Sharing Session on Useful Tips for Framing Strong FRGS Research Problem Statements

7 January 2025

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A part of the series: A Guide for a Beginner, by a Beginner

Some questions to reflect on

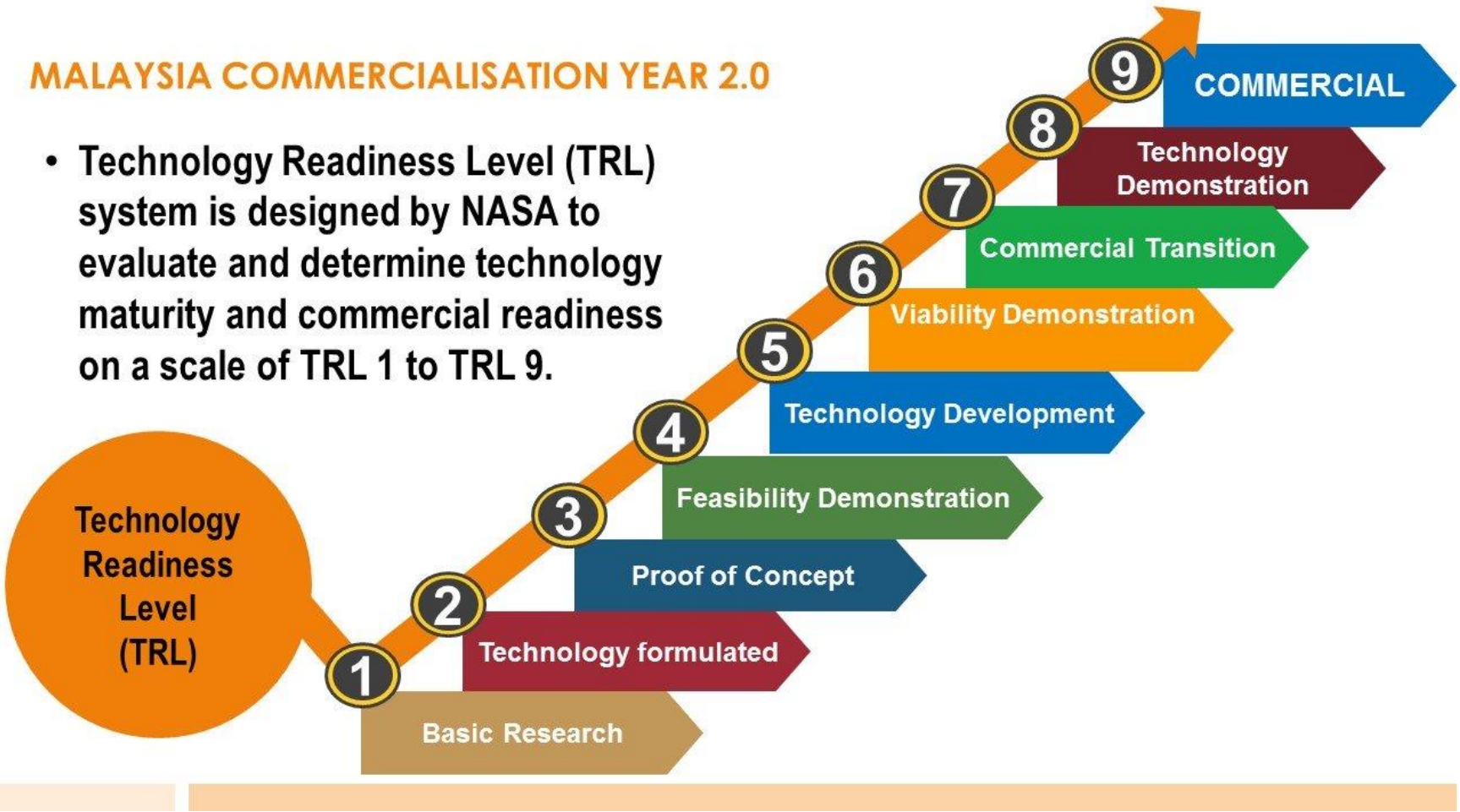
1. What should be the nature of my problem statement?
2. Where can I derive strong problem statement?
3. How can I assess the impact of my problem statement in relation to the Quintuple Helix, TRL 1 and TRL 2 ?
4. Which research domain should I choose in relation to my problem statement?
5. How can I frame problem statements as proposal titles?
6. Miscellaneous

What should be the nature of my problem statement?

Nature of FRGS grant

- Purely fundamental research (TRL 1)
- Not applied research (TRL 2)
- Nonetheless, the outcome of the FRGS would potentially lead to applied research or development work in the future (PRGS). How soon is the future?
- What is the fundamental equation you desire to formulate / construct / validate?
- Characterization work as sub-objective is ok

Technology Readiness Level (TRL)



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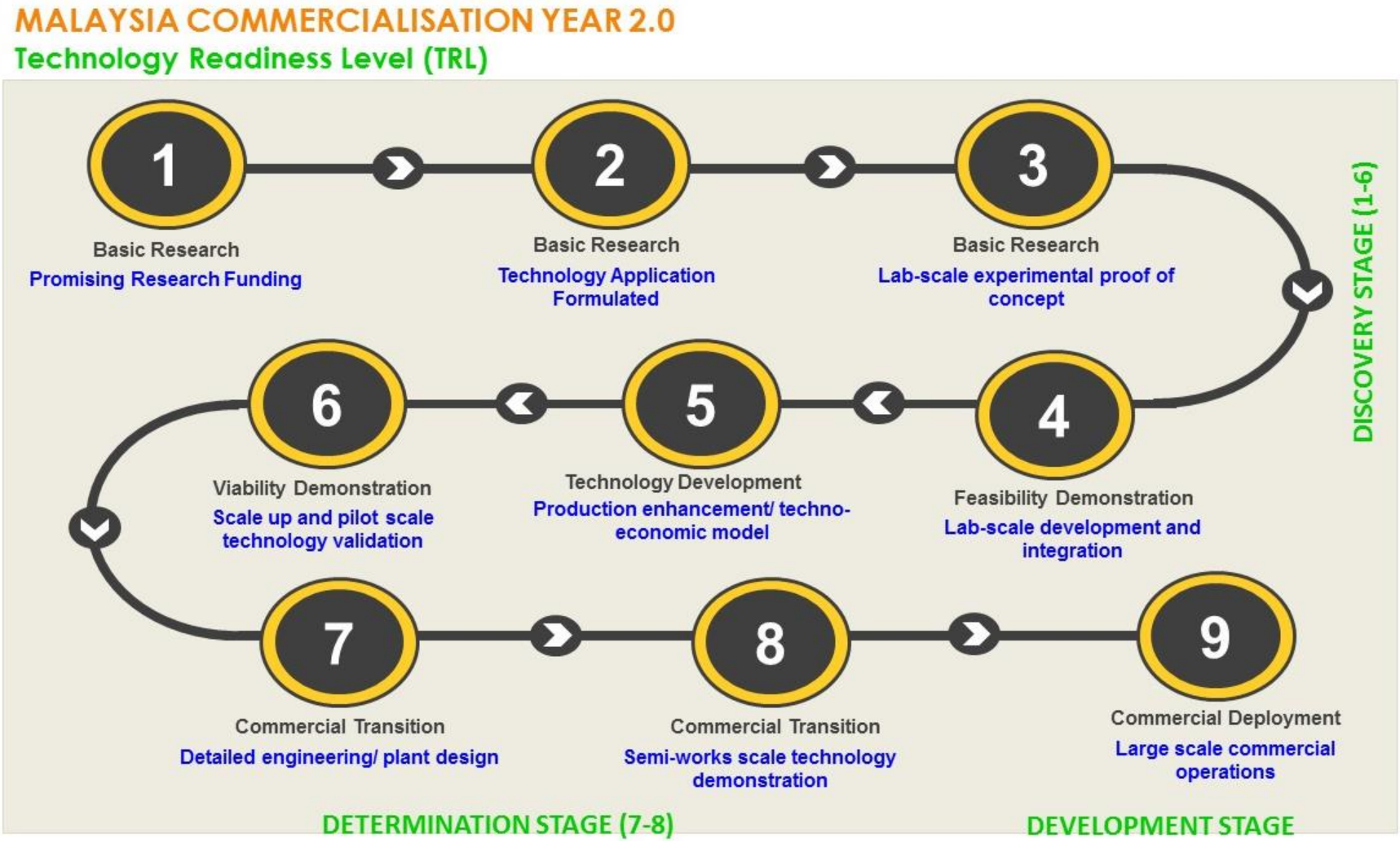
Technology Readiness Level (TRL)



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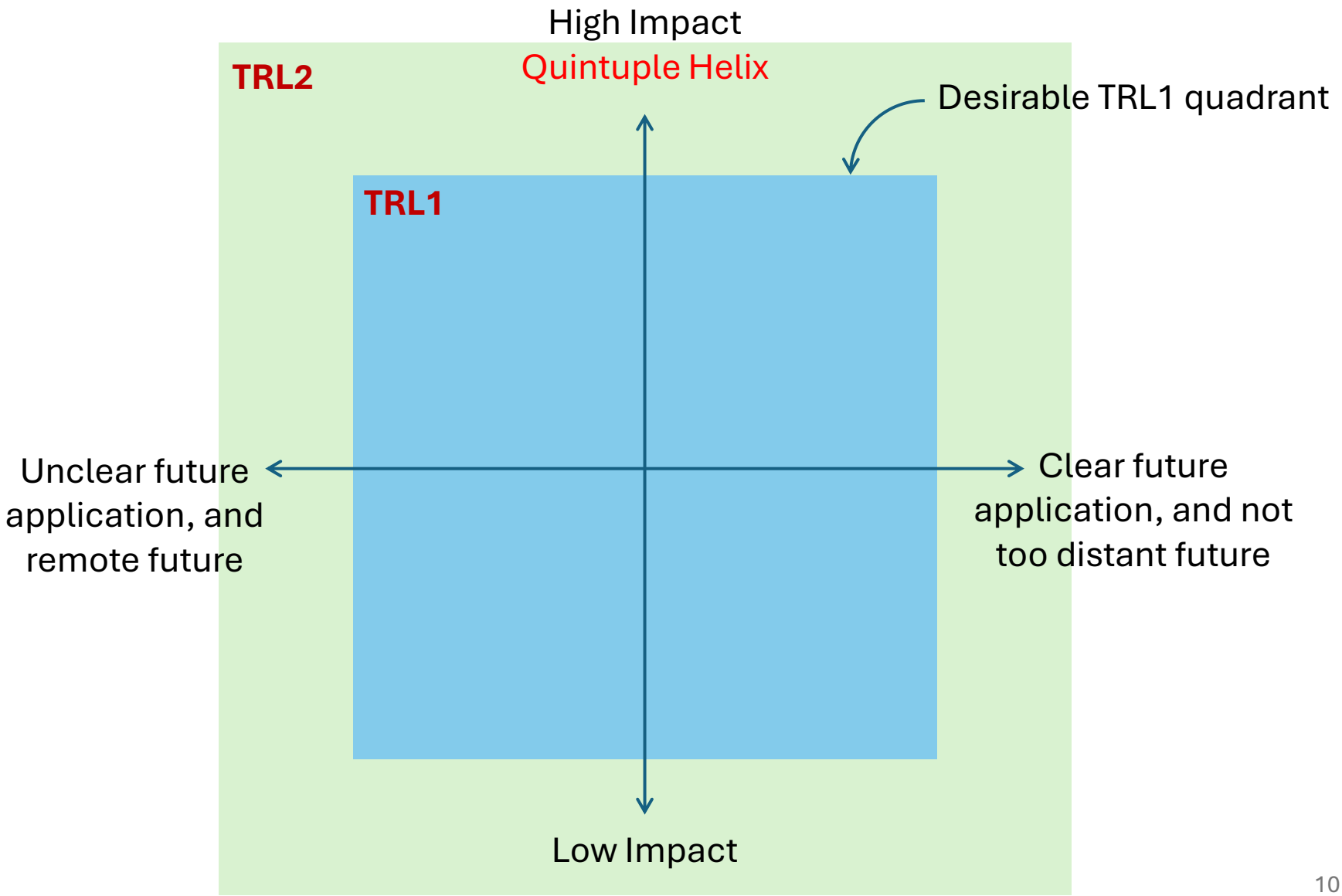
Where can I derive strong problem statements?

Problem statements

- Any sensible research problem that needs to be addressed at fundamental level
- Examples, research gap based on FYP / Master / PhD findings
- You did some earlier (FYP/Master/PhD) study, but the findings are inconclusive – this should be mentioned and clearly described in the problem statement section
- Add some figures and preliminary results to make the problem statement more convincing and compelling

How can I assess the impact of my problem statements in relation to the Quintuple Helix, TRL 1 and TRL 2 ?

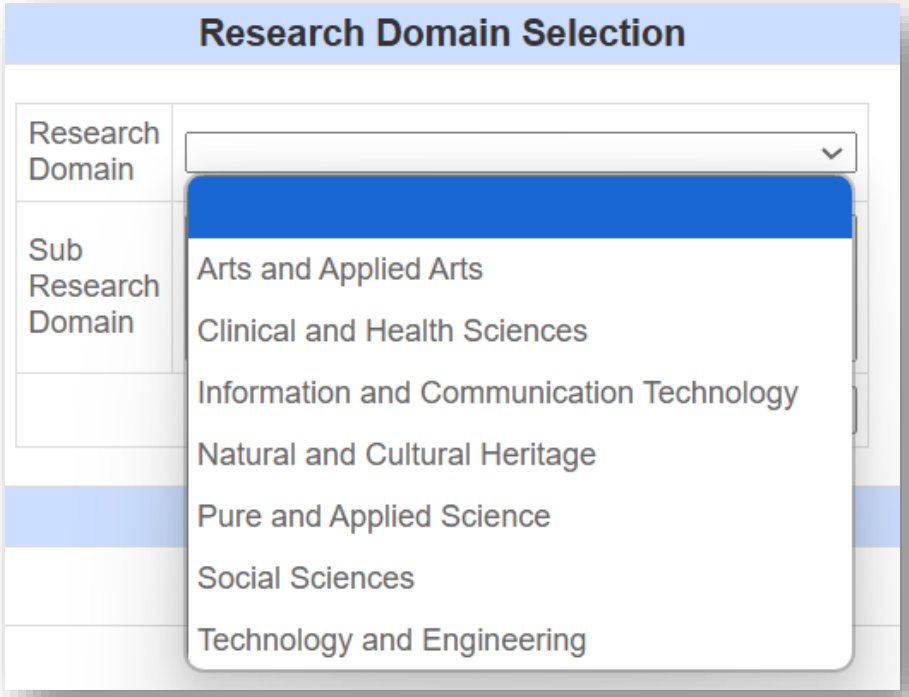
Problem statement & FRGS Mapping Criteria



Which research domain should I choose in relation to my problem statement?

Research Domain

- Crucial to choose the correct research domain



How can I frame the problem statements as proposal titles?

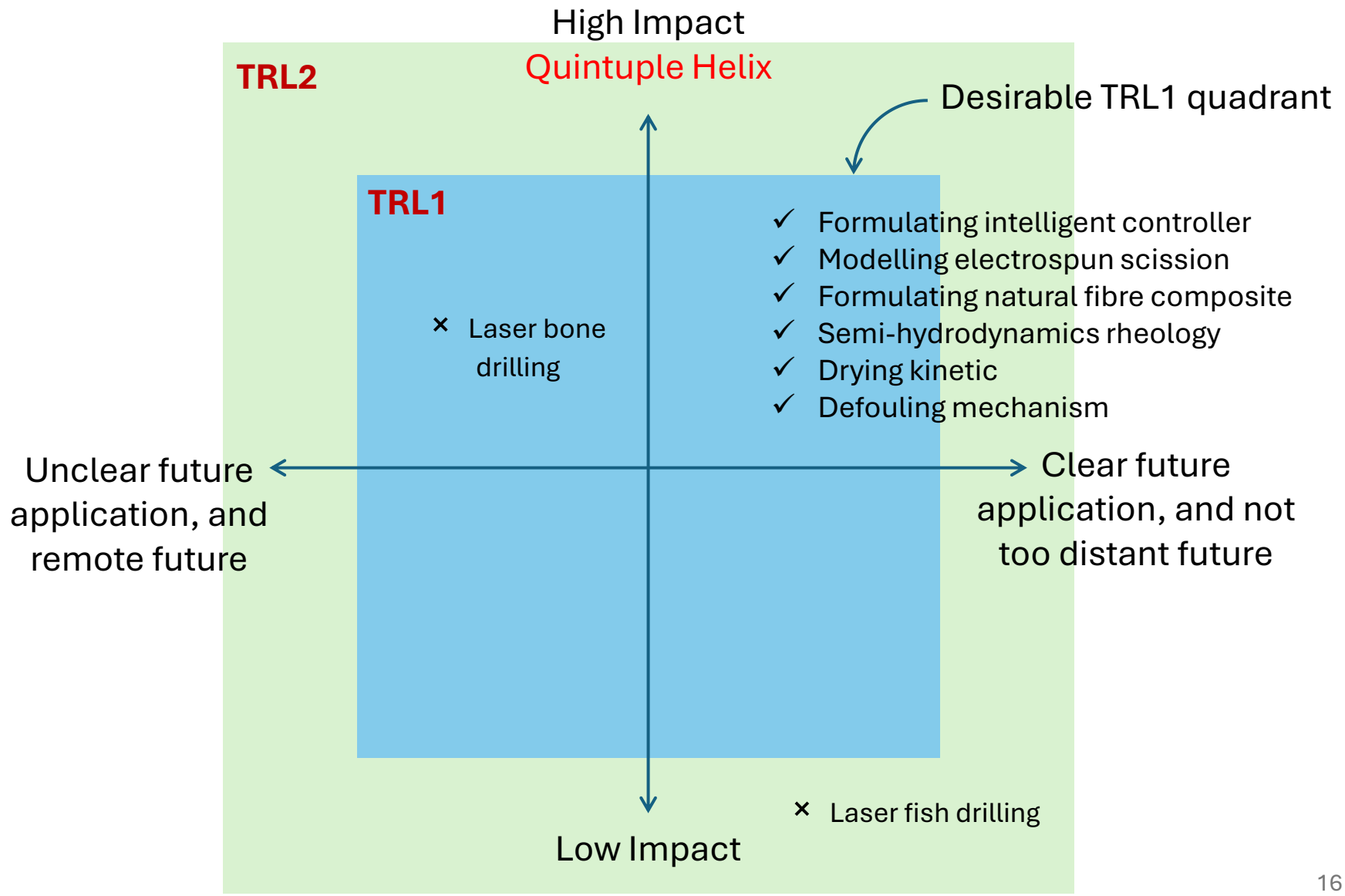
Successful FRGS proposals by JKMP

Year	PI	Title
2017	Fikri	Investigation of three-dimensional (3D) precision laser cutting of non-metals using modified computer DVD writer drives
2020	Marini	Mathematical modelling of electrospun fibre ultrasonication scission
2020	Danial	Investigation of nanosheets semi-hydrodynamics rheology for friction reduction and anti fouling
2020	Nicholas	Parametric study of environmentally-friendly Luffa Acutangula reinforced polymer composite and its fibre metal laminate for anti-impact design and applications
2021	Ana Sakura	Improving the white pepper drying behavior towards efficient drying process of the premium quality product employing hybrid drying scheme
2022	Fikri	Underwater defouling mechanism of freshwater bacterial (Caulobacter crescentus) biofilm by laser radiation for green biofouling treatment
2024	Annisa	Formulating an intelligent adaptive impedance controller for the assist-as-needed framework of the upper-limb exoskeleton

My un/successful FRGS proposals

Year	Type	Title	Status
2017	FRGS	Investigation of three-dimensional (3D) precision laser cutting of non-metals using modified computer DVD writer drives	√
2018	-	-	
2019	-	-	
2020	FRGS	Towards sustainable consumption and production: Experimental investigation on laser-assisted trepanning for precise high-speed extraction of fish's pituitary gland	☹
2021	FRGS	Damage mechanism of laser drilled bone under thermo-mechanical loading	☹
2022	FRGS	Underwater defouling mechanism of freshwater bacterial (Caulobacter crescentus) biofilm by laser radiation for green biofouling treatment	√
2023	-	-	
2024	-	-	

Problem statement & FRGS Mapping Criteria



Successful FRGS proposals by JKS

Year	PI	Title
2017	Charles	Fuzzy FMEA risk assessment of hydraulic flushing in managing sedimentation in open storm drain
2019	Norazzlina	Strength Optimization of Fiber Reinforced Peat using Scrap Tire for the Subgrade Embankment
2019	Lee Yee Yong	Porous Material with Thermal and Evaporation Properties for Thermal Comfort Evaluation
2020	Ahmad Kueh	Formulation of spectral composite tensegrity model for resonant frequency of Escherichia coli (E. coli) for clean sonar emission water treatment
2020	Idawati	Strength and Durability Prediction of Geopolymer Concrete Through Machine Learning
2020	Gaddafi	Establishment of Timber Engineering Properties and Classification for Product Development of Acacia Hybrid

Successful FRGS proposals by JKS

Year	PI	Title
2022	Abdul Razak	Optimizing Bolted Connection Strength for Malaysian Hardwoods
2022	Fauzan	Influence of soil rheology in the solid-fluid domain on submarine slide-pipeline impact force
2022	Siti Noor Linda	Critical Appraisement of Slope Failure Contributing Parameters for Slope Risk Assessment System of Western Sarawak via Multi Statistical Approaches with Artificial Neural Network
2023	Abdul Azim	Mechanism of concrete confining stress in enhancing the strength and ductility of steel plate reinforced CFST short column
2023	Alsidqi	Behavior of thermal contraction on cemented paste backfill in mine stope
2023	Inawati	Formulating the biokinetic parameters of aerobic granular sludge treating agro-based wastewater using artificial neural networks.
2024	Leonard	Interactive Mechanism of Biochar and Fertilizer in Enhancing Soil Nutrient Dynamics

Successful FRGS proposals by JKKST

Year	PI	Title
2020	Ibrahim	Synergistic effects between titania, copper oxide and palm kernel carbon support in a heterogeneous photocatalytic system for degradation of aqueous ammonia in synthetic leachate
2020	Yiin Chung Loong	Reaction mechanisms and kinetics of bio-based fuels production from hydrothermal liquefaction of oil palm-derived lignin via low-transition-temperature mixtures (LTTMs)
2021	Asrul	Converting waste energy to useful energy via a new Noise Barrier Energy Harvesting System.
2022	Ivy	Elucidation of Crystallization Kinetic and Thermodynamic Behaviours of Ammonium Sulphate in Wastewater via Eutectic Freeze Crystallization Process
2022	Khairul Anwar	Adsorption kinetic and isotherm study of zero-valent iron/graphene oxide particle in polyvinylidene fluoride ultrafiltration gravity-driven membrane for methylene blue removal

Successful FRGS proposals by JKKST

Year	PI	Title
2023	Nazeri	Faradaic Efficiency Optimization of Continuous Electrocoagulation System for Peat Water Treatment
2024	Afizal	Correlation of UiO-66 Metal Organic Framework (MOF) and Montmorillonite (MMT/UiO-66) Nanofiller in Polymeric Membrane for Efficient Heavy Metal Removal

Successful FRGS proposals by JKEE

Year	Type	Title
2017	Kudnie	Study on the Effect of TiO2 Doped Graphene Oxide and Reduced Graphene Oxide for Perovskite Solar Cell Application
2017	Yonis	A Novel Multi input DC-DC Power Converter for Integrated Solar PV-Micro Hydro Hybrid Renewable Energy System.
2019	Abdul Rahman	Receiver Scintillation Enrichment Using Zero Optimum Decision (ZOD) Technique In Free Space Optical Communication Transmission
2020	Tay Kai Meng	Formulation of a Novel Explainable Deep Fuzzy Reasoning Network with Learning Procedure for Complex Systems
2020	David Bong	Inconspicuous Keypoint Discovery and Matching for the Stitching of Near-Uniform Scene Images
2020	Rohana	Mathematical Formulation of Group Delay Variation CMOS Low Noise Amplifier in Breast Imaging System
2020	Norhuzaimin	Formulation and Mitigation of Soft Error in CMOS Memory System
2020	Yonis	An optimal control energy management strategy for a hybrid electric vehicle with battery/supercapacitor storage devices

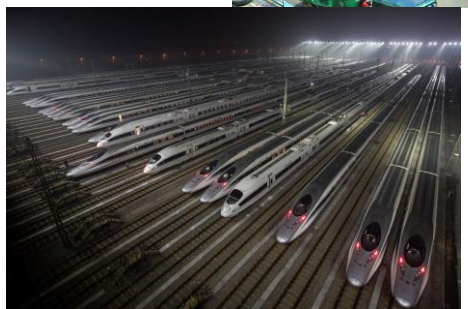
Successful FRGS proposals by JKEE

Year	Type	Title
2021	Ahmed	An Intelligent Modelling of Power Router in Cloud Computing Environment for Voltage Management of Grid-connected Renewable Resources
2021	Kasumawati	A Novel Transmission-based Risk Analytic Paradigm with Computational Intelligence for Prevention and Control of Infectious diseases: Case Study at Pasai Siong COVID-19 Cluster, Sarawak
2022	Hazrul	Multi-objective Predictive-Fuzzy-TOPSIS based Maximum Power Point Tracking for Proton Exchange Membrane Fuel Cell
2022	Yanuar	Experimental Investigation on Dielectric Properties of Palm Oil Methyl Ester-Nanofluid Under Different Esterification Process and Thermal Aging
2023	Then Yi Lung	Modeling of Near-Field Radiating Rectenna (NFRR) for Lightning Energy Harvesting: A Multi-Dimensional Analysis Approach in Malaysia
2023	Kho Lee Chin	Trust Scoring Optimization and Time-based Behavior Enhancement for Trust Management in the Internet of Vehicle

Miscellaneous

How can I determine my research landscape?

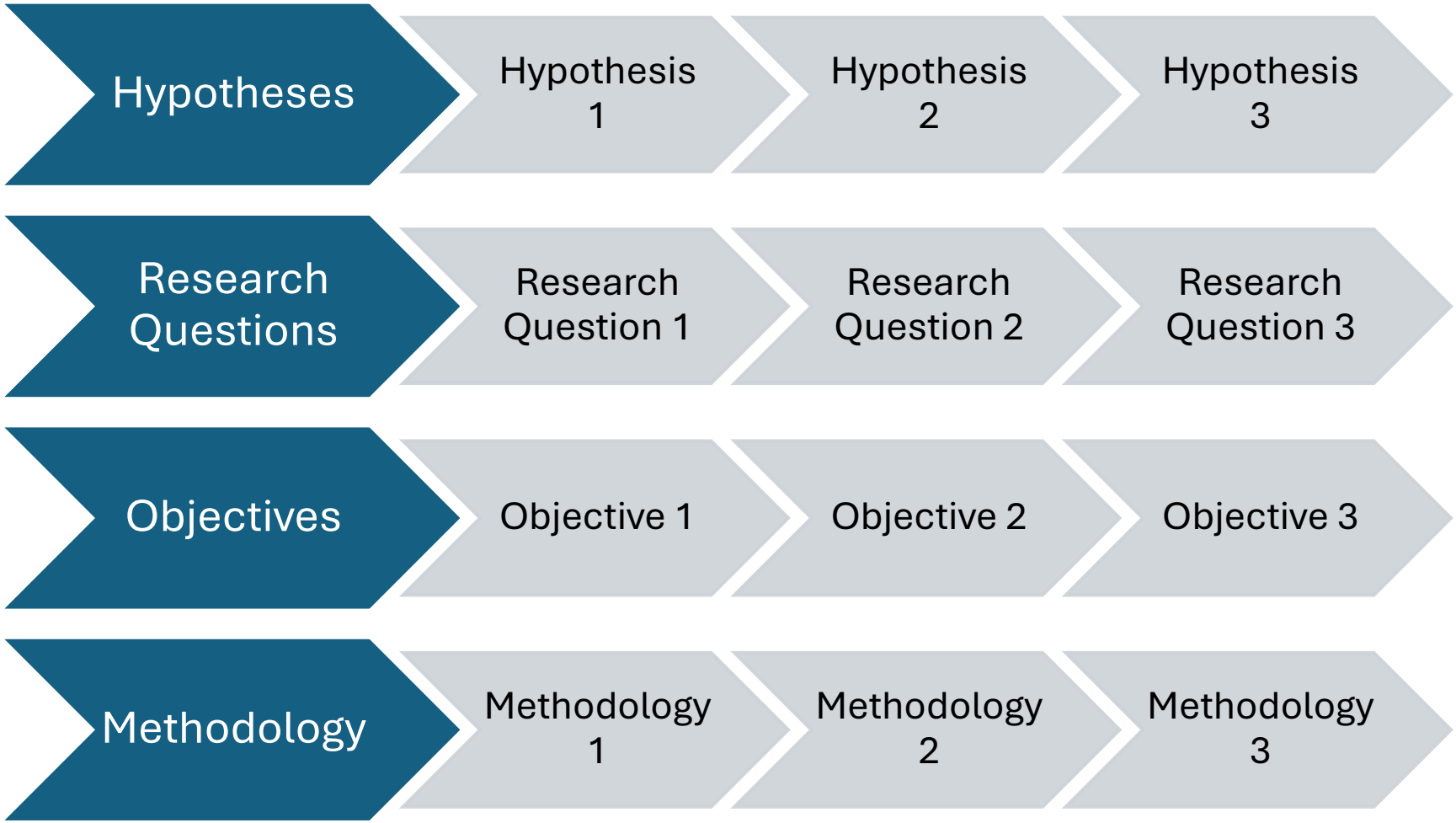
- Experiment or/and simulation
- Availability of research infrastructure
- Availability of research funding
- Survival
  - Short term → Publication / Grant
  - Mid term → Publication / Grant
  - Long term → Publication / Grant



Seminar by Prof Datuk Fauzi UTM

- Align academic activities with economic development in the region – reasons why proposals were rejected
- Need to think and strategise on how to survive in limited-resource institution to develop research activities
- SMART (specific, measurable, attainable, relevant, time-bound)
- Refer to disruptive technology trends
- Wow factor
- Do the right things, do things right
- Link

Constructive alignment



Useful slides by others

- Prof Omar Yaakob UTM
- Prof Che Hassan UKM (Ketua Domain Technology & Engineering)
- Prof Uda Hashim UNIMAP
- Prof Dato' Isa USM
- Prof Ku Ruhana UUM