Doctor of Philosophy in Computational Intelligence

An Integrative Framework for Adaptive Industrial Systems Optimisation

Tuesday, December 3, 2019

Supervisor and Student Profile

An Integrative Framework for Adaptive Industrial Systems Optimisation

Dr Barnabas Gatsheni

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Barnabas obtained a PhD in Computational Intelligence from the University of Edinburgh in the UK and an MSc in Electronic Engineering from the University of Nottingham in the UK. He then worked at the University of Essex in England as a Postdoctoral Research Fellow between 2001 and 2004. Barnabas then worked as a Quality Assessor at Delphi Energy and Chassis Systems in South East England. Barnabas spent January 2016 at the Neural Computing Research Group at Aston University in the UK. In 2017 Barnabas visited Guy Van den Broeck of the University of California, Los Angeles (UCLA) and established collaboration with him. Barnabas supervises Masters and doctoral students. Barnabas is the head of the Computational Intelligence Research Group.

Mr Mthandeni Langa

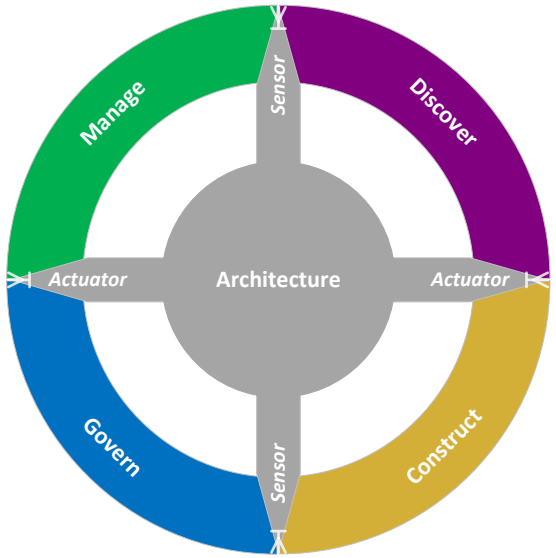
Researcher: mthandeni@gmail.com

Mthandeni is a payments integration solutions architect with a demonstrated history of leading challenging projects in the financial services sector. He enjoys teaching programming, systems architecture, object-oriented analysis and design, database management systems, IT management, information security and artificial intelligence. A published researcher, data architect, IT strategist and enthusiastic public speaker often invited in public and professional forums. He is currently finalizing an integrative principles of systems optimisation patent and is passionate about philosophy and research supervision. He is currently leading a project on unstructured data in one of the four banks in South Africa and concurrently supervising masters students at Wits Business School while employed as a strategic tutor at the University of Johannesburg.

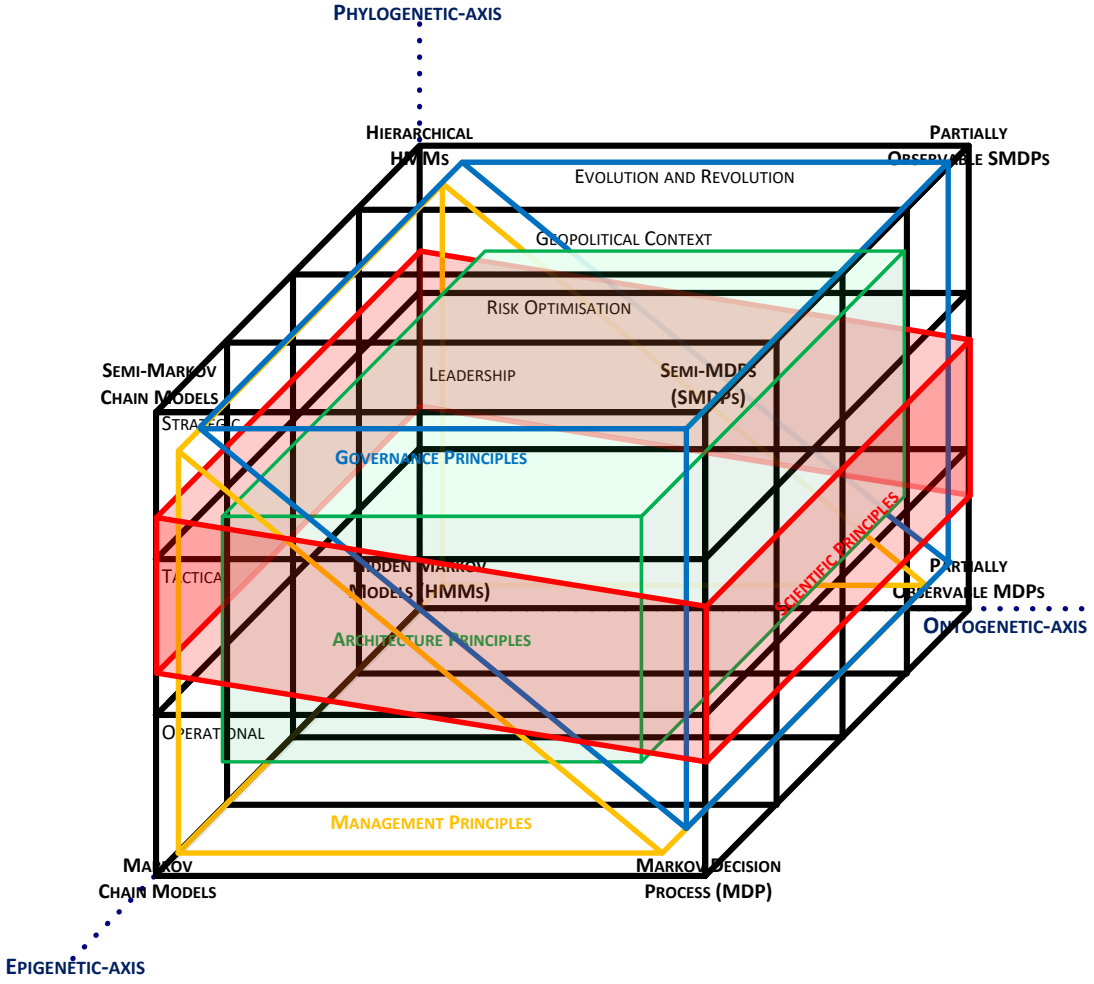
Talk Outline

- State Abstraction and Context-Oriented Solutionism
- An Indidiyelo Multiagent Optimisationism
- The Agents' Programming Framework
- Integrative Algorithmization Context
- Evolutionary Swarm Thinking
- Integrative Perspective
- Conclusion

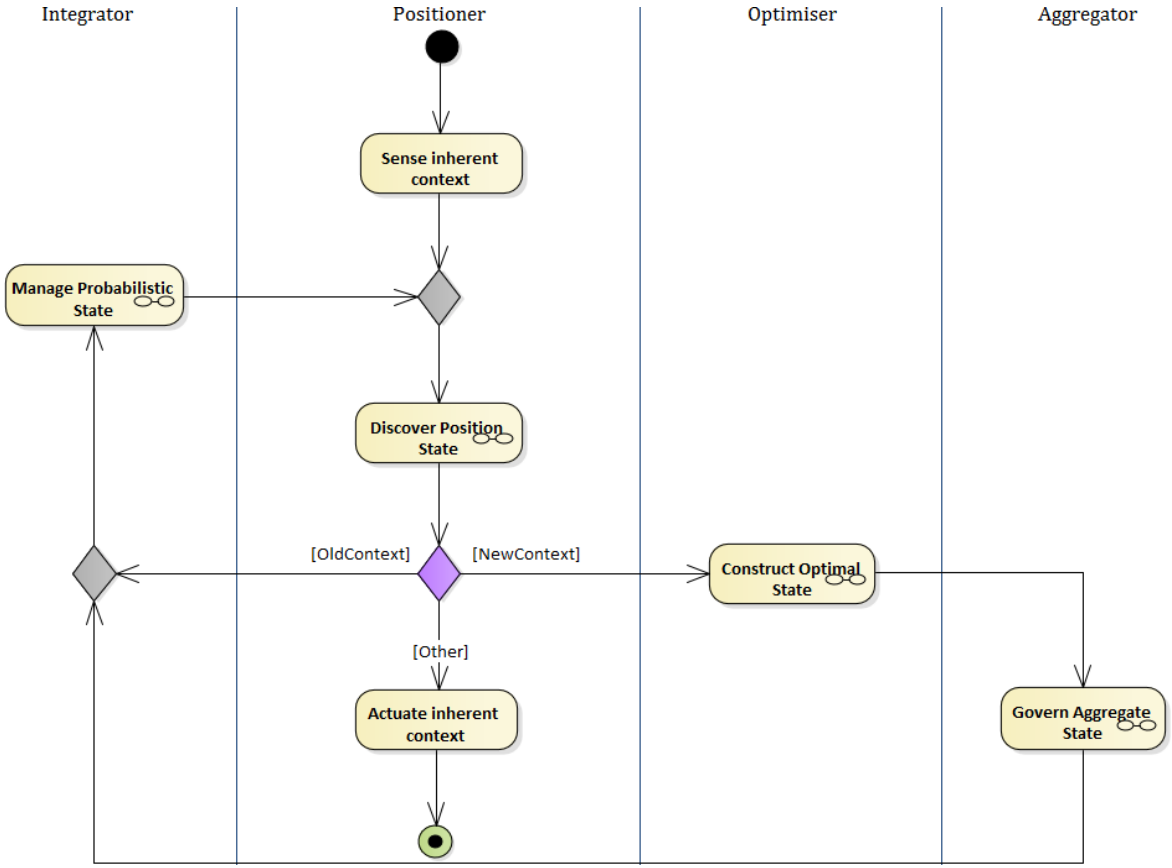
State Abstraction and Context-Oriented Solutionism



Industry 4.0: The 4th industrial revolution, 4IR, pursues the integration of production processes and network connectivity to facilitate intelligent behaviour resulting in machines and corresponding hardware exploiting embedded *software* capabilities to independently exchange digital information to discover, construct, govern and manage integral industrial processes over cognitive architectures.

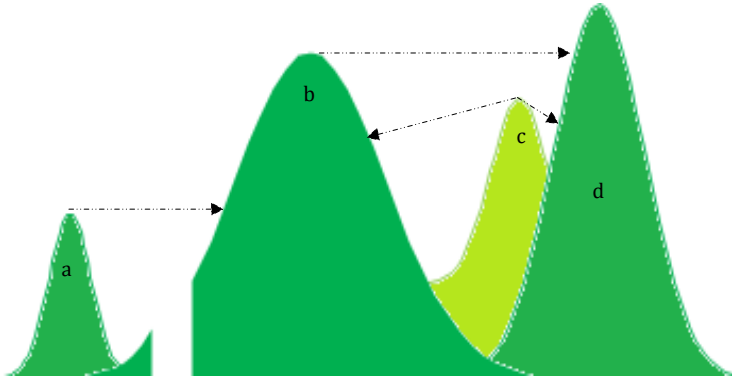


An Indidiyelo Multiagent Optimisationism

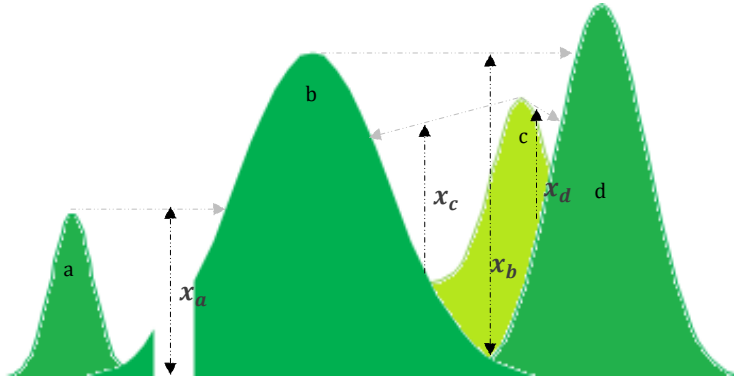


The Agents' Programming Framework

Positioner



Optimiser



$$\underset{x}{\text{minimise}} \quad a^T x + E\left[\underset{y(\omega)}{\text{minimise}}\ c(\omega)^T y(\omega)\right]$$

The objective function (OF)

$$\text{subject to} \quad A(x) = b$$

Deterministic constraints

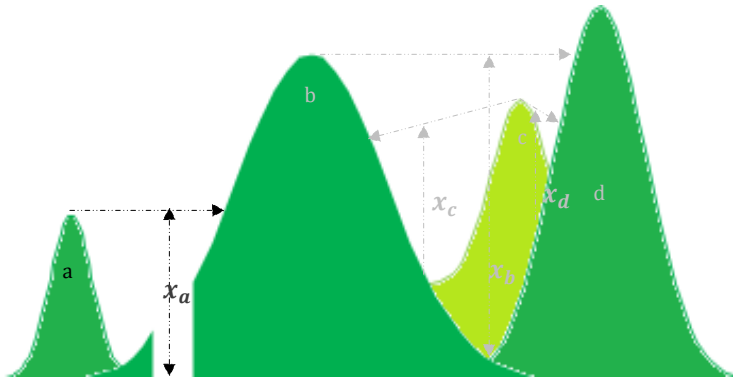
$$B(\omega)x + C(\omega)y(\omega) = d(\omega)$$

Stochastic constraints

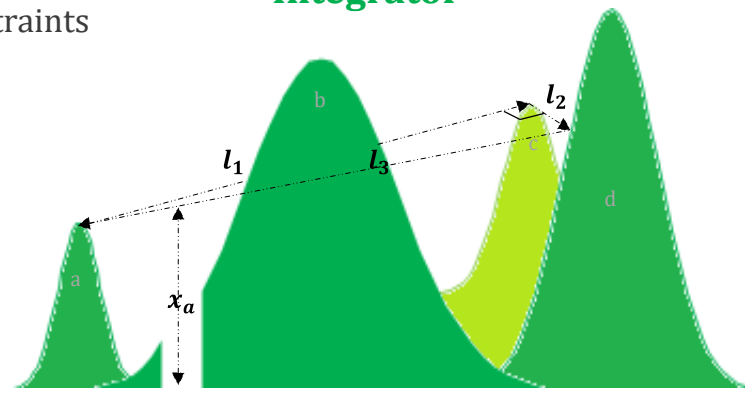
$$x \geq 0, \qquad y(\omega) \geq 0,$$

Inequality constraints

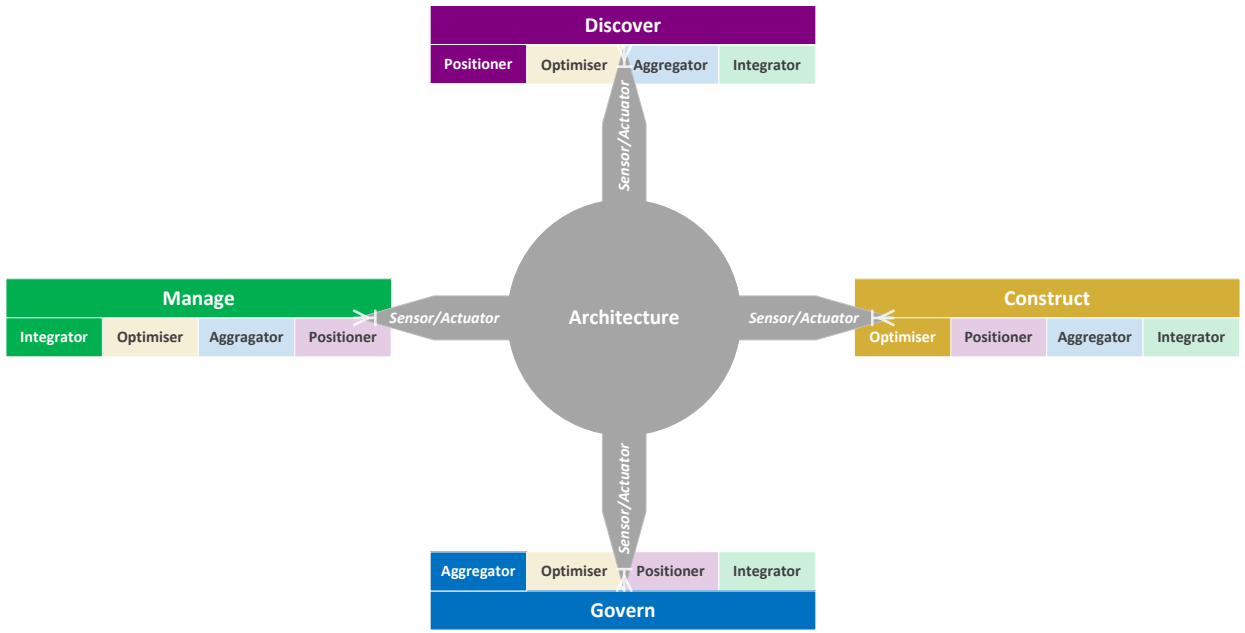
Aggregator



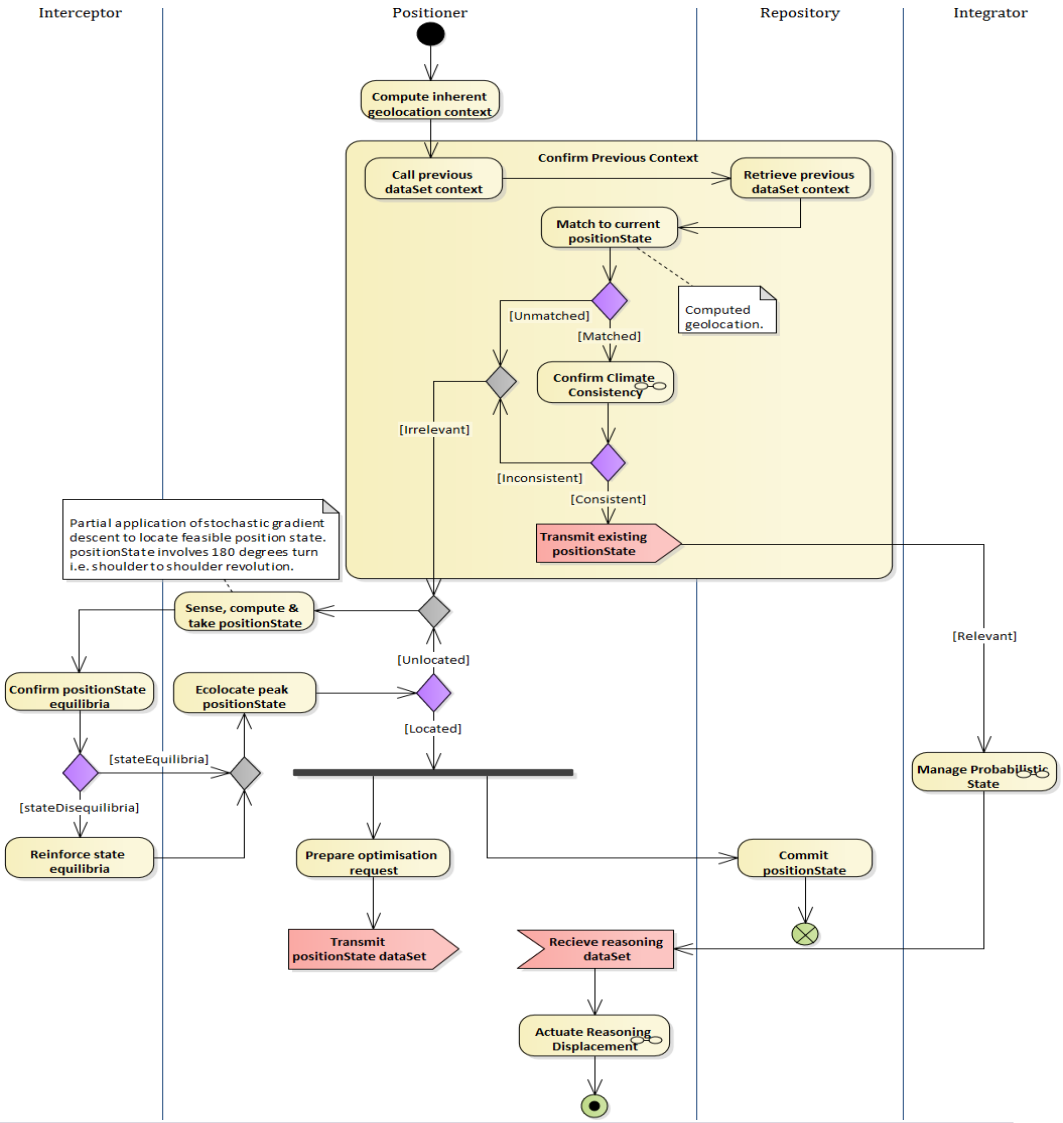
Integrator



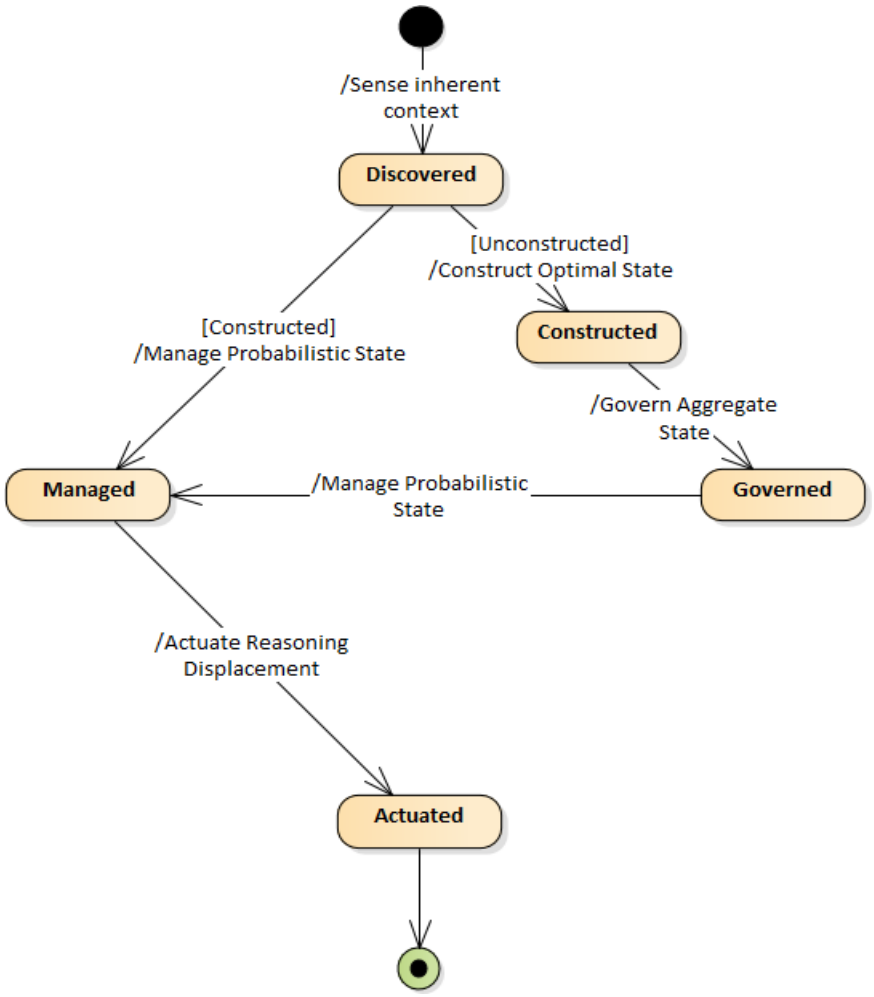
Integrative Algorithmization Context

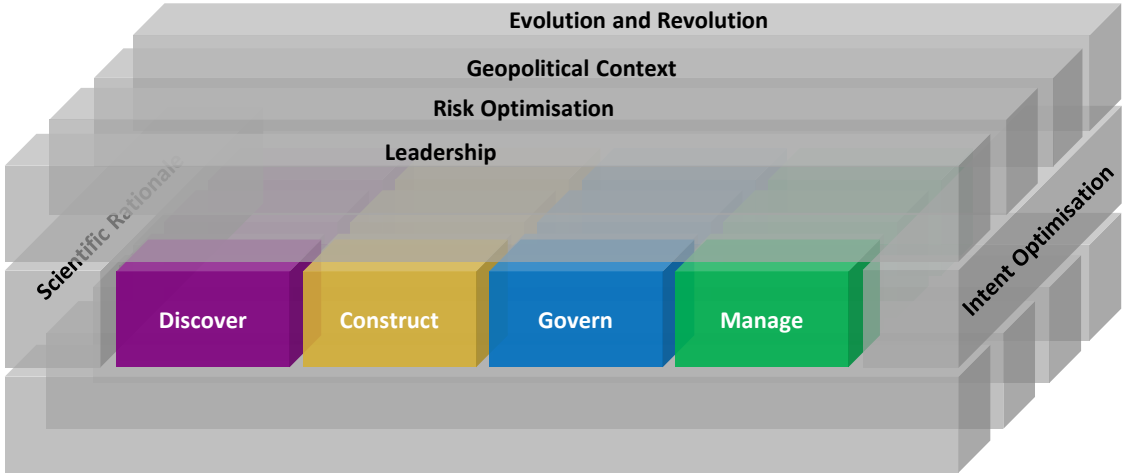


Agent's Intention	Primary Agent (0.80)	Secondary Agents ($l ::= l_1 \vee l_2 \vee l_3$)			Cognitive Architecture (0.05)	Contextual Implication
		$l_1 \equiv 0.05$	$l_2 \equiv 0.05$	$l_3 \equiv 0.05$		
Discover	Positioner	Optimiser	Aggregator	Integrator	T	Discovered
Construct	Optimiser	Positioner	Aggregator	Integrator	T	Constructed
Govern	Aggregator	Optimiser	Positioner	Integrator	T	Governed
Manage	Integrator	Optimiser	Aggregator	Positioner	T	Managed



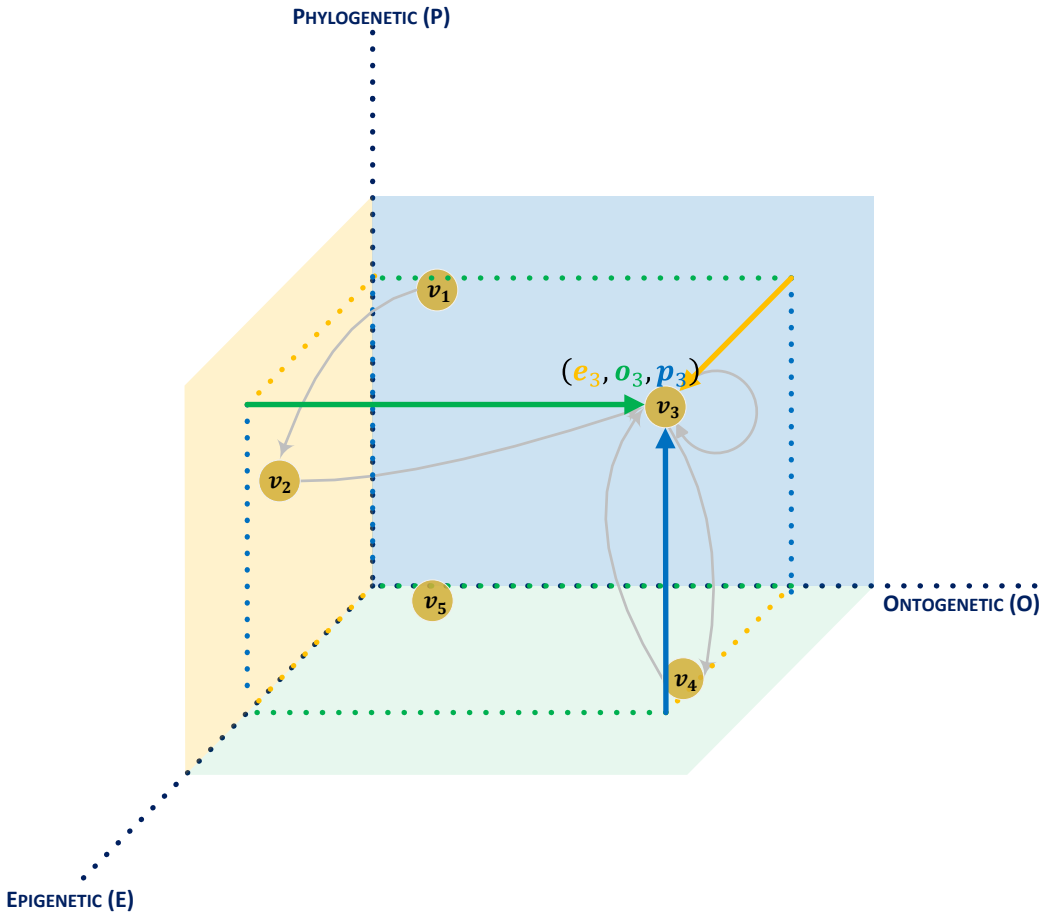
Evolutionary Swarm Thinking

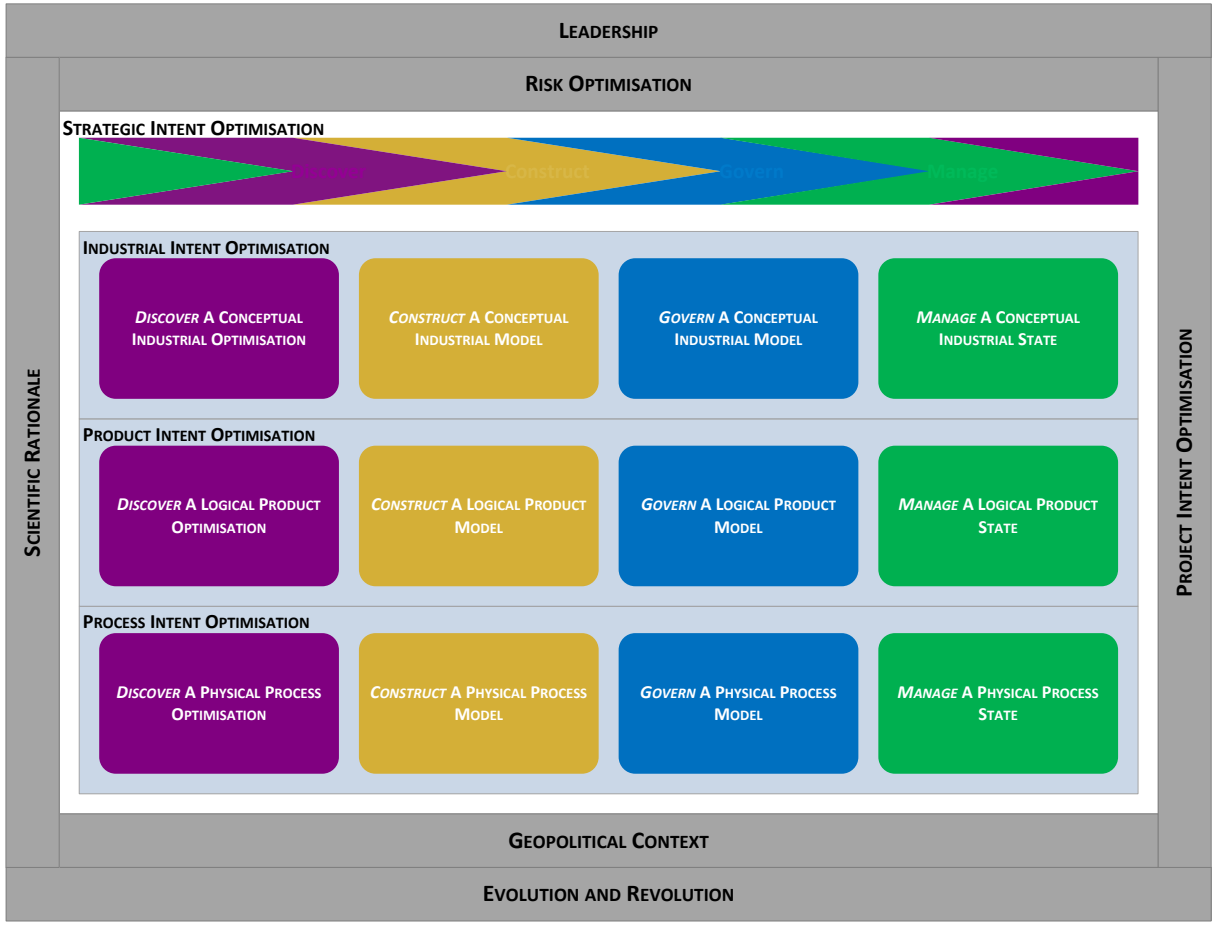




An agent (organisation) is a particle in a computational universe, its propensity to adapt is subject to internal and/or external factors. Absolutely known factors can be rationalised by determinism whilst unknown elements can be rationalised by stochastism. Sustainable organisation reengineering should optimise contextual prevailing factors.

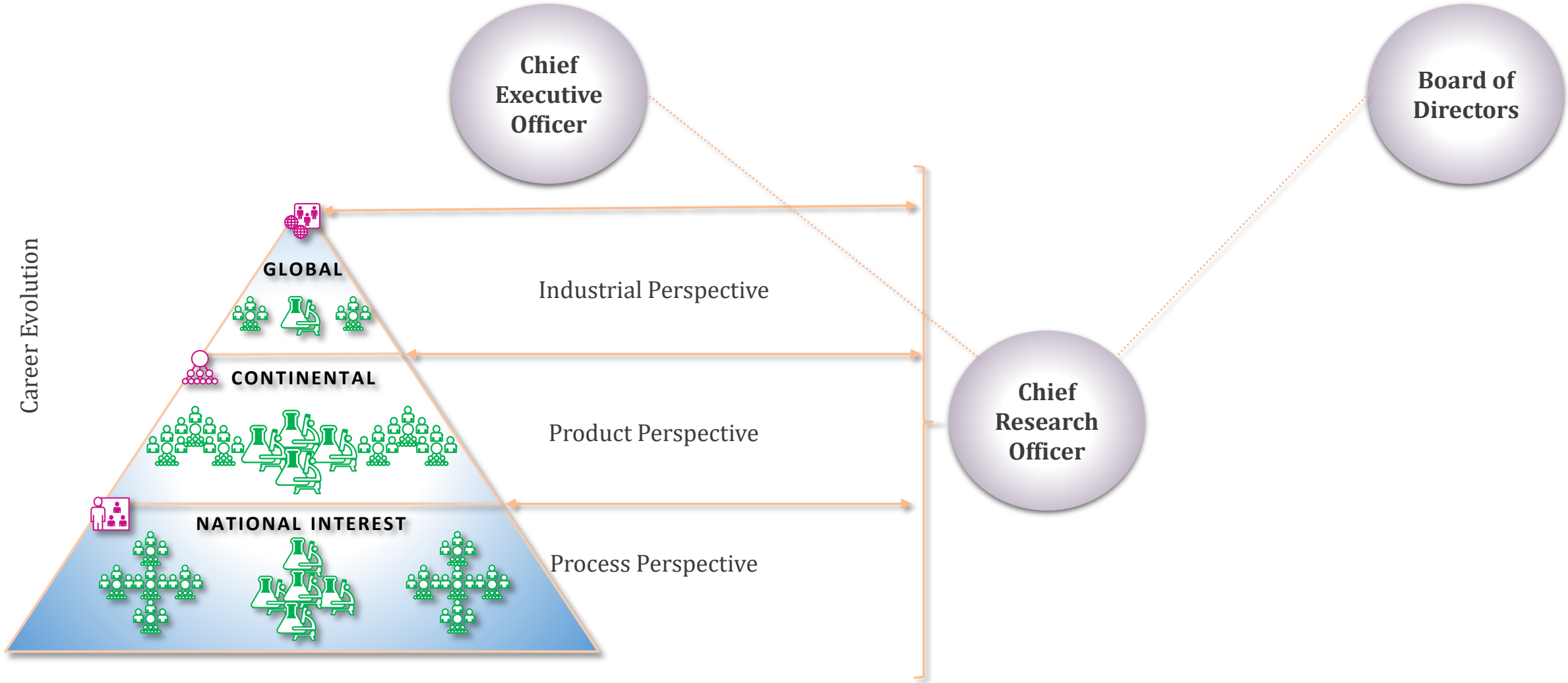
Integrative Perspective





An Integrative Framework for Adaptive Industrial Systems Optimisation!

Conclusion


Chief Executive Officer
Board of Directors
Career Evolution
GLOBAL
CONTINENTAL
NATIONAL INTEREST
Industrial Perspective
Product Perspective
Process Perspective
Chief Research Officer

Questions

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