

Technology Readiness Levels

Technology Readiness Level's (TRL's) are used to define the maturing of a technology, ranging from TRL 1, when research has been initiated, to TRL 9, once technologies have entered the market. The table provides stage descriptors for different sectors, i.e. science and engineering, health sciences/medical and software.

Level	TRL 1	TRL 2	TRL 3	TRL 4	TRL 5	TRL 6	TRL 7	TRL 8	TRL 9
Science & Engineering	Basic idea	Concept developed	Experimental Proof of Concept	Lab Demonstration	Lab scale validation (early prototype)	Prototype demonstration	Capability validated on economic runs	Capability validated over range of parts	Capability validated on full range of parts over long periods
							Pilot system demonstrated	System incorporated in commercial design	Proven system ready for full deployment
				Component and/or system validation in laboratory environment	Laboratory scale, similar system validation in relevant environment	Engineering/pilot scale, similar (prototypical) system validation in relevant environment	Full-scale, similar (prototypical) system demonstrated in relevant environment	Actual system completed and qualified through test and demonstration	Actual system operated over the full range of expected mission conditions
Software			Software to test and evaluate basic concepts on simple model problems representative of final need	Escalate model to more realistic representation of industrial system. Confirm basic formulation	Model contains all major elements of need. Solve industrial strength problems by code developers OR achieve functionality by expert users. Document performance. GUI.	No specialist intervention required from programmers/developers. This includes basic GUI interface. If required, programming to be according to ISO standards.	Install, run and evaluate software in actual goal environment (e.g. prospective client's computers). Demonstrate use by clients	Evaluation done by target representative clients on representative hardware platforms. Complete GUIs, users manuals, training software support etc. Typical user driven 'bug hunting'	Product proven ready through successful operations in operating environment
Medical Science	Basic Research		Preclinical Research		Late Preclinical Research	Phase I Trials	Phase II Trials	Phase III Trials	Phase IV Trials
Phase	Research			Translation / Development			Commercialisation		

Innovation Management Journey

Innovation Management Stage	Main Objectives	Indicative TRLs
1. Intellectual Property Protection	Protection of research results through patents, utility models, or other forms of intellectual property.	TRL 1–3
2. Market Analysis and Commercialisation	Assessment of the target market, identification of industrial partners, and evaluation of commercialisation pathways (licensing or creation of a spin-off/start-up).	TRL 3–5
3. Technology Development	Prototype development, technology validation, testing and demonstration in relevant environments, and progression toward production and advanced trials.	TRL 4–8
4. Funding	Securing financial resources appropriate to the different stages of technology development, from proof of concept to commercialisation.	Cross-cutting
5. Commercialisation	Transfer of the technology to the market through licensing agreements with existing companies or through the creation of a new company (spin-off/start-up).	TRL 8–9