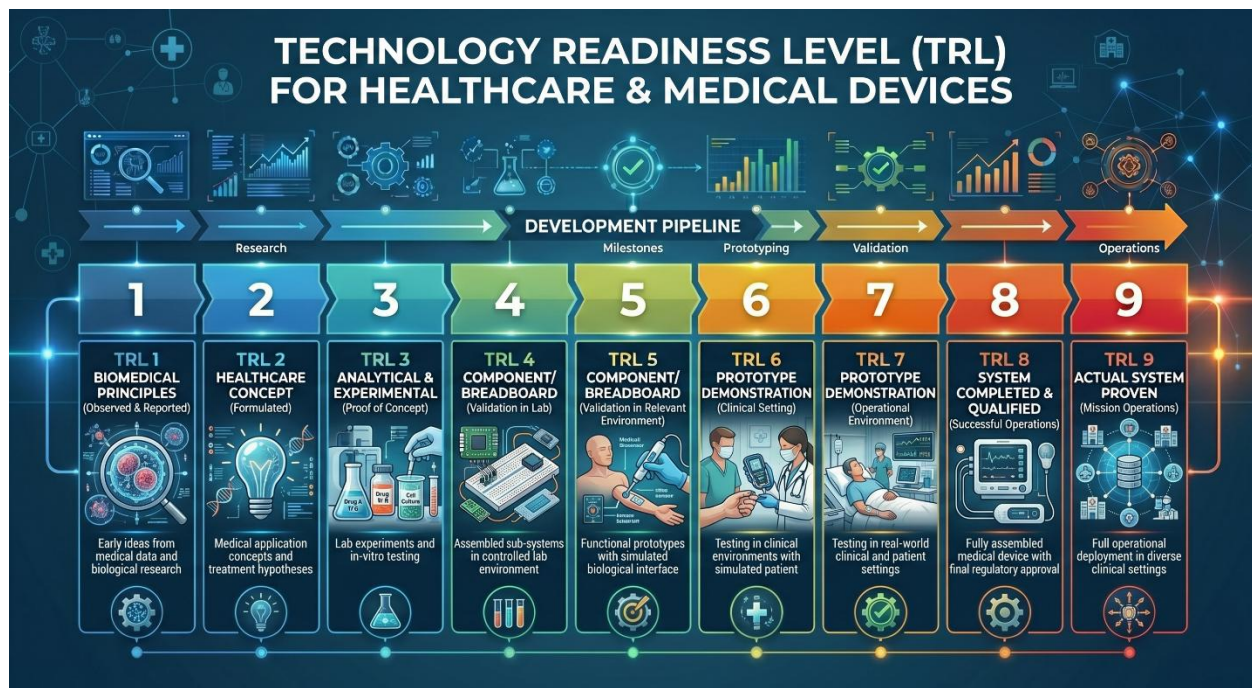


Definition of Technology Readiness Level (TRL)



TRL 1: Basic principles observed and reported

Scientific research begins to be translated into applied research and development. It involves reviewing relevant literature and prior art to understand basic principles and properties.

TRL 2: Concept and/or application formulated

Practical applications can be invented. Applications are theoretical, and there may be no proof or detailed analysis to support the assumptions. Activities are limited to analytic or feasibility studies.

TRL 3: Concepts demonstrated analytically or experimentally

Active research and development are initiated. This includes analytical studies and laboratory studies to physically validate that the analytical predictions of separate elements of the technology are correct. This stage provides the Proof-of-Concept.

TRL 4: Key elements demonstrated in laboratory environment

Basic technological components are integrated to establish that they will work together. Laboratory-scale prototype designed to demonstrate and solve specific technical issues in a controlled lab environment.

TRL 5: Key elements demonstrated in relevant environments

The basic technological components are integrated with reasonably realistic supporting elements, enabling the technology to be tested and demonstrated in a simulated or relevant environment.

TRL 6: Representative of the deliverable demonstrated in relevant environments

A representative model or prototype system (well beyond the laboratory scale) is tested and demonstrated in a simulated operational environment, where external factors are controlled to mimic reality.

TRL 7: Final development version of the deliverable demonstrated in operational environment

The demonstration of an actual system prototype in a real operational environment (such as an actual field or clinical evaluation report) where external variables cannot be controlled.

TRL 8: Actual deliverable qualified through test and demonstration

The technology has been proven to work in its final form and under expected conditions. In almost all cases, this TRL represents the end of true system development. The final system is fully tested for quality, stability, and relevant regulatory standards, and is ready for implementation or integration into the healthcare system.

TRL 9: Operational use of deliverable

The actual technology or finished product is successfully deployed and used continuously by customers in the market or utilized for public benefit. The system is fully proven, accepted, and all minor post-deployment issues have been resolved.

References:

1. Catherine G. Manning. Technology Readiness Levels - NASA [Internet]. [cited 2026 May 25]. Available from: <https://www.nasa.gov/directorates/somd/space-communications-navigation-program/technology-readiness-levels/>
2. National Science and Technology Development Agency (NSTDA). Technology Readiness Level (TRL) Application Manual: National Science and Technology Development Agency (External Publication Edition) [Internet]. 2016. Available from: <https://www.nstda.or.th/rqm/allmedia/category/1-pr.html?download=25:trl-ver-2-1-external>