What will the future look like under Industry 4.0 and digital transformation in the healthcare space?

Morris Hosseini, Partner

Roland Berger
Strategy Consultants

Stuttgart, April 21st, 2015

Across industries, a technological and a sociological revolution are under way

Trend overview

A TECHNOLOGICAL REVOLUTION

Mobile internet / democratization of Smartphone

Potentially infinite storage capacities – Cloud

M2M communication

Decrease of technologies costs

A SOCIOLOGICAL REVOLUTION

Faster and faster penetration of new technologies

Increasing success of innovative business models based on free offerings

Expectation of immediate and continuous availability of services

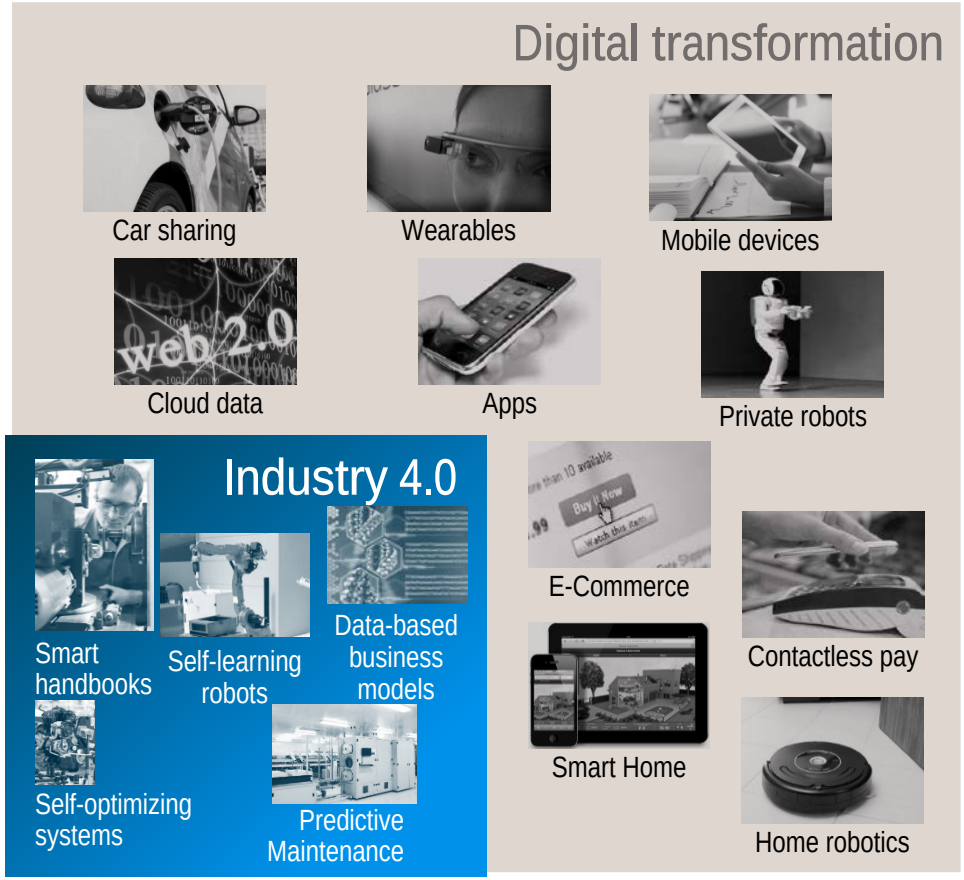
EXPONENTIAL TRANSFORMATION

- INDUSTRY 4.0
- DIGITAL TRANSFORMATION

Source: Roland Berger

Industry 4.0 can be understood as the full integration and digitalization of the industrial value creation

Definition of Industry 4.0 (not exhaustive)

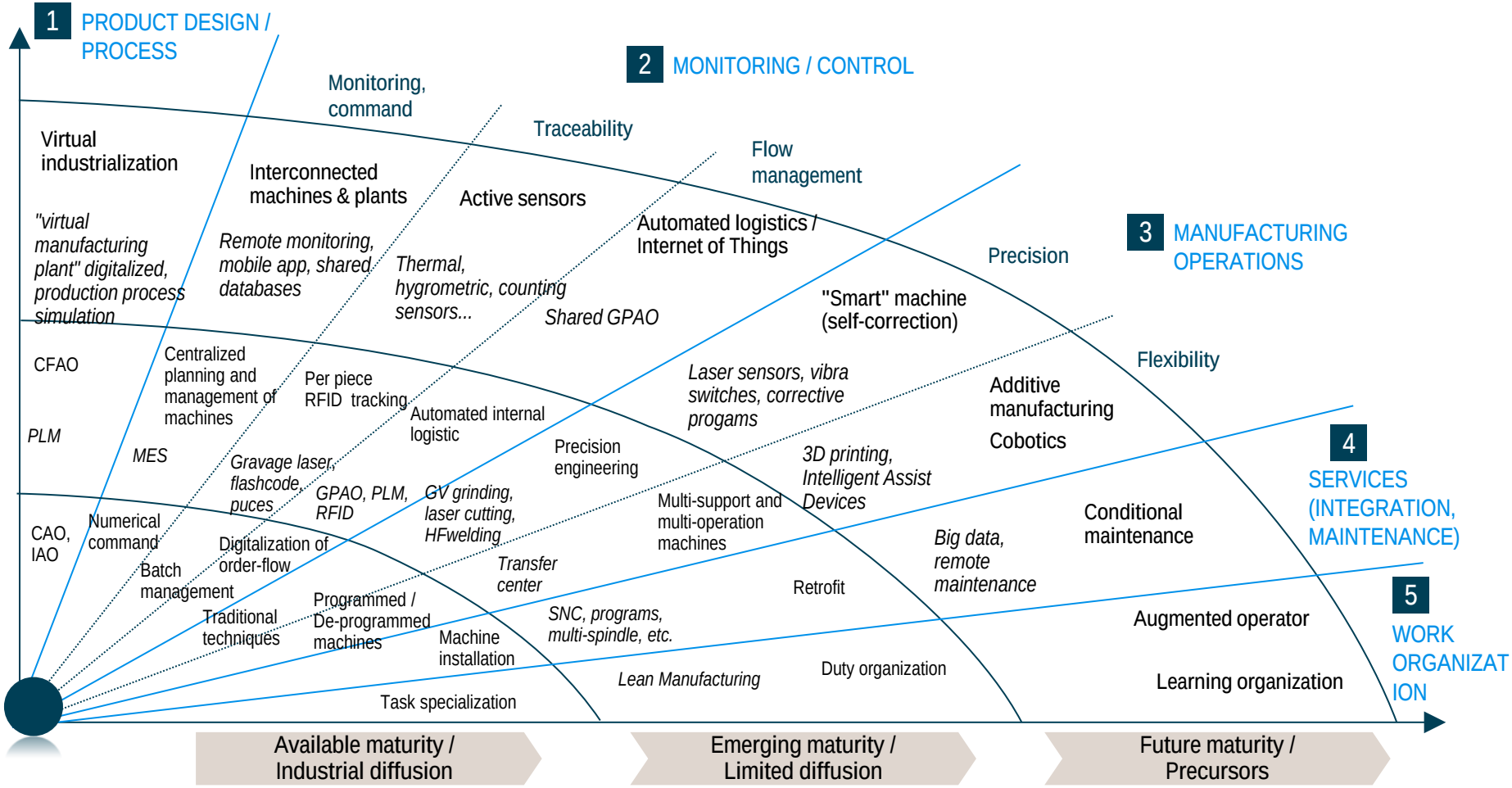


- **Digital transformation** refers to the changes associated with the application of digital technologies in all aspects of human society
- Industry 4.0 is the **industrial application** of the concepts applied in the **digital transformation**, **key elements are:**
  - Complete connectivity with real-time ability
  - Decentralized, intelligent and self optimizing / organizing
  - Modular and reconfigurable
- Assessment of **Industry 4.0 impact** needs to take **analogies** from **digital transformation** and specifics of the manufacturing industry into account
- The digital transformation in the **consumer goods sector is much more advanced** than the industrial application – In the **healthcare space**, it has now arrived and **is changing the landscape**

Source: Plattform Industry 4.0, MIT Sloan Management Review, Roland Berger

Industry 4.0 combines a wide set of technologies at different stages of maturity

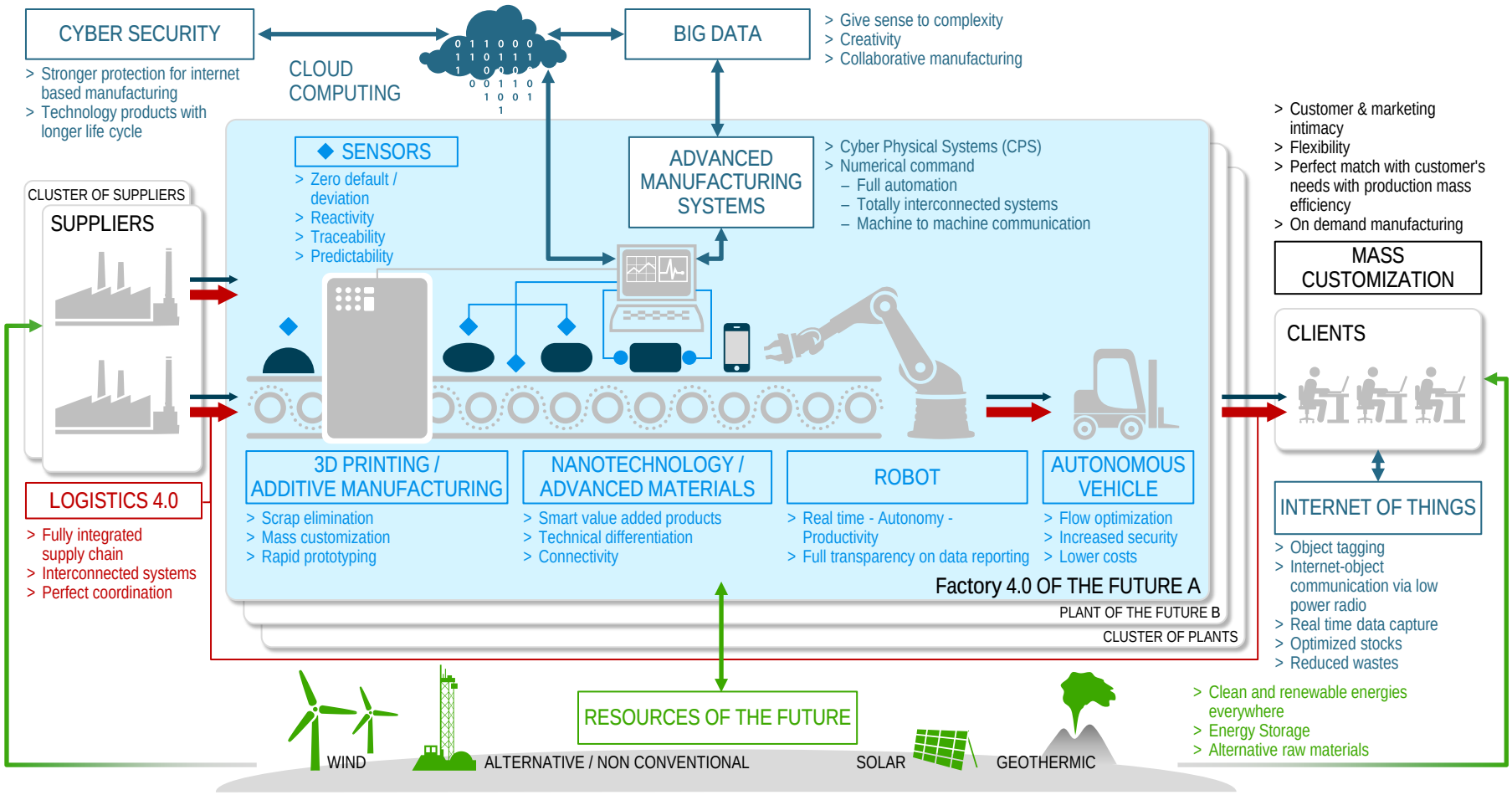
Example of technology mapping – Extract



Source : Roland Berger

The Factory 4.0 ecosystem – A set of technologies about to interconnect and disrupt plant operations

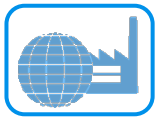
Factory 4.0 ecosystem



Source: Roland Berger

A smart Factory 4.0 is like a social network – People, machines and resources communicate and interact with each other autonomously

Factory 4.0 – key potential features



Global Facilities

> The center point of Industry 4.0 is a network of global production facilities

> **Pooling and bonding with partner companies from the same industry will increase profitability**

> Interactions between industrial facilities and their environments create socio-economic systems with lots of benefits

Social Machines

> **Social machines are knowledge-based, sensor supported and spatial distributed unities of autonomous production systems**

> Social machines share newly gained information with their peers – additional configuration efforts are needless

Augmented Operators

> **Augmented operators have an virtually extended view on production processes**

> Smart devices as for example smart phones and tablets help employees to fulfill their tasks

> The future development will further intensify the socio-technical interactions

Smart Products

> Smart products are clearly identifiable and always localizable

> All information about the production process is stored on the product (e.g. by using RFID chips)

> **Smart products are therefore able to steer their production process autonomously**

Virtual Productions

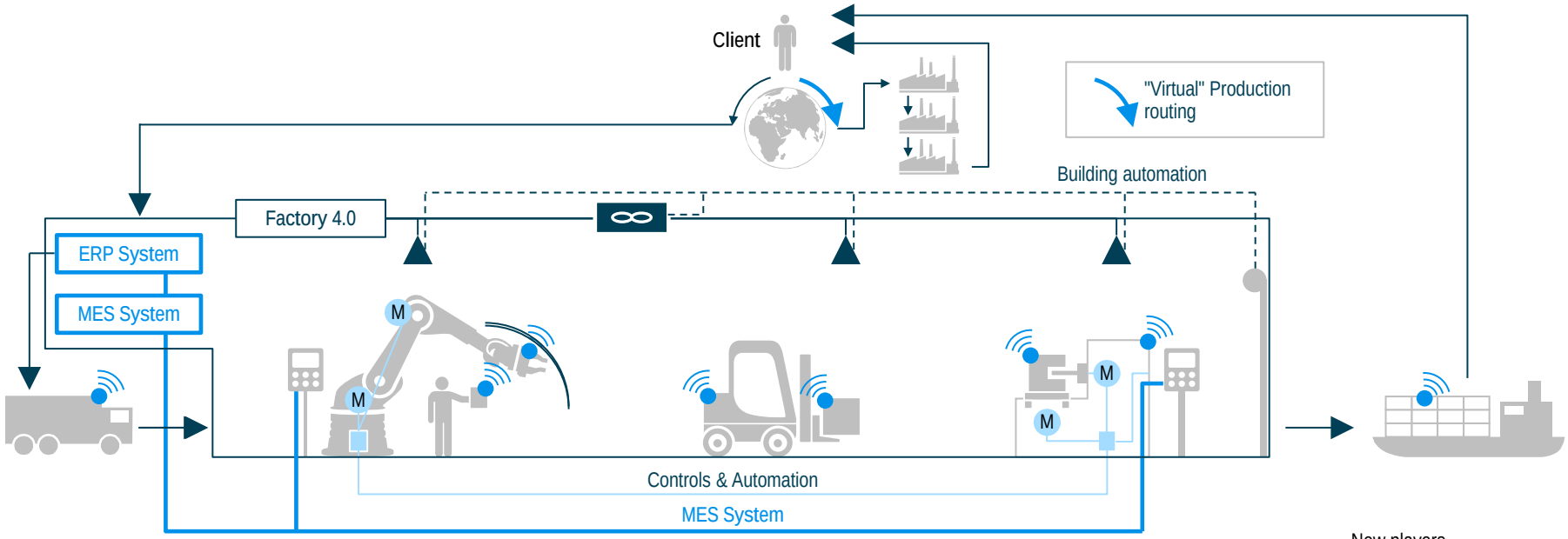
> **A virtual production is characterized by digitalized production systems that interlink all dedicated people, machines and resources**

> Analysis of existing data and simulation of future states allows an optimized production

Source: Arbeitskreis Industrie 4.0; Roland Berger

Data and communication will be the backbone of Industry 4.0 – Some players with already wide offering and new players entering

Positioning of different players for Industry 4.0 – Factory view



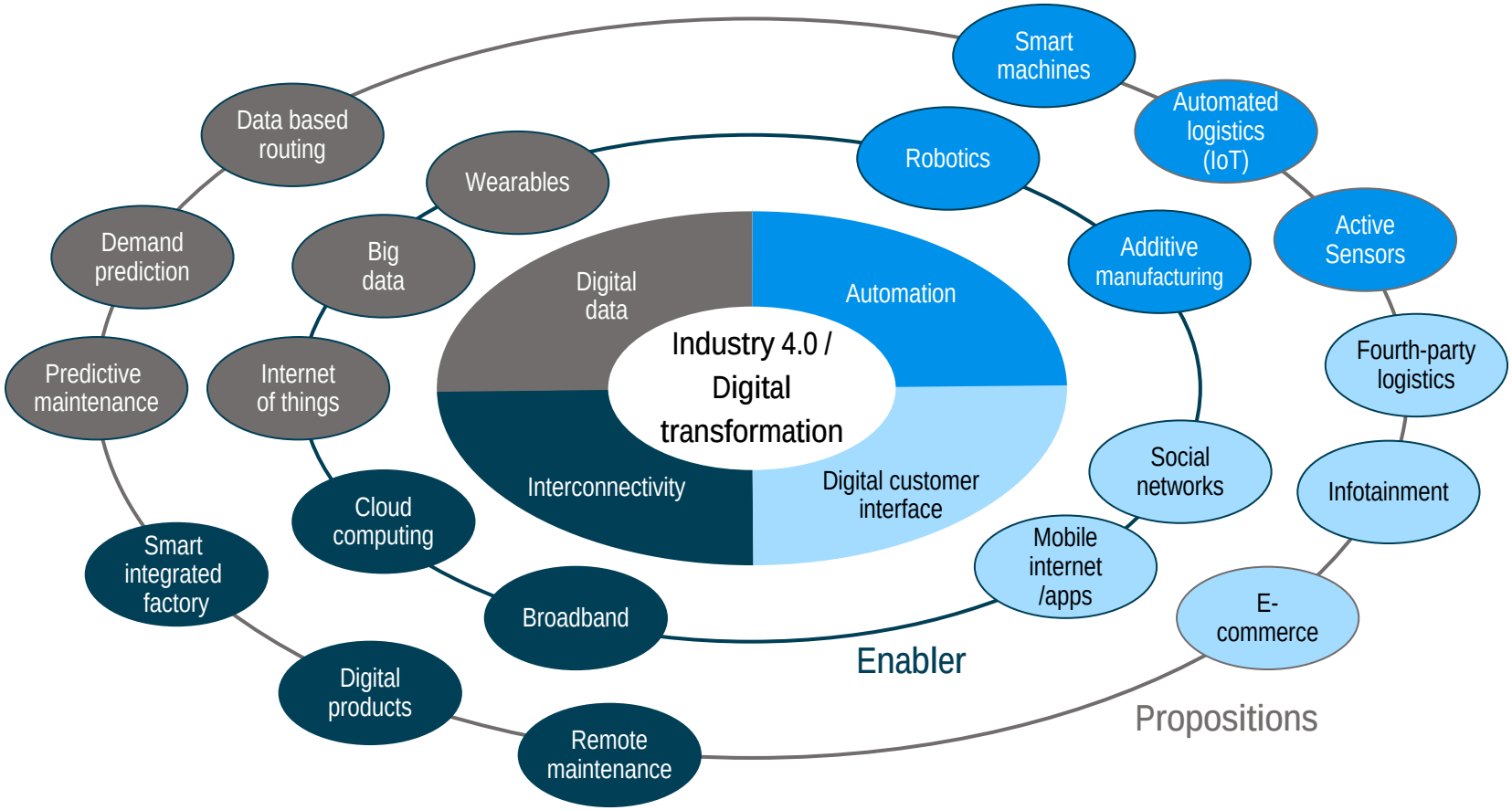
	ERP System	MES System	Sensors/Automation	Building Automation	3D Data	New players: Big Data Services
Data/ Funct.[1)]	> All transaction data > Asset data > Price/cost data	> Shopfloor transaction data > Machine data > Maintenance data > Logistic data	> Sensor status like pressure, position etc., communication with other sensors > Machine control data	> Status of all building data, e.g. temp., light, access control, ventilation	> Product 3D data > Factory 3D data > PLM data	> Storage capacity > Algorithms and analytics > Connectivity
Players[1)]	ORACLE, SAP	SIEMENS, APRISO, mpdv	SIEMENS, Rockwell Automation, BOSCH, FANUC	SIEMENS, BOSCH, Honeywell	SIEMENS, DASSAULT SYSTEMES, PTC	IBM, Google, T

1) Not exhaustive; examples only

Source: Roland Berger

Industry 4.0 and digital transformation work via four levers that are supported by new enabler technologies and propositions

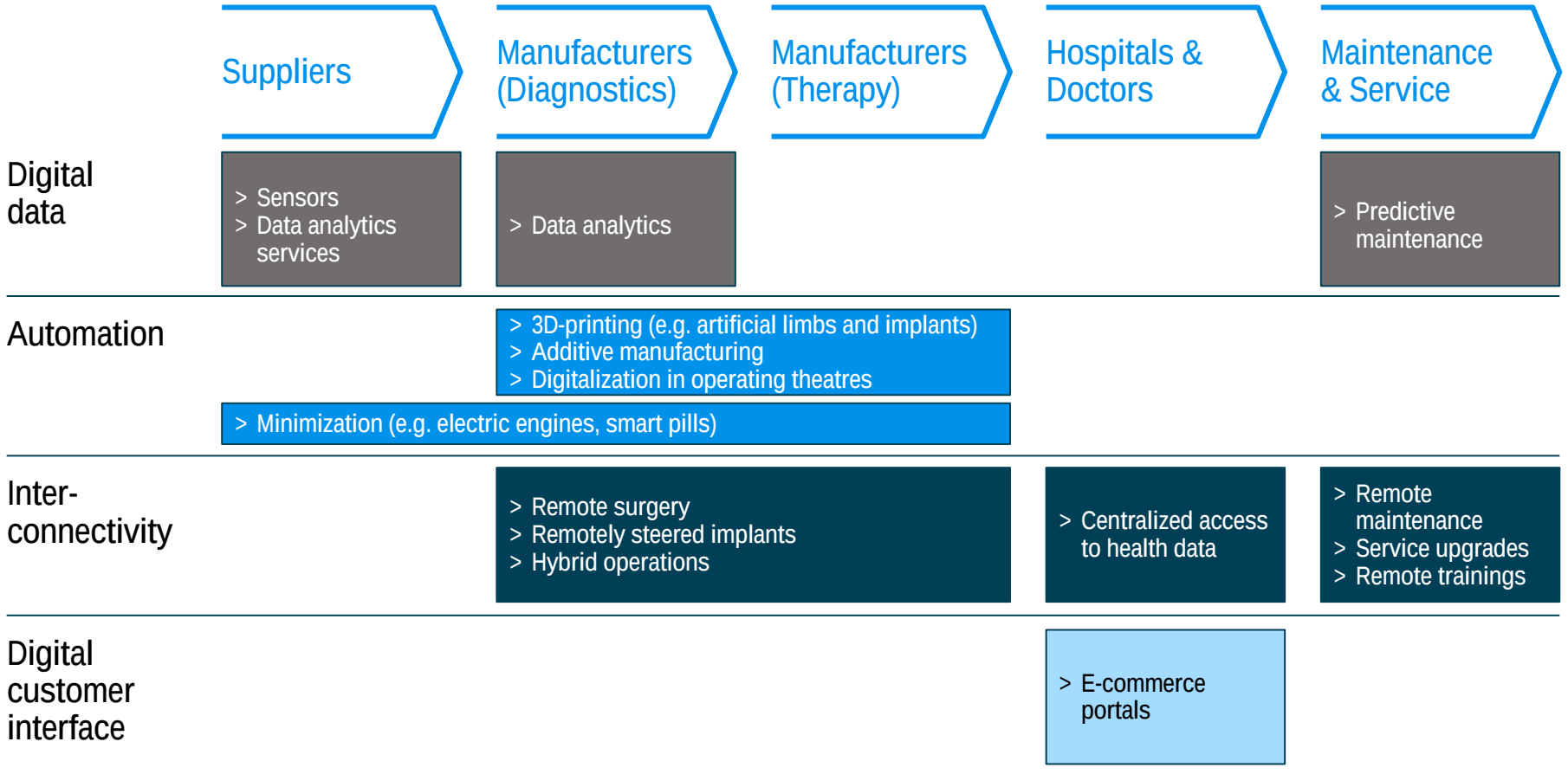
Example of technology mapping - Extract



Source: Roland Berger

Novel applications along the value chain in MedTech especially from digital data and increased connectivity

Selected use cases from digitalization in the MedTech industry



Source: Roland Berger

As an example, Additive Manufacturing brings new options to the manufacturing and materials world – Potential for disruptive change

Paths of disruption for Additive Manufacturing

Direct production from CAD data
Freedom of design
Complexity for free
Part consolidation
Elimination of tooling
Prod. cost independent from batch size
New manufacturing processes

Path of disruption	Individual products	New geometries & materials	Decentra-lized production
			
Examples	> Prototyping > Mass customization – Medical products – Jewelry – Gimmicks > Small series production	> Integration of new, enhanced functionalities (more efficient products) in high tech materials > Development of new materials/material properties > New repair strategies	> Industrial production on demand – production by quantity – by location (decentralized) > Home printing/production > Outsourcing to partners

New business models (B2B, B2C)

Limited impact Strong impact

Source: Pictures EOS, Roland Berger, NASA

Within MedTech, "technical" printing as well Bio Printing has found first applications in the area of regenerative medicine

Overview Additive Manufacturing technologies

Production Technologies (DIN 8550)

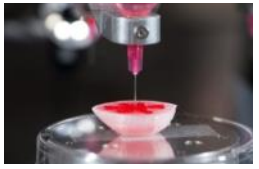
Master Forming | Forming | Cutting | Joining | Coating | Change of material properties

Dimension

1 Materials	Plastic		← Ceramic, glass →		Metal
Physical condition	Liquid		← Solid, pastrious materials →		Powder
2 Technology	Powder Bed Fusion		← 7 different technologies →		VAT Photo-poly-merization
3 Application	Personnel Printers		← Prototypes, Mock ups →		Series Production

Bio Printing

Materials
- > Cell suspension
- > Cell-encapsulating hydrogels
- > Microfluidic fill-in for cells
- > Bio-filaments



Technology/Application
- > Inkjet printing
- > Acoustic bioprinting
- > Laser-induced bioprinting
- > Laser-guided bioprinting
- > Extrusion-based deposition

Source: Roland Berger

Industry 4.0 will have fundamental impacts on traditional ways of doing

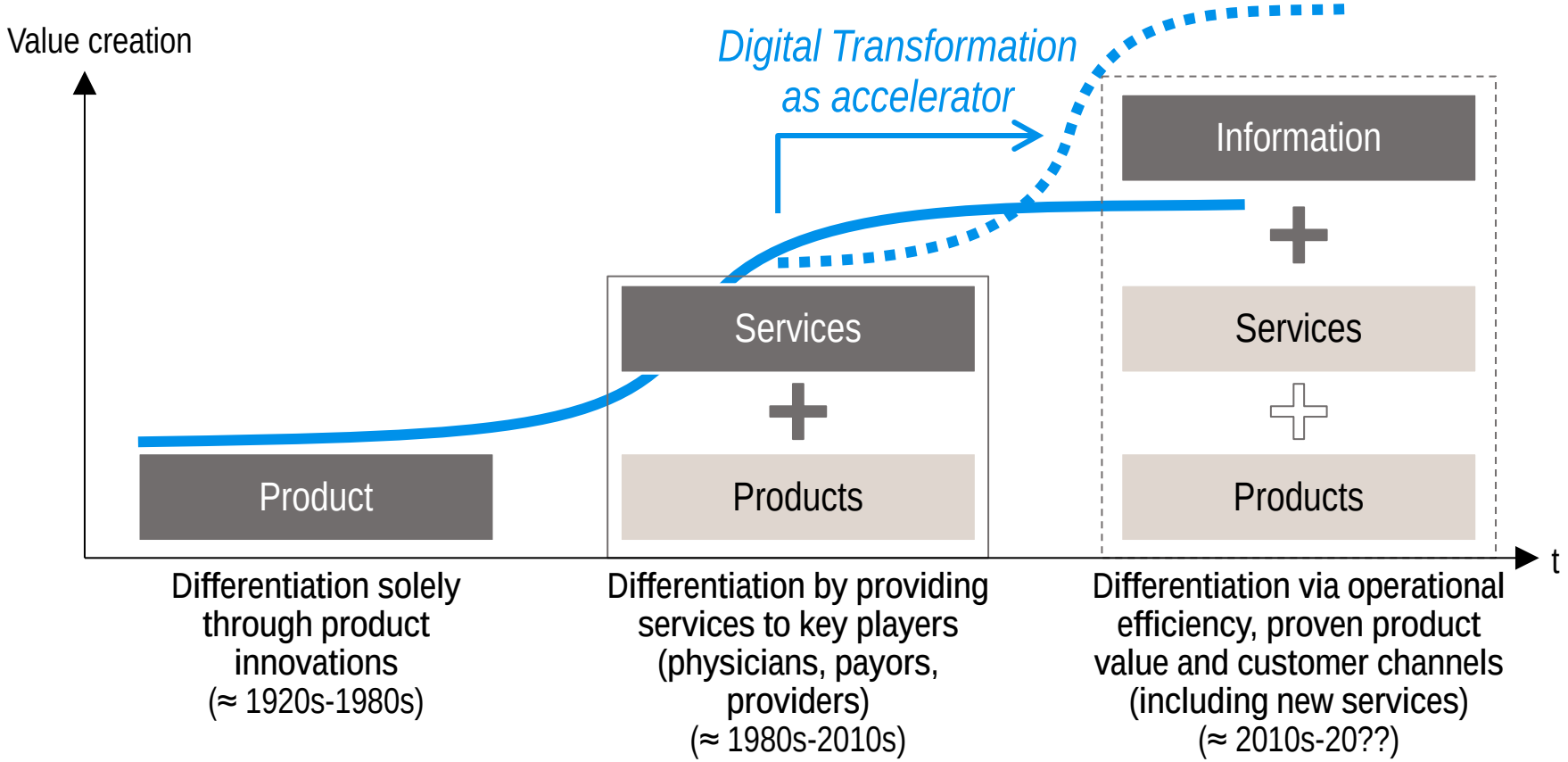
Impacts of Industry 4.0

1	Flexibility / Mass customization	> Ability to reduce changeover time – seamless production change > Dynamic product schedules allowing to adapt real-time to customer needs
2	Direct client relationship	> Closer relationship between producer and customers > Disintermediation and change of business rules
3	De-laborization	> Reduced share of labor cost – Reduced dependency to LCC
4	Asset rotation	> Increase machine open time & utilization, reduce breakdown time thanks to conditional maintenance > Reduce stocks along the value chain
5	Decentralization / Regionalization	> Reduce impact of size / scale effect – Ability to decentralize processes > Possibility to relocate production process close to customer needs
6	Fast-product launch	> New product industrialization is performed seamlessly and without disruption > People are guided through virtual tools to adopt new products
7	Shift of skillset	> Less working forces in daily operations thanks to automated robotics > Maintain of needs for medium-qualified workers due to simplified Human-Machine Interface

Source: Roland Berger

Moreover, digital transformation impacts the healthcare space far beyond the product only by tapping into the information dimension

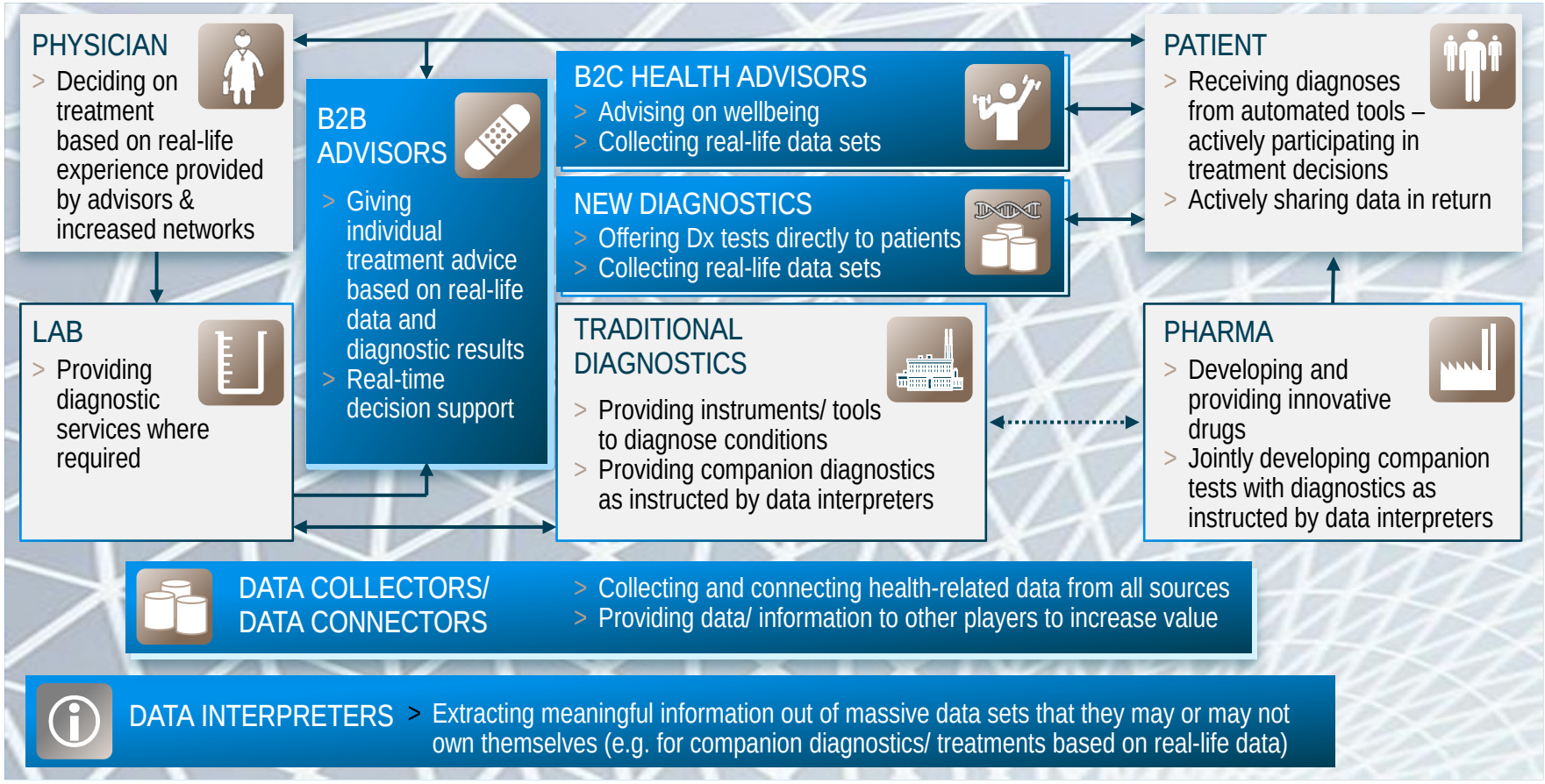
Evolution of healthcare product business offering



Source: Roche, Roland Berger

Data-driven business models have the potential to re-shape the customer landscape for MedTech and healthcare players

Healthcare market 2020 with data-driven business models – Simplified view

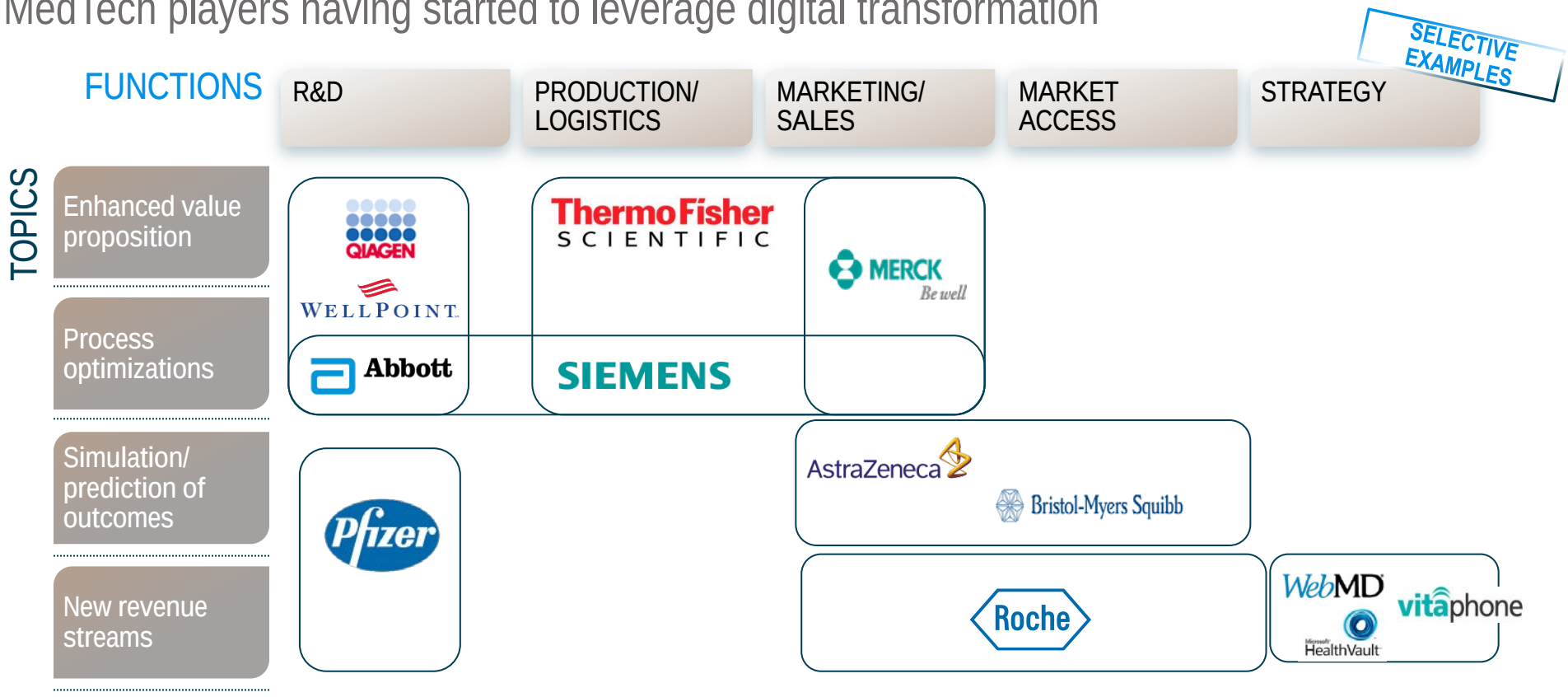


Traditional established players New players from digital transformation

Source: Roland Berger

Leading MedTech players have already understood the value of data and started to leverage extra value for their business

MedTech players having started to leverage digital transformation



The key to success is knowing **how to get access** to the required data (generating or collecting) and **how to generate value** out of it (connecting the dots or interpreting the results)

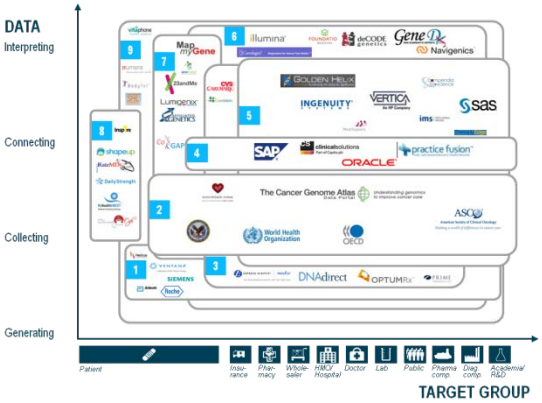
Source: Roland Berger

Analyzing this space, Roland Berger has developed a data-based business model landscape in healthcare

Data-based business model landscape in healthcare

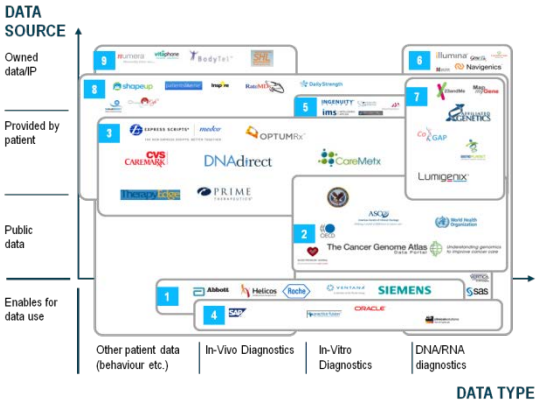
Database with +290 existing business models and market approaches

FIRST MATRIX



Stakeholder and data activity matrix

SECOND MATRIX

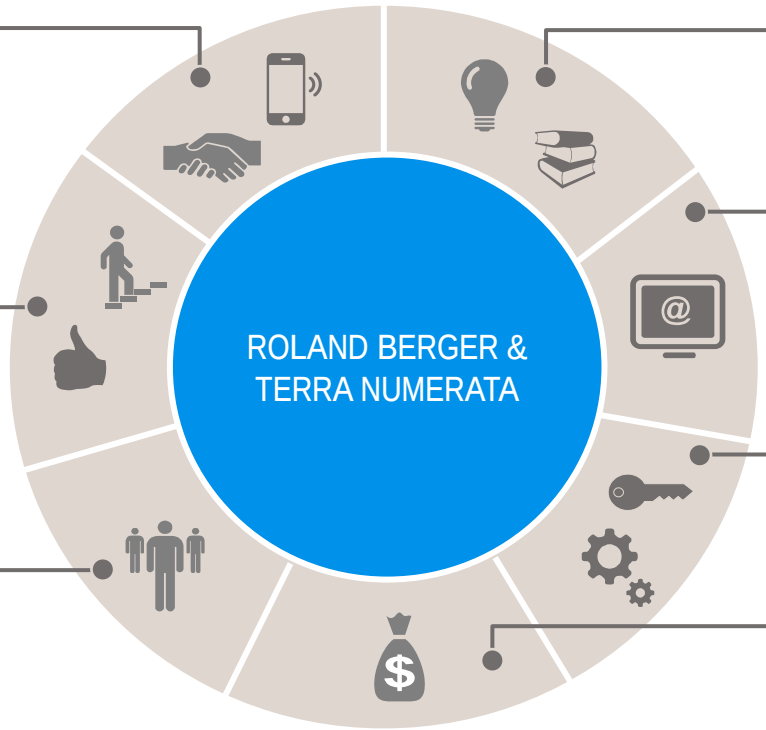


Data type and data source matrix

Source: Roland Berger

Leveraging digital transformation requires many different areas of expertise, hard to find under one roof…

Digital transformation requirements



1 **Connect to the Digital world**
> Influencers
> Entrepreneurs
> Think tanks
> Institutions

2 **Detect innovation**
> Schools
> Start-ups
> Incubators

3 **Conceive new businesses**
> Web developers
> Designers
> IT players
> Data scientist

4 **Proof and test digital innovations**
> Prototypers
> Living / Development laboratories

5 **Finance new businesses**
> VCs
> Investment funds
> Crowdfunding platforms
> Development capital

6 **Staff digital projects**
> Recruiters
> Trainers

7 **Launch new businesses**
> Accelerators
> Viral marketing
> Agencies

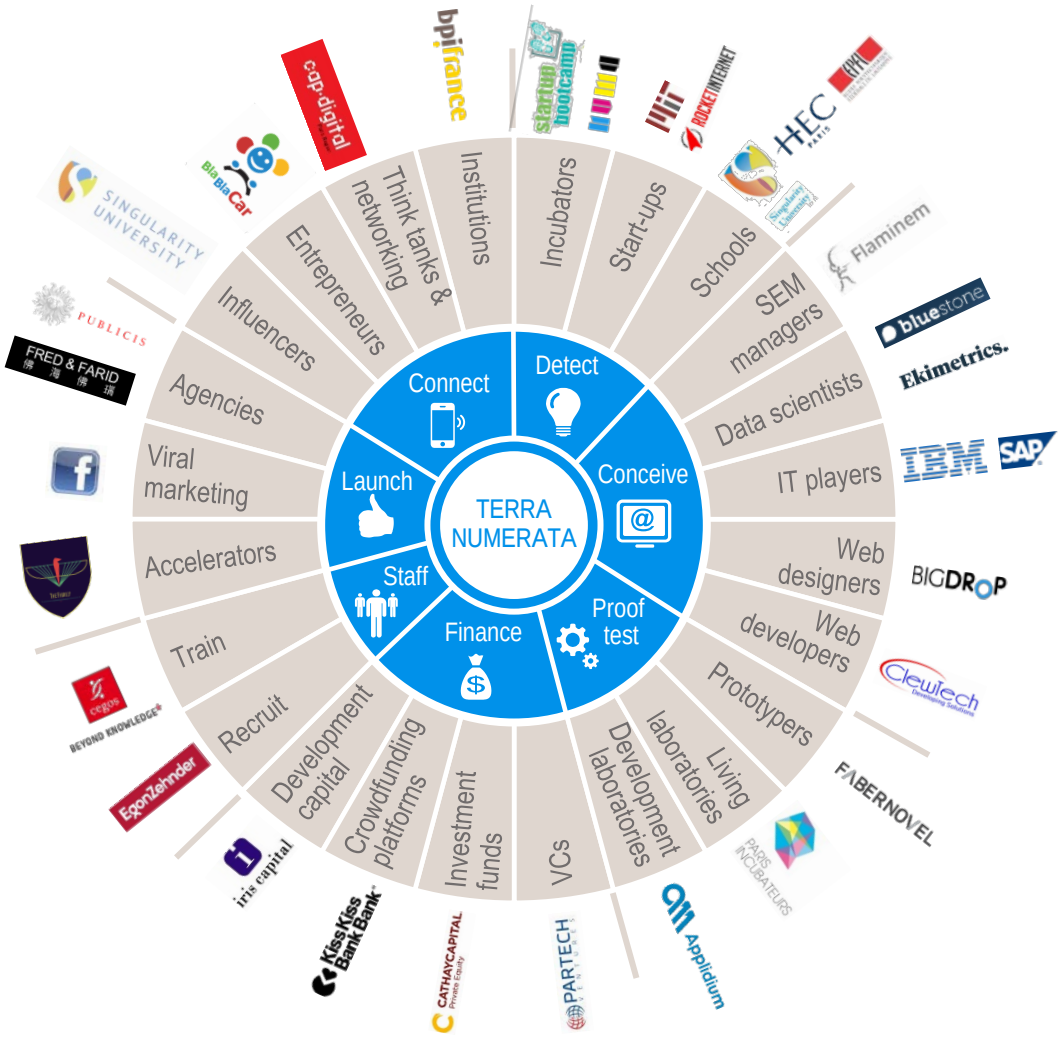
Source: Roland Berger

…this is why Roland Berger launched Terra Numerata through partnerships and alliances

Terra Numerata

> Covering the entire value chain and meeting clients' needs
  - Consulting
  - Investment
  - Technical platforms with partnerships
  - Specific expertise (cloud, data scientists, developer, etc.)

> Playing the role of an architect within Terra Numerata offer by ensuring the quality of services for each part of the value chain thanks to partnerships with digital leaders steered by Roland Berger digital experts



Source: Roland Berger

Let's think: act!

Roland Berger
Strategy Consultants