How does digital transformation contribute to reinventing organizations in the largest European hospital (AP-HP)?

Martin HIRSCH, CEO, AP-HP
AP-HP, a European world-renowned university hospital

39 hospitals
A public health service for everyone, 24/7
Operating budget of €7.5 billion

100,000 staff members including 23,500 doctors (mostly highly specialized, associating hospital practice with university research).

21,190 beds: 12,000 for acute diseases and 9,190 for rehabilitation, psychiatry & long-term care
1.3 million admissions per year: 335,000 surgeries, 2,400 transplants, 38,000 births

178 reference centers “rare diseases” (out of 363 on national level, 49%)
AP-HP is a reference for specialized and excellent care in many fields. The 23,500 AP-HP doctors are mostly highly specialized, with an advanced level of qualification obtained through hospital practice associated with university research.

For them, working at AP-HP, also guarantees access to cutting-edge biological laboratories and high-performance technical platforms.

Medicine at AP-HP is a special state of mind – a symbol of the French school of medicine and surgery – acquired during residency. It promotes leadership, initiative and progress in medical knowledge. With its multidisciplinary hospital teams, the AP-HP provides recognized expertise in every medical and surgical field.

All AP-HP hospitals are committed to guaranteeing maximum safety in patient care and are accredited by the French National Authority for Health (Haute Autorité de Santé).
- AP-HP professionals account for more than 8,000 publications in peer-reviewed journals every year, especially in the field of clinical research.

- AP-HP led more than 3,400 research projects, of which over 100 were of international range, accounting for 40% of medical research publications in France.

- It maintains almost 500 international patents, with a comprehensive licensing policy with strong outreach towards small or large businesses. It has strong partnerships with French universities and research bodies.
A deep transformation is needed in the context of major challenges:

- **Reorganization of the whole hospital system in France**
  - Concertation challenges
  - Creation of public hospital groups

- Maintaining a **high level of attractiveness** in a very competitive environment for healthcare professionals as well as patients

- **A highly constrained environment** in financial and organizational terms: the desired improvement of services must come to fruition while **controlling the costs**
Digital transformation is a major axis of our global transformation plan

**AP-HP transformation plan 2019-2023**

- Conduct major new operations changing structures and organization
- Adapt our organizations to care and research evolutions
- Regain attractiveness among patients and in the territories
- Strengthen teamwork and human resources management

- Strengthen health product costs control and optimize our purchasing, logistics and technical sectors

**4 objectives:**

- Fluidify
- Secure
- Optimize
- Innovate (datas)

- Secure, build and diversify our revenues
- Accelerate digital transformation
The hospital is transformed, the IS is centralized through robust solutions such as ERP: SAP, Orbis ...

- Hospital world confronted with profound transformations for several decades
  - Improvement of services rendered to the patient in a constrained environment in financial and organizational terms
  - Requirement of continuous improvement of performance
  - Establishment of regional hospital groups

- Digital = strong innovation vector
  - The hospital is in deep technological transformation on its uses

The hospital IS lives its mutation through a light computing - independent software for some in hospitals

This mutation requires the implementation of a solid and agile information system because all actions performed in hospitals call on the IS
At AP-HP, the Patient is at the heart of this digital mutation ...

- **Digital transformation through innovative technologies and evolving processes to:**
  - Facilitate access and management of the patient in the hospital
  - Simplify your care path, streamline the administrative circuit
  - Support the evolution of medical and hospital care organizations for the purpose of efficiency while ensuring the medical safety of the patient

- **Implementation of ambitious projects, while taking into account the security of health data**
  - Health Data Warehouse
  - Information Portal for Patients and Healthcare Professionals
  - Computerized Patient File that groups all medical data for all hospitalizations, consultations and emergency calls to the AP-HP based on a unique identifier for each patient
    - Better reliability of information, better fluidity for the AP-HP medical teams concerned thanks to innovative and powerful tools
  - Connected machine
  - Computerized prescriptions, computerized care
  - Security (video, SIEM, intrusions, ...)
  - Management of patient meal trays
  - Management of computerized appointments
  - Robotic pharmacy, computerized labs and imaging
  - Communications to hospitals outside the fluidized APHP, from city offices, laboratories outside the AP-HP
Digital transformation: rethinking 10 experiences for patients and healthcare professionals

Patients:
1. Reach the hospital
2. Make an appointment
3. Register in maternity ward
4. Complete pre-admitting process

5. Be greeted and guided in the hospital

Healthcare professionals:
9. Speed up the flow of information
10. Get an easier access to the patient file

6. Pay for their care
7. Access their patient file
8. Interact with caregivers

Care units & centres
Reception
Counters
Admissions
Standard
For each project:

Service commitments
A positive view of digital transformation, firstly driven by service commitments towards patients and professionals. Key figures are defined to set goals and reach them.

Better work conditions
Our professionals’ work conditions must benefit from these new tools that enable them to refocus on their core activities and free time up for high added value tasks, closer to patients and their relatives.

Economic performance
The projects ensure their viability and respect the institution’s economic constraints. Notably, each project must anticipate and guarantee its return on investment.
More than a list of projects, we are designing a global and integrated program

Interconnected projects that need one another to happen:
Numeric tools serving the work organization

- Zero paper
- Archive functions
- Reception / secretariat / orientation functions
- EPR: ORBIS
- Online appointment making
- Vocal recognition
- Online reports consultation
- Secured messaging
- Treatment offer readability
- Telephone switchboard
Services to patients: a multi-channel approach

Teleservices diffusion on diverse media is ready or under development

The mobile app
- mainstream teleservices-
  Treatment offer readability
  Online appointment making
  Online pre-admission
  Online payment

The patient portal
- secured teleservices-
  Maternity ward registration
  Online pre-admission
  Online payment
  Medical reports inquiry
  Medical surveys

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Digital transformation induces a better attractivity

For caregivers

For our 39 hospitals and their professionals:
- Better work conditions
- Time saving, tasks optimization, productivity
- Refocus on core activities, renewed motivation
- Sharing and securing information
- Research development

Connexion with other stakeholders in the city (Caregiver portal under development)
- Fluent and secured information flow

For patients

- Higher treatment offer readability (website redesign)
- Time gain (patient portal for online procedures)
- Simplified care pathway
- Smoother administrative circuit
- Easier access to the hospital and care
- Better patient experience (better caregiver-patient relationship, less anxiety…)
- Shorter time spent in the hospital
Data Driven Strategy and value creation

- Epidemiological research on hospital cohorts
- Interventional research support
- Artificial Intelligence & Innovation
- Partnerships

Management
- Hospital Management - KPI dashboards

- Safety (drug safety, patients’ adverse events …)
- Training
A translational an unique Data Lake

- PACS: MRI, CT...
- LIMS: Lab Results, Biology
- EHR: Patient Demographics, Visits, Diagnosis – ICD 10, Procedure, Medication
- Genomics
- Patient Reported Outcomes

- >8 million Patients
- 20 million Medical Records
- 13 million Medical Acts
- >10 million Diagnosis
- 1.5 billion Lab. Results
- 50 million Medical Reports

Environmental Data
Value Creation and Digital transformation socle

Open Data

Data access for numerous applications

WS–REST/API

IA and partnerships

R&D

Clinical Research support

Raw Data

Data Lake

Processed, Standardized, Use Case Specific Data

Data Valorization

$ Management

Innovation

Consumption Pattern
Data-driven innovation for value-based care

- Score calculation
- Predictive signals identification…

- « Patient or MP is automatically notified of medical risk
  - Integration in a dedicated care pathway

- Integration of different data sources

- MP adapt the course of treatment
  - Incidence of disease decreases

Analysis & Interpretation

Knowledge integration

Data integration

Evaluation of professional Practices

Towards a learning Health System
Ambitious projects following the same trends as the CIO’s of the private sector

- **Information System (IS) without borders:**
  - Implementation of Agile & Scrum methodologies, Devops ...
  - Integration, deployment, monitoring of our applications
  - Switch from monolithic architectures to microservices
  - Open Data initiatives
  - Implementation of a patient portal to give access to medical records and on-line administrative procedures (pre-admission, appointment booking, payment, PRO...)

- **An exploitation of Dark analytics – big data**
  - Use of big data technologies and construction of a data analytics platform with high computation technologies
  - More than 40 on-going research projects focused on the implementation of 4P medicine:
    - Fracture prediction for osteoporosis patients at 3 years by analyzing bone densitometry scores during routine abdominal scans
    - NLP extraction pipelines for medical reports
    - Work on deep learning algorithms for imaging analysis (tumor detection in breast cancers)
    - Emergency Room attendance prediction for hospital management

  - Working at the national level to build a National Rare Disease Databank to improve the management of rare diseases
Impacts of this change on the AP-HP CIO

The Digital Department to ensure the success of these mutations must be able to:

- Guarantee the solidity of the entire IS, urbanize the IS, adapt the IS to meet the needs of the hospital's professions
  - Diminish the number of solutions
  - IT flexible and agile

- Rely on solid and secure architectures for its infrastructures
  - Set up industrial devices to cover an operational IS at any time without disrupting the use of the IS by the hospital
  - Consolidating data center

- Rely on the rules and best practices
  - Processes are fundamental to the construction of a professional and efficient IS through proven methods: CobIT, ITIL, CMMI, Lean six sigma, Iso27001 ...
  - Up-to-date software licenses - do not wipe down with the latest versions but manage obsolescence

- Measure IS performance, implement effective monitoring
  - Indicators of availability, activity, infrastructure performance, Application Performance Indicators, Critical Flows

- Measure the performance of the IT department through the processes
Implementation of transformation plan within the Digital Department

- **Cost control, often the first goal of Digital department transformation plans**
  - Control of operating expenses by better visibility, exit of investments - induced by the evolution of the business model of the builders and the publishers towards a rental mode "As a Service"
    - Migration to the Cloud
    - Outsourcing of services with lower added value - office support, management, operation of infrastructures, hosting

- **Identification of projects contributing to the transformation plan on the various identified areas of earnings** (cost control, provision of new uses, commitment and communication on performance indices)

### Cost
- Optimize the management of IS obsolescence
- Lead technological transformations
- Reduce application and infrastructure assets, and better manage demand (commissioning, commissioning)

### Use
- Implement new solutions and adopt new uses
- Set up service contracts - measure, engage
Digital transformation requires a substantial investment…

But a significant return on investment by 2023 is expected

- **Efficiency**
  - About 37 M€ payout by 2023

- **Research & Innovation**
  - Database enrichment

- **Reinforced strategic management**