KURSUS MODULE 2 JKR MALAYSIA

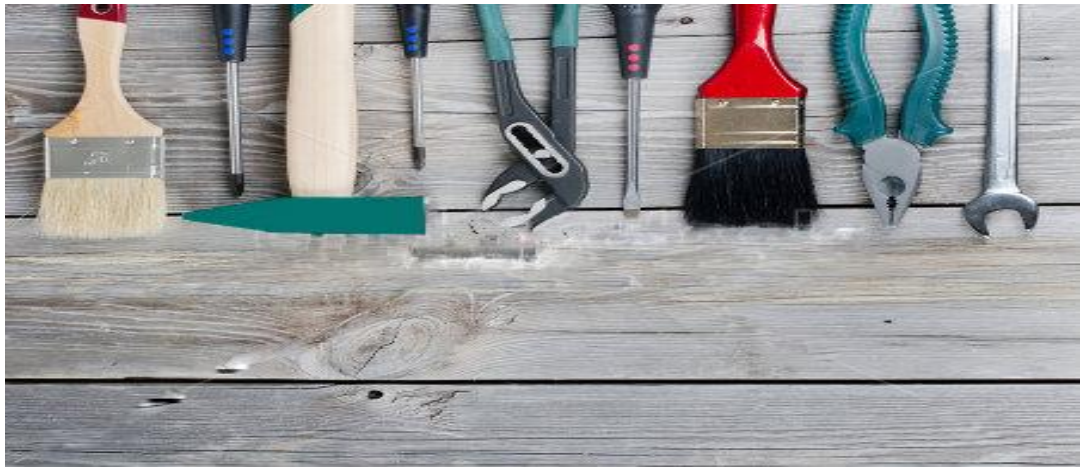
VM / VE

TOOLS & TECHNIQUES

the power of tools

Why are tools important in VM study?

- More objective (quantitative) evaluation
- Better justified decision making
- More structured and systematic process
- Minimize conflicts and argument
- Aid for achieving consensus
- Increase competency level of VM facilitator



pre lab stage

TOOLS / TECHNIQUES	PURPOSE(S)
• VE Study Pre Requisite Form	• Check project readiness for VE Study implementation
• VE Study Pre Lab Checklist Form	• Requirement checklist for implementing VE Study
• VE Lab Participant Identification (A.C.I.D. Test Form)	• Determine the required composition of lab members; • Ensure right people for right roles & responsibilities
• Client Value System (CVS) (Tool - Paired Comparison)	• Set priority of value objectives to be delivered; • Prioritize criteria for allocating resources and incorporate in design
• Function Analysis System Technique (F.A.S.T. Diagram) – *Initial draft by Facilitator* • Goals & Systems Modelling – *Initial draft by Facilitator*	• Represent the whole picture of required functions under study; • Guidance in aligning functions with objectives and project deliverables
• Site visit • Similar Facility Walk Through	• Understand the physical context and constraints • Provide basis of users' needs & requirements

pre lab stage (cont'd)

TOOLS / TECHNIQUES	PURPOSE(S)
• Meeting / Discussion	• Interfacing with client / Project Manager / HOPT / Designers / HODT
• Interviews / Questionnaires	• Facilitate on exploring project issues (evidences) • Explore possible value problems to be resolved
• Cost Worth Index	• Identify indicative mismatches to be resolved
• Drawings & Documents Analysis	• Gather project background & basic information • Identify indicative mismatches to be resolved • Provide valuable information in improving value
• VE Study Model(s) • **Cost Model** • **Life Cycle Cost** • **Space Model** • **Quality Model**	• Provide basis for value study (Cost / LCC / Space/ Quality Models); • Facilitate in selecting VE study scope & identifying indicative mismatches
• Post Occupancy Evaluation (POE) (of similar facility)	• Provide valuable information to improve value (functional & operational performance; users' needs and requirements)

cost worth index

Cost is the price paid or to be paid.
(note: one man's price is another man's cost)

Worth is defined as the least cost to perform the required function(s) or functional equivalent - consider only cost of basic function(s); excluded secondary function(s)

- Establish worth as a target or basis
- Measure Cost Worth Index; if cost is higher than worth, the value must be improved by reducing the cost
- Derive alternatives through creativity which cost is less than worth, then value for money is obtained

Source: Kelly and Male (2003)

cost model

MODEL KOS BERASASKAN REKABENTUK YANG DIBANGUNKAN SEBELUM KAJIAN VE:

ITEM	DESCRIPTION (AS IN PDA 1)	COST MODEL (BEFORE VE)
	CONSTRUCTION COST	
1	Contractual and General Items	1,800,000.00
2	200 mm diameter Micropile	450,000.00
	300 mm diameter Micropile (API Pipe)	6,200,000.00
3	Demolish Existing Road	350,000.00
4	Site Clearance	100,000.00
5	Earthworks	500,000.00
6	Retaining Wall	500,000.00
7	Soil Nailing	450,000.00
8	Flexible Pavement	550,000.00
9	Road Furniture	117,000.00
10	Drainage	351,000.00
11	Traffic Sign	250,000.00
12	Making Good Existing Road	800,000.00
13	Temporary Road Diversion (& Traffic Management)	147,000.00
14	Landscaping & Bio Engineering (Erosion Protection)	2,000,000.00
15	Environmental Protection Works	50,000.00
16	OSHA (Safety & Health)	250,000.00
	OTHER COST	
17	Variation of Prices (VOP)	370,000.00
18	Documentation	10,000.00
19	Advertisement	10,000.00
20	Contingencies	800,000.00
21	Supervision	-
	TOTAL PROJECT COST	**16,055,000.00**

space model

	SPACE	GRADE/	NO. OF PEOPLE PER ROOM	NO. OF ROOM	AREA (Mps)	TOTAL AREA (Mps)	NEW TOTAL AREA	ADDITIONAL	REDUCTION	REVIEWED	REMARKS	LAIN - LAIN KEPERLUAN
UNIT AMRA												
1	Pejabat Penyelia Persenjataan	32	1	1	15	15	12		3	12		4 punca kuasa 13 Amp, 1 talian telefon, set computer & printer warna, kelengkapan pejabat dan perabot yang bersesuaian.
2	Pejabat Am	17/22	3	1	5	15	15			15		1 talian telefon, 2 set workstation dengan 4 punca kuasa 13 Amp bagi setiap set workstation, set computer & printer warna, kelengkapan pejabat dan perabot yang bersesuaian.
3	Stor Senjata		1	1	20	20	20			20		Mengikut spesifikasi PDRM
4	Bengkel Senjata		1	1	20	20	0		20	0		Mengikut spesifikasi PDRM
5	Rak Senjata		1	1	20	20	0		20	0		Mengikut spesifikasi PDRM
6	ruang kaunter					0	8	8		8		
	tempat serah senjata /ksosong senjata					0	15	15		15		
	Bilik LSF					0	12	12		12		
UNIT PEMANDU												
6	Pejabat Am	17/22	4	1	5	20	20			20		16 punca kuasa 13 Amp, 1 talian telefon, set computer & printer warna, kelengkapan pejabat dan perabot yang bersesuaian.
7	Bilik Rehat Pemandu		4	1	5	20	20			20		4 punca kuasa 13 Amp Loker, sofa, katil dan perabut bersesuaian.
8	Ruang Parkir		0	0		0	0			0		Mengikut spesifikasi PDRM

JKR
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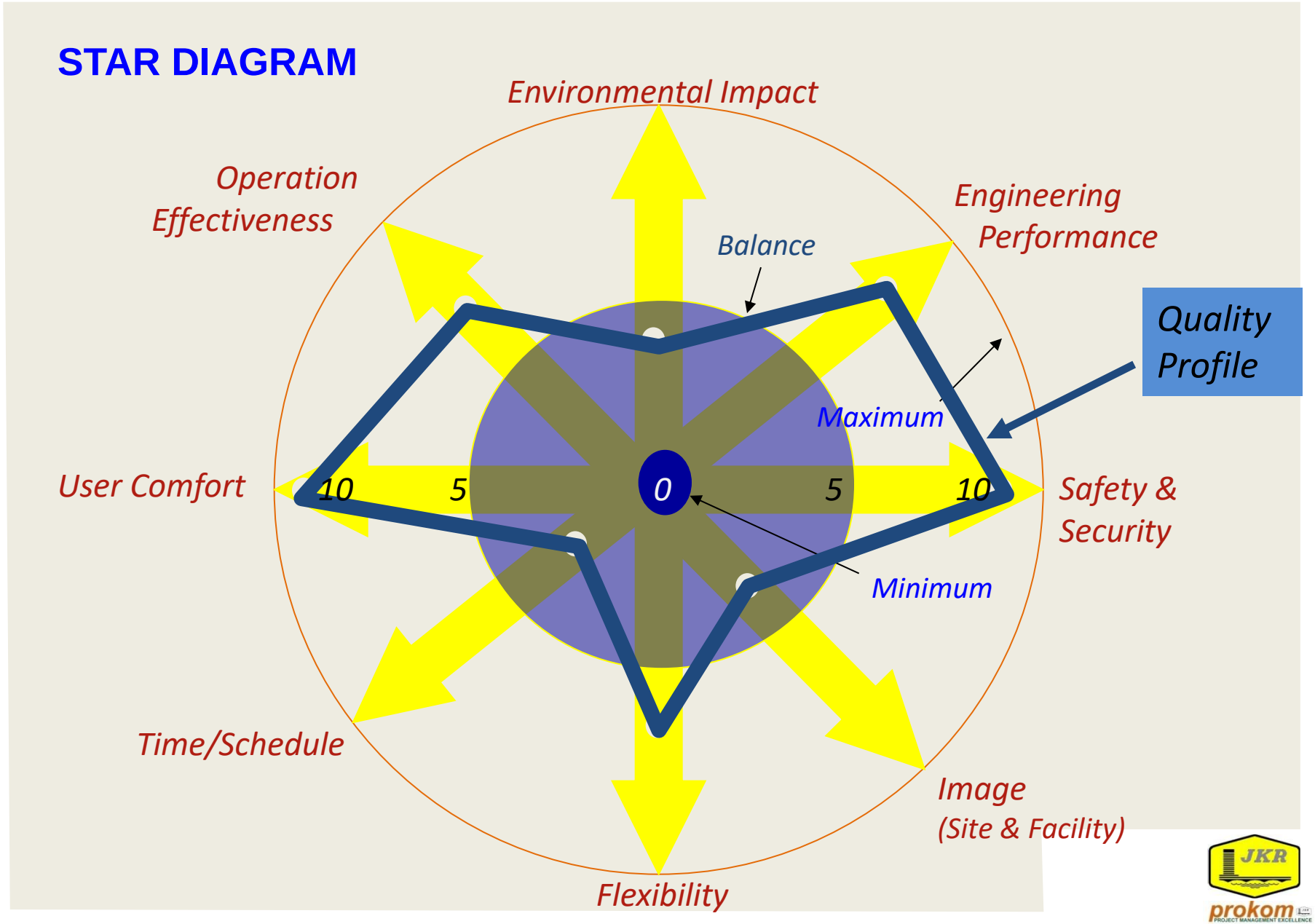
PROJECT MANAGEMENT EXCELLENCE

quality model



lab stage – (1) information phase

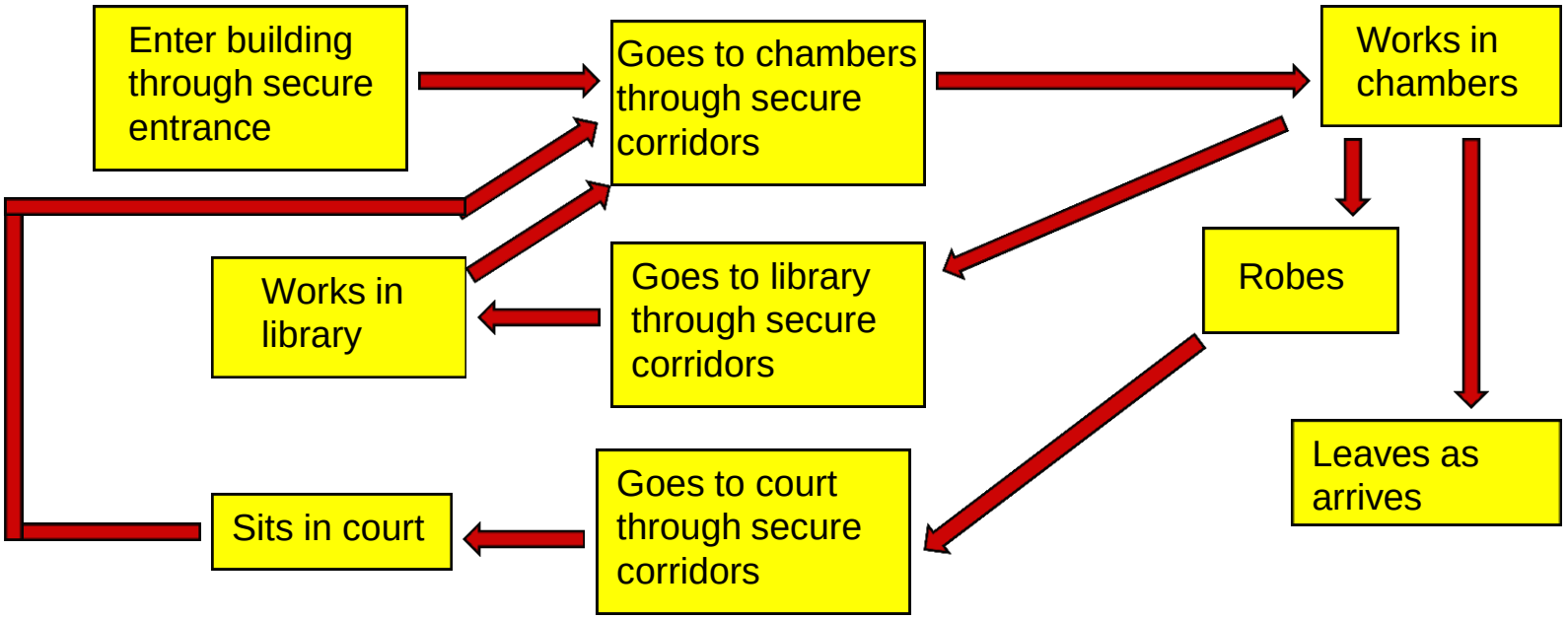
TOOLS / TECHNIQUES	PURPOSE(S)
• VE Lab Kit: - Slides on VE in Public Projects; - Slides on VE Lab Agenda; - Slide VE Study Objectives; - Slide VE Lab work groupings; etc.	• Provide understanding to participants of VE Study initiative, VE Lab programme / agenda; expected study outputs; lab work groups and their scope of study etc.
• VE Study Model(s) - *verification by VE Lab*	• Verify basis for value study (Cost / LCC / Space/ Quality Models); • Facilitate in exploring mismatches and confirming scope under study
• Client Value System (CVS) (Tool - Paired Comparison) *- present CVS as set by client*	• Inform prioritized value objectives to be delivered; • Prioritize criteria for allocating resources and incorporate in design
• Information Phase Template	• Identify, gather and record basic information (parameters) and issues of project / design / scopes under study

lab stage – (2) function analysis phase

TOOLS / TECHNIQUES	PURPOSE(S)
• Function Analysis System Technique (F.A.S.T. Diagram) – *Verification by VE Lab*	• Represent the whole picture of required functions under study; • Guidance in aligning functions with objectives and project deliverables
• Goals & Systems Modelling - *Verification by VE Lab*	• Match or review required functions with deliverables.
• Functional Space Diagramming - User Flow Analysis - Spatial Adjacency	• Determine spatial functions to improve users flows, adjacencies, facilities performance and operational efficiency.
• Function Analysis Phase Template - Concept (Project) / Space / Element / Component / System - Functional Specification - Cost Worth Index	• Determine the function requirements (basic / secondary functions) at respective level(s) • Identify value mismatches (cost / function etc.) • Basis in function-based evaluation and decision making in lab

functional space diagramming

USER FLOW CHART - USER:JUDGE



functional space diagramming

SPACE ADJACENCY - COURT

Courtroom

5					Judge' suite
2	1				Solicitor's library & robing room
5	-1	2			Police office & cells
1	-1	4	5		Prisoner interview room
5	0	-1	-5	-5	Jury room

example of function (space)

Classroom

Basic Function
Gather Trainees

Secondary Function
- ***Assure Privacy***

Required Secondary Function
- ***Facilitate Training***

example of function (component)

Doors

Basic Function
Control Access

Secondary Function
- ***Provide Aesthetic***

Required Secondary Function
- ***Resist Fire***

lab stage – (3) creative phase

TOOLS / TECHNIQUES	PURPOSE(S)
• Brainstorming of Ideas - Free Wheeling - Slip Method - Round Robin, etc.	• Generates as many ideas in solving the identified value issues and mismatches.
• Creative Phase Template	• Record the generated ideas (without judging them yet!)

lab stage – (4) evaluation phase

TOOLS / TECHNIQUES	PURPOSE(S)
• Evaluation Phase Template	• Systematically evaluate generated ideas to shortlist ideas for development • Obtain consensus decisions of shortlisted ideas
• CFTE Criteria: - Client Acceptance - Function Suitability - Technical Feasibility - Economic Feasibility	• Review the long list of generated ideas in terms of their feasibility and client acceptance to guide in the shortlisting process
• EDI Categorization: - “Evaluate” (Potential Ideas) - “Discard” (Non Potential Ideas) - “Information” (Potential for Future)	• Shortlist potential ideas for further evaluation (at Development Phase) based on the earlier CFTE Criteria evaluation
• Group consensus • Multi voting	• Narrowing a list of ideas or options • Select best ideas or options
• Weight Evaluation Matrix	• Evaluate alternatives based on specific criteria weight

lab stage – (5) development phase

TOOLS / TECHNIQUES	PURPOSE(S)
• Development Phase Template - Advantages / Innovation - Disadvantages / Risks - Sketches - Calculations (Quantity / Cost / Design)	• Record the justification and decision made (calculation; sketching; costing etc.) on the evaluated potential ideas
• Group Consensus • Multi voting	• Narrowing a list of ideas or options • Select best ideas or options
• Summary of Recommended Ideas	• Summarize accepted ideas as VE Study Recommendations
• Action Planning	• Schedule or review planning for post lab activities (action plan) and identify owner of responsibilities
• VE Lab Feedback Form	• Improve overall VE Lab facilitation performance

lab stage – (6) presentation phase

TOOLS / TECHNIQUES	PURPOSE(S)
• Presentation	• Obtain the VE lab members' agreement; and • Secure the client's / stakeholders' agreement on VE recommendations and study findings
• Feedback	• Improve or refine lab outputs / VE Study recommendations / findings
• Lab Consensus	• Agreed on VE Study recommendations • Agreed on study findings referring to pre-determined VE Study Objectives (Scope / Project Cost etc.)

post lab stage

TOOLS / TECHNIQUES	PURPOSE(S)
• VE Report	• Consolidate and encapsulate all information been sought, generated ideas, evaluation, justifications, recommendations and findings from the lab
• Presentation (if required)	• Present VE Study recommendations for securing the client's / stakeholders agreement
• VE Post Lab Action Plan Report	• Monitor post lab progress and implementation of VE Study Recommendations based on the agreed Action Plan
• VE Post Lab Compliance Report	• Assess implementation of VE Recommended Ideas • Gather lesson learned and inputs for continuous improvement

VM / VE Tool (1)

CLIENT VALUE SYSTEM

(CVS)

client value system (CVS)

Value Criteria as Client Value System:

"Factors or influences (arising from stakeholders; users; customers; authorities; financiers etc.) impacting the client's view on value objectives and the judgement of allocating resources in achieving a mission or objectives"

Source from: VM in Construction Projects - Kelly, Male & Graham (2004)

CAPITAL COST (CAPEX)

SAFETY

ENVIRONMENT

AESTHETICS / IMAGE / ESTEEM

TIME

COMFORT

EXPANDABILITY / FLEXIBILITY

POLITICS / COMMUNITY / POPULARITY

OPERATING COST (OPEX)

SECURITY

EXCHANGE

prioritizing CVS

Prioritizing Steps:

- Select value criteria which are relevant to issues being addressed in strategic brief / project brief.
- Define each criterion in relation to more and less prioritized scenarios.
- Use tool ‘Paired Comparison’ scoring to prioritize and rank all criteria.
- Translate ranked criteria and summarize finding based on the prioritization.
- Communicate finding to team members as value objectives to be transmitted in project delivery.

using paired comparison for CVS

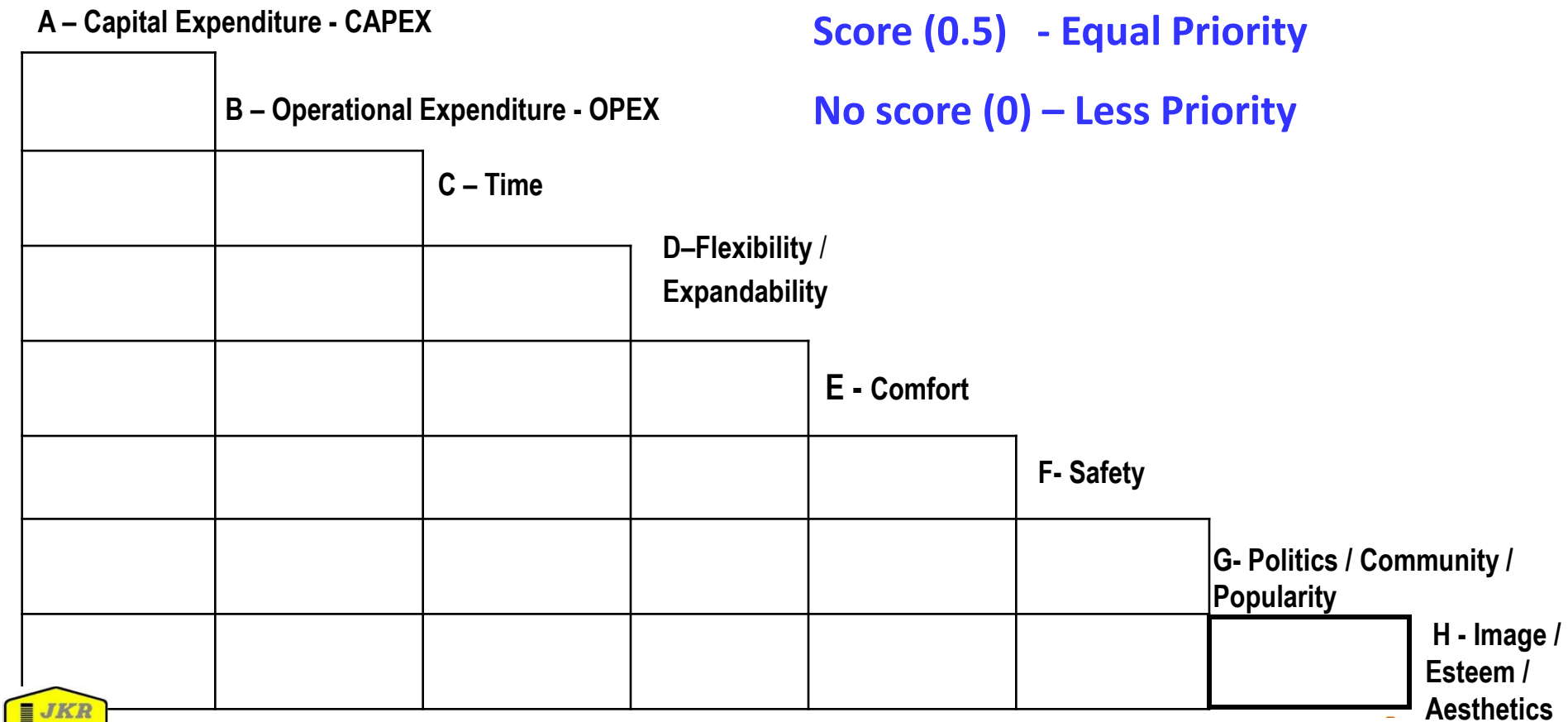
Adapted with customization from source:
VM in Construction Projects -
Kelly, Male & Graham, UK, (2004)

PRIORITIZATION CONTINUUM:
(customized scoring method)

Score (1) – Priority

Score (0.5) - Equal Priority

No score (0) – Less Priority



CVS - criteria definition

VALUE CRITERION	PRIORITIZATION CONTINUUM
Capital Expenditure (CAPEX)	The budget being considered is not able to be exceeded. Priority – Tight budget is fixed Less Priority – Budget is flexible
Operating Expenditure (OPEX)	Associated costs with operations and maintenance are at a controlled forecast. Priority - Operating costs to be controlled to the minimum Less Priority – Being some flexible in the operating cost

CVS – critetia definition

VALUE CRITERION	PRIORITIZATION CONTINUUM
Time	To assess time significancy from the present to the completion of project. Priority – Time is the essence – even a day late would be “no value” to client. Less Priority – Time is at large
Expandability / Flexibility	Reflects a continuing changing environment (technology; process etc.) in the design. Priority – High ability to accommodate changing functions or expansion Less Priority – Unlikely to change to any extent

CVS - criteria definition

VALUE CRITERION	PRIORITIZATION CONTINUUM
Comfort	The physical and psychological comfort of the building that will impact human performance. Priority – highly to impact performance if comfort is compromised Less Priority – Unlikely to impact performance
Safety; and /or Security	Refers to the level of safety and/or security to be ensured - physically and psychologically Priority – high demand to be ensured safe / secured Less Priority – ensuring safety / security is not a big demand

CVS – criteria definition

VALUE CRITERION	PRIORITIZATION CONTINUUM
Environment	Refers to the extent which project result in a sympathetic approach to environment – like energy consumed Priority – High concern on protecting environment Less Priority – Less impact on environment
Politics / Community / Popularity	An external dimension that makes politics / community / popularity / good neighbour are important to the client. Priority – Requiring client to make popular decision to the external force Less Priority – Having less force to make popular decision

CVS – criteria definition

VALUE CRITERION	PRIORITIZATION CONTINUUM
Image / Aesthetics / Esteem	The extent to which client wishes to commit resources for an aesthetic statement / portray esteem / create image of the organization. Priority – High need to attract the admiration Less Priority – Aesthetic / esteem / image is being no significance
Exchange	Also refer as resale – the monetary value of project as an asset to increase share value, for rental or to be sold. Priority – Requiring maximum return Less Priority – Return is not an expected consequence

SISTEM NILAI KLIEN

PRIORITIZED CLIENT VALUE SYSTEM (CVS)

PRIORITIZATION	SCORE
1. CAPEX	4.5
2. OPEX	4.5
3. TIME / SCHEDULE	4.0
4. SAFETY	4.0
5. ENVIRONMENTAL IMPACT	2.5
6. COMFORT	0.5
7. COMMUNITY	0.5

A – Capital Expenditure - CAPEX

0.5 A 0.5 B	B – Operational Expenditure - OPEX					
0.5 A 0.5 C	0.5 B 0.5 C	C – Time/Schedule				
0.5 A 0.5 D	0.5 B 0.5 D	1 D	D – Safety			
1 A	1 B	1 C	1 D	E – Comfort		
1 A	1 B	1 C	1 D	0.5 E 0.5 F	F – Community (Users)	
1 A	1 B	1 C	0.5 D 0.5 G	1 G	1 G	G – Environment

Nota: Skor bagi setiap Sistem Nilai Klien daripada hasil analisis *Paired Comparison* seperti di atas
(Skor diberi samada 1.0 atau 0.5 atau Tiada; menurut keutamaan dalam perbandingan)

SISTEM NILAI KLIEN

KETERANGAN *CLIENT VALUE SYSTEM* (CVS)

- Pelaksanaan projek ini perlu seimbang dalam menitikberatkan kos projek yang optimum dan munasabah menurut peruntukan yang ditetapkan ***(CAPEX);*** dan juga kos penyelenggaraan yang minimum ***(OPEX).***

- Ia perlu dilaksanakan dengan kadar segera ***(TIME)*** bagi menangani implikasi kejadian kerosakan cerun tambakan yang lebih serius dan laluan jalanraya terputus. Manakala ciri-ciri rekabentuknya perlu menitikberatkan aspek keselamatan ***(SAFETY)*** pada struktur binaan dan juga terhadap pengguna.

- Keseluruhan projek ini juga perlu mengambil kira aspek pemeliharaan alam sekitar seperti mengurangkan impak hakisan dan mendapan tanah serta pencemaran terhadap kawasan sekitarnya ***(ENVIRONMENTAL)***.

PRIORITIZATION	SCORE
1. CAPEX	4.5
2. OPEX	4.5
3. TIME / SCHEDULE	4.0
4. SAFETY	4.0
5. ENVIRONMENT	2.5
6. COMFORT	0.5
7. COMMUNITY	0.5

- Aspek keselesaan kepada pengguna jalanraya (***COMFOFT***) dan keperluan untuk memenuhi kehendak komuniti setempat ***(COMMUNITY)*** adalah paling minimum berbanding nilai-nilai yang lain.

VM / VE Tool (2)

FUNCTION ANALYSIS SYSTEM TECHNIQUE

(F.A.S.T. DIAGRAM)

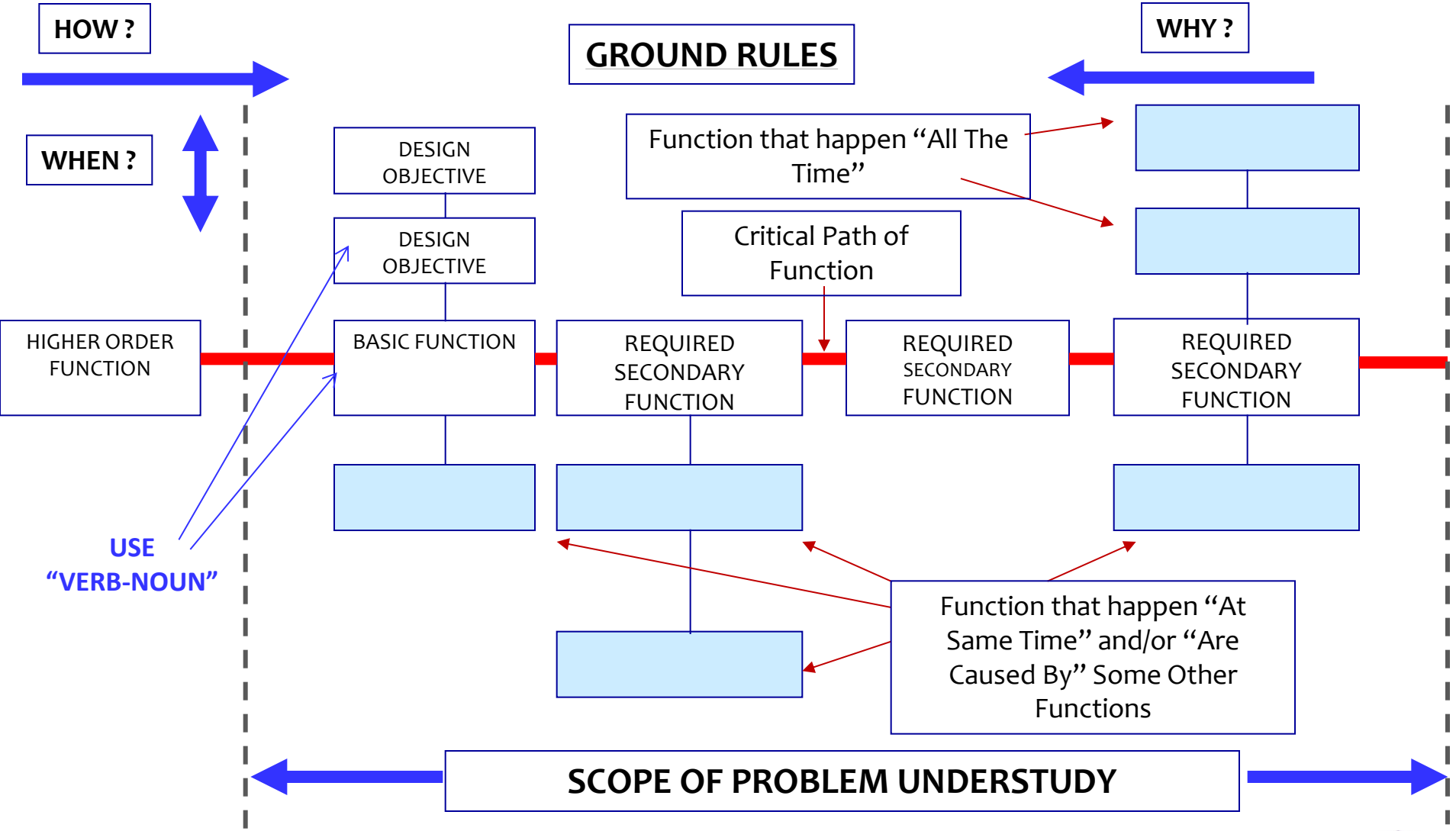
FAST diagramming

F.A.S.T. – Function Analysis System Technique *(By: C W Bytheway, 1964)*

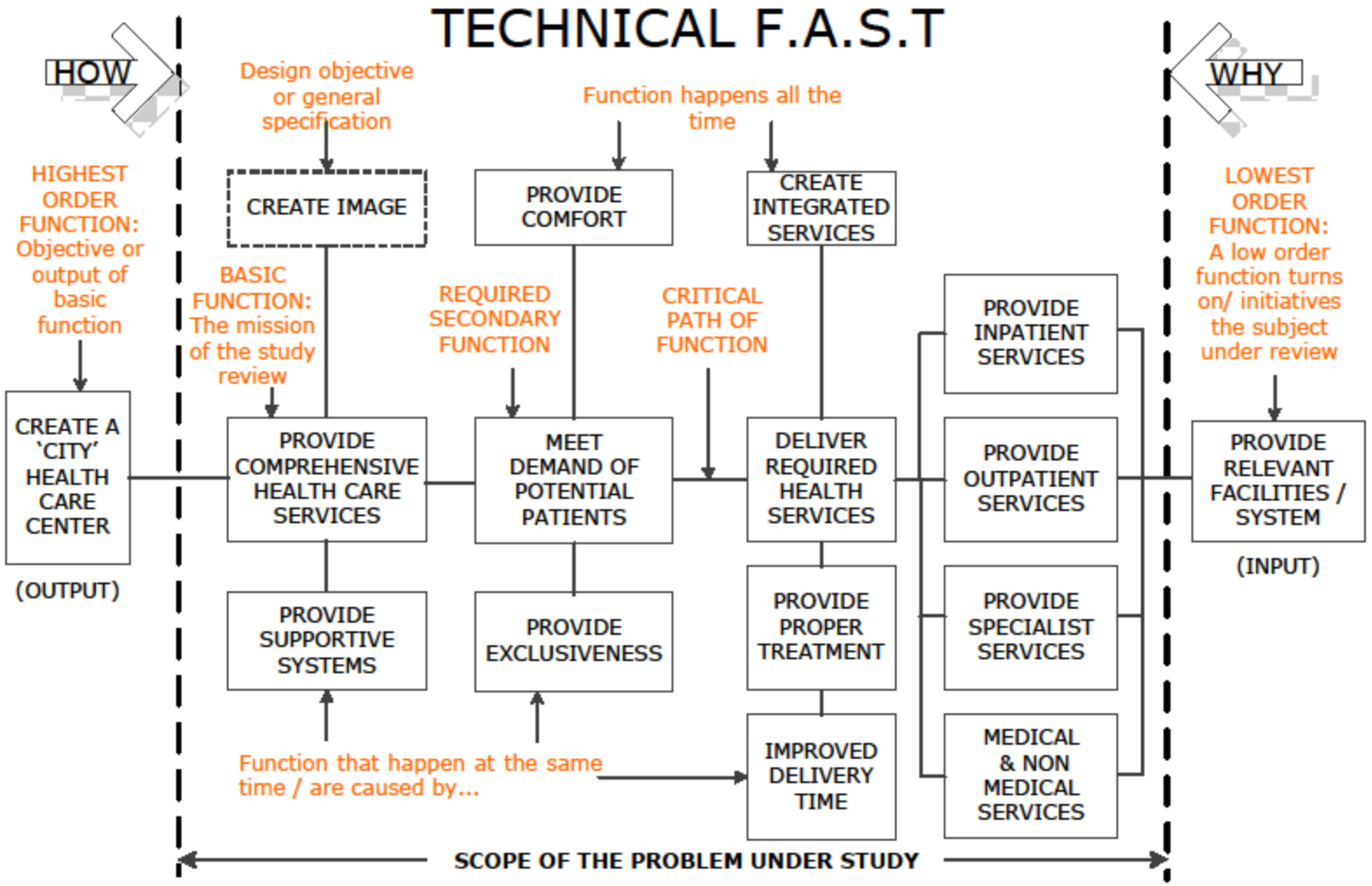
Types of FAST Diagram:

- **Technical FAST** – Map out core functions of a product or project as a major logic path which are supported by secondary functions.
- **Task FAST** or **Function Logic Diagram** – Determine primary functions of needs and supporting functions as wants to achieve the product or project or system mission *(Kelly & Male, 1993)*.
- **SMART Diagram** – (*Simple Multi Attribute Rating Technique*) – similar to Task FAST but describe the objectives' characteristics (not functions) and uses weighting and scoring system in deciding the importance of each objective *(SMART Methodology by: Green S D, 1992).*
- **Strategic FAST** – Also similar to Task FAST that illustrates project mission-aligned functions which cascaded from strategic level to technical level and with highest order needs at the top and lowest order wants at the bottom *(Kelly, Male & Graham, 2004)*.

technical FAST

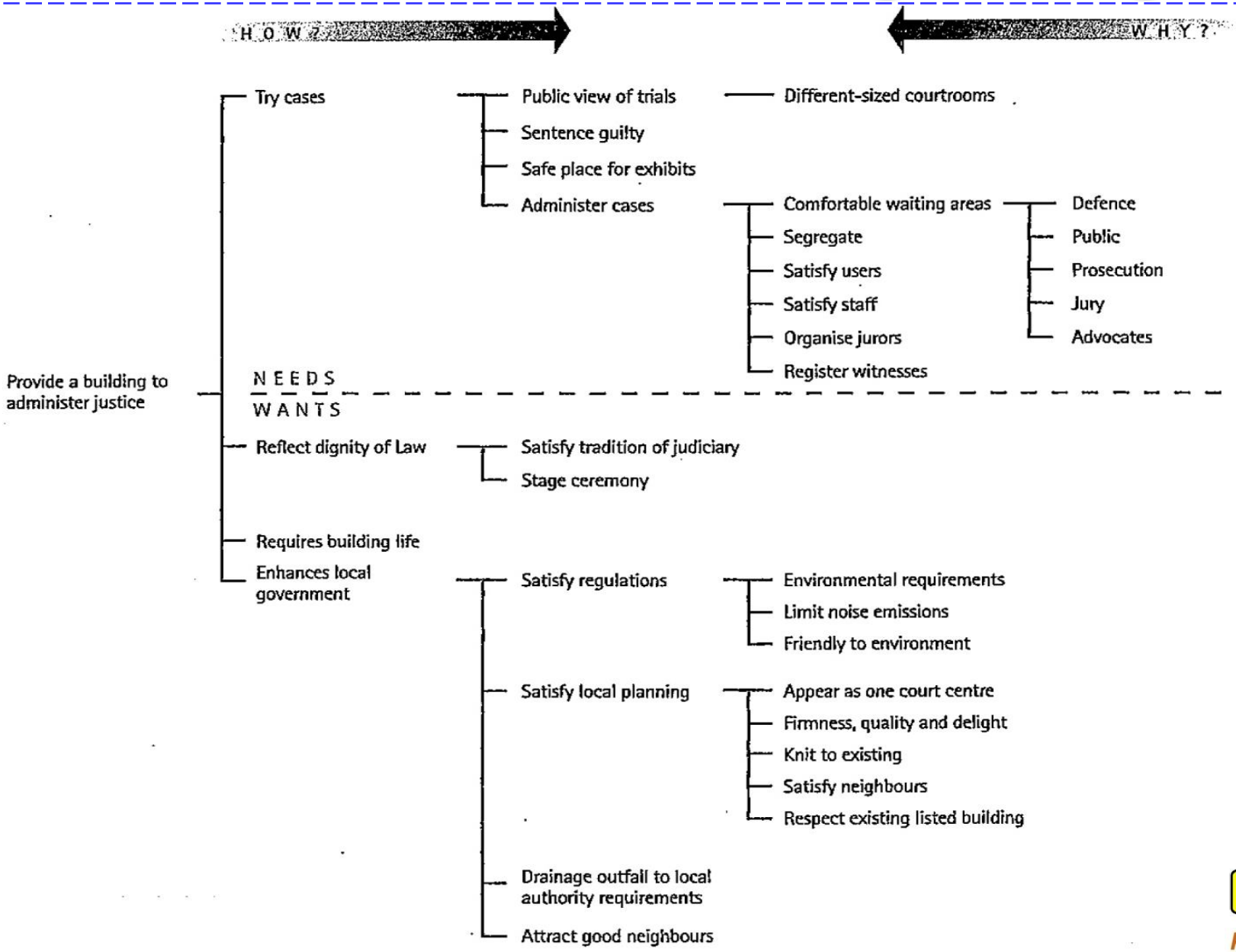


technical FAST – sample project

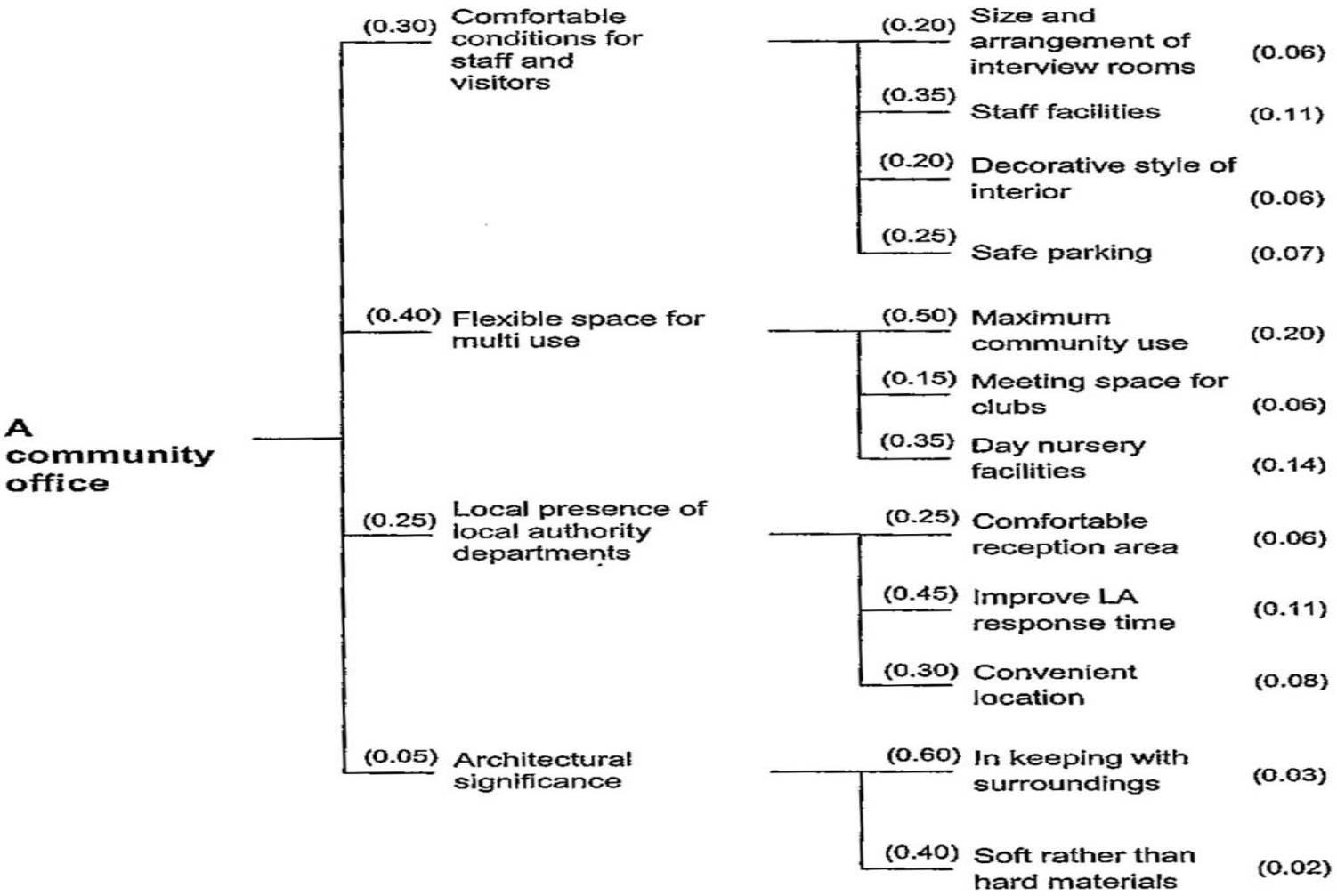


NOTES: This F.A.S.T diagram is optional and it is prepared for the purpose of this VE study in understanding the objectives and functions of the project.

task FAST or function logic diagram

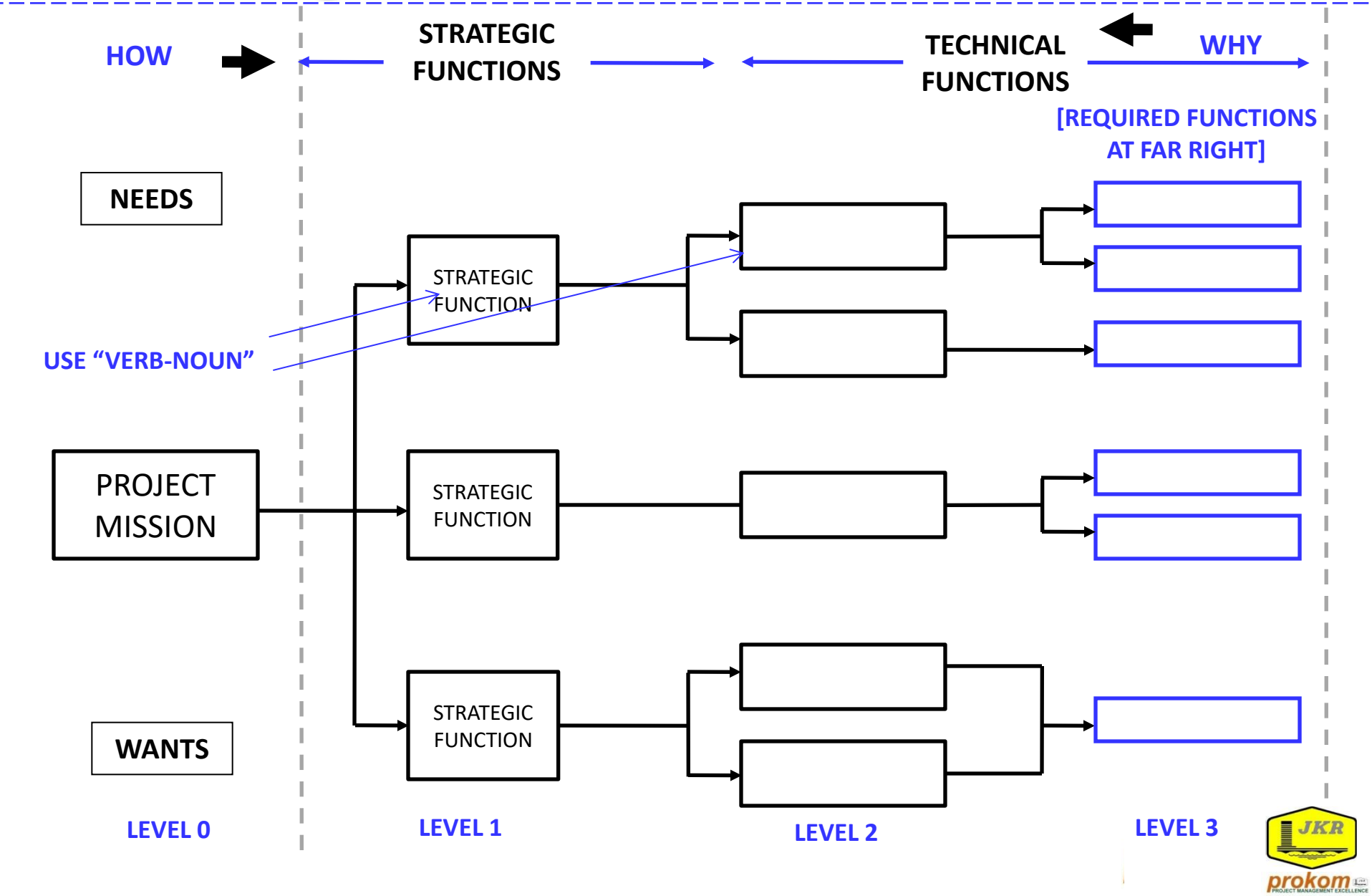


SMART diagram

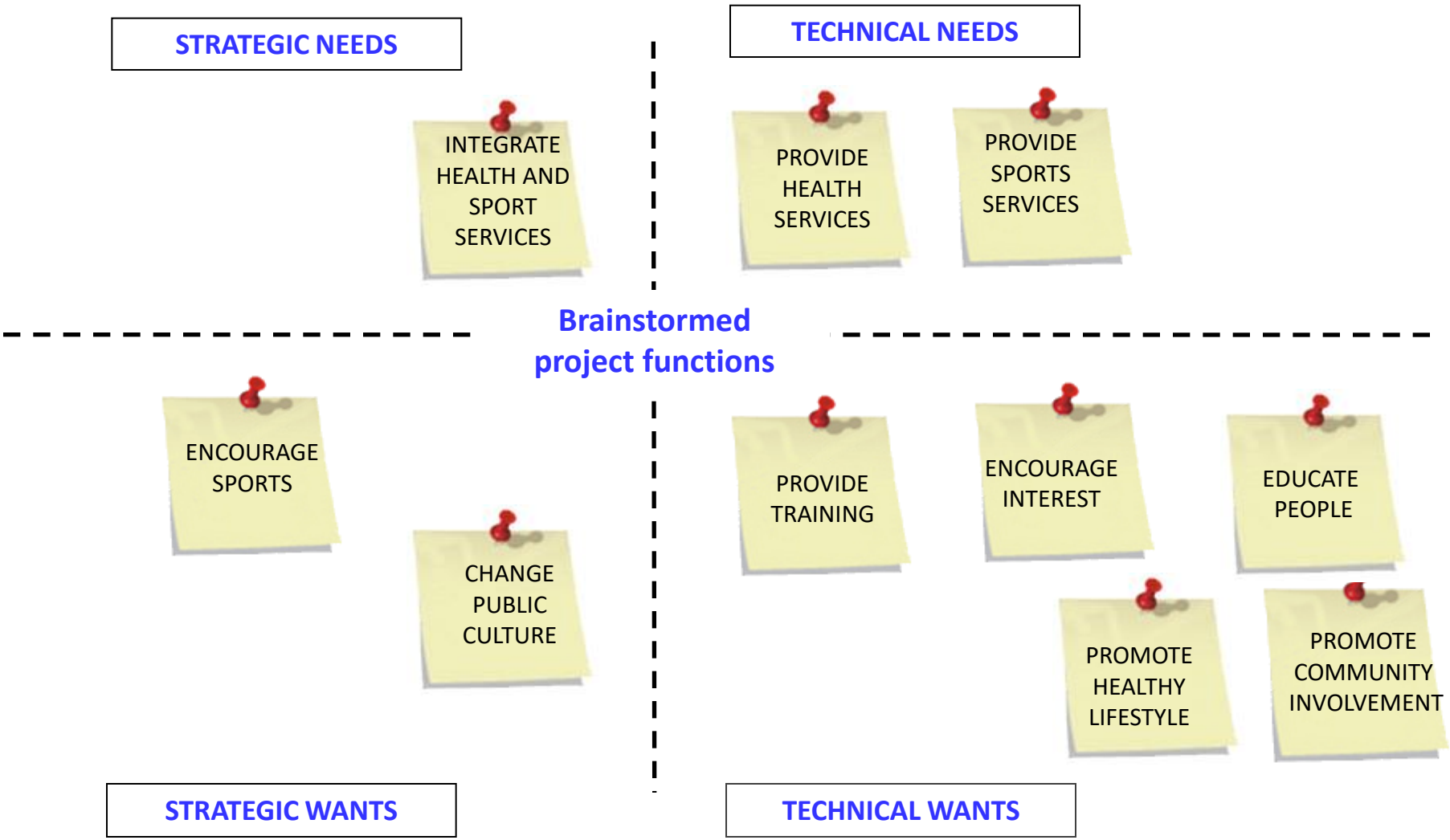


Level 0 Level 1 Level 2

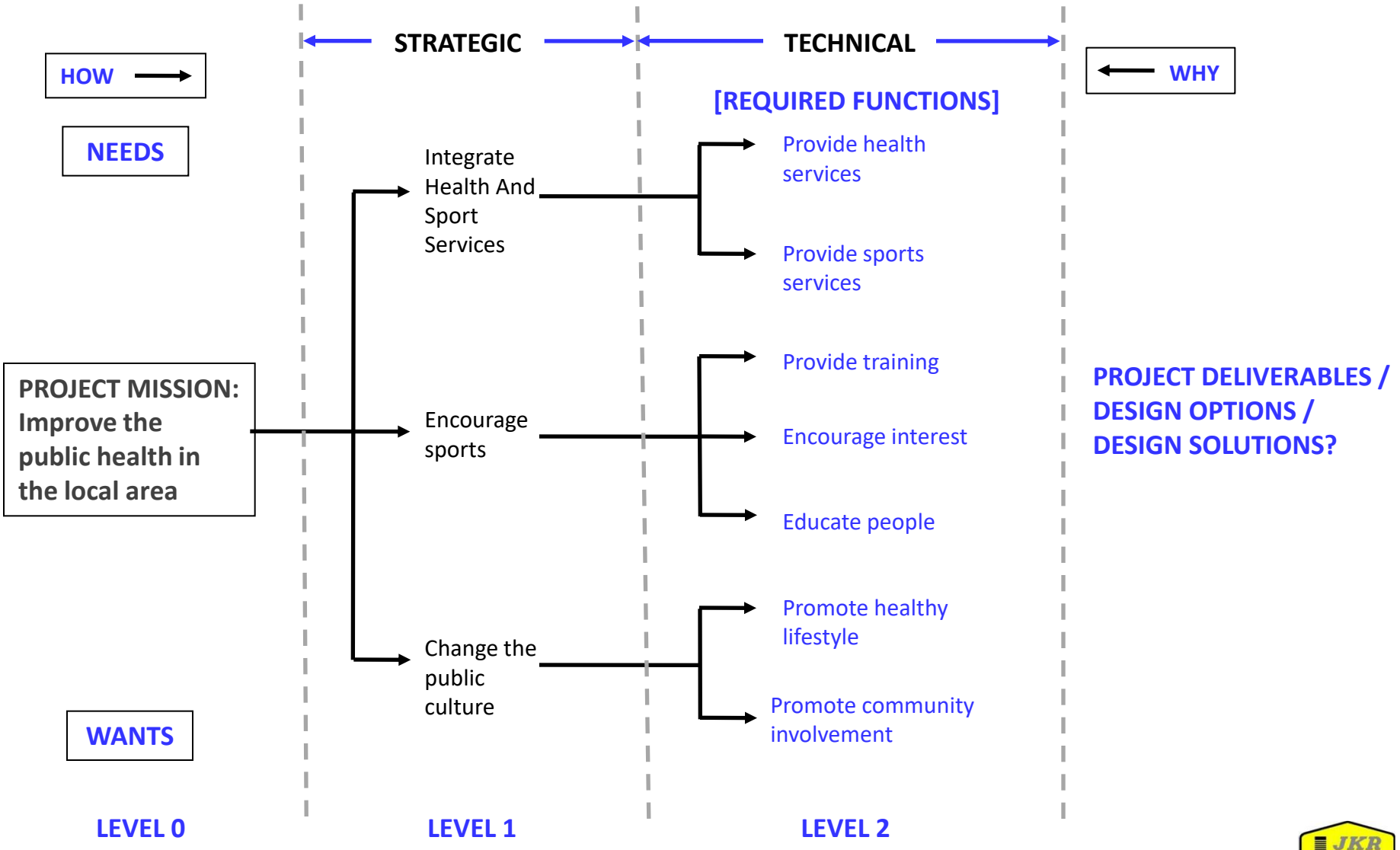
strategic FAST



matrix of project functions



developing strategic FAST



project functions - examples

Examples of Strategic Functions (A Building Project)

- Allow accessibility
- Change perception
- Improve living standard
- Support economic growth
- Promote sustainability
- Enhance communication
- Enhance community spirit
- Establish integration
- Improve user interface
- Involve community
- Conserve environment

Examples of Technical Functions (A Building Project)

- Provide flexibility
- Improve operability
- Ensure safety
- Enhance comfort
- Facilitate users
- Portray aesthetics
- Create pleasing environment
- Improve circulation
- Ensure hygiene
- Provide shelter
- Support activities

Note: Both strategic & technical functions examples above are not meant to be related to each other and not exhaustive.

strategic FAST outcomes

- **Advanced tool - “Goals & Systems” Modelling**

  Determine (from FAST diagram) the required functions (as “Goals”) that project needs to perform and match them with possible options or existing solutions of deliverables (as “Systems’’) – to identify mismatches and accomplish the required functions.

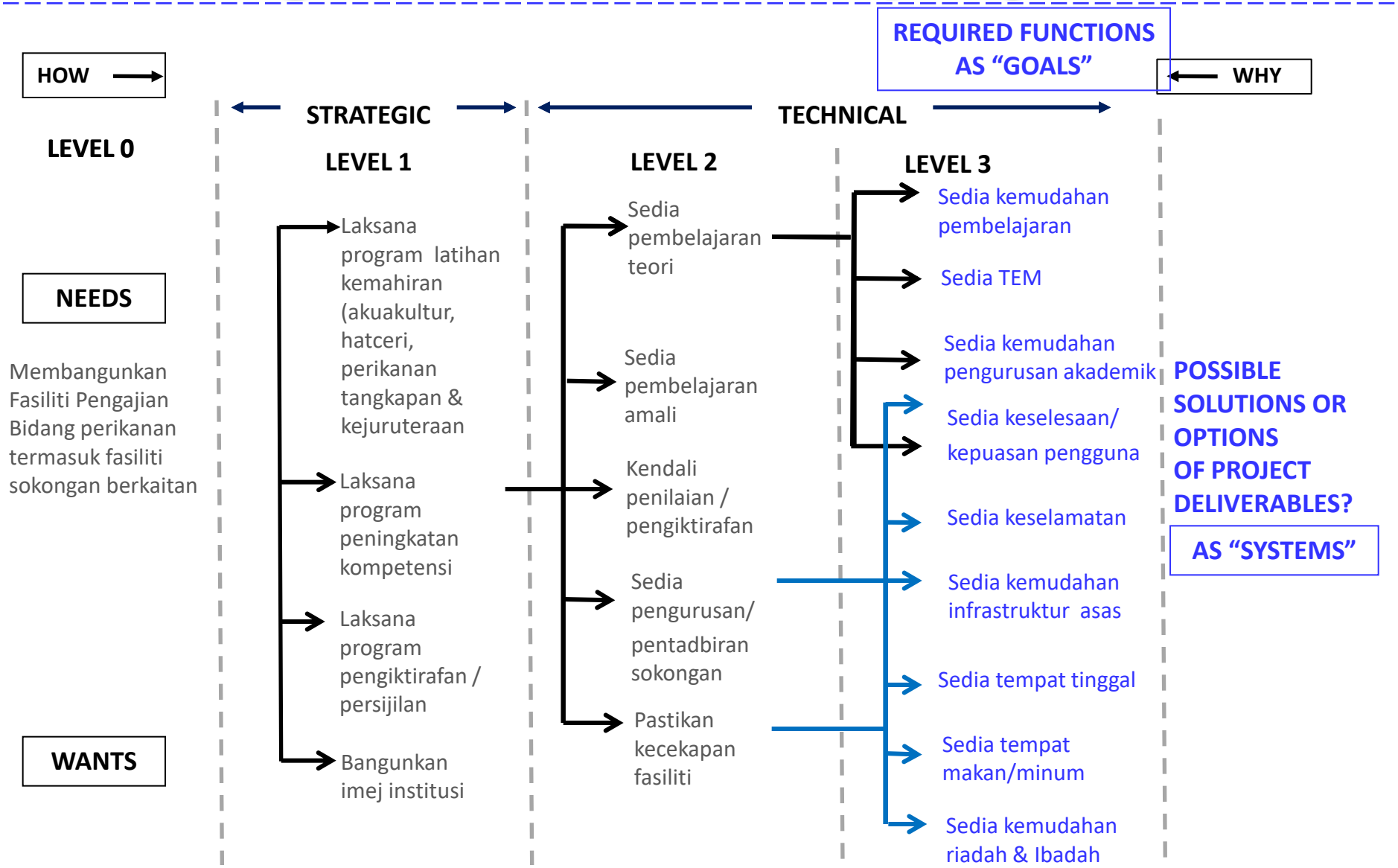
- **Function-based criteria for selecting best option**

  The technical functions shall be the baseline criteria in comparing a set of possible options for selecting the best option that fulfils the required functions.

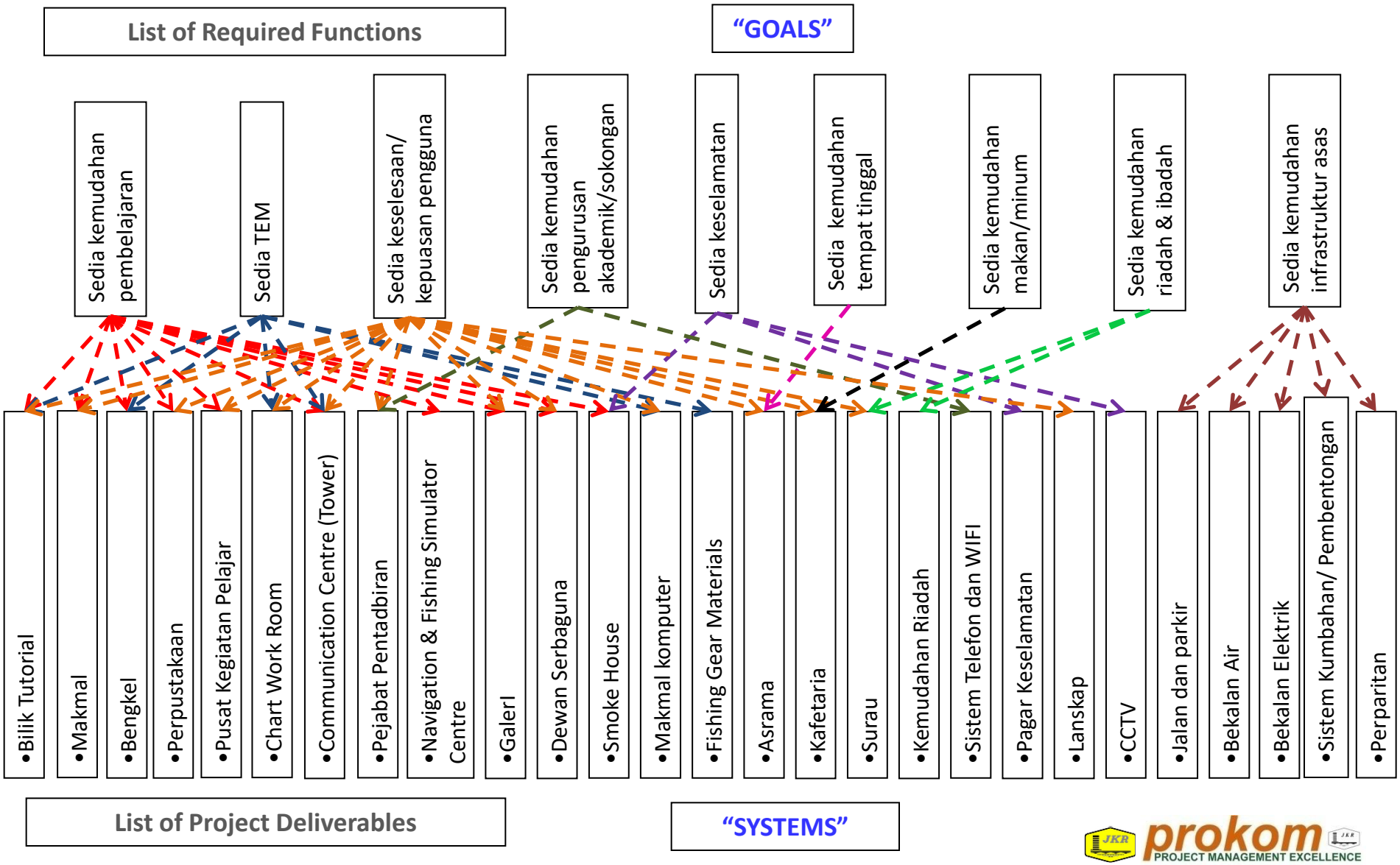
- **Prioritized functions for design / cost priority**

  The higher ordered “needs” and lower ordered “wants” functions (in FAST diagram) shall prioritize the required technical functions which need to be more or less emphasized in design solutions and/or in allocating project cost / resources.

strategic FAST – JKR project



“goals & systems” – JKR project



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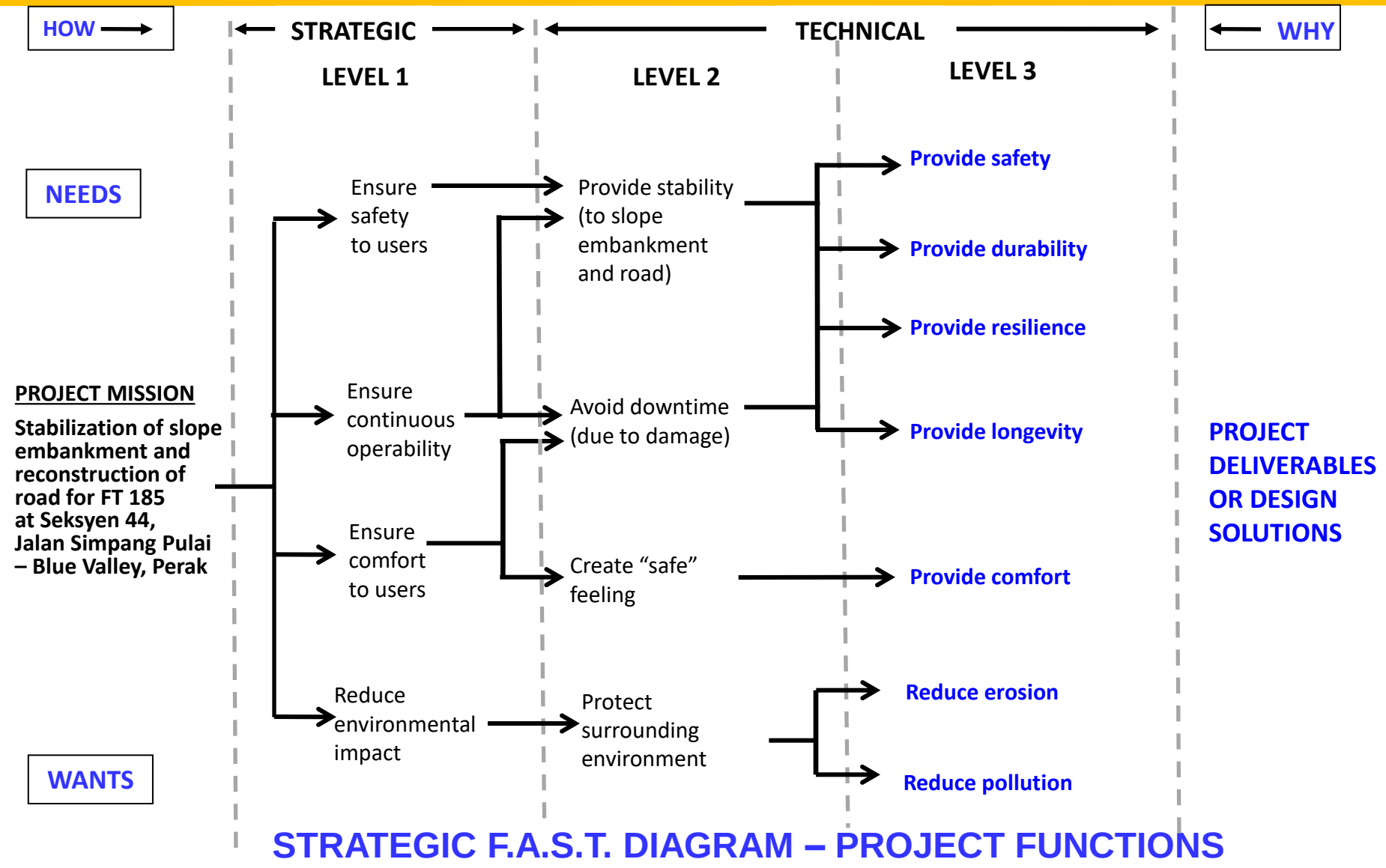
VE LAB

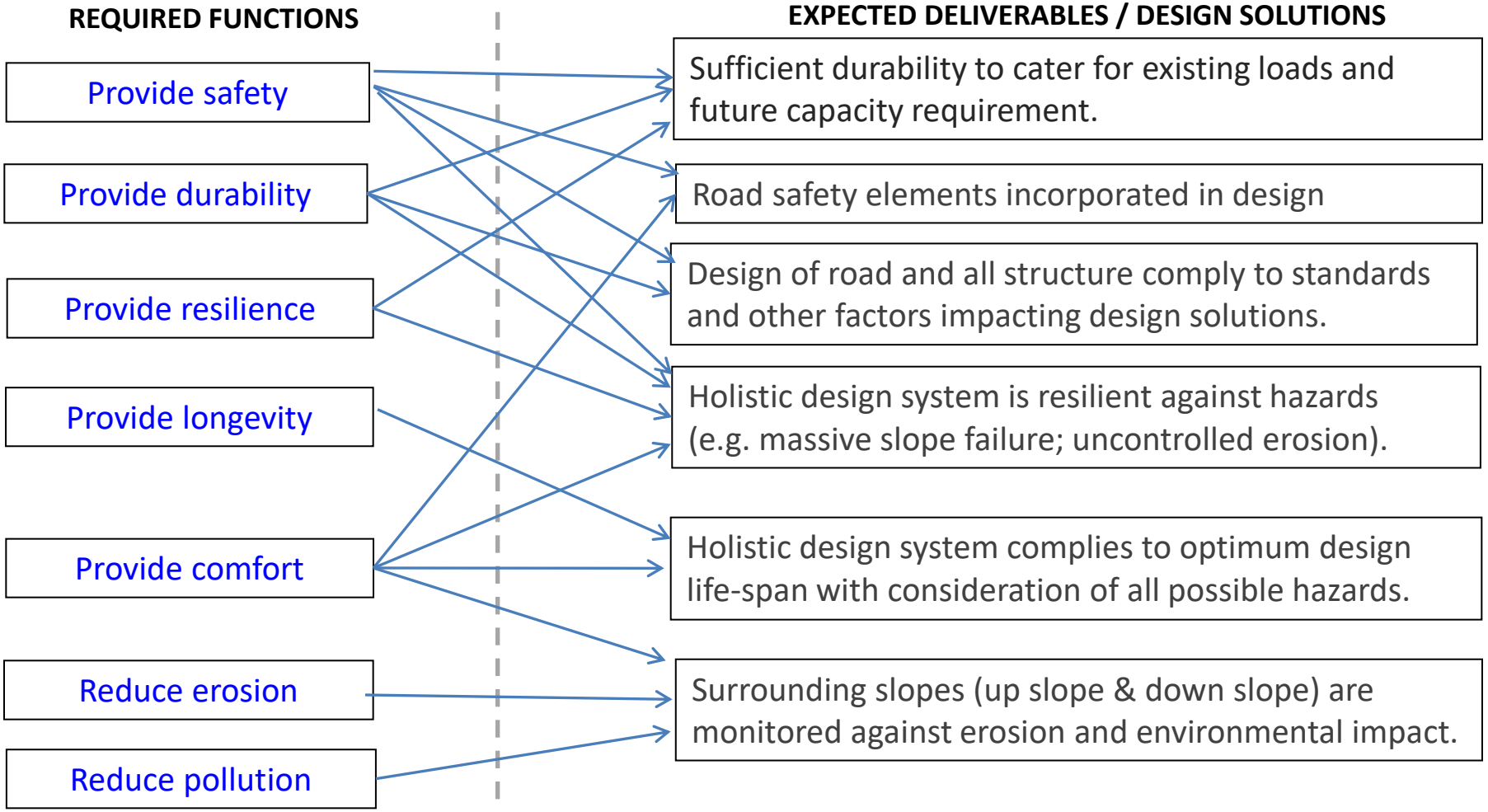
FUNGSI PROJEK (1)



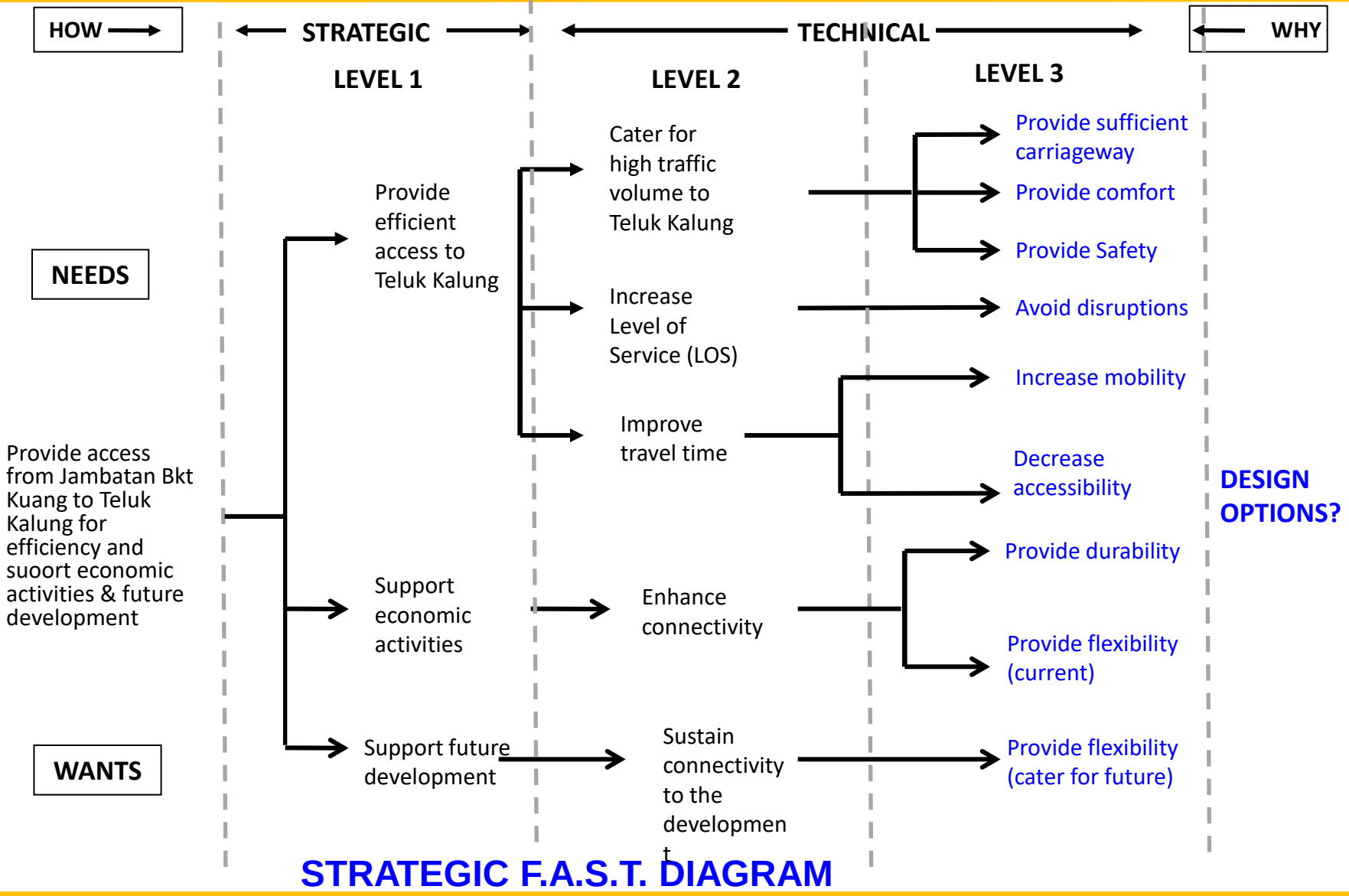
STRATEGIC F.A.S.T. DIAGRAM – PROJECT FUNCTIONS

FUNGSI PROJEK (1)

"GOALS & SYSTEM MODELLING" (FUNCTION BASED DELIVERABLES)
- REQUIRED FUNCTIONS & EXPECTED DELIVERABLES



FUNGSI PROJEK (2)



STRATEGIC F.A.S.T. DIAGRAM

FUNGSI PROJEK (2)

FUNCTION-BASED DESIGN OPTION SELECTION

REQUIRED FUNCTIONS	Utilize " U-Turn" at Jalan B	Ramp Down to Simpang A - B	Directional Ramp to Jalan A
Provide sufficient carriageway	√	√	√
Provide comfort	X	X	√
Provide safety	X	X	√
Avoid disruptions	X	X	√
Increase mobility	X	X	√
Decrease accessibility	X	X	√
Provide durability	√	√	√
Provide flexibility (current)	X	√	√
Provide flexibility (cater for future)	X	X	√
	FUNCTIONALLY NOT VIABLE	FUNCTIONALLY NOT VIABLE	FUNCTIONALLY VIABLE

QUESTION ?

THANK U!