Overview of the Healthcare Sector

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This article describes some of the stakeholders of the healthcare sector and the factors which influence the application of systems engineering within it. For an overview of healthcare systems engineering and how it deals with these influences see the Healthcare Systems Engineering article.

The healthcare sector is a complex system made up of people, facilities, laws and regulations. It addresses current health, tries to ensure wellness, treats medical problems; creates new medication and medical devices; manages the health both individuals and populations; and helps determine regulations for safety, privacy, the environment, and healthcare delivery itself.

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Stakeholders

There are many types of stakeholders in the healthcare sector. The space covers everyone from the general public – who have a stake in their own health and the health of those around them for issues like infectious disease – to the individual researchers who investigate current healthcare problems. The high-level groups of stakeholders include:

- The general public;
- Healthcare providers (such as doctors, nurses, clinics, and hospitals);
- Payers (such as insurance companies);
- Public health organizations;
- Researchers, scientists, and corporations in the pharmaceutical industry;
- Medical device manufacturers;
- Policy makers (particularly those with interest in public health, healthcare safety or privacy policies);
- Healthcare information technology technicians and organizations; and
- Professional organizations and societies relevant to the various aspects of the space.

The healthcare sector is an enormous area financially as well. For example, out of $2.87 trillion on healthcare spent in the US in 2010, the breakdown of components is:

US Healthcare Expenditures in 2010 (information from Emmanual 2014)

Hospital Care	$921B
Physician Services	$555B
Prescription Drugs	$280B
Nursing Home Care	$151B
Other Medical Products	$113B
Dental Services	$93B
Government Public Health	$84B
Other Professional Services	$79B
Home Health Care	$77B
Research	$48B

The sections below provide insight into the landscape for these the stakeholder groups where there is sufficient information currently available. More detail will be

added as the healthcare aspects of the SEBoK mature and the team will take particular care to incorporate additional information from outside the US going forward.

Healthcare Delivery

The largest share of the money spent on healthcare in the US healthcare is in hospitals (almost a third). The number of hospitals has been relatively flat for the last 20 years. However, due to the growing cost pressures and increasing paperwork, there has been a general consolidation of hospitals into chains, and independent physician providers into hospitals or group practices. (Emmanuel 2014)

Overall Hospital Landscape (information from (AHA 2014))

Total Number of All U.S. Registered * Hospitals	5,627
Total Number of U.S. Community ** Hospitals	4,926
Total Number of Nongovernment Not-for-Profit Community Hospitals	2,870
Total Number of Investor-Owned (For-Profit) Community Hospitals	1,053
Total Number of State and Local Government Community Hospitals	1,003
Total Number of Federal Government Hospitals	213
Total Number of Nonfederal Psychiatric Hospitals	403

Hospitals range from small community hospitals to the New York-Presbyterian Hospital/Weill Cornell Medical Center with 2,259 beds (Becker 201)], or the University of Pittsburgh Medical Center Presbyterian with $12B in revenue in 2013. (Becker 2013).

Hospital chains tend to be less than 10 hospitals, with less than 10 chains having more than 10 hospitals (Becker 2015). The largest two have almost 200 hospitals (Community Health Systems with 188 and Hospital Corporation of America with 166). The largest systems by revenue are Kaiser Permanente and the Veterans Health Administration with revenue or budget of slightly over $50B each.

Medical Devices Manufacturers

The medical device development landscape is diverse, composed of many markets of intermediate size (many being above $10B in size, with high single digit to double digit growth rates). Some examples are, with projected market sizes in 2020, are:

Types of Medical Devices and Projected Market Share
(Emmanuel 2014)

Medical Device Type	Projected Market Share
In-vitro diagnostics (IVD)	$75B
Endoscopy	$33B
Interventional Cardiology	$27B
Infection control	$17B
Minimally invasive surgery	$14B
Defibrillators	$13B
Dental Implants	$10B
Infusion pump	$ 7B
Magnetic Resonance	$ 7B
Digital Xray	$ 5B

As described in Healthcare Systems Engineering, this is the area of the healthcare sector that is most closely aligned with classic product-focused businesses.

Healthcare IT

There is a large uncertainty in what constitutes Healthcare IT. The most visible segment is the Electronic Medical Record (EMR) or Electronic Health Record (EHR), but there is also large markets in billing management, clinical decision support, image management, etc. But there is a divergence of market sizes with estimates around $60B [Bain, FierceIT] and some around $104B [Markets and Markets, MedGadget, and PRNewswire].

An EHR installation at a hospital is similar to an Oracle database installation at a company, where much of the cost is customizing the database and workflows to the institution's policies and workflows, and in training the users to the new system and standardized practices which come with IT and automation.

The top 10 Healthcare IT solution providers in 2015
(information from (Healthcare Informatic 2015))

Company	2015 Revenue
Optum	$5.2B
Cerner Corp.	$3.4B
McKesson	$3.1B
Dell	$2.9B
Cognizant	$2.7B
Philips	$2.7B
Xerox	$2.4B
Siemens	$2.0B

Epic Systems Corp. $1.8B
GE Healthcare $1.5B

Public Health Systems

The World Health Organization (WHO) defines public health as "all organized measures ... to prevent disease, promote health, and prolong life among the population as a whole. Its activities aim to provide conditions in which people can be healthy and focus on entire populations, not on individual patients or diseases. Thus, public health is concerned with the total system and not only the eradication of a particular disease." (WHO 2016) Governments at each level define exactly what "public health" will encompass, but typically there are three areas: epidemiology, provision of health services, and workplace and environmental safety and policy. Epidemiology is the study and control health-related events, including disease. Various methods can be used to carry out epidemiological investigations: surveillance and descriptive studies can be used to study distribution; analytical studies are used to study determinants." (WHO 2016, "Health topics: Epidemiology"). Health services may include services such as preventive vaccinations, disease screening, or well-baby or well-child programs. Environmental safety can include developing policies for automobile or workplace safety, monitoring the quality of drinking water, or even conducting restaurant health inspections. In addition to these wide varieties of work, public health organizations are increasingly expected to be responsible for the health-related aspects of disaster and emergency response efforts.

In the US, the public health "system" is really a patchwork of independent healthcare departments. Each state or territory defines the scope and responsibilities of its own public health "department", requiring information and cooperation from hospitals, private physicians, emergency personnel, laboratory networks, and sometimes public health organizations from other states. (Gursky 2005)

Conclusion

In addition to each group of stakeholders being complex in itself, these stakeholders then interact and work together - or sometimes contradict one another. This makes the landscape of the healthcare systems engineering space itself complex and highlights the need

for systems thinking and systems approaches when attempting to address any health-related issues or challenges.

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None.

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None.