

Chapter 15

The Human Centred Approach to Bionanotechnology in Telemedicine: Ethical Considerations

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ABSTRACT

The information and communication technologies (ICTs) field is expanding rapidly and affecting several domains of mankind, as for example healthcare. Therefore, ICTs can act as an enabler or a provider these fields through telemedicine. Consequently, promoting an human centred and ethical approach is the primary challenge concerning ICT healthcare innovation. Simultaneously, can we deter- or at least discourage- innovation that serves malicious ends, or that causes serious threats to humanity? So, the purpose of this contribution is to discuss the relationship between ICT evolution and healthcare, particularly concerning a specific correlated research fields: bionanotechnology and telemedicine. For that, the authors will focus in its applications, and sort of ethical and moral dilemmas encompasses.

INTRODUCTION

Innovation by tradition was viewed as a linear process: from basic research to technology progress, test/evaluation, demonstration, deployment, commercialization, and ultimately, market penetration. And possibly, if successful, market saturation,

obsolescence, and finally substitution. Human (and social) factors- needs, desires, demands, behaviour- were considered either not intuitively, anecdotally, coincidentally, mechanically, and often reactively. Innovation was firstly defined as hard science, engineering, and production, with marketing and sales trailing behind, as “army camp followers”. Therefore, the primary challenge to promulgate

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a more human centred and ethical approach to manage and account for innovation is:

- Can we encourage innovation that adds net social value? That is, whose benefits clearly outweigh its costs?
- At the same time, can we deter—or at least not encourage—innovation that serves malicious ends or that causes serious threats to humanity?

Plus, it seems obvious that healthcare innovation have huge benefits from ICT; however, such technologies have the ability to affect positively and negatively patients, and so society must investigate their impacts, namely in telemedicine. Nevertheless, the main purpose is to approach bionanotechnology as a research field. But, how can we define bionanotechnology? As we will demonstrate, such concept is still an ongoing debate, and for that we need to address two levels of arguing:

- What is biotechnology? Which are its applications, particularly medical applications? What ethical and moral dilemmas arise?
- What is nanotechnology? Which are its applications, particularly medical? What ethical and moral dilemmas occur?

Biotechnology can be broadly defined as the condition of using organisms or their products for commercial purposes. It has been used into food, crops or domestic animals; but, recent developments in molecular biology have given biotechnology a new meaning, prominence, and potential. It is (modern) biotechnology that has captured the attention of the public, and of course encompasses a great deal of ethical and moral dilemmas.

Nanotechnology is the creation of functional materials, devices, and systems through control of matter on the nanometer length scale, the

exploitation of novel properties and phenomena developed at that scale (Bonsor, 2002). Throughout literature it is possible to find several examples of nanotechnology applications: giant magnetoresistance in nanocrystalline materials, nanolayers with selective optical barriers, nanomedicine robots, etc. (Institute of Molecular Manufacturing, 2003). Concerning the possible and moral dilemmas of such technology it is usual that philosophers, ethicists and many scientists frequently speak as if such objects will exist in a nearly future, but in fact they already exist which clearly creates a policy vacuum (Moor, 2001).

Only after such discussion is feasible to acknowledge the aim of your contribution: how can we define bionanotechnology as a research field? Which are its medical applications? What sorts of ethical and moral dilemmas are involved? And, could the level of such dilemmas be a sum of biotechnology and nanotechnology, or imposes new challenges?

BACKGROUND

E-health Versus Telemedicine

ICT have been developing rapidly for several decades now. Thus, the health sector has witnessed the creation of a vast number of applications:

- **Telemedicine:** Which is leading to a radical change in medical practices and in practitioner/patient relationship
- **E-health:** Which provides sources of information and new services for practitioners and patients
- **Smart cards:** Which allow claim forms to be sent electronically and may, in the middle term, be used for other services and procedures

Accordingly, previously to our stream analysis we need to debate some important features: un-

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