and/or countries. In their opinion, the exchange of ideas, technologies and know-how was a valuable tool for the development of medical science (Κούτης et al. 1990, 32). They further argued that computerized systems like the 'EGINO-DOIT' opened up the opportunity for the development of

38 For more information about the overviews for the use of computers in medicine, as the Greek medical community presented, see: Παππάς, Κ. (1989). Η Πληροφορική στο Χώρο της Υγείας. *Επιθεώρηση Υγείας*, 1(1): 41-42, and Κανάκης, Γ., Ι. Κεσισόγλου, Α., Μπουνόβας, Γ., Φίλος, Κ., Σιμόπουλος. (1992). Οι Ηλεκτρονικοί Υπολογιστές στον Τομέα της Ιατρικής. Επιθεώρηση Υγείας, 3(17): 48-51

inter-disciplinary and multinational research groups. This could be based on the easy sharing of statistical data from various countries, which allowed for efficient construction of epidemiological maps and statistical tables.

In the following year (1991), a team of academic physicians and computer specialists from the University of Patras published an article in *Health Review.* In this article they described a computerized system for the electronic management of the university obstetrician-gynecologist clinic (Ματκάρης et al. 1991). In their opinion, a computerized system for a hospital department ought to combine two kinds of services. First, services that had to do with the administration of hospitals, and, second, services directly related to carrying out medical work. According to the authors of this article, the use of the University of Patras computerized system could limit the time that the medical staff had to spend with administrating obligations. The system was described as easy to use by anyone, even those who were not very familiar with computers. The article also outlined the possible use of this computerized system in the handling of statistical data and in providing educational services to the medical community.

All the articles considered above were referring to autonomous computer units, as opposed to computers that were embedded in other medical apparatus, i.e., computers that were sub-components of other medical equipment. For example, in the period under consideration most medical imaging technologies contained a computing sub-unit. Computer units that were embedded in broader medical machines/equipment also received some attention, usually in the form of paragraphs placed within articles that described these broader machines. For a flavor, I may refer to a 1992 *Health Review* article, which described a new version of an analyzer used at

a hematological laboratory (Αλεξιάδης et al. 1992). The authors of this article were at the 'Agios Pavlos' hospital of Salonika, Greece. The article was enthusiastic about this new analyzer, the use of which allowed taking it into account many more parameters of blood analysis in an efficient manner. The authors of this *Health Review* article were clear about the key-role that proper electronic computing equipment played within this new analyzer. In their opinion, the availability of a computing sub-component that offered rapid calculation was key to the study of several hematological parameters.

4.6 Conclusion

The introduction of computers in Greek healthcare systems goes back to the middle of 1980s. It was expected that computers could offer solutions to several problems, especially those connected with the work of physicians. Several software houses were developed in Greece in order to address the computer needs of public and private sector. The medical community got involved in the development of specialized software in the 1990s.

The technical community tried to introduce software through the use of terms that showed to demystify computers and to create a positive attitude against them. Most of the attention was saved for software that had to do with the management of physician work.

On the other hand, the medical community was also interested in the development of software that could help them in the medical work, in addition to helping them in the management/organization of their work. For example, they were interested in the development of tools for the statistical analysis of their data, which could help them with their research and other work. In the 1990s, the medical

community appeared less hesitant to experiment with the use of computers and with getting involved in the development of specialized software.

There seems to be an interesting contrast between the way the two communities –technical and medical- wrote about computers. The medical community was placing the emphasis on the production of special software, which could be of specific aids in the research and medical work. On the other hand, for software experts medical applications were only one of the many possible domains of the application of general purpose software.

Chapter 5

Conclusion

In this thesis I presented my findings regarding the introduction of representative new medical technologies in Greece, based on my study of the presentation of these technologies in selected Greek media (representing the medical, technical and daily press).

My first case study was focused on the introduction of medical imaging technologies in the Greek healthcare system and the Greek society more generally. My basic observation regarding the presentation of the medical imaging technologies is that most media never went in any depth in addressing the paradox of having such a large number of CT, MRI and mammography machines and so much dissatisfaction with the lack of proper access to them. The mushrooming of profitable private diagnostic centers has been treated as something natural, without wondering if it is normal for patients to expect to have access to them without a proven need. Journalists were very critical of the state health care system without pointing to the actors that were responsible for the problems with the way medical imaging technologies were incorporated into it.

According to the media accounts, this was due to the lack of an organized way of designing the introduction, the distribution, the installation, the maintenance and the use of medical imaging technologies across the country. According to the sources considered, this explains the overgrowth of the private sector against the public sector. The inappropriate integration of medical imaging technologies into the Greek

public healthcare sector was a decisive factor in the overall devaluation of public sector. The private medical imaging diagnostic centers are by now a rather profitable business in Greece.

My second case study concerns attempts at developing telemedicine in Greece. I identified two distinct periods: one lasting from 1989 to 1999, and one from 2000 to the present. During the first period, there was considerable enthusiasm regarding the development of telemedicine whereas during the second period there was much skepticism. Most of the articles that I studied were focused on reporting failures and on offering explanations about these failures. Journalists were also assuming that telemedicine was a well-defined and developed technology that could be immediately used in Greece. Journalists were enthusiastic about its prospects in Greece. They were referring to it in almost utopian terms. Their discussion of the failure to have the anticipated development of telemedicine in Greece is also abstract. In this case too, I observed a general criticism against the state that was not coupled by details on what ought to change, those responsible, etc.

At the same time, there were medical practitioners that doubted the very appropriateness of telemedicine. Physicians were generally more sceptical than journalists regarding telemedicine. The case of medical computing allows us to elaborate by detecting a difference between technologists and physicians. This case is based on a study of the presentation of the first attempts (1984 to 1993) at introducing computers into medicine. I presented the approaches of two distinct communities, the technical and medical community. The first attempts for the promotion of software to the Greek society started from the technical community. Technologists, like journalists, were very optimistic about the automatic use of

computers in medicine. In their articles, they used expressions like: “a new friendship was born”, “effective, easy to use, quite simple for all routine works, quick, and reliable” or “promises to easily tame the wild animal of bureaucratic and routine work that overwhelms every dental clinic”, which sought to demythologize the use of them and to create a fruitful environment for their acceptance. A few years later, the medical community started to warming-up about the introduction and use of them in medicine. In comparison to technologists, physicians wanted to be convinced about the workability and the usefulness of medical computing.

The eventual failure of telemedicine in Greece, against initial enthusiasm, is suggestive regarding the technology-society relationship. As it turns out, a proper geography (e.g. many remote islands) and the general availability of proper telemedicine techniques was not by itself enough to lead in the successful integration of telemedicine into the Greek healthcare system. According to the most critical views of those considered, a number of other prerequisites were not there: organized sustain support by the Greek state, health professionals that were willing to adapt to this environment, lack of coordination between health units, inflexibility when it came to ongoing training, shortage of encouragement to participate in innovative approaches, and tendency to work individually rather than in a team.

Based on everything that I have read, it seems to me that the lack of organized state efforts was also the reason behind the paradox that we find in the case of the introduction of medical imaging technologies in Greece. On the one hand, the number of installation in Greece has been uniquely large. Yet, on the other hand, because of the lack of proper planning by the Greek state there have been constant complains about inadequate access to them. Taken together the overgrowth of

medical imaging technologies sector in Greece, and the underdevelopment of telemedicine point to the importance of a proper overall institutional context for the success or failure of a new medical technology.

The lack of proper state policies affected the whole chain of the Greek healthcare system, from the state hospital to the state-supported insurance agencies. According to the sources considered, the decision of many Greeks to go to the private diagnostic centers in order to avoid long waiting lists at the state hospitals overwhelmed the budgets of the state insurance agencies (who had to pay for exams undertaken at private diagnostic centers). Noticeably, the cost of a scan in a private diagnostic centers is usually the double (and in some cases as much as ten times higher) than the cost of the same scan at state hospitals.

The lack of proper information by the Greek insurance agencies was presented as an additional reason for the disappointment of Greeks who were insured through the national healthcare system. In the case of mammography, we saw that many Greek women, and especially those who live in the countryside, ignored that their insurance agencies covered the cost of mammogram at state hospitals. More generally, this lack of information seems to have contributed to the limited use of preventive medicine in Greece. As we saw, Greek women downplayed the importance of the systematic checking of their health.

Regarding the physician–technology relationship in the Greek society, in all three case studies we saw that Greek physicians were not against the introduction new technology to the Greek healthcare system. However, the lack of proper conditions seems to have discouraged many physicians (as it clearly happened in the case of telemedicine) while it created serious problems in the proper use of medical

imaging technologies at state hospitals.

A general conclusion from the three cases that I studied, regarding the Greek media and how they selected to communicate medical technologies with the Greek public, is that the Greek media focused on a general talk about the use of medical technologies without elaborating on the problems that these technologies represented upon their introduction into the Greek healthcare system. Also, the Greek media refers to medical technologies either with enthusiasm for their possibilities, or with very 'catchy' expressions in order to create a positive climate for them in the Greek society and without mention the difficulties that maybe come up using these technologies. As a result, these three cases confirm the findings of Dimopoulos, Koulaidis, and Gogorosi about the normative mediation of Greek media in shaping the Greek public's attitudes about science and technology.

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