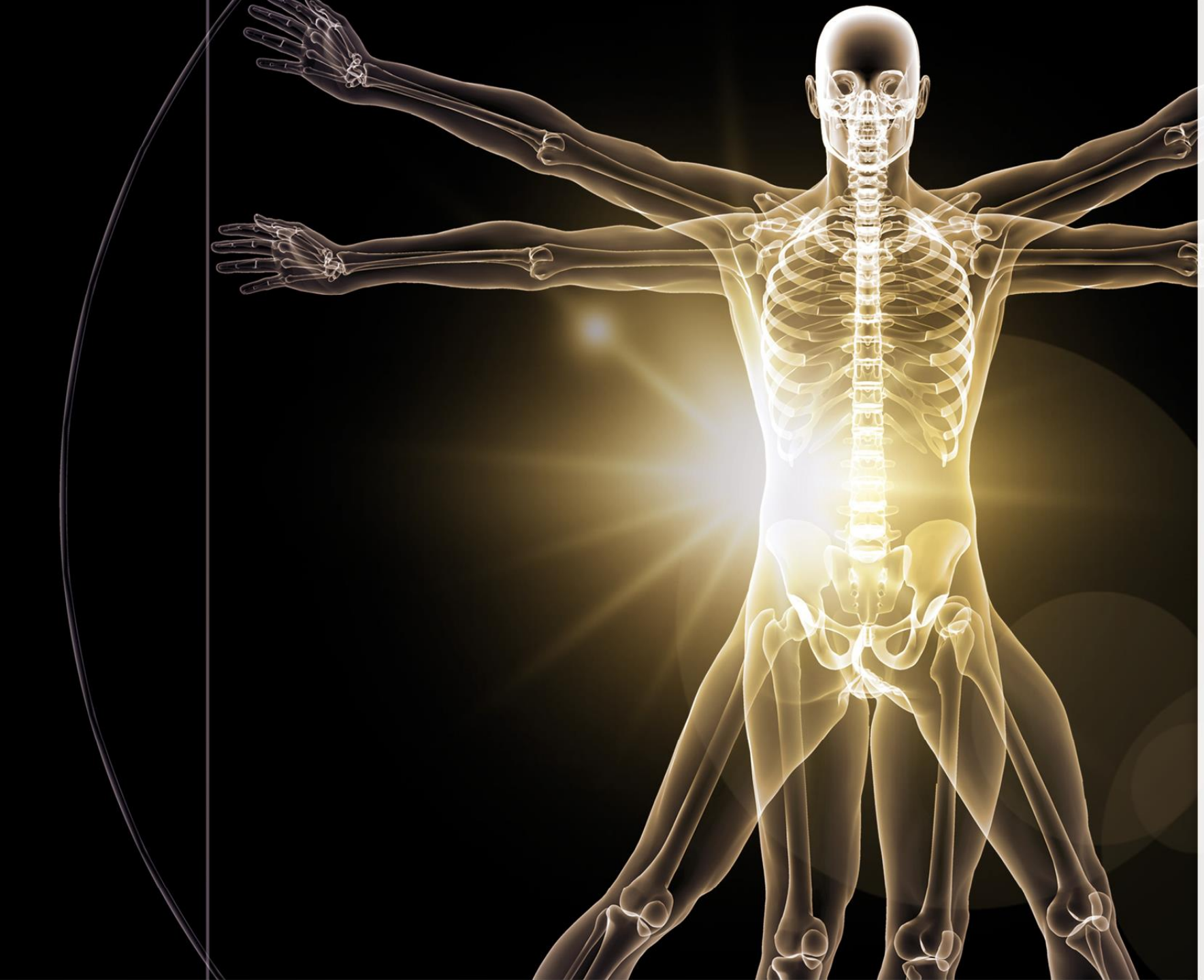

IS3R 2023

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Service: The Hidden Cost

CHARITÉ
UNIVERSITÄTSMEDIZIN BERLIN

Service - The Hidden Cost: Maintenance of Imaging Equipment – How do we make machines more reliable and service faster?

Bernd Hamm
(with the help of Maria Kuhn and Mathias Goyen)

Hidden cost from another perspective …

Service per year:
25.000 $

Tire set:
38.000 $

Rim set:
50.000 $

Brakes:
44.000 $

Importance of Maintenance for Imaging Equipment

Proper maintenance is crucial for equipment performance and patient safety.

- Regular maintenance is essential for longevity and reliability of equipment
- Poor maintenance leads to equipment failure, higher costs and loss of efficiency of imaging procedures (… and to an unsatisfied customer)

Challenges with Current Imaging Equipment

Maintenance challenges impact on patient care and revenue.

- Frequent breakdowns lead to extended service **downtime**
- Backlog of **patients waiting** for scans
- Longer waiting times for patients and **less revenue** for the provider (radiologist, clinic)

The Need for Faster Service

- Rapid service is critical to **minimize downtime** and prevent the loss of revenue
- Delays in service can cause disruptions in patient care, such as delayed diagnosis and treatment
- To ensure faster service, customers may consider working with **third-party maintenance providers** who can offer onside service and quick turnaround times for repairs

Ways to Improve …

…… the traditional approach

… Reliability

- **Frequent** preventive maintenance, cleaning, and part replacement
- Regular diagnostic **checks** to detect issues early

… Service Speed

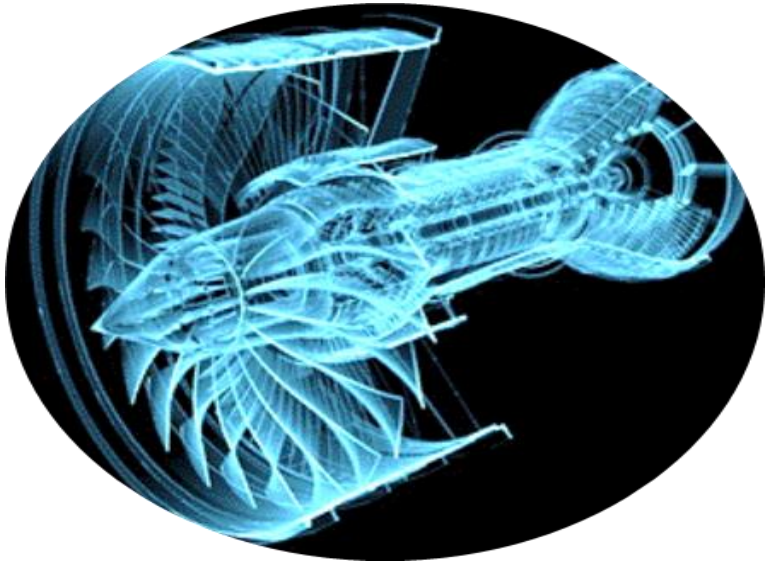
- Different levels of service conditions
- Adequate training and resources for service providers

Ways to Improve …

…… the (digital / AI) approach: „Predictive Performance“

Jet engine

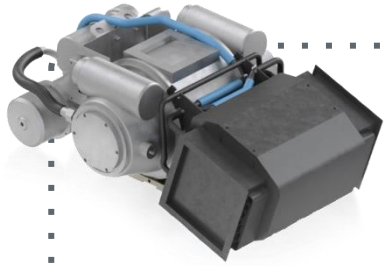
Integrated sensors collect data in real-time



Self-learning system allows predictions

from GE HealthCare

Tube Watch … Predict the Performance (“smart remote”)



Real System

High Voltage

Filament

Calibration

Filament Aging

Calibration

Stability

Spits

Anode

Rotation Speed

Friction

Beam stability

Housing

Oil Temp

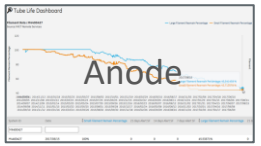
Cooling

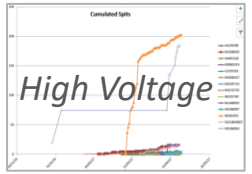
Oil Pressure

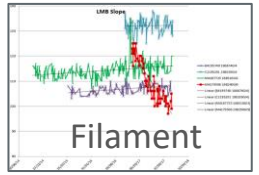
Virtual System

Use digital twin and machine data to create a unique virtual CT tube model, based on a 10-day period in which CT tube information is captured. By collecting information on a daily basis, we compare XR tube aging to the virtual model to predict the estimated remaining life based on:

- ✓ HV stability
- ✓ Filament life
- ✓ Anode rotation
- ✓ Housing







HV stability

Filament Life

Anode Life

Housing

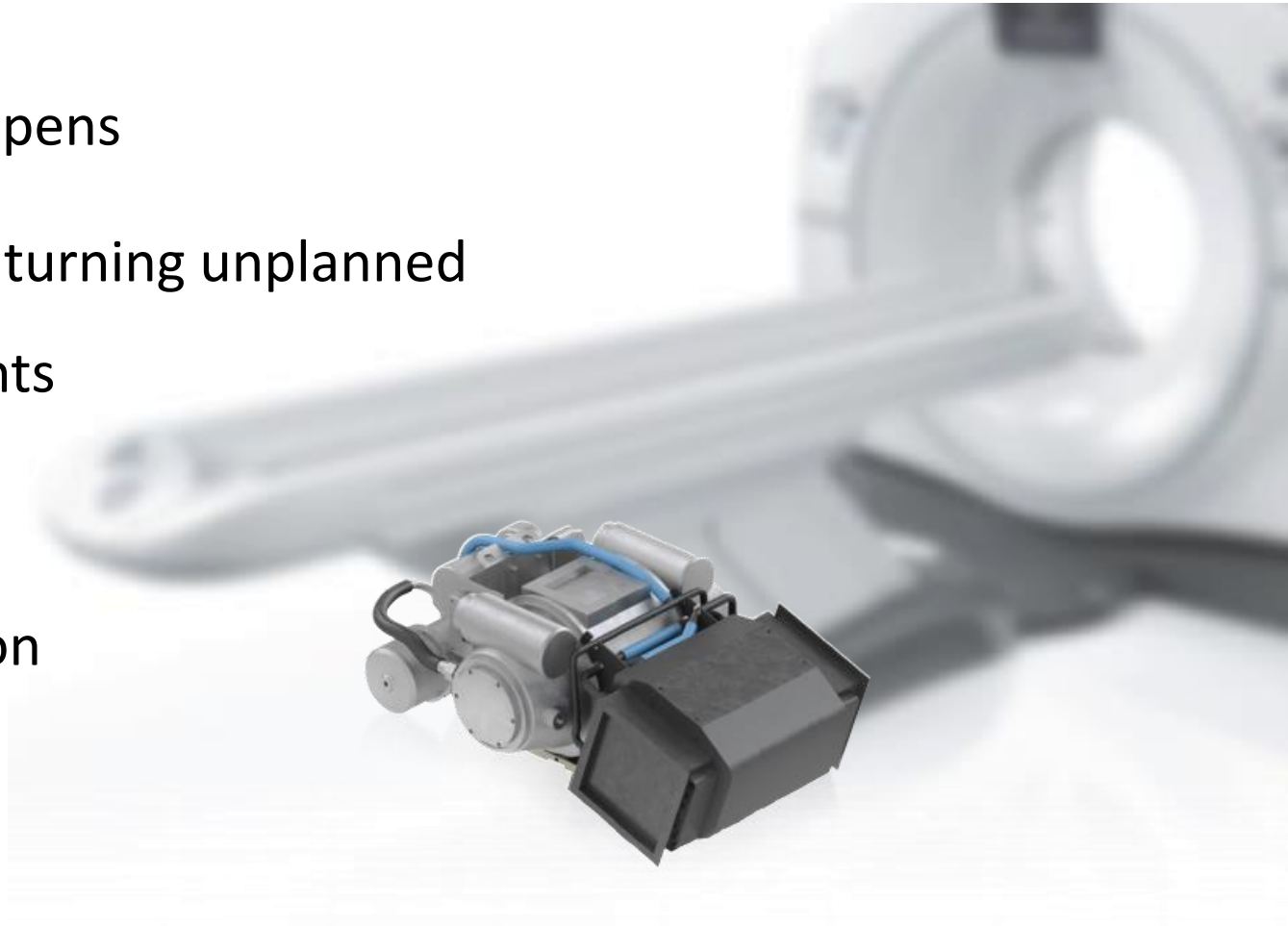
Prediction

If the algorithms identify a potential failure, GE is well positioned to provide proactive part delivery and service scheduling, which can help reduce tube-related downtime by up to 75 percent.*

CT Tube Life Calculation

*Results may not be typical of every customer’s experience.

- **Anticipate** tube failure before it happens
- **Schedule** tube delivery and service, turning unplanned downtime into planned service events
- **Reduce** operational disruption
- **Enhance** patient and staff satisfaction
- **Challenge:** GDPR



In part from GE HealthCare

Financial performance

- Maintain exam revenue
- Optimize labor costs

Operational efficiency

- Minimize workflow disruptions
- Decrease stress for the staff
- Reduce mistakes due to overtime fatigue

Patient satisfaction

- Less exam rescheduling
- On-time diagnosis
- Less patient stress

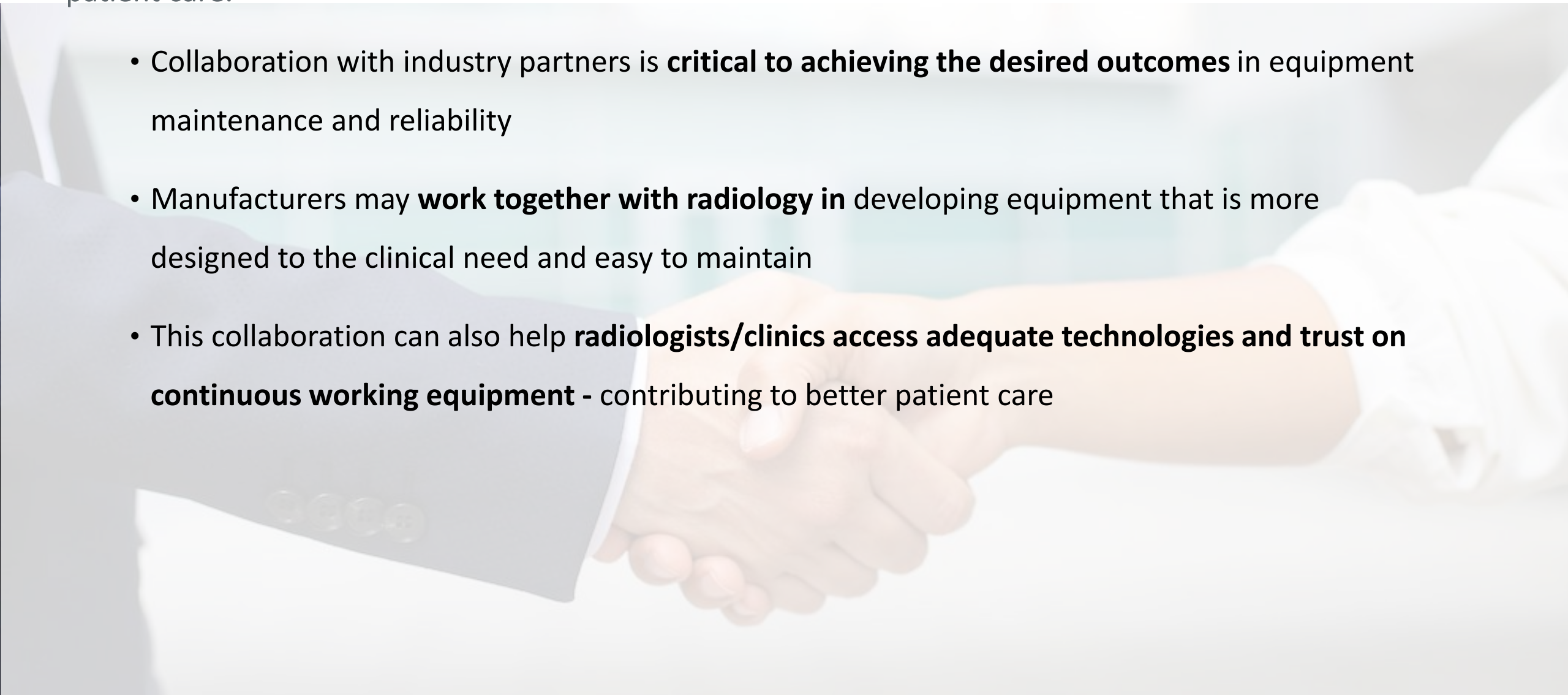
Challenges in a Fast-Changing Environment

We are facing more and more challenges and we need to be prepared.

- **Rising energy cost:**
  The cost of energy, particularly fossil fuels, is increasing rapidly.
  This can impact the cost of operating imaging equipment.
- **Unstable energy supply:**
  Power blackouts are becoming more common due to aging infrastructure and extreme weather conditions. These disruptions can impact the availability of imaging equipment, leading to delays and cancellations of patient appointments.
- **War and political instability:**
  Conflicts and political instability in certain regions can impact the supply of energy and critical materials used in the manufacture of imaging equipment.

Collaboration with Industry

Collaboration is essential for ensuring reliable equipment performance and better patient care.



- Collaboration with industry partners is **critical to achieving the desired outcomes** in equipment maintenance and reliability
- Manufacturers may **work together with radiology in** developing equipment that is more designed to the clinical need and easy to maintain
- This collaboration can also help **radiologists/clinics access adequate technologies and trust on continuous working equipment -** contributing to better patient care