ARAB bioclinic 3
BIOMEDICAL & CLINICAL ENGINEERING

The 3rd International Conference
**ON Biomedical & Clinical Engineering**

# Clinical – Medical Engineering

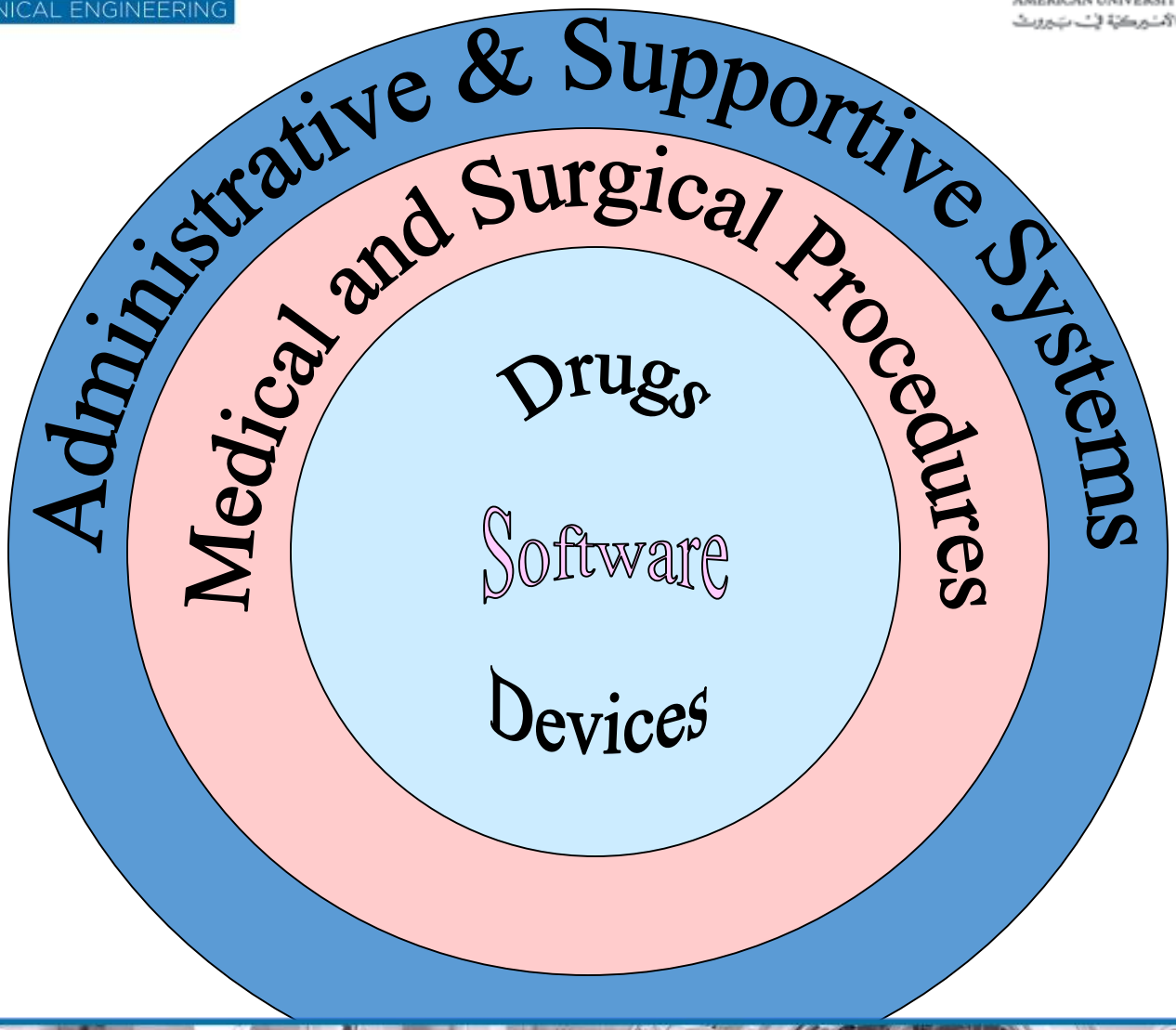
## *New Paradigms*
## *New Challenges*
## *& AUB Experience*

**| Bassam Tabshouri**

# Outline

1. HealthCare Technology
2. New Paradigms- New Challenges
3. Medical Engineering Interfaces- Topics
4. Our Experience at AUB
5. HTMA
6. Final Words

# Healthcare Technology
(WHO)



# Healthcare Technology (WHO)

A tool to:

* *Prevent*
* *Diagnose*
* *Treat*
* *Rehabilitate*

# Different Paradigm

A clinic, polyclinic, and a hospital can be considered as a Technology

# Challenge 1

## Information & Knowledge Transfer

A hospital is
an organization
that knows how to do things

Sidney Winter

# Challenge 1

## Information & Knowledge Transfer

# User Errors: Lack of Training

*70%* of accidents with OR Clinicians involving a medical device are due to "user error" or "incorrect technique"

*ECRI Alert H0297: Insufficient Operating Room Technology Training for Clinicians may Put Patients at Increased Risk of Harm*

# Different Paradigm

# The most dangerous places to be in USA


No. 3 killer : preventable medical errors

Cost $1 trillion

Deaths 250,000

*Year 2015*


500 jumbo jet crash/ year

i.e. more than 1 crash daily!!!

# Challenge -1

Why don't "knowledge & practices" transfer properly?

* *Absorptive Capacity of Recipient (& viscosity)*
* *In-house best practices take of 27 months*

*Dr. Gaberial Szulanski (INSEAD)*

# Challenge -2

## Information & Knowledge Transfer- How to Filter?

**Information inflation:**

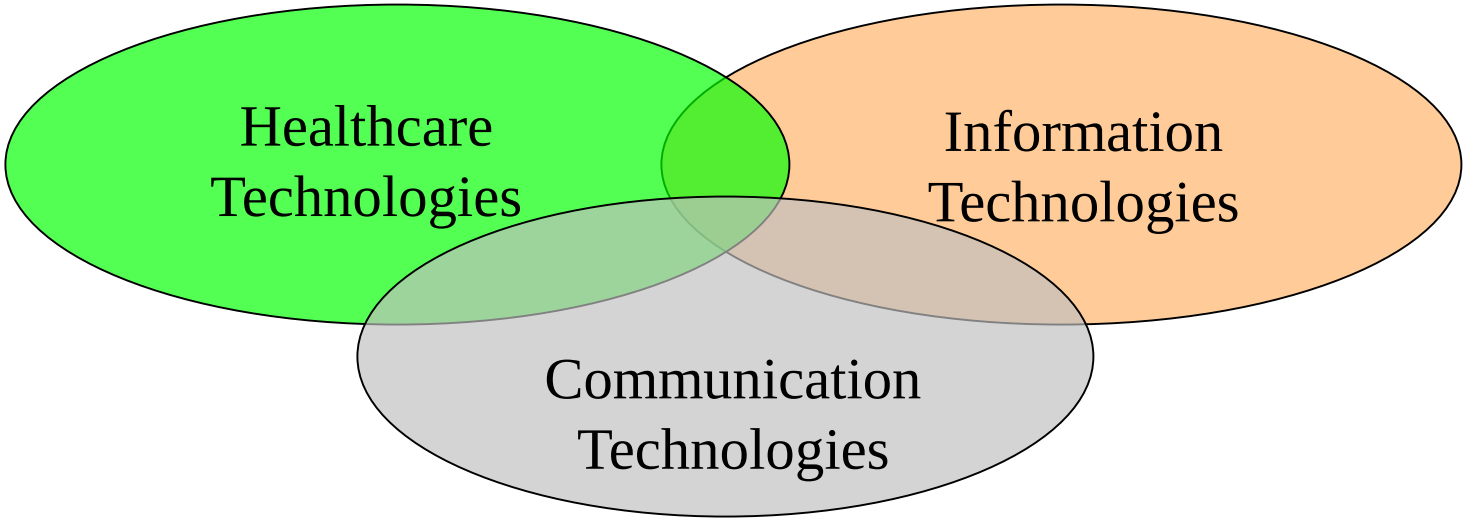
**3-5 million articles in**

**20-30 thousand journals**

***SBU (Dr. Schersten, 2000)***

# Challenge -3

## Convergence of Technologies



# Challenge -3


# Bugs & Security Problems

Software Bugs-Viruses- Security- Backups & Networks- Communication Failures

# Challenge -3


# Bugs & Security Problems

4,000 daily ransomware attacks in 2016!

*US government report*

MEDICAL DEVICE CYBER SECURITY:
Protecting our Devices in an Unsafe World
*Danielle McGeary, MS BME, Chief, Clinical Engineering*
*VA Boston Healthcare System*

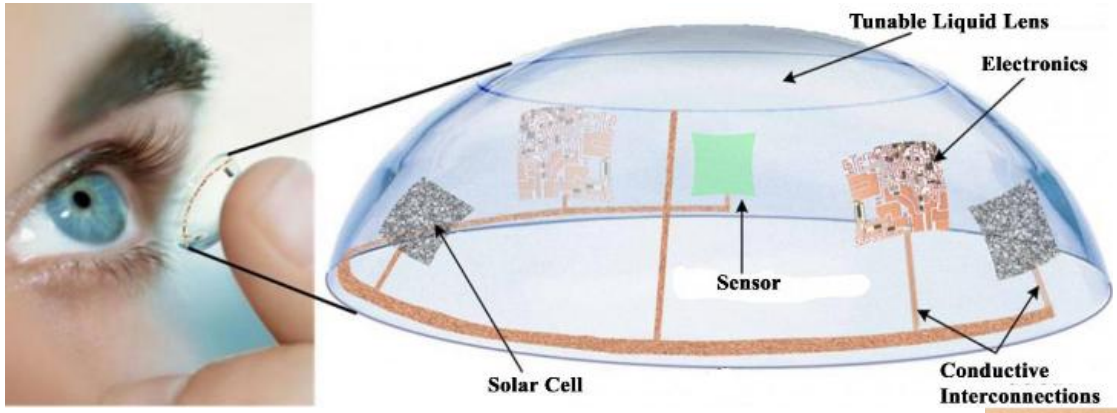
# Challenge -3

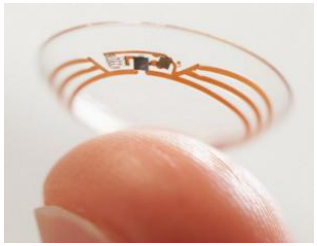

# Bugs & Security Problems

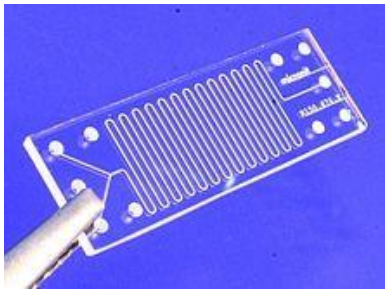
Over the course of 24 hours beginning August 30 (2017), there have been 20 million attempts at a ransomware attack through an email attachment

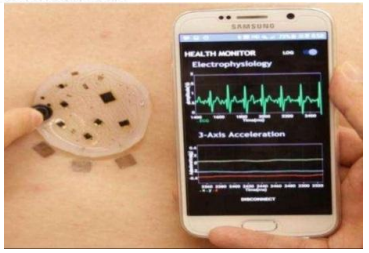
http://www.healthcareitnews.com/news/cybersecurity-firm-warns-20-million-active-ransomware-attempts-last-24-hours Sept 4, 2017

# Challenge -4
# Technology Trends

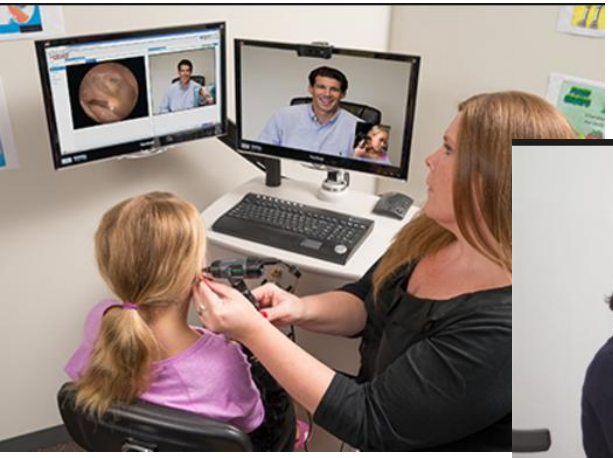


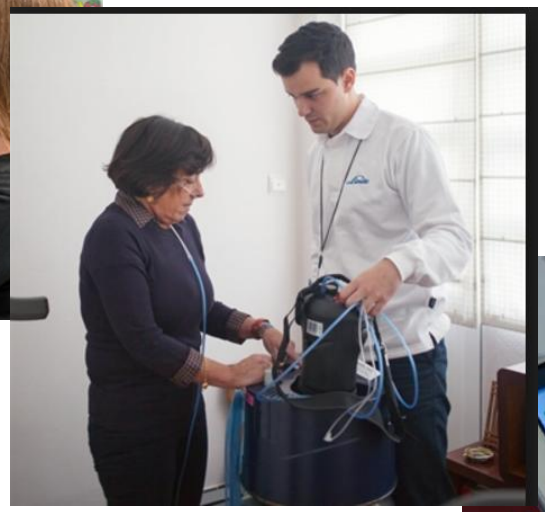





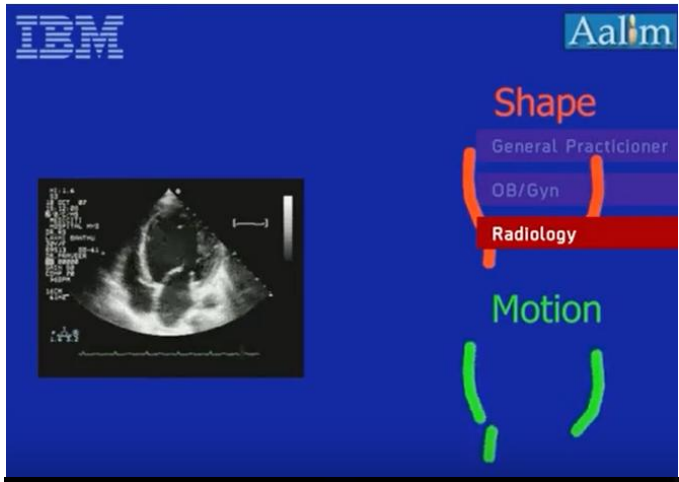



# Challenge -4
# Technology Trends
## Telemedicine, Homecare & Point of Care






# Challenge -4
# Technology Trends
## Artificial Intelligence/ Decision Making





# Technology Watch-out

*"The development of full artificial intelligence could spell the* end of the human race."

*Stephan Hawking*

*AI is* "our biggest existential threat."

*Elon Musk , CEO of Space-X*

# Technology Watch-out

*The real problem is not whether machines think but whether men do.*

B.F. Skinner, *Contingencies of Reinforcement*, 1969.

# Technology Watch-out

*Education makes machines*

*which act like men*

*and*

*produces men*

*who act like machines.*

Erich Fromm; as cited in: Noah ben Shea (2001) *Great Quotes to Inspire Great Teachers*. p. 23.

# Challenge -5

## Different Paradigm- Systems

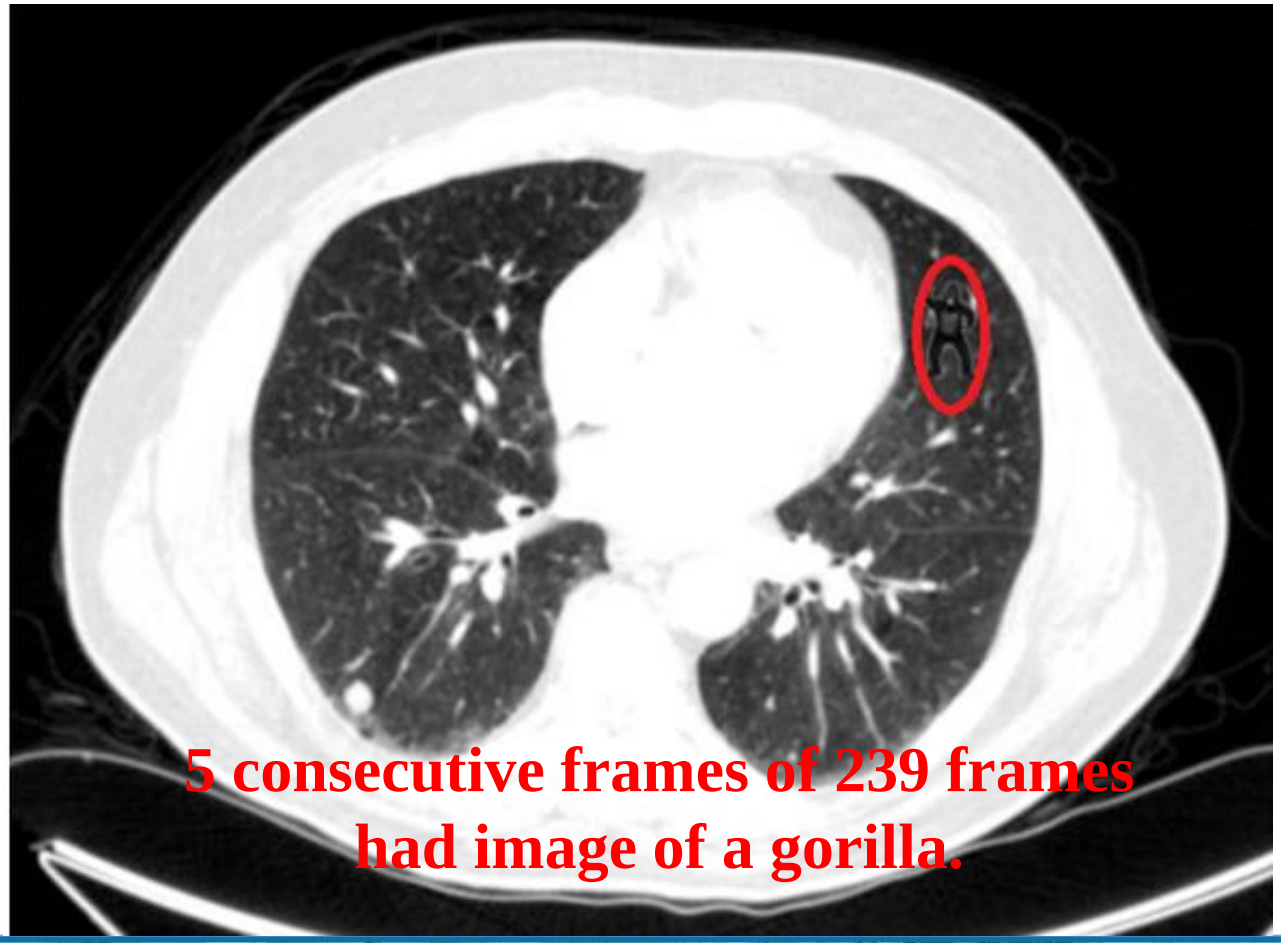
"The compilation of safe components doesn't necessarily add up to a safe system."

*Leveson, MIT. 2012*
*a safety consultant to the National Aeronautics and Space Administration*

# Hospital Environment

# Challenge -7

## Human Factors



# Challenge -8

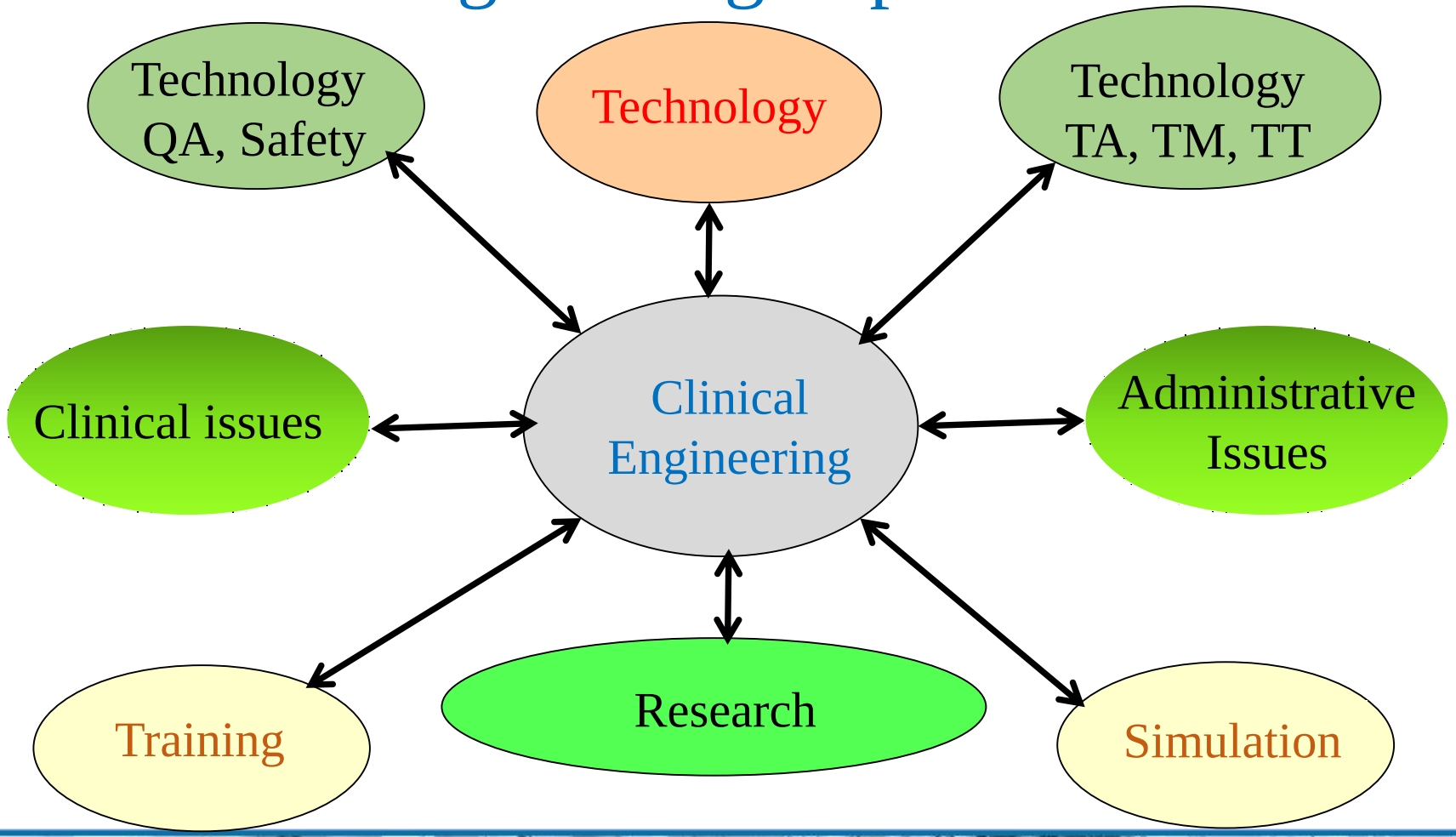
## Maintenance

40% of health-care equipment in developing countries is out of service,

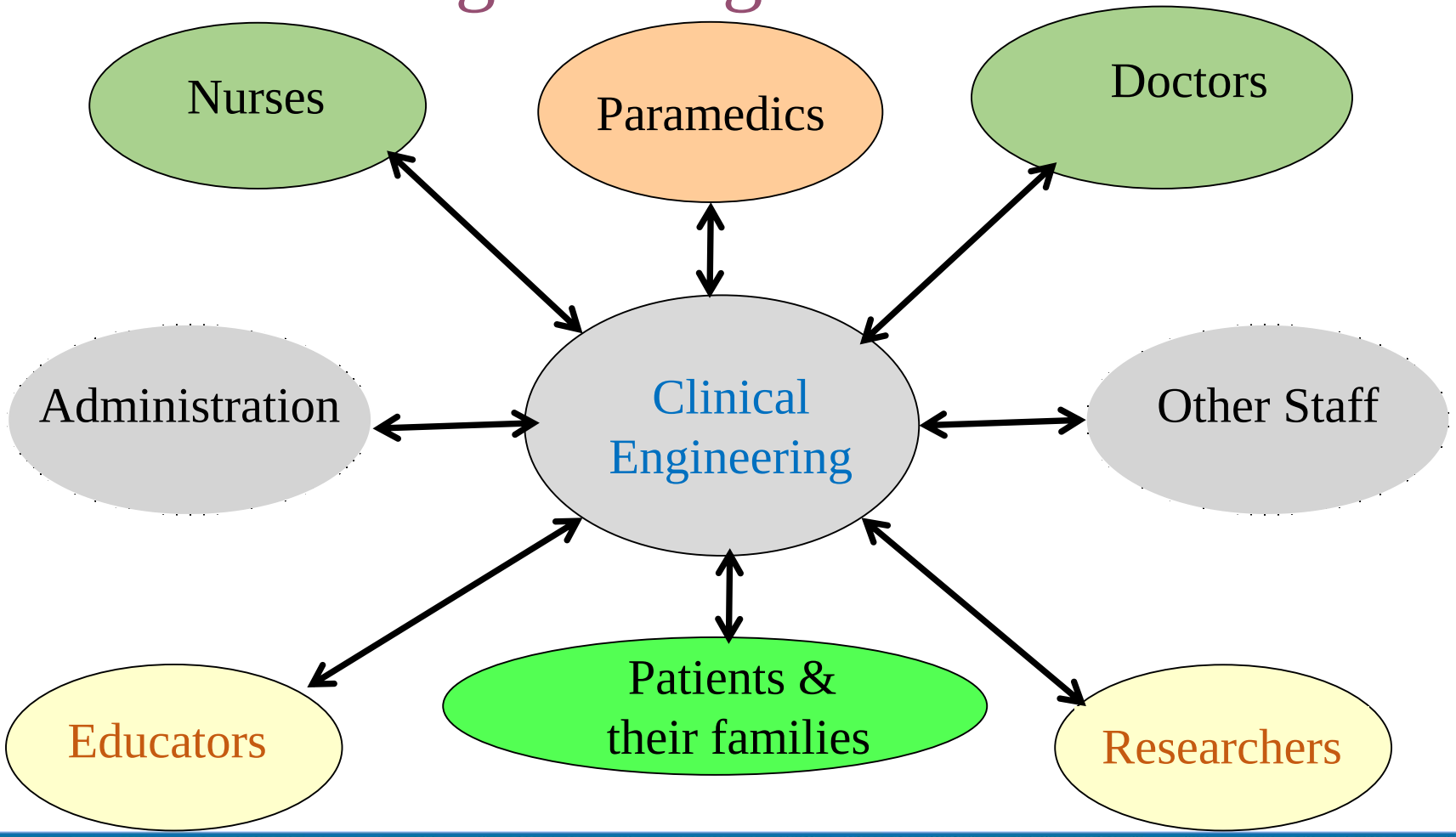
vs. < 1% in high-income countries.

*WHO*

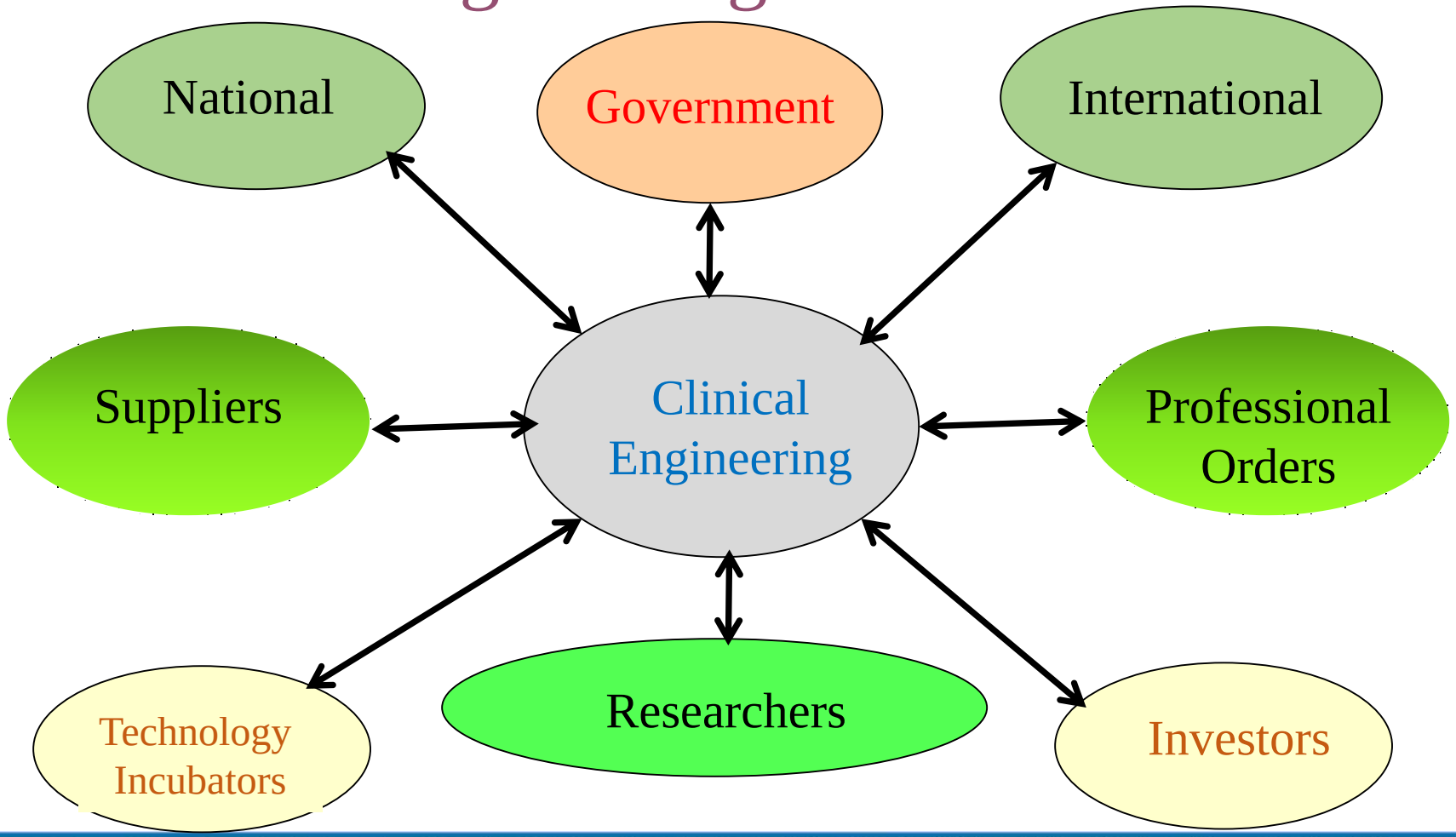
# Medical Engineering Topics Dealt With



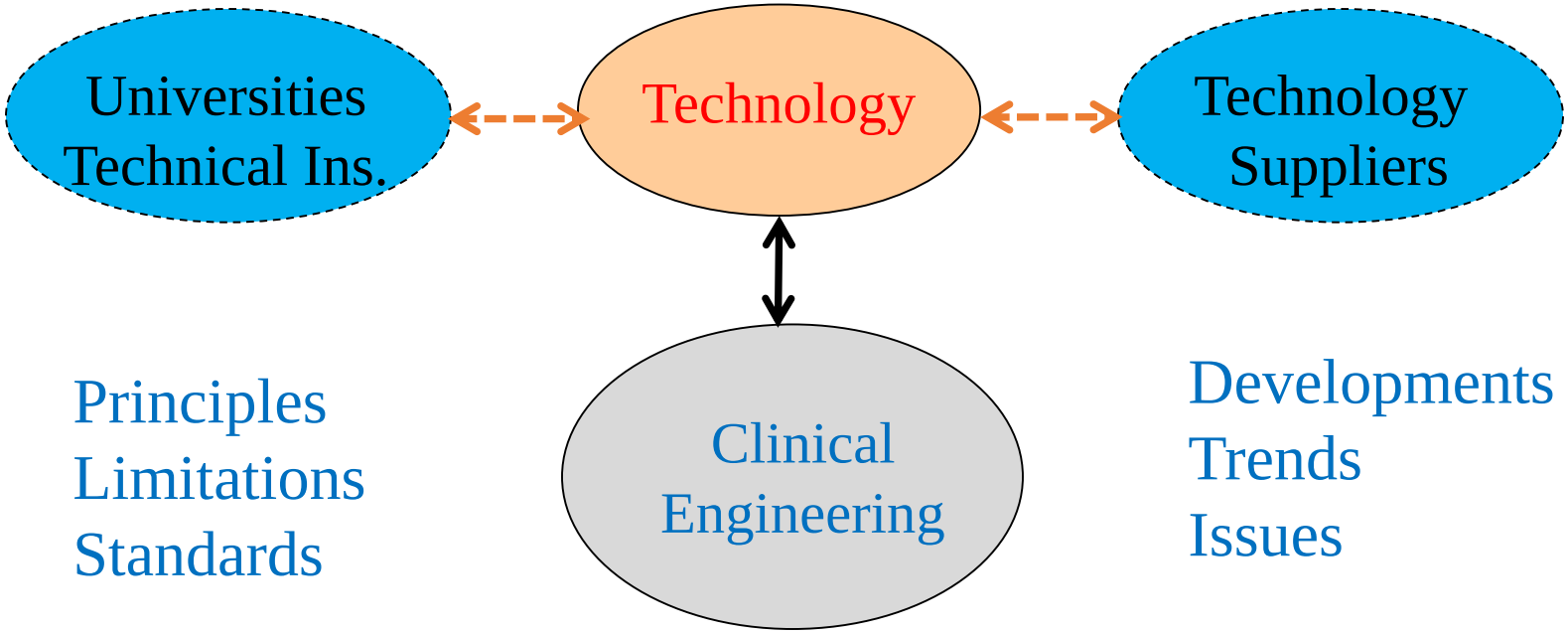
# Medical Engineering Inner Interfaces



# Medical Engineering External Interfaces



# Role of Private Sector

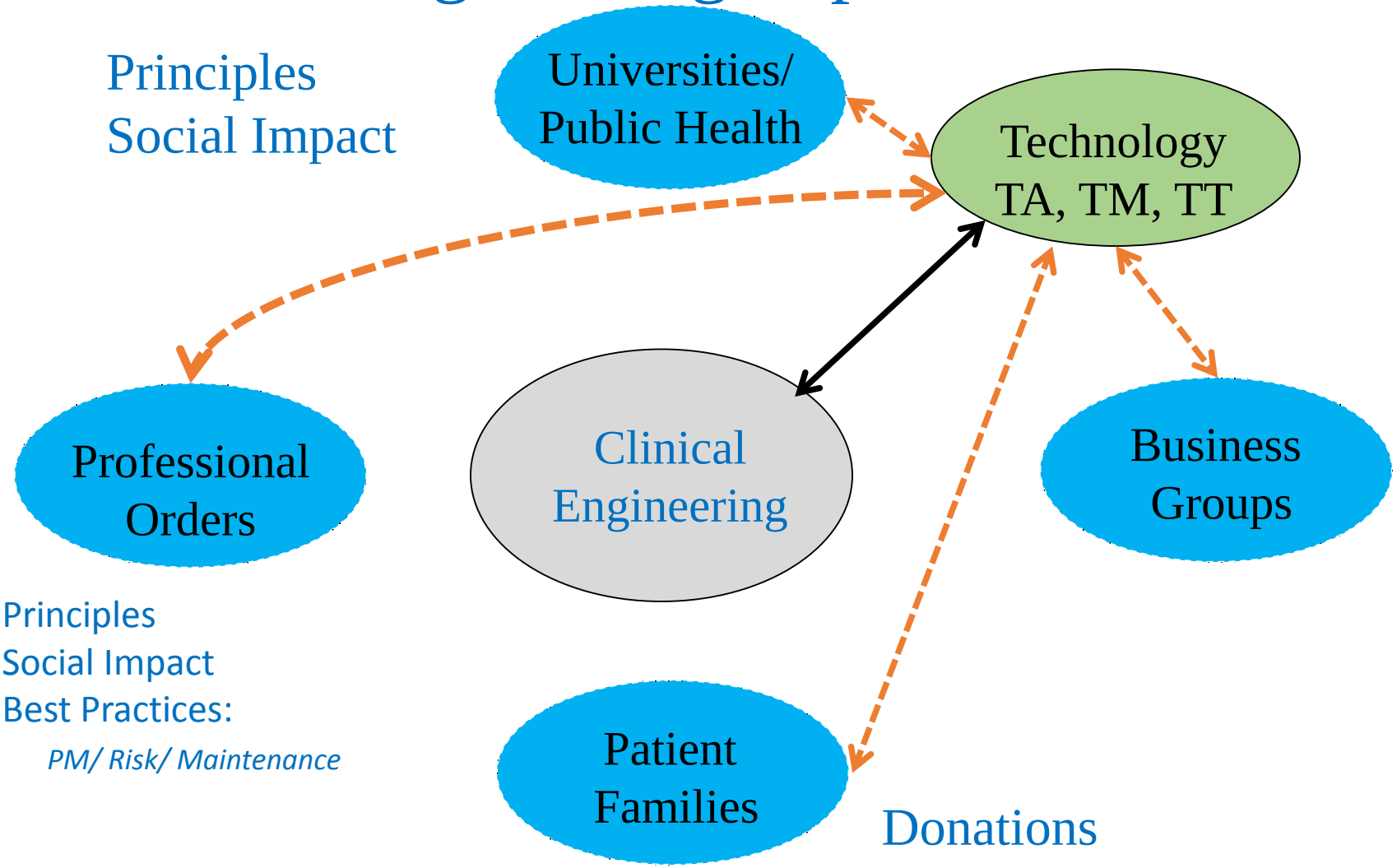



Principles
Limitations
Standards

Developments
Trends
Issues

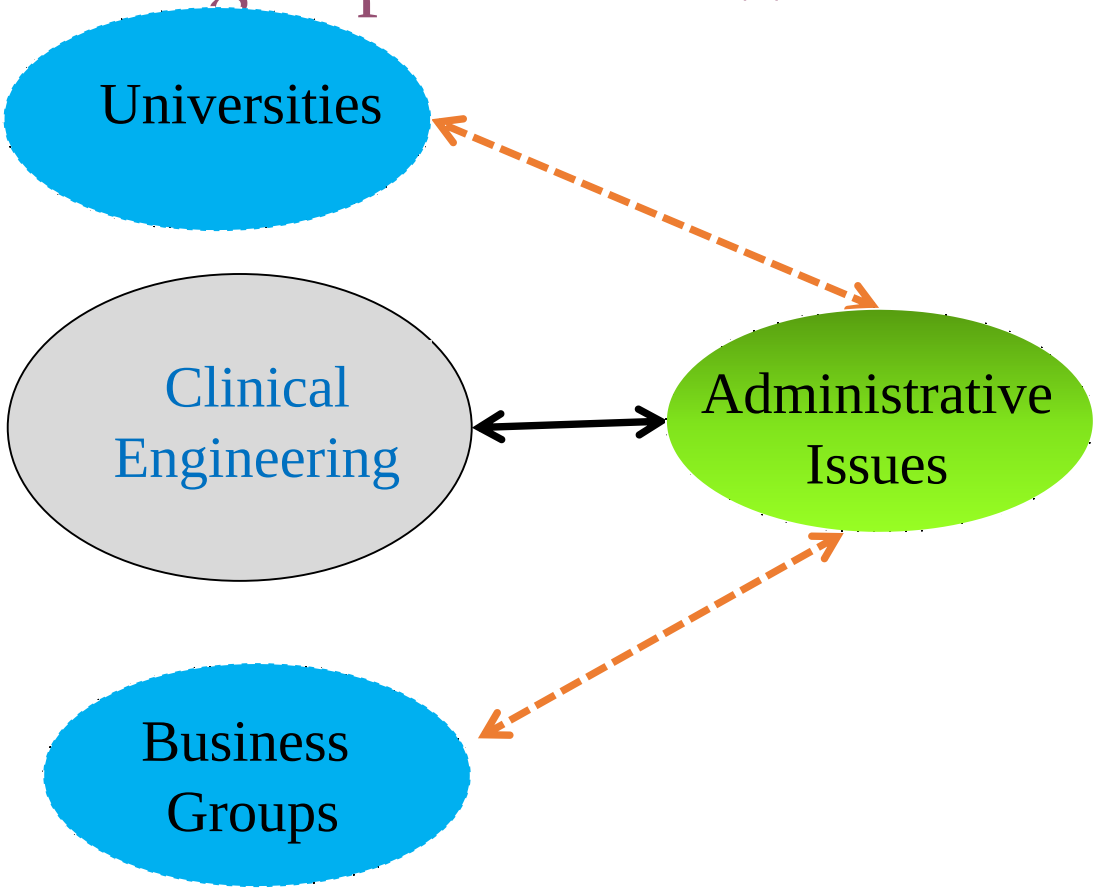
*Biomedical- IT- Communications*

# Medical Engineering Topics Dealt With

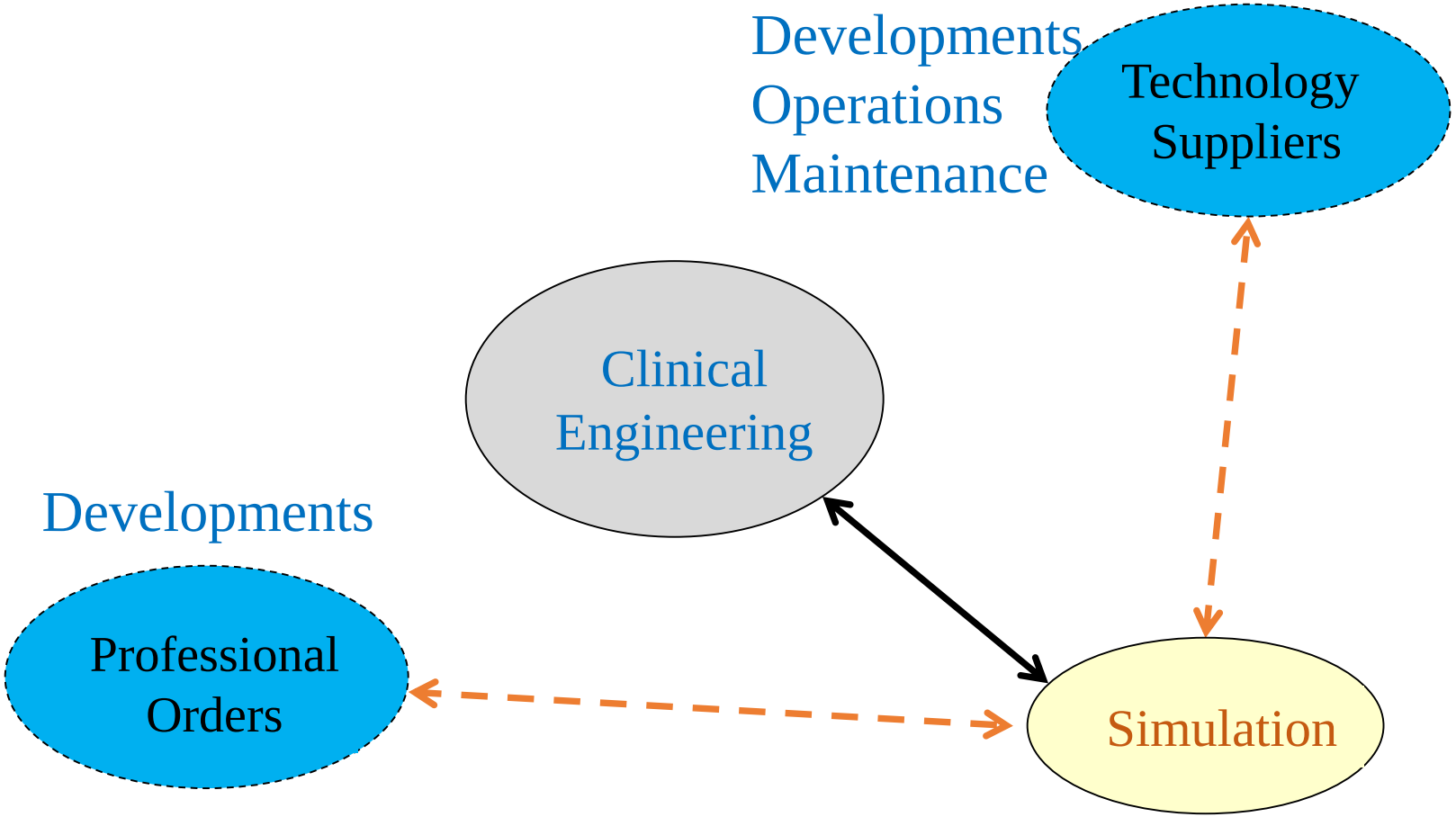


# Medical Engineering Topics Dealt With

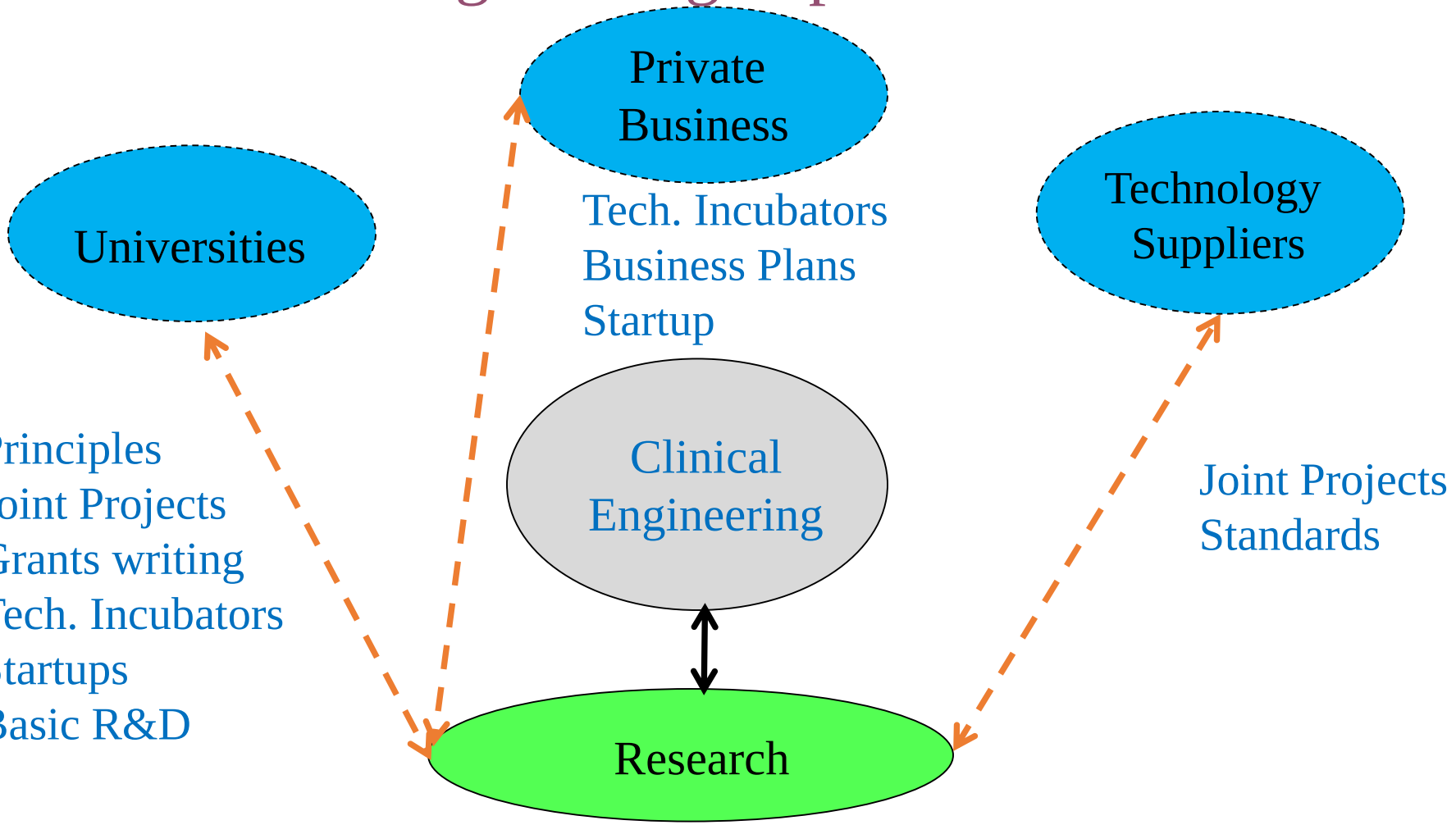
Soft Skills
Delegation
Negotiations
Financial analysis
Change Management
Project Management



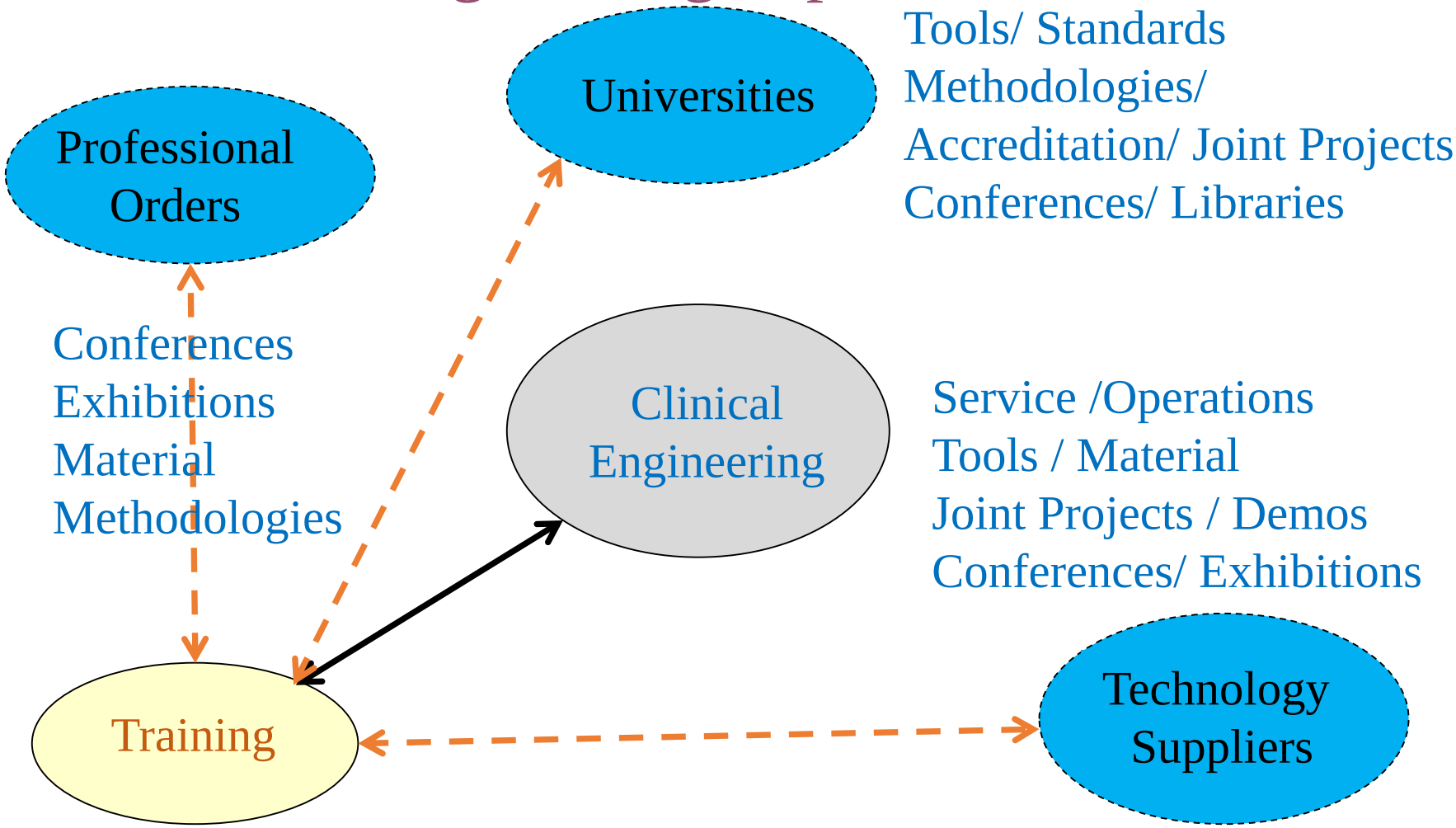
# Medical Engineering Topics Dealt With



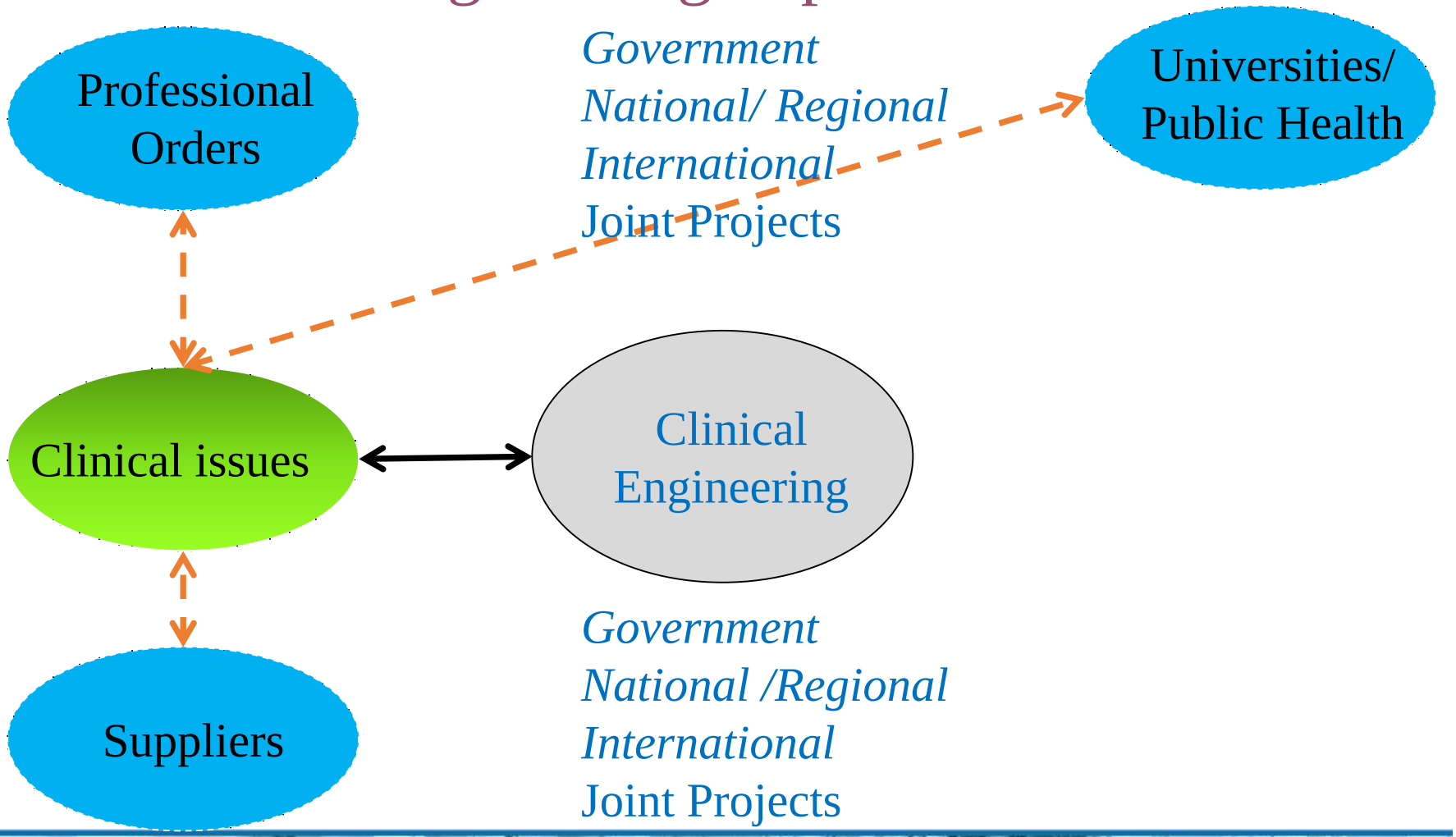
# Medical Engineering Topics Dealt With



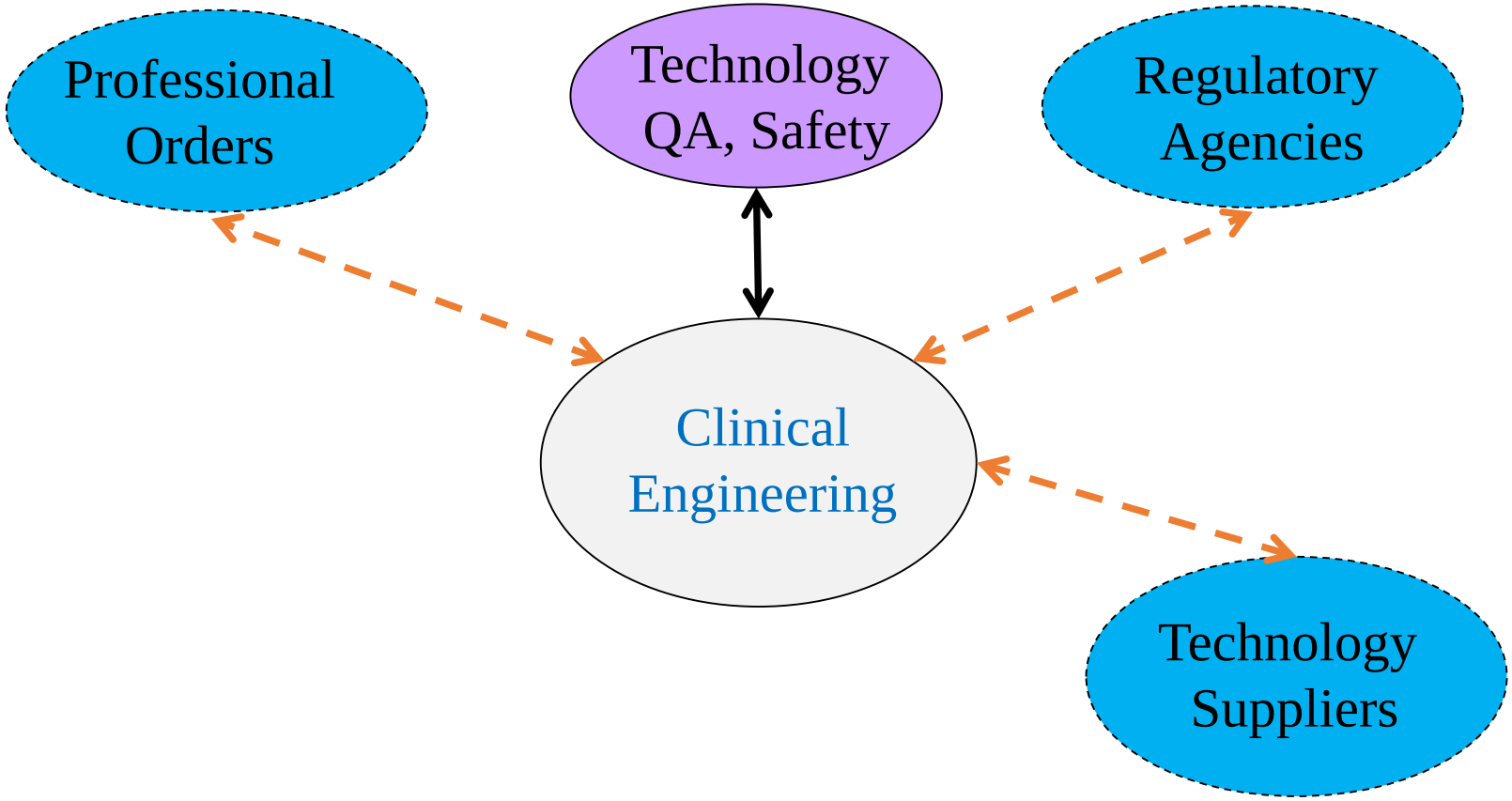
# Medical Engineering Topics Dealt With



# Medical Engineering Topics Dealt With



# Medical Engineering Topics Dealt With



# Historical Background

- December 1866

  The College opened the first class with 16 students

- 1867

  The School of Medicine was started.

# Historical Background

**Over 30,000 thousand graduates world wide**
**Chartered in USA - NY**
**Belongs to 2 eco-systems USA and Lebanon**
**Apply International standards with scarce resources**

# Historical Background

The field of Clinical Engineering is relatively new.
(sometimes referred to as Biomedical or Medical Engineering)

- 1967

The first Clinical Engineering Department was started at George Washington University.

- 1968

AUBMC Medical Engineering Department Founded

# Medical Engineering Mission

Provide technology transfer and technology management services to the

Faculty of Medicine at AUB, AUBMC
other AUB faculties
and other institutions
in Lebanon and the region

in a cost-effective manner &
in accordance with international standards in education, research, and patient care.

# Medical Engineering Experience

Medical IT
E- health Application
Simulation

Training

Faculty of
Arts & Sciences

Faculty of Medicine

Healthcare
Technologies

# Medical Engineering Experience

Technology transfer and management

Attending to the challenges mentioned & the 2 ecosystems AUB belongs to

Compliance with standards: JCAHO, JCI, JC, CAP, MAGNET, ISO and Lebanese MOPH

# Medical Engineering Experience

## Consultations:

**Lebanon:** WHO, UNICEF, Italian Government, Lebanese MOPH, LHMA, Syndicate of Hospitals, Engineering firms

**Iraq:** WHO, World Bank

**KSA**: National Guards and King Fahed Medical City , SFDA, Bioclinic

# Medical Engineering Experience

## Training

Program for **doctors** on use of medical equipment

Material for **nurses and technicians** on use of equipment

Established an outline for **biomedical technicians** training program

# Medical Engineering Experience

## Training

Support of MS and PhD in Biomedical Engineering program.

Continuing Education to doctors, nurses and other healthcare administrators on technology transfer and management (soon)

# Medical Engineering Experience

## R&D

AUB-EU effort to establish technology incubators and accelerators

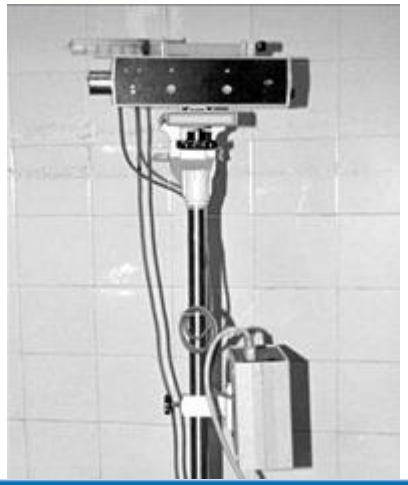
EU Tempus and Horizon 2020

HTMA

# Equipment/ Technology R&D

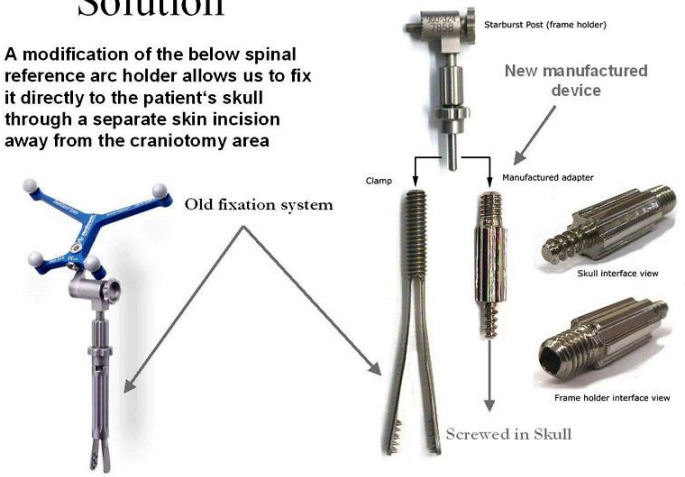
## Problem

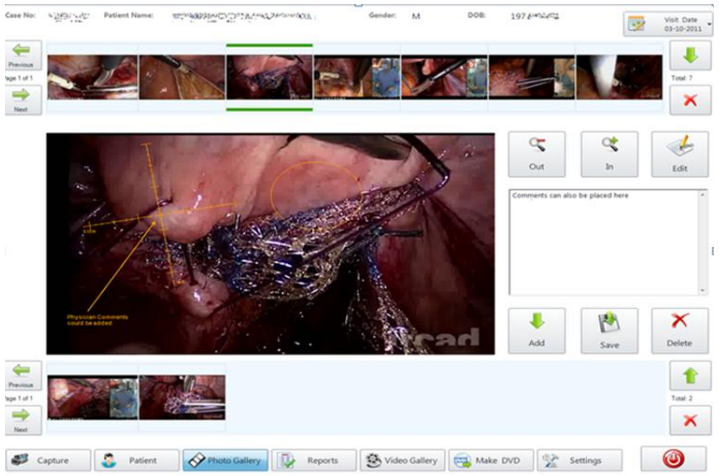
**Tumors of the central region are best operated on under local anesthesia**
**Head cannot be fixed under local anesthesia using the below Mayfield retractor (its uncomfortable to the patient)**



## Solution

**A modification of the below spinal reference arc holder allows us to fix it directly to the patient's skull through a separate skin incision away from the craniotomy area**

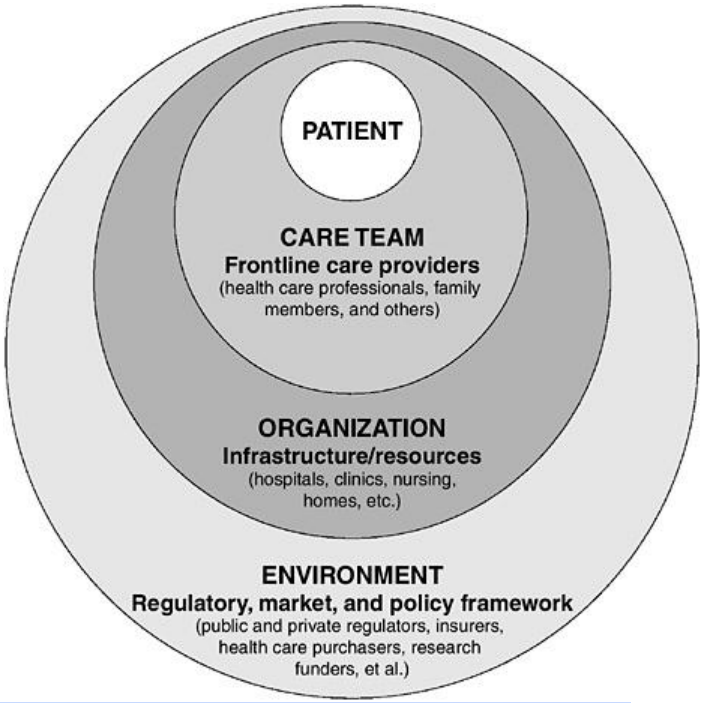


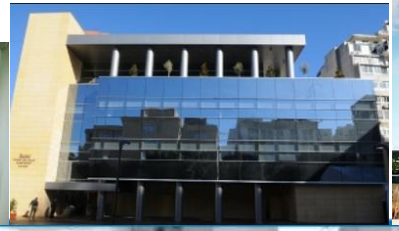



# Medical Engineering Other

# Different Paradigm

A clinic, polyclinic, hospital , and the Health Care System can be considered as a Technology



ARAB bioclinic 3
BIOMEDICAL & CLINICAL ENGINEERING

1902 AUBMC
AMERICAN UNIVERSITY of BEIRUT MEDICAL CENTER
المركز الطبي في الجامعة الأميركية في بيروت

# **H**ealth **T**echnology **M**anagement & **A**dvancement

# VISION

Lead innovative healthcare technology management, assessment and advancement of solutions and initiatives
for safe quality healthcare, education and research through the development of professionals, standards, systems, and technologies
in Lebanon and the region

# Towards a Healthcare Technology Innovation Hub in Lebanon and the Region- March 4, 2017

# Towards a Healthcare Technology Innovation Hub in Lebanon and the Region- March 4, 2017

# Towards a Healthcare Technology Innovation Hub in Lebanon and the Region- March 4, 2017

# Towards a Healthcare Technology Innovation Hub in Lebanon and the Region- March 4, 2017

# Towards a Healthcare Technology Innovation Hub in Lebanon and the Region- March 4, 2017

# Towards a Healthcare Technology Innovation Hub in Lebanon and the Region- March 4, 2017

# Towards a Healthcare Technology Innovation Hub in Lebanon and the Region- March 4, 2017

# Medical Devices: From Idea to FDA Approval- April 29, 2017

# Medical Devices: From Idea to FDA Approval- April 29, 2017

# Medical Devices: From Idea to FDA Approval- April 29, 2017

# Medical Devices: From Idea to FDA Approval- April 29, 2017

# Medical Devices: From Idea to FDA Approval- April 29, 2017

# Medical Devices: From Idea to FDA Approval- April 29, 2017

# Final Words

# Final Words

... the eminent challenges that is faced by the MEA and the pressing needs due to conflicts or the lack of human resources, call for innovative solutions and technologies to overcome todays challenges tomorrow