

**Technology Readiness Level (TRL)**

Technology Readiness Level (TRL) is a type of measurement system used to assess the maturity level of a particular technology.

**TRL Characterisation**

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| **TRL LEVEL** | **DESCRIPTION** | **CHARACTERISATION** |
| **TRL 1** | Basic Principle | * Technology research
* Pure science begins translation to R&D
 |
| **TRL 2** | Formulation of Concept | * Early studies for application formulation
* Invention & Practical Application Begins
 |
| **TRL 3** | Experimental Proof of Concept | * Analytical validation & proof of concept
* Start active research & development
 |
| **TRL 4** | Lab Validation | * Validation in laboratory environment
* Ready to begin bridge for technology transition
 |
| **TRL 5** | Validation in real environment | * Validation in relevant environment
* Ready to enter technology development
 |
| **TRL 6** | Demonstration in real environment | * Demonstrated in relevant environment
* Ready to enter system development
 |
| **TRL 7** | Demonstration of prototype | * Demonstrated in operational environment
* Ready for limited production decision
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| **TRL 8** | Product/System complete and qualified | * Compliant, qualified, & test/demo complete
* Ready for operational evaluation
 |
| **TRL 9** | Product/System proven | * Completed operational evaluation
* Ready for full-rate
 |

**Source:**

1. National Aeronautics and Space Administration (NASA) Technology Readiness Level (2012)
2. International Collaboration Fund Guideline, Kementerian Sains, Teknologi dan Inovasi (MOSTI) (2019)

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|  | **PRGS 2.0****TECHNOLOGY READINESS LEVEL [TRL]****EVALUATION FORM*****Borang Penilaian******Tahap Kesediaan Teknologi*** |
| **A.** | **PARTICULARS OF RESEARCH & RESEARCHER***MAKLUMAT PENYELIDIKAN & PENYELIDIK* |
| **(i)** | **Name of Product:***Nama Produk:* |
| **(ii)** | **Name of Lead Researcher:***Nama Ketua Penyelidik:* |
| **(iii)** | **Name of Co-Researcher:***Nama Penyelidik Bersama:* |
| **(iv)** | **School/Institute/Centre/Unit:***Pusat Pengajian/Institut/Pusat/Unit:* |
| **B.** | **CONTACT INFORMATION***Maklumat Perhubungan* |
| **(i)** | **Email:***Emel:* |
| **(ii)** | **Office No:***No Pejabat:* |
| **(iii)** | **H/P No:***No H/P:* |
| **C.** | **BRIEF EXPLANATION OF THE INVENTION**(Provide a brief explanation of the invention. Use diagrams if it gives better understanding of the product)***Penerangan Ringkas Ciptaan****(Berikan penerangan ringkas berkaitan ciptaan ini. Gunakan gambar rajah jika ia boleh memberi penerangan yang lebih jelas berkaitan produk)* |
| **D.** | **LEVEL OF KNOWLEDGE** |
|  |  |
|  |  | **Yes** |  | **No** |  |
| **(i)** | Basic scientific principles observed |  |  |  |  |
| **(ii)** | Possible application exists |  |  |  |  |
| **(iii)** | Paper studies confirm basic principles |  |  |  |  |
| **(iv)** | Paper studies show that application is feasible |  |  |  |  |
| **(v)** | Physical laboratory experimental evidence confirms basic principles |  |  |  |  |
| **(vi)** | Laboratory experiments verify feasibility of application |  |  |  |  |
| **(vii)** | Rigorous analytical studies confirm basic principles |  |  |  |  |
| **(viii)** | Physics underlying the technology is well understood |  |  |  |  |
| **(ix)** | Overall system requirements for end user’s application are known |  |  |  |  |
| **(x)** | Science known to extent that mathematical and/or computer models and simulations are possible |  |  |  |  |
| **(xi)** | System interface requirements known |  |  |  |  |
| **(xii)** | Operating environment for eventual system known |  |  |  |  |
|  |  |  |  |  |
| **E.** | **Has analytical and experimental proof-of-concept been demonstrated in a laboratory environment?***(Answer the following questions based on the current research outcome)* |
|  |  |  |  |  |  |
|  |  | **Yes** |  | **No** |  |
| **(i)** | Have experiments validated the predicted capability of technology components? |  |  |  |  |
|  |  |  |  |  |  |
| **(ii)** | Paper studies indicated that system components ought to work together? |  |  |  |  |
|  |  |  |  |  |  |
| **(iii)** | Did the technology fulfill the necessity or introduceding innovations towards the related field?  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| **F.** | **Has lab-scale testing of equipment been completed in a laboratory environment?***(Answer the following questions based on the current research outcome)* |
|  |  |  |  |  |  |
|  |  | **Yes** |  | **No** |  |
| **(i)** | Have system requirements been finalised and documented? |  |  |  |  |
|  |  |  |  |  |  |
| **(ii)** | Have end user’s requirements been finalised and documented? |  |  |  |  |
|  |  |  |  |  |  |
| **(iii)** | Laboratory experiments with available components show that they work together |  |  |  |  |
|  |  |  |  |  |  |
| **(iv)** | Available components assembled into a prototype |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| **G.** | **Has pilot-scale testing been demonstrated in a relevant environment?***(Answer the following questions based on the current research outcome)* |
|  |  |  |  |  |  |
|  |  | **Yes** |  | **No** |  |
| **(i)** | Have system interface (internal & external) requirements been documented? |  |  |  |  |
|  |  |  |  |  |  |
| **(ii)** | Does the pilot-scale operate under realistic conditions in a relevant environment? |  |  |  |  |
|  |  |  |  |  |  |
| **(iii)** | Has integration of modules/functions been demonstrated in a relevant environment? |  |  |  |  |
|  |  |  |  |  |  |
| **H.** | **Prototype***(Answer the following questions based on the current research outcome)* |
|  |  |  |  |  |  |
|  |  | **Yes** |  | **No** |  |
| **(i)** | Does the prototype solve the problems?  |  |  |  |  |
|  |  |  |  |  |  |
| **(ii)** | Can you show how the prototype solved the said problems? |  |  |  |  |
|  |  |  |  |  |  |
| **(iii)** | Can you show the important elements inside the prototype? |  |  |  |  |
|  |  |  |  |  |  |
| **I.** | **Demonstration***(Answer the following questions based on the current research outcome)* |
|  |  |  |  |  |  |
|  |  | **Yes** |  | **No** |  |
| **(i)** | Can you demonstrate the prototype? |  |  |  |  |
|  |  |  |  |  |  |
| **(ii)** | Can you show all the prototype function if demonstrated? |  |  |  |  |
|  |  |  |  |  |  |
| **(iii)** | Does the prototype have the metrics to conclude that the prototype confirms the basic principle? |  |  |  |  |
|  |  |  |  |  |  |
| **J.** | **Evidence**Please provide evidences through email (picture, report, video, etc.). You also can book a Webex session to explain further and to demonstrate your prototype.***Bahan Bukti****Sila berikan bahan bukti menerusi emel (gambar, laporan, video, dll.). Anda juga boleh menempah sesi Webex untuk memberi penerangan lanjut dan membuat demonstrasi prototaip anda.***Khairul Syahmi Brahim**ksyahmi@usm.mysyahmibrahim@gmail.com**Webex Session (subject to availability and first come first serve)**Date:Time: |
| **K.** | **OTHER ISSUES**Please state other comments that you would like to make on your research/invention/ product.***Lain-lain isu****Sila nyatakan ulasan lain yang ingin dibuat terhadap penyelidikan/ciptaan/produk anda.* |

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**Signature of Researcher Date**

*Tandatangan Penyelidik*  Tarikh