Uses of Interactive Devices such as Artificial Intelligence Solutions for the Improvement of Human-Computer Interactions through Telemedicine Platforms in France

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Introduction

Health is an essential sector in the digital transformation of our society, using interactive devices.

Isaac’s report = transition from curative to more predictive medicine.

Villani’s report = importance of Artificial Intelligence.

Importance of social and territorial inequalities in health “Medical deserts", with issues of traceability of care acts and health pathways, with telemedicine.

We first define our scientific position and the methodology used.

Then we present the use of data in telemedicine and Artificial Intelligence data processing.

Observations on AI applications in telemedicine through cases analysis.

Effects of the combination of the two technologies.

After a discussion finally, we give a conclusion focusing on main challenges tackled and perspectives for future works.
Research-action approach, this paper associates two researchers, one with a university position and the other with a more consulting position and implication in experimental activities.

Back and forth between theory and practice, by comparing practical results with theoretical issues, to produce knowledge for action.

Interdisciplinary field of information and communication sciences, in the perspective cf. F. Bernard articulation of the four dimensions of links (relationships and interactions in a systemic dimension), meaning, knowledge and action.

Complementarity of information and communication: importance of information to shape organizations / communication to foster change with cooperative dynamics.
An ICOE Approach: Information and Communication Organizing Ecosystems (Organizations, Groups, Territories, etc.).

Articulation of Economic Intelligence and Quality without forgetting the innovation dimension in process approaches.

Notion of situation (activity, management, information, communication, etc.) cf. Goffman, Girin with all the ambivalence of technology.

Tensions = in favor of new uses of digital technology to improve patient services (Vallancien) / standardization cf. “uberization” (National Board of Doctors).

"Situational and interactionist semiotics" (Mucchielli) integrating the dimension of emotions and leadership and trust building in complex projects.
Technological advances impacting healthcare and the magnitude of disruption

<table>
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<tr>
<th>Technology (Digital Medicine, Genomics, AI &amp; Robotics)</th>
<th>Proportion of workforce affected</th>
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<td>1. Telemedicine</td>
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<td>2. Smartphone apps</td>
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<td>3. Sensors and wearables for diagnostics and remote monitoring</td>
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<td>4. Reading the genome</td>
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<td>5. Speech recognition and natural language processing (NLP)</td>
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<td>6. Virtual and augmented reality</td>
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<td>7. Automated image interpretation using AI</td>
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<td>8. Interventional and rehabilitative robotics</td>
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<td>9. Predictive analytics using AI</td>
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<td>10. Writing the genome</td>
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3 - The Use of Data in Telemedicine and the AI Data Processing

**Use of Data in Telemedicine**

**Five situations** or types of telemedicine: tele consultation, tele expertise, tele monitoring (for chronic diseases), tele assistance and medical answers for emergency regulation.

Considering **different types of patients** especially dependent elderly, patients with chronic diseases, outpatients after surgery in hospital.

Telemedicine **platform** as a connecting device.

Teleconsultations = instantly interactions between the patients and the doctors for providing services: medical appointment, collect of the patient’s agreement, stakeholders’ authentication, diagnosis and medical report, prescription (for drugs, etc.), data recording, billing and payment processes.

Integration of the **EHR** for adding data and the report of the teleconsultation, with eventually the telemedicine video record.
Preventive medicine
- Monitoring of connected devices
- Anticipation of chronic episodes
- Personalized advice for the quality of life

Clinical research
- Review and overview of publications
- Screening of molecules
- Epidemiological observation

Aid for diagnosis and healthcare
- Assistance for diagnosis
- Automatic analysis of medical imaging
- Review of the healthcare record
- Recommendations for treatment

Medical virtual assistant
- Monitoring of home care
- Preparation of consultations
- Coaching of patients
Machine learning, deep learning:

Implementation of EHR in hospitals and the extension of Information Systems (IS) AI solutions strengthen the evolution towards a personalized, preventive, predictive and participative medicine.

Mass production of healthcare data:

Human-Computer Interactions linked with the patients’ empowerment.

A more global approach towards the determinants of healthcare.

Integration not only medical, but social, psycho-social information.

Different uses of AI:

Retrieval of the Appropriate Information
Automatic Analysis of Medical Imaging
AI Advice for Prescriptions with Machine learning algorithms.
4 - Observation of AI Applications in Telemedicine

**Analysis of New Trends for AI in Telemedicine**

Especially for the patients’ orientation.

Data collection before a consultation

The example of Lemonaid Health.

Personalized **Diagnosis** Support

The telemedicine application Ada Health (Germany)

A Case Example of Telemedicine Using AI:

MédecinDirect as is a telemedicine platform

Analysis Based on the Reasons for the Consultation

Decision Support System
5 - Effects of combining telemedicine and AI technologies

The Impacts for the Doctors

Complementarity of AI and telemedicine.

AI contributes to securing the whole process of a teleconsultation.

The New Scopes for the Patients

Development of teleconsultations not only results of recent changes in regulation and of the context of “medical desertification”, but also of the patients’ current needs.
6 – Discussion

The interactive devices studied (AI, telemedicine) are very promising and should constitute major levers of the digital transformation to make the health system evolve from a purely curative and fee-for-service medicine to a more preventive medicine cf. Isaac’s report.

But with the ambivalence of technology (Ellul).

In France, engineers have always occupied a privileged place, with the risk of technological "solutionism" and only technocentric approaches.

Importance of integration of new project management methods (known as "agile").

Method to develop trust in complex projects as the Fears - Attractions - Temptations (FAcT) - in Mirror method (Le Cardinal).
“Medical deserts" being also *digital deserts* with specific work on **AI and rurality**, data and weakened territories or smart cities and smart territories.

Another essential aspect about **evaluation** of the impact of these new devices and their **added value** in improving services for both health professionals, patients and their families with the notion of "**health democracy".

A new “**territorialization**” of health management, with the affirmation of “**Healthcare Interface Organizations**” – HIO (Healthcare Networks, multi-professional healthcare centers, home hospitalization, etc.) to overcome the **barriers** between primary care sector and the hospitalization sector.

New **coordination professions** and also to give meaning to data, not only data scientist but also human data mediation.

Not forget the **human dimension** of healthcare (M.J. Thiel).
7 - Conclusion

**Complementarity** of AI and Telemedicine.

With the rise of more uses in telemedicine, we are witnessing a new step in the **transformation** of the healthcare system, with major challenges to overcome. In a context of Augmented Man and Everything is Internet.

The digital process in telemedicine is based on a **Human-Computer Interactions**, both requiring and producing data and exchange them. The use of AI strengthens the requirements of the information systems **interoperability**.

Implementation of AI solutions = also complex **ethical questions** about the use of medical and behavioral personal data (privacy), with the upcoming extension to genetics. From an ethical point of view, beyond the patients’ free consent, the use of their healthcare data mandates a differentiated exploitation according to their sensitivity.
Opportunities but also risks (ambivalence) with temptations to use AI for services to patients without any human interaction: risk of any only “solutionist’ approach, but medicine is managing human beings and not only materials or connected objects.

Importance of these challenges shaping the whole future of our society. Health is an essential sector to observe the issues and challenges of the digital transformation of our entire society.
Thank you very much for your Attention!

Questions?

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Abstract

The health sector, like all sectors of our society, is strongly impacted by digital transformations. We propose to consider it through new uses of Interactive Devices in the scope of Artificial Intelligence (AI) solutions for the improvement of Human-Computer Interactions, principally through Telemedicine Platforms in France. First of all, we define our scientific position and the methodology used. Secondly, we present the use of data in telemedicine and Artificial Intelligence data processing. Furthermore, we consider observations of AI applications in telemedicine, through cases analysis. We then analyze the effects of the combination of the two technologies. We discuss the main challenges of this digital transformation with the risk of a "solutionist" and "technocentric" approach, sometimes forgetting that health is above all based on a human dimension and interactions. We also outline the question of territories. Finally, we give a conclusion focusing on the main challenges undertaken as well as provide some perspectives.