Developing a systems analysis framework for the National Poverty Alleviation System

Mario Marais, Marita Turpin, Mapule Modise,
Leanne Scott (UCT), Mwansa Saidi and Isabel Meyer

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Project team

• Isabel Meyer	Operations Researcher
• Enoch Ralehoko	Agro-economist
• Geci Karuri	Architect & sociologist
• Mwansa Saidi	Architect
• Johan Strydom	Systems Engineer
• Marita Turpin	Operations Researcher
• Mapule Modise	Operations Researcher
• Alet Visser	Environmental Researcher
• Mario Marais	Soft OR & theology
• Leanne Scott	Operations Researcher

Project purpose

- To use systems methodologies developed in a science and engineering environment
- Apply these towards a better understanding of the National Poverty Alleviation System

Outcomes

- Establish a *suitable framework* for analysis
- Enable stakeholders and decision-makers to engage towards a *more effective system*

The system

- Poverty alleviation delivered through variety of independent mechanisms
- Delivery mechanisms evolves organically, rather than through design
- Entities each have own objectives and focus areas (e.g. as defined by funding agencies)
- Can lead to optimisation of behaviour of components/subsystem rather than the system as a whole
- Need for the system as a whole to be studied

Methodology

- Use principles of Systems Engineering
- Supplement with other appropriate systems approaches
- Develop a framework from which to describe, analyse and evaluate the system
- Preliminary study has showed promise of this approach

What is Systems Engineering?

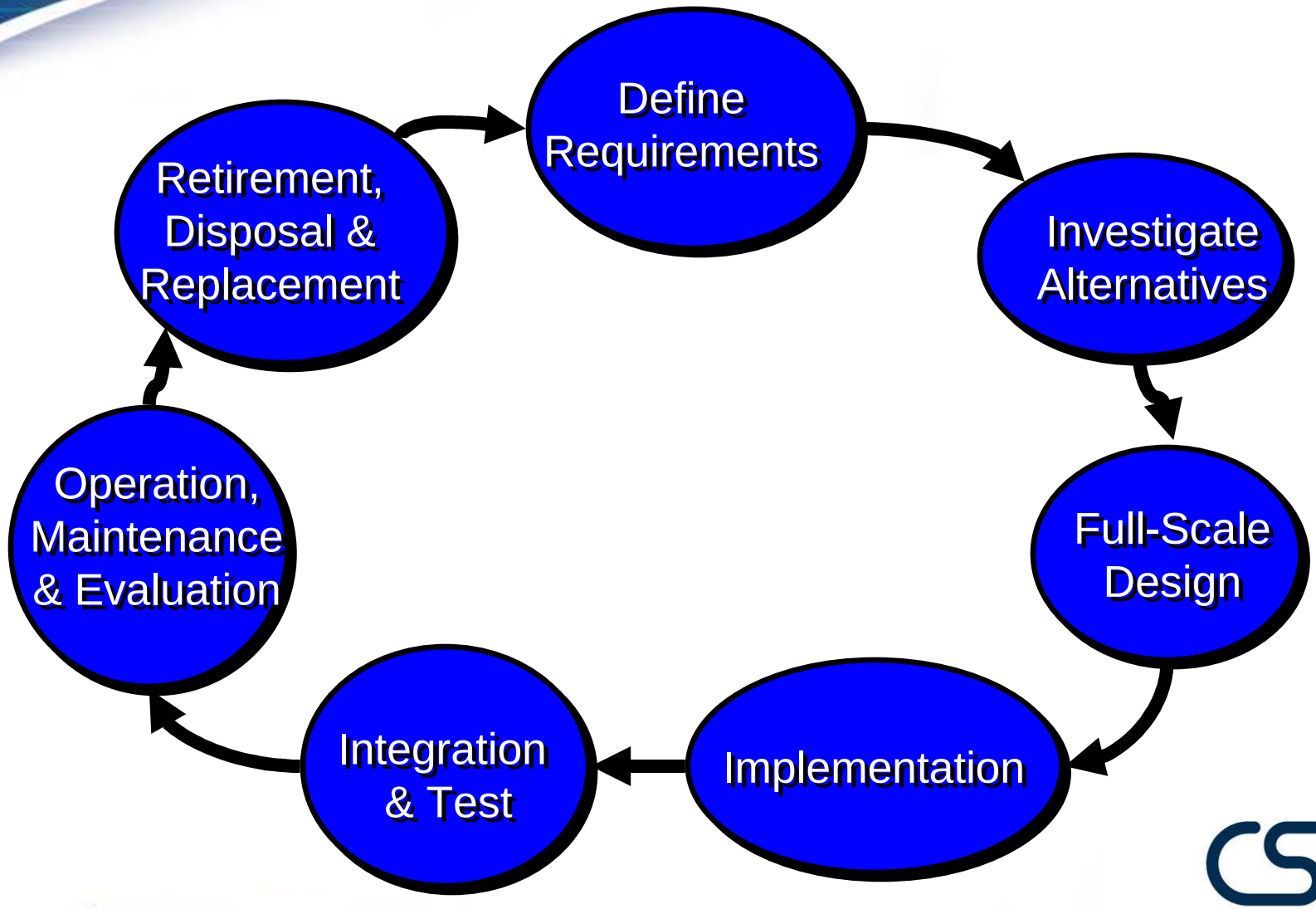
- Systems Engineering *integrates* all the disciplines and specialty groups into a team effort forming a *structured* development process that proceeds from concept to production to operation. Systems Engineering considers both the business and the technical *needs* of all customers with the *goal* of providing a *quality* product that meets the user needs.

- Normally used by engineers to design technical systems with high fidelity requirements, although:
  - SE Principles are *more generally applicable* and are used with eg. economical, organisational and environmental systems
  - SE applies to *entire life cycle* of a system

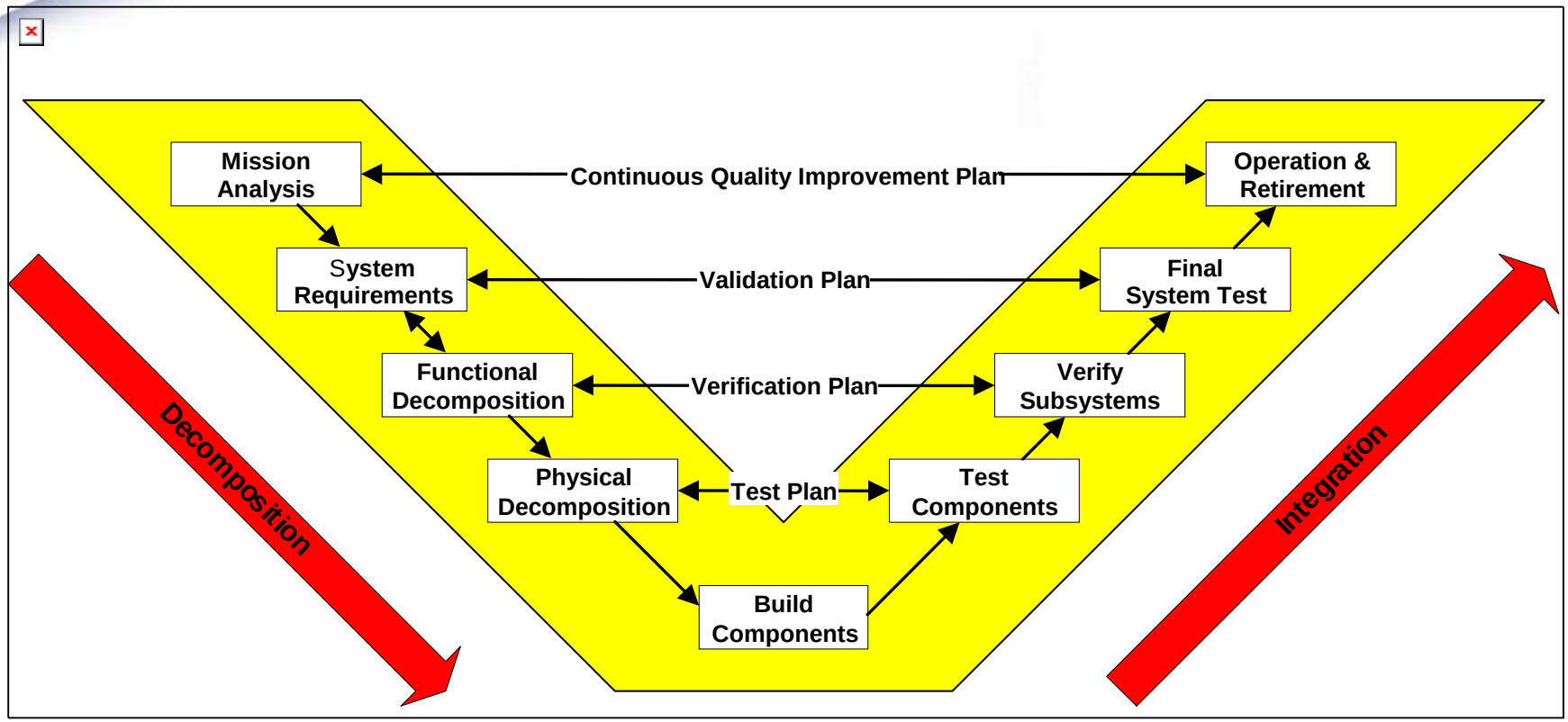
Purpose of Systems Engineering

- Increase the probability of success
- Reduce risk
- Reduce total life-cycle cost

The systems life cycle



The V life cycle model



The design downstroke and the manufacturing upstroke

Our approach

- To describe in a structured manner and better understand the entire National Poverty Alleviation System

- Development philosophy: assets based as opposed to needs driven
  - Assets or capitals: eg. social, human, economic, environmental
  - Helping people to help themselves: as individuals, communities, citizens partaking in eg. the economic system
  - Not a zero sum approach
  - Benefits long term rather than short term

SE and social systems

- Social systems are highly responsive and adaptable
- One cannot extensively measure or evaluate without affecting the system
- Experimentation and building alternatives not always ethical or feasible
- Interventions can have very long term consequences
- Frog vs bicycle example

SE and NPAS

- NPAS is a social system
- NPAS is not formally defined as a system
- It already exists and can never be designed from scratch
- We want to describe and analyse rather than design or (re)build
- No-one has a formal blueprint or the complete picture

Project tasks

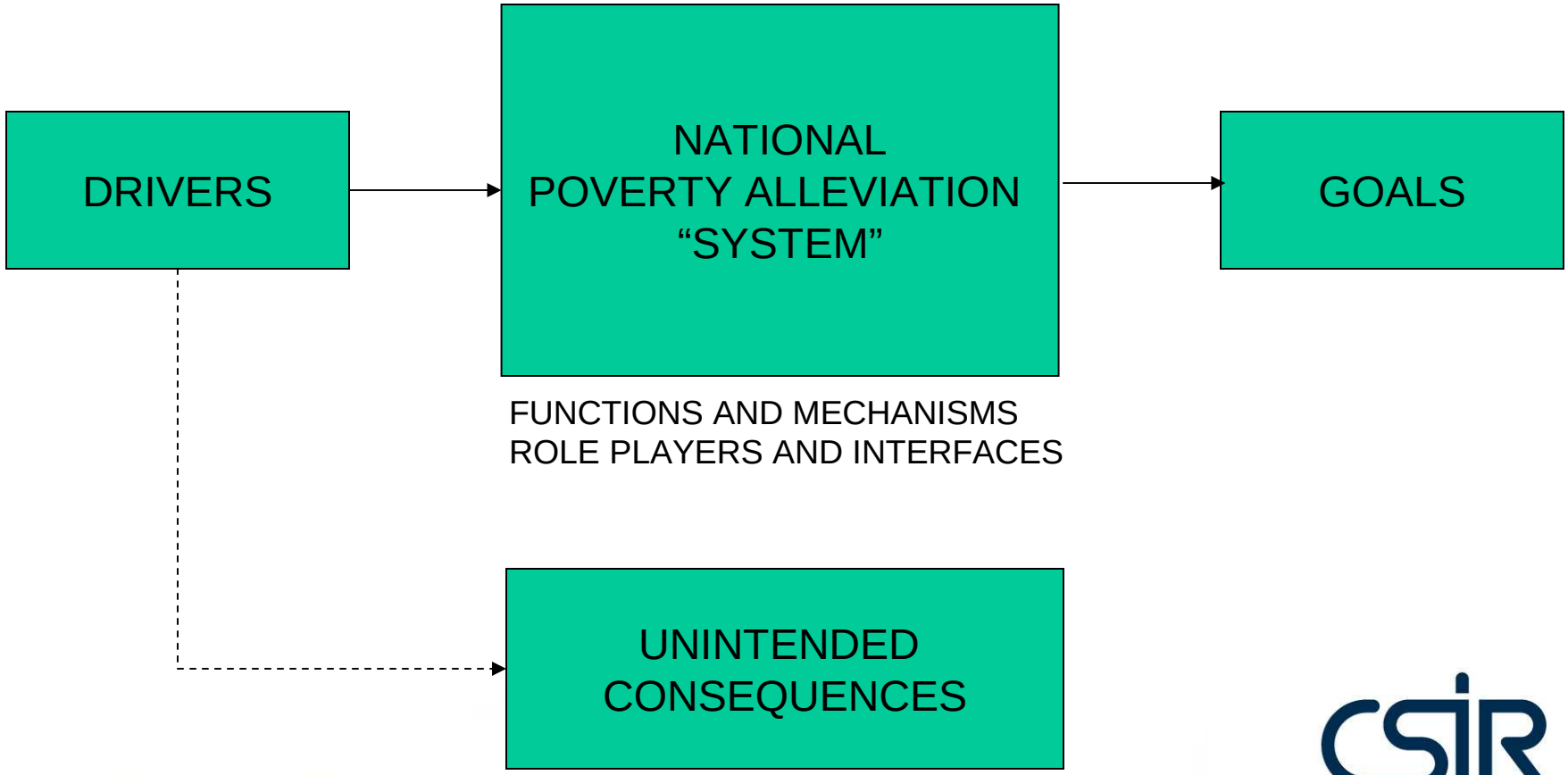
- Develop and evaluate a suitable framework for analysis
- Describe NPAS landscape
  - Roleplayers
  - Goals
  - Functions
  - Interactions
- Develop indicator data repository
  - What is currently measured
  - What should be measured?

Systems description and findings

Applying the Process of SE

- What goals do the current poverty alleviation system aim to achieve?
- What functions are being performed by the current system?
- Who are the current users of the system?
- Who are the role players?
- What are the connections/links between them?

A Systems View



Learning

- The SE approach:
  - Clarified thinking on objectives of the system(s)
  - Showed the lack of clarity about the roles and responsibilities
  - Highlighted redundant functions
  - Illustrated the complexities introduced by coordination structures

- A bridge is required between SE and social scientists
  - An unfamiliar language
  - We needed a flexible methodology to describe as well as design a system with technical, social and economical components.
  - Use social systems methods in conjunction with the SE approach

- Supplement with social systems methods
  - Soft Systems Methodology (worldviews of actors)
  - Critical Systems Thinking (question assumptions – e.g. boundaries, highlight marginalized role players)

Developing a Systems Framework for Studying NPAS

- Courtney's framework

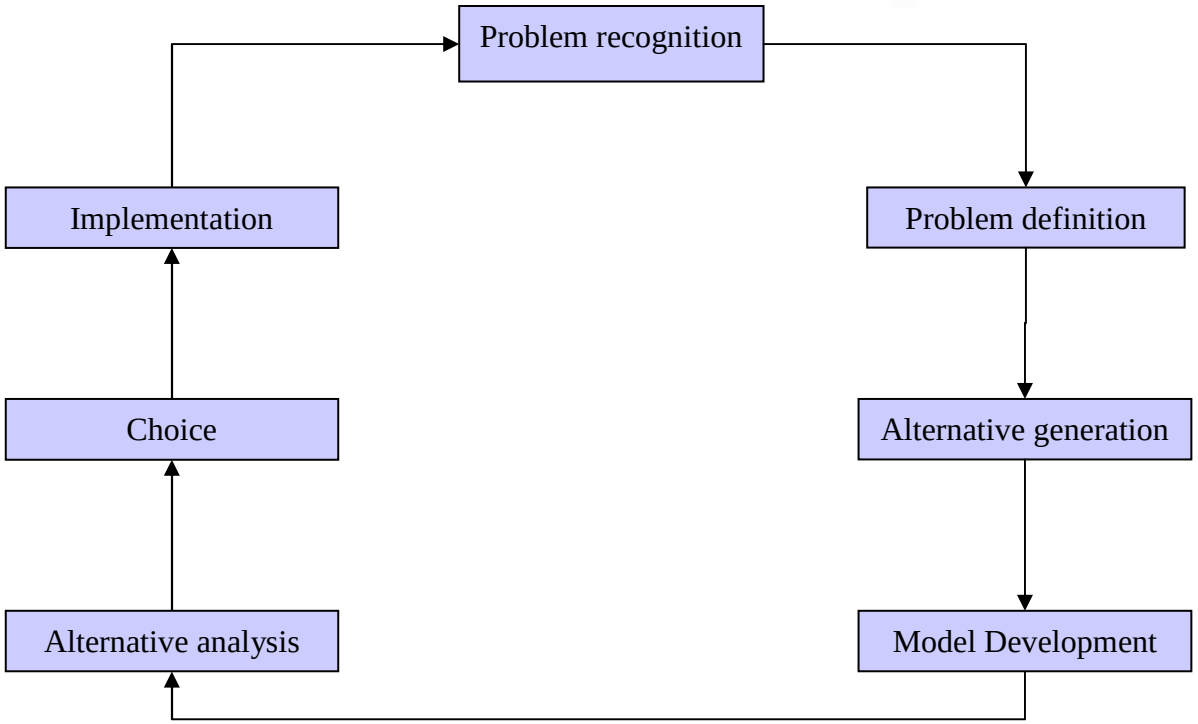
- Adapting the framework:
  - Contrast SE with Soft Systems Methodology
  - Focus on technically feasible alternatives vs socially feasible alternatives

The article abstract…

- Singerian inquiring organizations based on Churchman's inquiring systems and Mitroff and Linstone's unbounded systems thinking are designed to deal with wicked decision situations.

Courtney, J.F., Decision making and knowledge management in inquiring organizations: toward a new decision-making paradigm for DSS, *Decision Support Systems*, Vol 31(2001), 17-38.

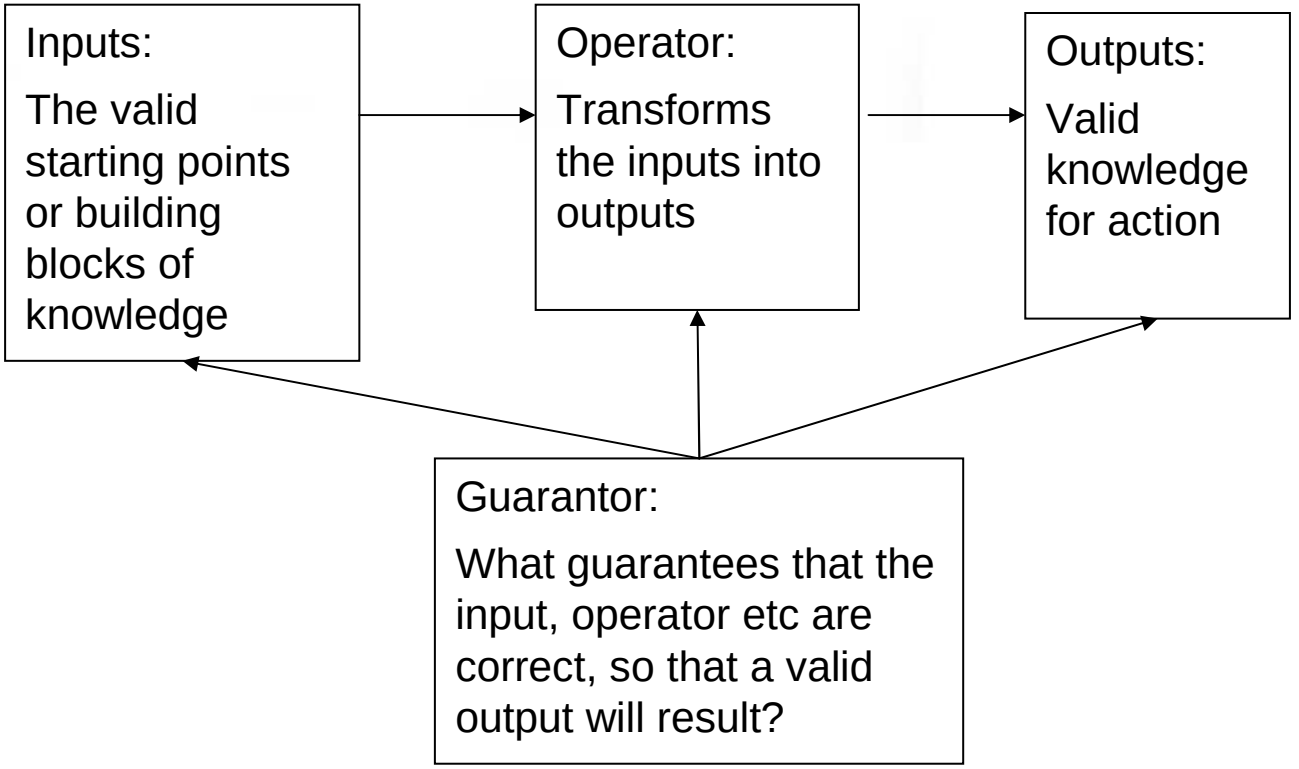
Conventional Decision-making Process



Types of inquiry systems

- Churchman described the work of five philosophers Leibniz, Locke, Kant, Hegel and Singer from the perspective of systems theory.
- These five inquiring systems constitute different approaches to the creation of knowledge.

An inquiry system



"a system of interrelated components for producing knowledge on a problem"

Churchman, in Mitroff and Linstone, 1993

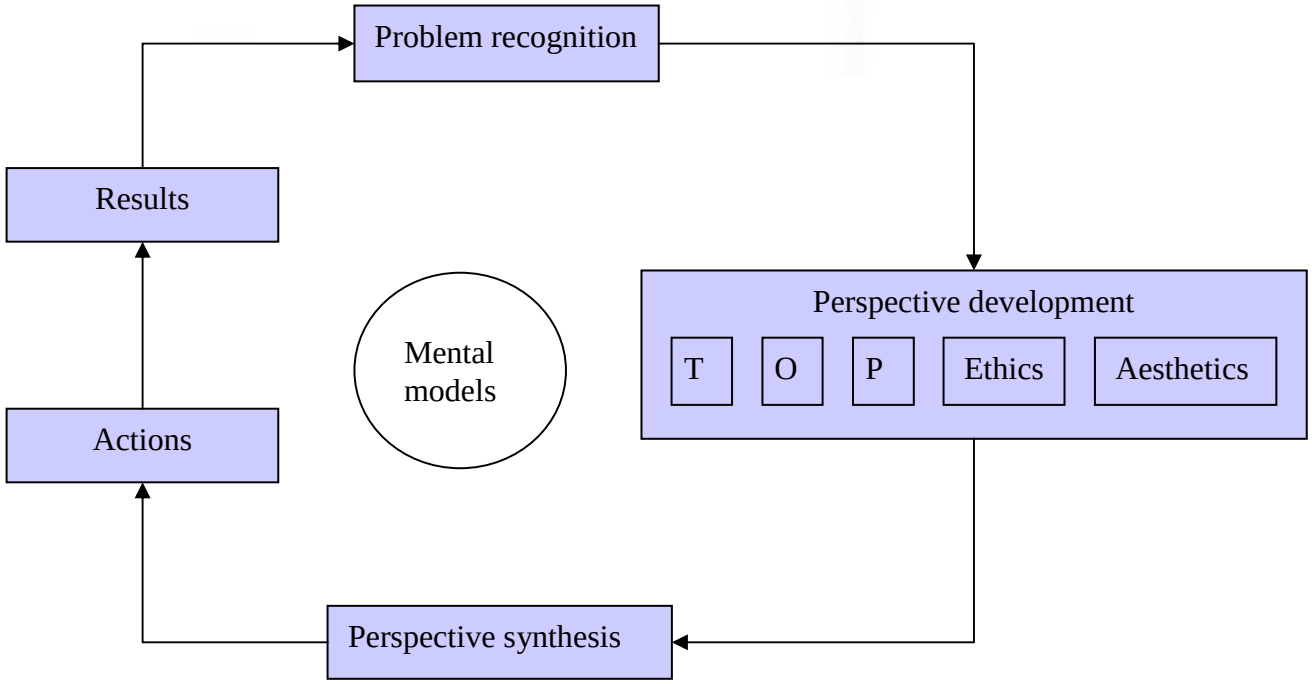
Types of inquiry systems

- Analytic-deductive (Leibniz):
  - Inputs: facts, Output: single truth (Logic)
- Inductive-consensual (Locke):
  - Inputs: Facts and Expert opinion, Output: consensus (Delphi techn)
- Multiple realities (Kant):
  - Inputs: Observations structured by our minds, data & model inseparable, Outputs: range of alternatives for decision-maker (Strategic planning)
- Dialectic (Hegel)
  - Inputs: Opposing models, Outputs: learning by decision-maker
- Multiple perspectives (Singer)
  - Inputs: problems and knowledge domains (disciplines) inseparable, Sweep in all possible disciplines and inquiry systems
  - Outputs: Knowledge for all (not just scientists) (Unbounded Systems Thinking)

Multiple Perspectives

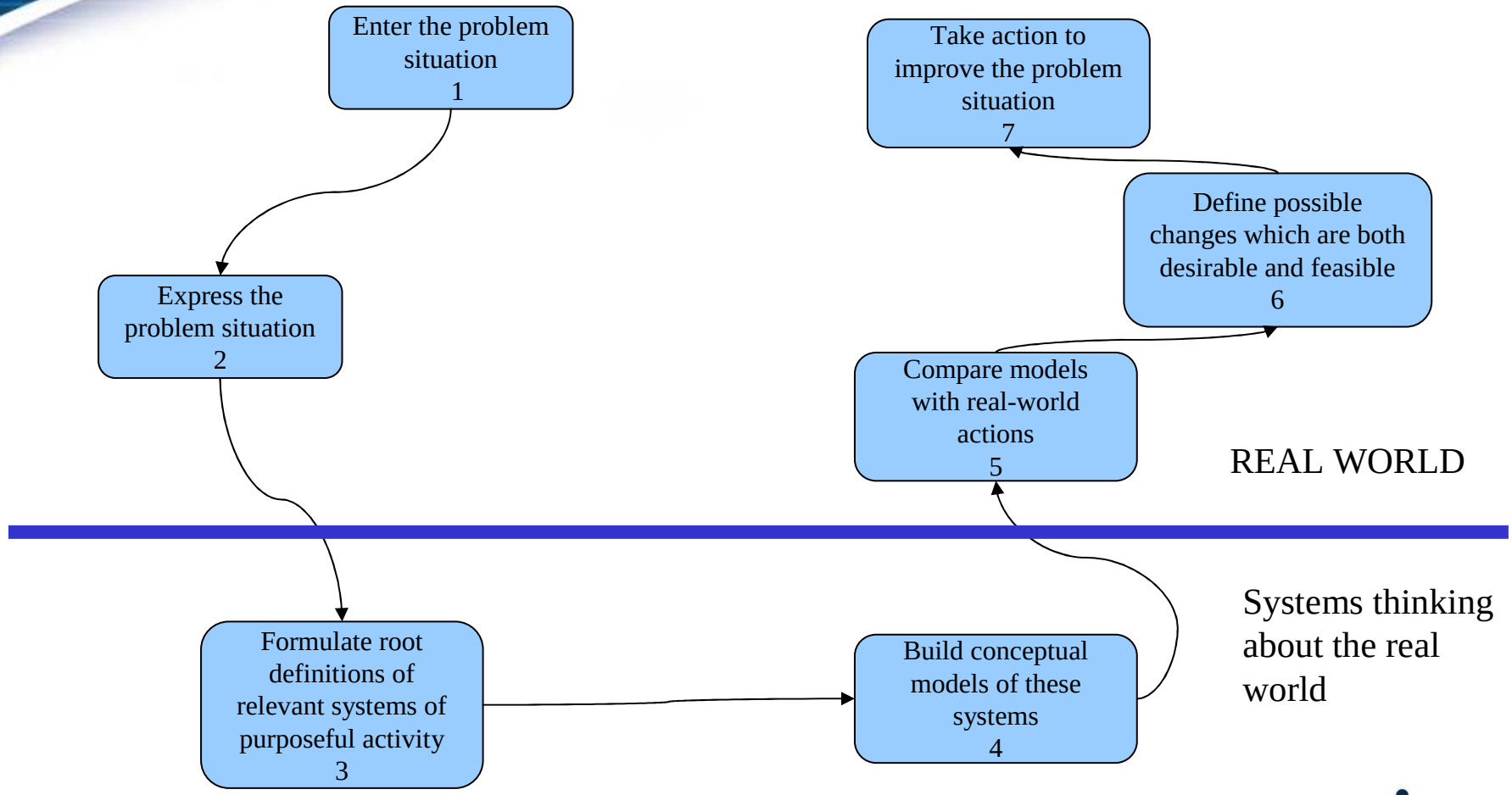
- The interconnectedness of all systems and the interrelatedness of all problems (Singer and UST). Requires a holistic approach and many views on a problem - Multiple perspectives:
  - Technical (analytic-deductive, multiple realities)
  - Organisational (many role players functioning in groups)
  - Personal (individual needs/agendas)
  - Ethical
  - Aesthetical

Courtney's Framework



A new decision-making paradigm for Decision Support Systems

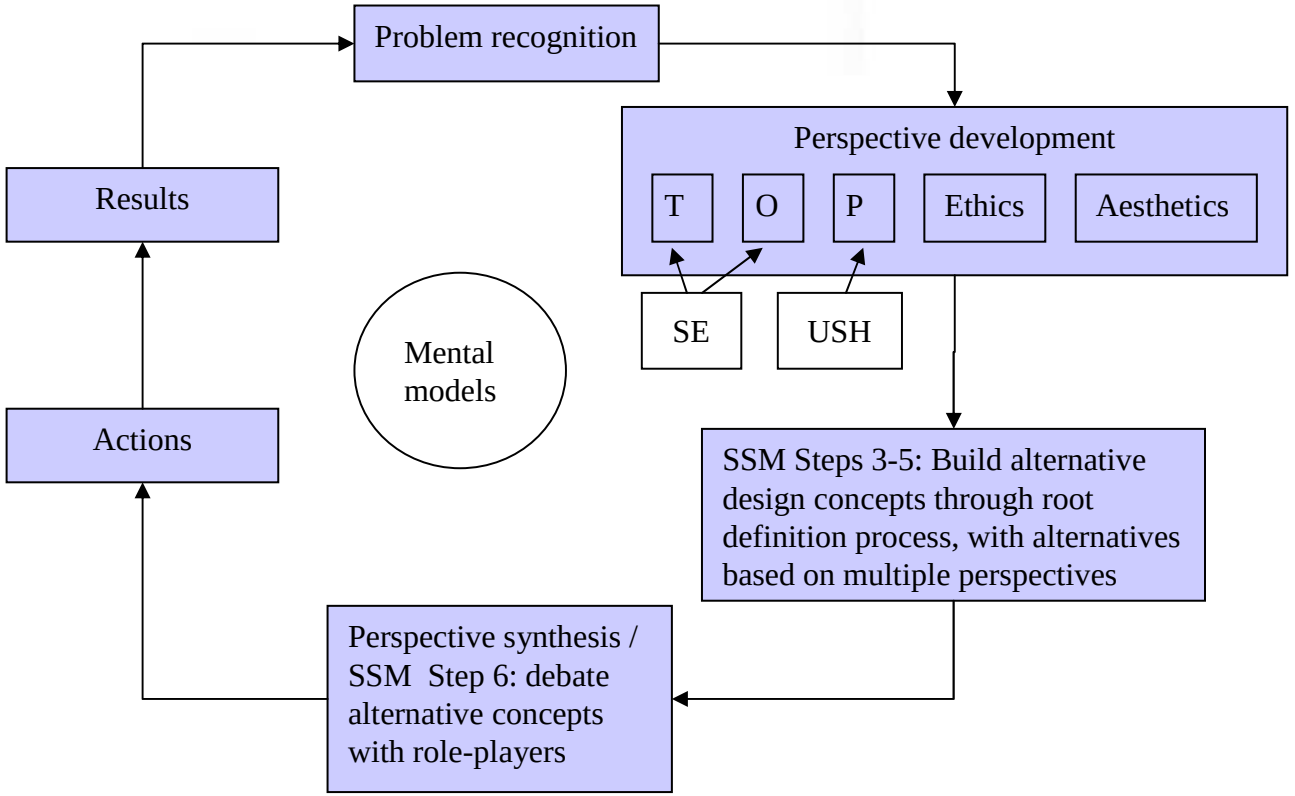
Soft Systems Methodology



Systems thinking about the real world

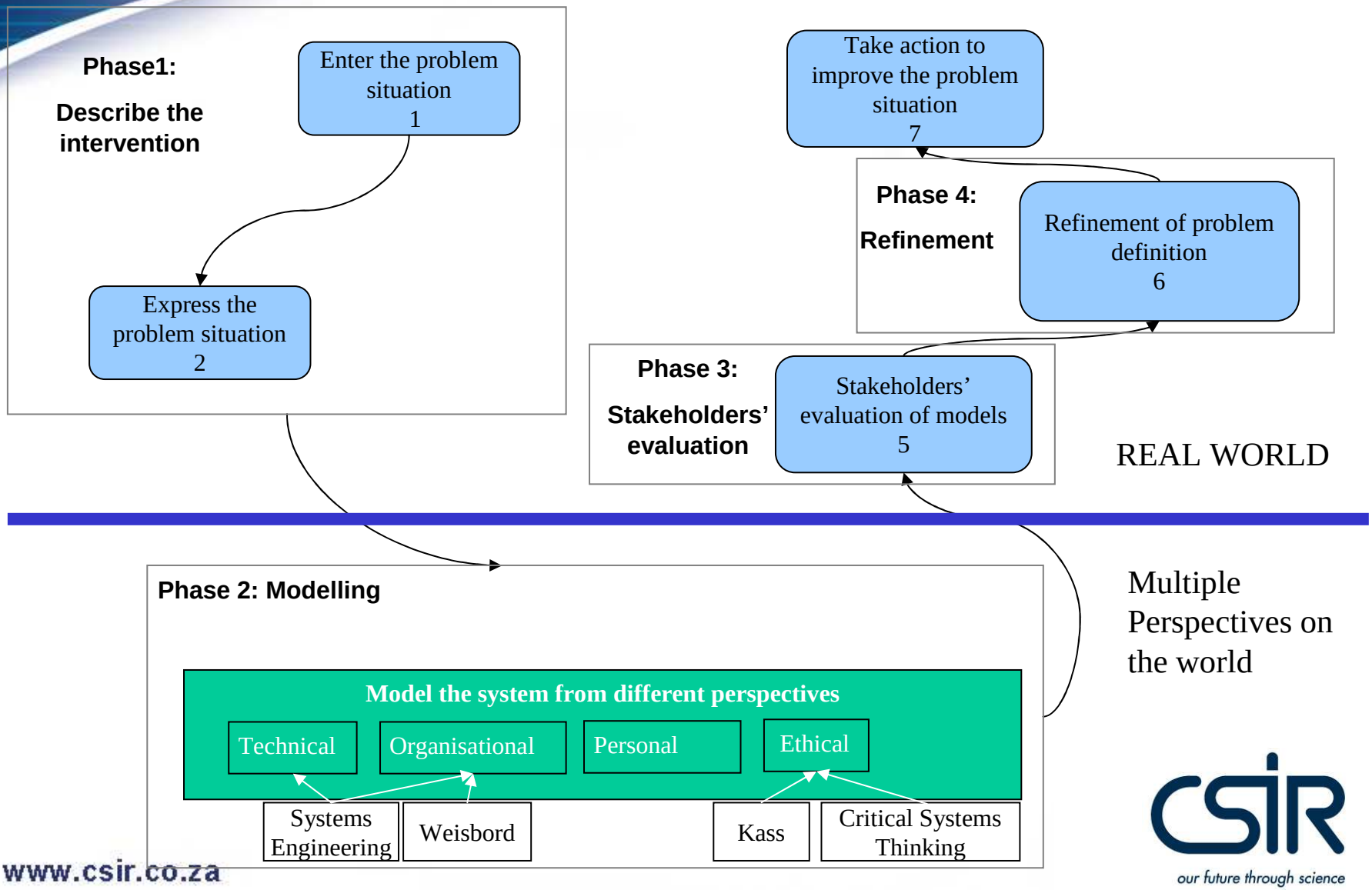
Peter Checkland

A Systems Framework for Studying NPAS



A modified version of Courtney's decision support framework

Systems Analysis Framework



Phases

- Phase1 Describe the intervention
- Phase 2 Modelling
  - Use SE to provide the technical perspective on the system, and develop views from the organisational, personal and ethical perspectives simultaneously
- Phase 3 Stakeholders' evaluation
  - Test the modelling results with the stakeholders
- Phase 4 Refinement of problem definition

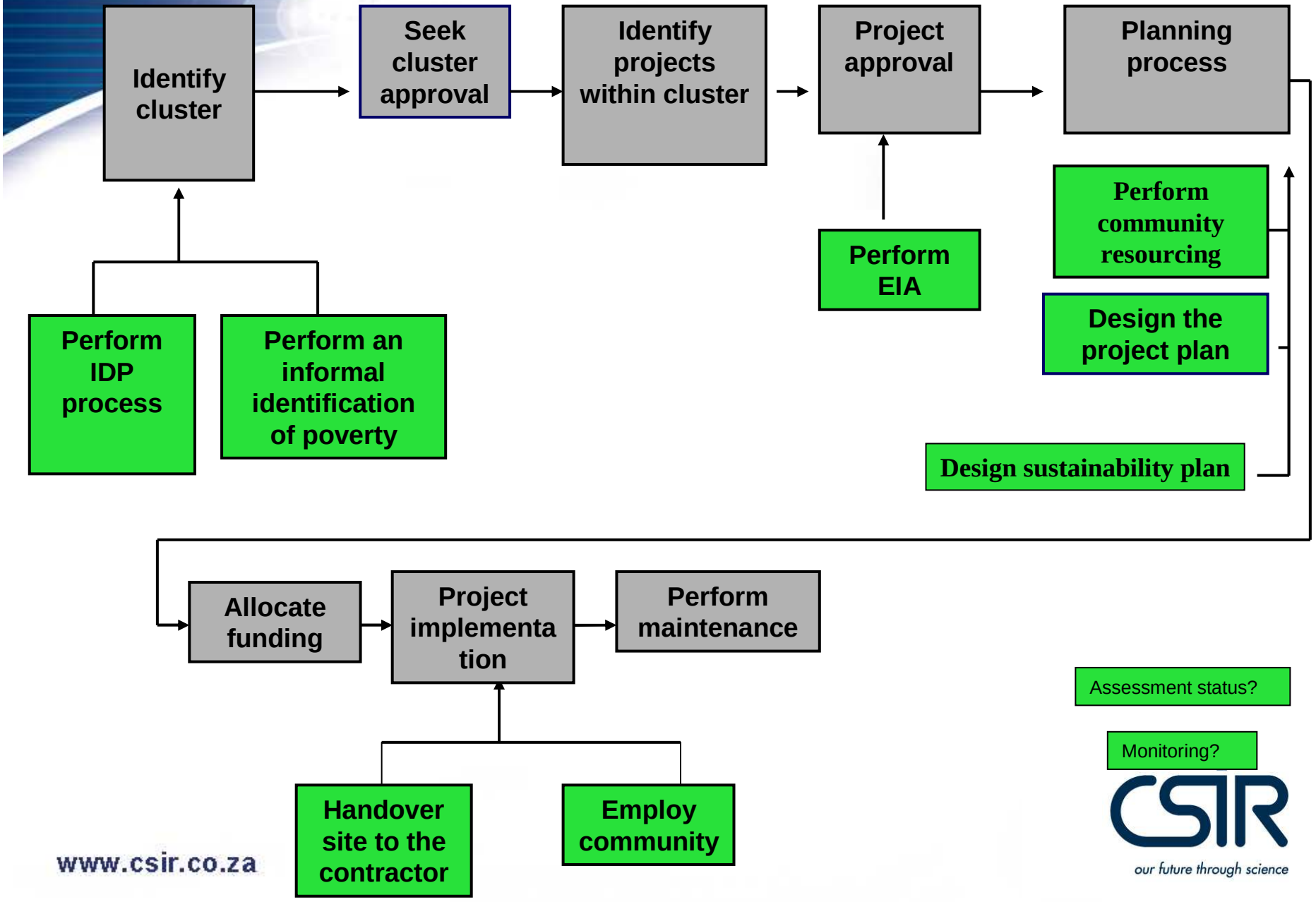
Application of the framework

- Test and develop the framework
  - Two case studies:
    - A desktop study of a completed initiative that spans the whole NPAS (The Community Based Public Works Programme)
    - Focus on a community: Kensington
- Collate existing indicators and develop new systems based indicators

Case 1:
Community Based Public Works Programme (CBPWP)

- Historical programme, bounded in time
- Implemented by NDPW
  - Core business: provision & maintenance of gov't physical assets
- Objectives
  - Creating short term employment
  - Creating useful assets
  - Create sustainable employment opportunities
- Principles
  - Targeting of poverty pockets
  - Targeting the poorest of the poor in rural areas
  - Local authority empowerment

CBPWP: Functional decomposition



CBPWP: Entities and Interactions - N-squared diagram

NDPW	Contractual agreement	Contractual Agreement Funding							
Reports progress	**PDPW**	Monitors Project approval							
Reports progress	Submits application for approval	**PIA**	Contractual Agreement Funding	Contractual Agreement Funding					
		Reports Information	**Cluster Manager**						
			Reports Information	**Contractor**		Employment	Contracts skills transfer?		
			Reports information		**Social facilitator**	Training and empowerment			Training requirements?
				workforce	-Quality input as CSC -Participation	**Community (Worker)**			
				workforce		Employment?	**Emerging Contractor**		
				procurement				**Supplier**	
			Reports Information			On job training			**Trainer**

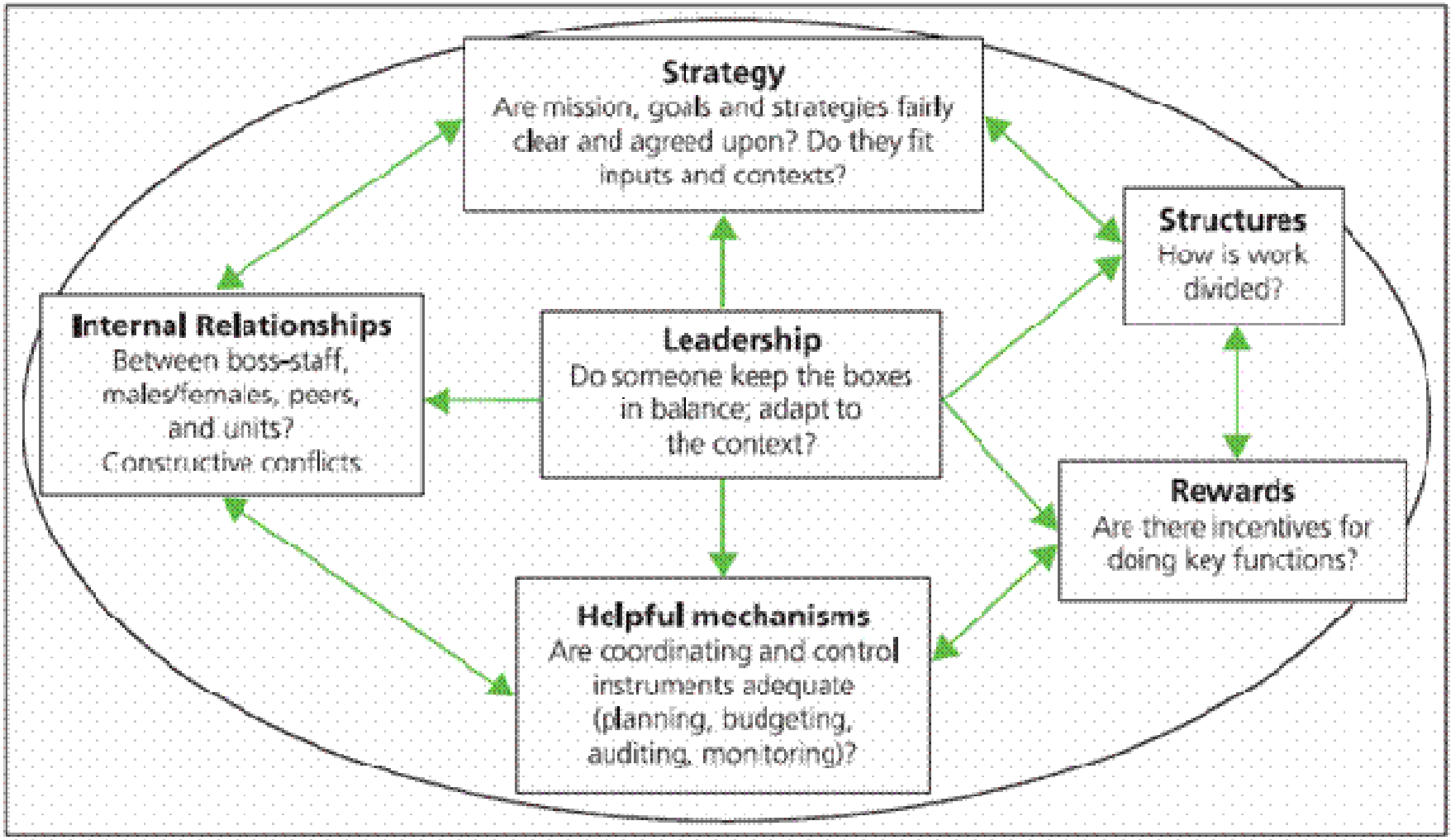
CBPWP Implementation: structure

- Institutional arrangements
  - NDPW: provide funding and project management system
  - PDPW: monitoring function
  - DM: Implementing Agents
  - Beneficiaries; contractors, service providers, workers, com members: benefit from participation, capacity building and empowerment
- Approach
  - Participatory development in line with democracy
- Modes
  - Standard
  - Rapid

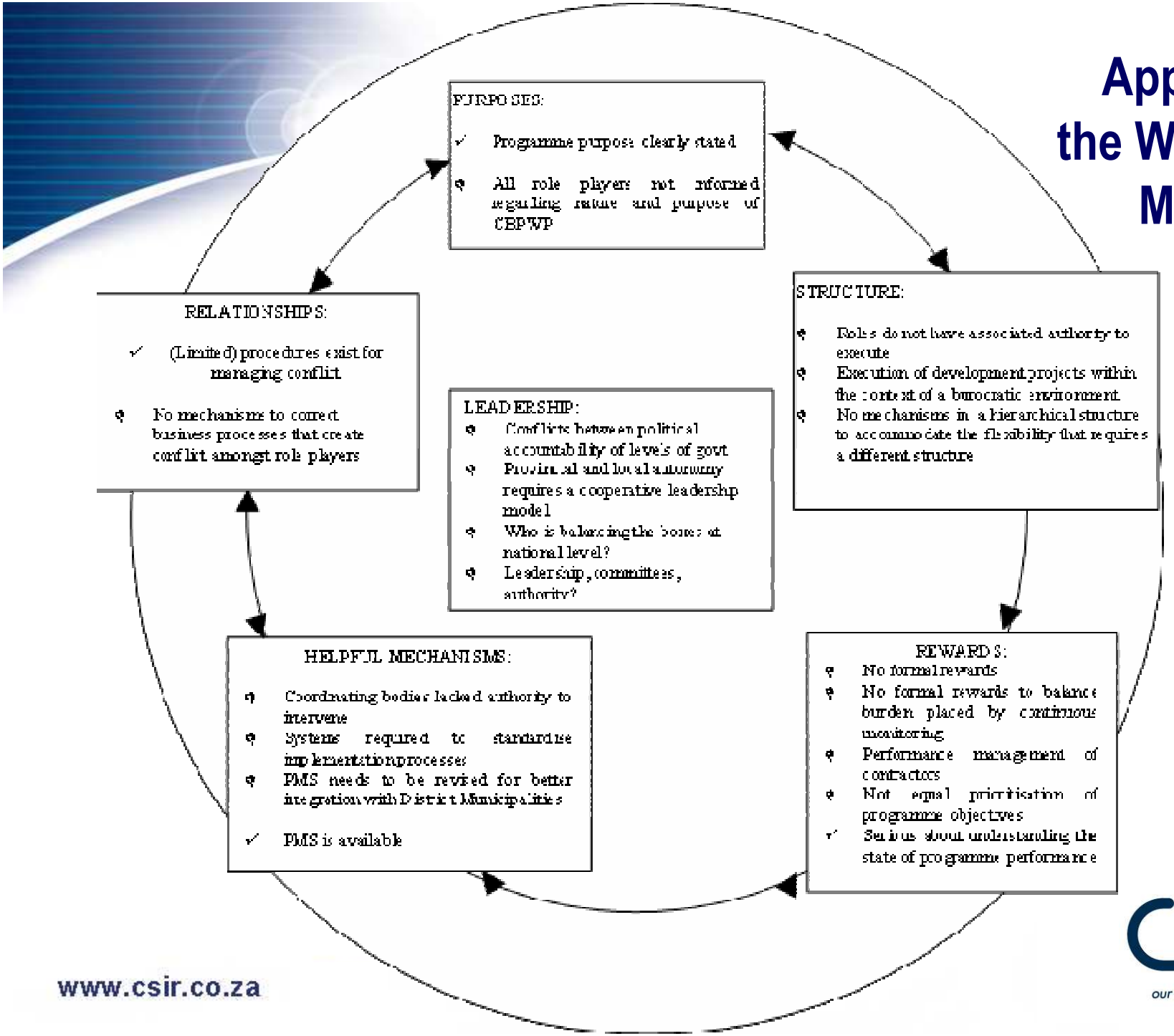
Organisational Design Perspective
A progression of views on an organisation

- The environment
- The context of the network of other organisations that surrounds it
- Multiple views on the organisation (functional-rational,political)
- Integrative analysis of the organisation (e.g Weisbord's six boxes model, the Star model).

Integrative Analysis:
Weisbord's six boxes model



Applying the Weisbord Model



Ethical Perspective

Kass' model

- What are the poverty reduction goals of the proposed programme?
- How effective is the programme in achieving its stated goals?
- What are the known or potential burdens of the programme?
- Can burdens be minimized? Alternative approaches?
- Is the programme implemented fairly?
- How can the benefits and burdens of the programme be fairly balanced?

Critical Systems Heuristics (Ulrich, Flood, Jackson)

- 12 critical questions
- Concerns system boundaries as well as marginalised parties

The twelve critical boundary questions

- *Sources of Motivation*
  - Who is (ought to be) the client or beneficiary? That is, whose interests are (should be) served?
  - What is (ought to be) the purpose? That is, what are (should be) the consequences?
  - What is (ought to be) the measure of improvement or measure of success? That is, how can (should) we determine that the consequences, taken together, constitute an improvement?
- *Sources of Power*
  - Who is (ought to be) the decision-maker? That is, who is (should be) in a position to change the measure of improvement?
  - What resources and other conditions of success are (ought to be) controlled by the decision-maker? That is, what conditions of success can (should) those involved control?
  - What conditions of success are (ought to be) part of the decision environment? That is, what conditions can (should) the decision-maker not control (e.g. from the viewpoint of those not involved)?
- *Sources of Knowledge*
  - Who is (ought to be) considered a professional or further expert? That is, who is (should be) involved as competent provider of experience and expertise?
  - What kind expertise is (ought to be) consulted? That is, what counts (should count) as relevant knowledge?
  - What or who is (ought to be) assumed to be the guarantor of success? That is, where do (should) those involved seek some guarantee that improvement will be achieved – for example, consensus among experts, the involvement of stakeholders, the experience and intuition of those involved, political support?
- *Sources of Legitimation*
  - Who is (ought to be) witness to the interests of those affected but not involved? That is, who is (should be) treated as a legitimate stakeholder, and who argues (should argue) the case of those stakeholders who cannot speak for themselves, including future generations and non-human nature?
  - What secures (ought to secure) the emancipation of those affected from the premises and promises of those involved? That is, where does (should) legitimacy lie?
  - What worldview is (ought to be) determining? That is, what different visions of 'improvement' are (should be) considered, and how are they (should they be) reconciled?

Ethical Perspective
Kass' model applied

- How effective is the programme in achieving its stated goals?
  - Goal: sustainable employment opportunities
  - Why increase the supply of low-skilled workers if the demand is limited?
  - Training was too job-specific and too short: limiting the possibilities of starting a business, lack of acceptance of the qualifications which limited employability.
  - Increased feelings of self-worth.
- Is the programme implemented fairly?
  - Inability to achieve equity targets
- How can the benefits and burdens of the programme be fairly balanced?
  - Short-term interventions such as the PWP does not address the fundamentals of a labour market with chronic structural problems
  - Attention and resources is diverted away from larger, integrated initiatives that can reach the desired goal.
  - Integrate with other initiatives to avoid undesirable outcomes such as disruption of local livelihoods strategies.

Reflection & discussion

Reflections

- Multi-disciplinary team
  - Took a long time to understand each other and move forward
- Difficult to engage the Systems Engineers
  - Have to use their tools to understand why they think the way they do…
- Turning philosophy into a process
  - Need to suspend scepticism
  - Need to apply the framework to understand it
  - Closing the gap between analysis and action (need Organisational, Personal perspectives)
  - Sustainability: need SE's life cycle focus
- How to engage/communicate with the community?
- The amount of effort involved!

mmarais@csir.co.za