

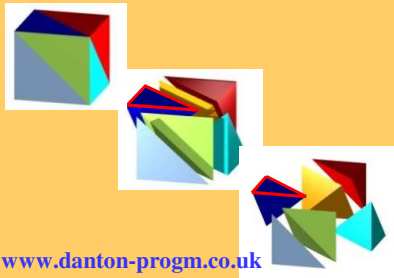
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Exploring the link between complexity and risk – The energy view

Dr Dimitris N Antoniadis

31st January 2019



About Dimitris



Dr Dimitris Antoniadis

Director of *DAnton progm* consultancy; 30+ years in Programme and Project Management.

Author of the book '*Demystifying Project Control*'

Worked for various organisations such as:

BAA, Southern Water, Thames Water, Balfour Beatty, Brown & Root, T&T, Carillion, UK Power Networks.

And in various roles:

Programme Manager, Head of PMO, Project Manager, Head of Project Control.

PhD in Complexity, MSc in Project Management and BEng (1st) Mechanical Engineering

- Fellow of the Association for Project Management
- Fellow of the Chartered Management Institute
- PMGreece founding member



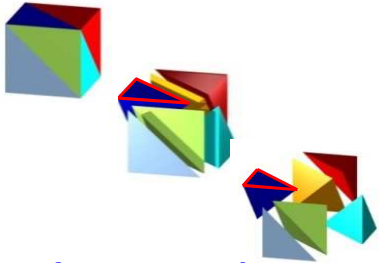
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Content / Discussion



The presentation will cover:

- Some facts about the background and the challenges in the energy sector
- Decisions and approach to tackle the challenges
- Software systems and structures
- The approach to Risk Management
- The Issues with the implementation
- Some results from surveys, interviews and case studies
- Rethinking the approach - the call for complexity management
- Complexity characteristics
- Conclusion / Discussion



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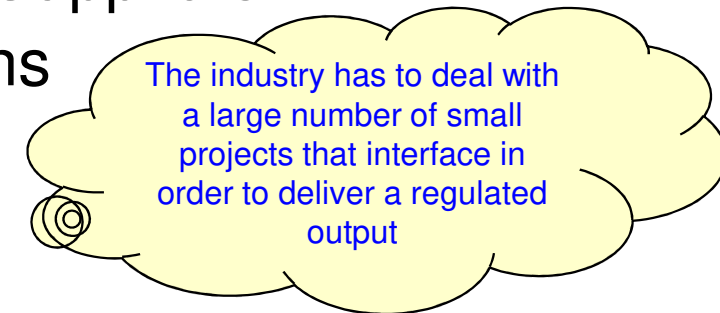
The energy background and the challenges - 1

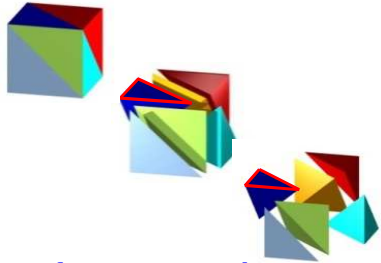


- The external environment
- The Internal environment
- The collaborative environment - Contractors / Suppliers
- The interconnections between the organisations
- The implementation of processes.
- The large number of small projects.

For example:

- Regulated annual workload: approx. 45% of projects with budget less than £0.5M
- Non-regulated annual workload: approx. 75% of projects with budget less than £200K





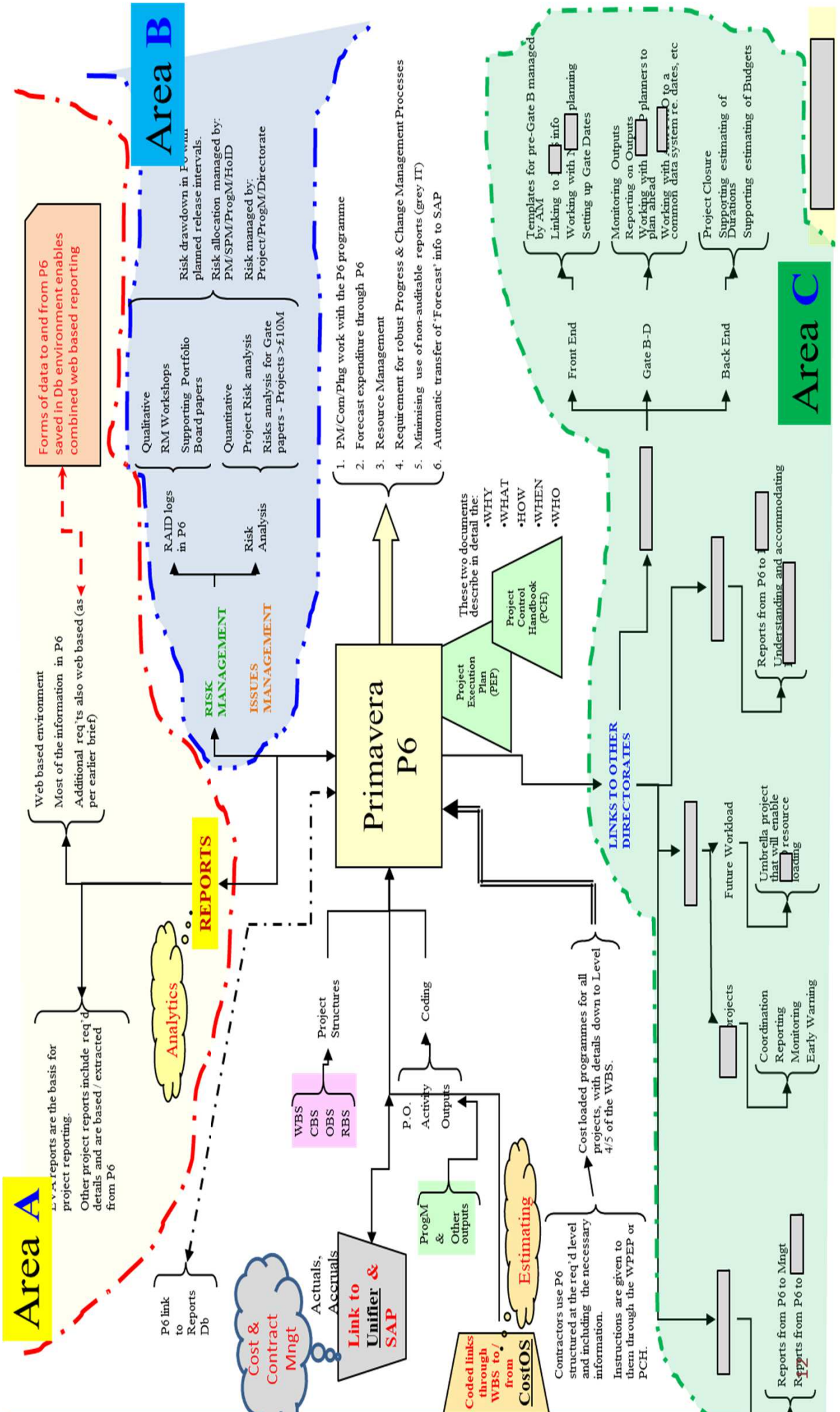
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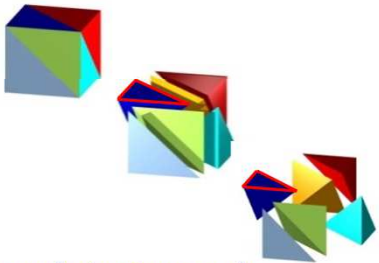
The other challenges and decision taken



- Faced with the above and the RIIO – ED1 requirements for:
 - Significant efficiency and innovation
 - Quality and service
 - Difficult competitive landscape
 - Skills shortage
- Embarked on major Business Transformation Programme changing processes and systems to enable:
 - Collaborative working
 - Geographical diversity
 - Varying work practices

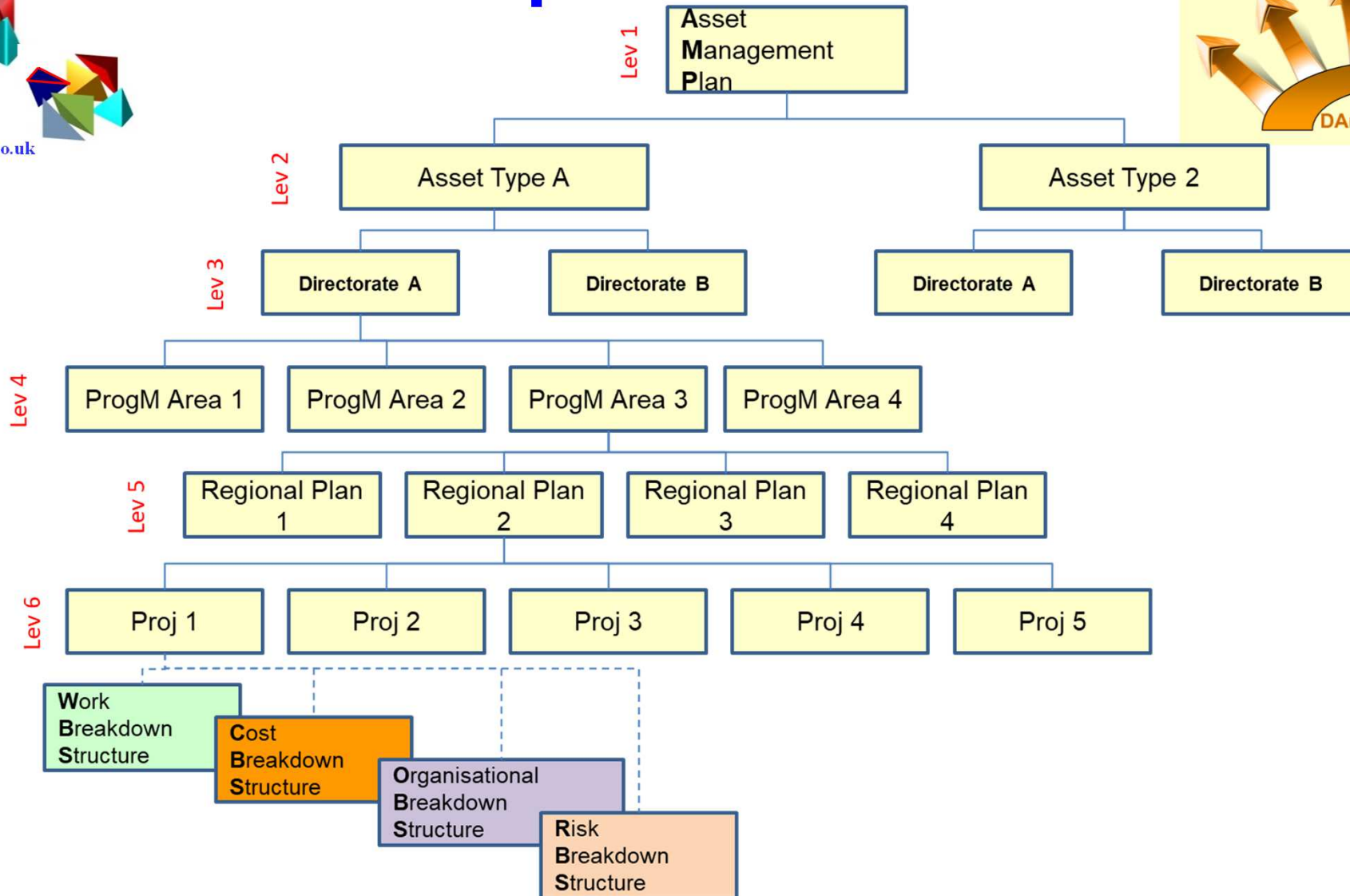
Integrated Programme & Project Management System





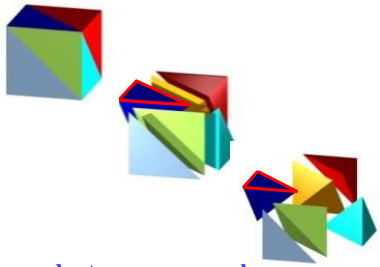
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Set up of structures



Asset Hierarchy

Project Structures

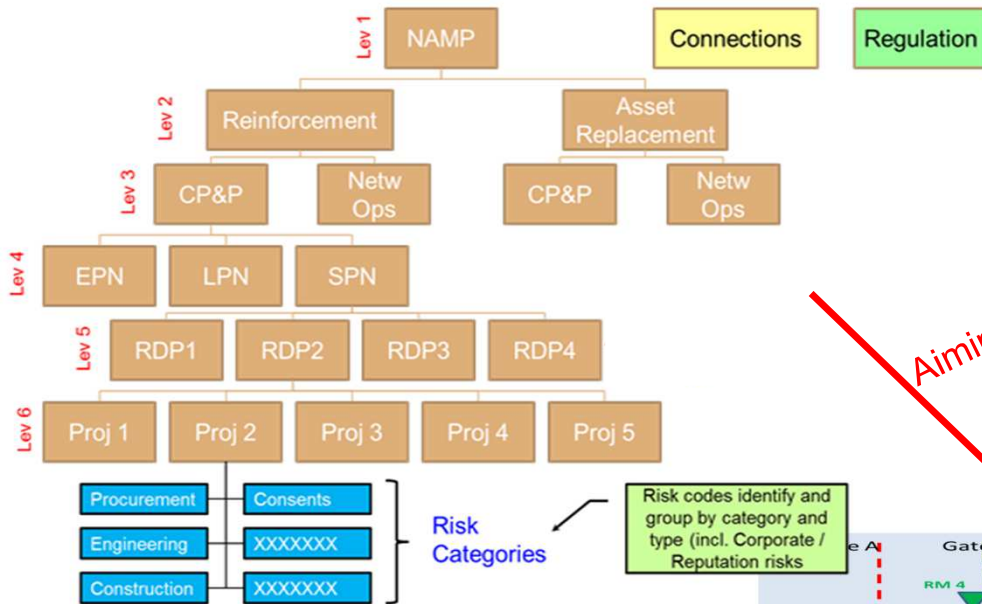


Risk Management & Structures

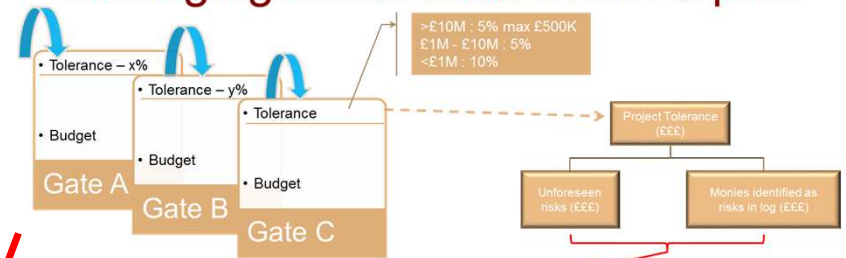


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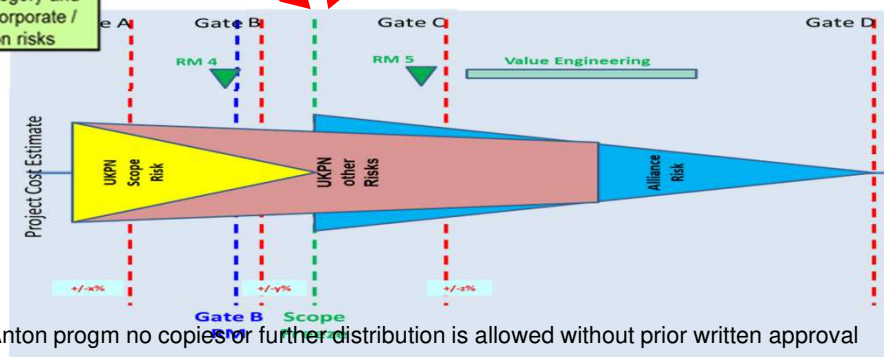
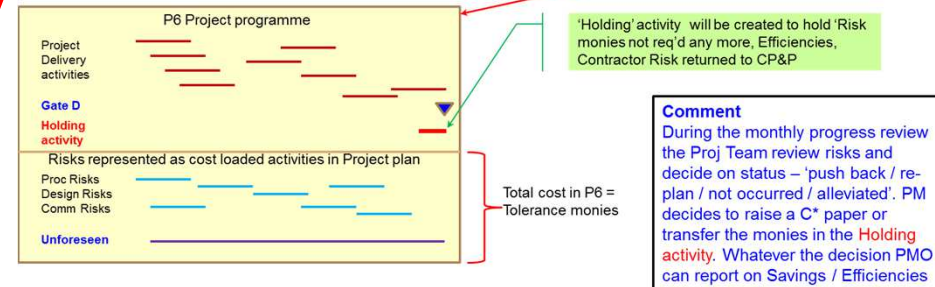
Risk Breakdown Structure

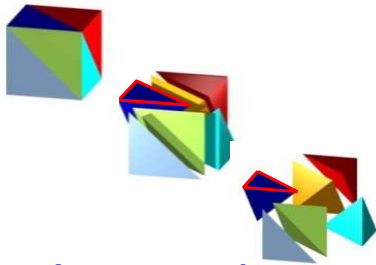


Managing Risks from within a plan



Aiming to:





Risk Management examples



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The screenshot shows the Oracle Primavera P6 Risk Register. The table lists various risks with columns for ID, Name, Type, Status, Owner, Probability, Schedule, Cost, Score, Res., Exposure, Exposure Start, Exposure Finish, and Activities. A detailed view of risk R0022 is also visible at the bottom.

	BL Project Total Cost	Project Risk Exposure	UKPN Risk % of Total Cost	Duration % Complete	UKPN Gate Stage	UKPN Project Manager
	98,582,688	2,026,625	2.06	0%		
	25,892,253	69,750	0.27	0%		
	5,384,960	0	0.00	98%	Gate B	
	4,608,836	0	0.00	98.7%	Gate B	
village	3,661,443	6,750	0.18	88.7%	Gate C	
	3,428,014	26,250	0.77	98.1%	Gate B	
ing E16 1D...	8,809,000	36,750	0.42	95.1%	Gate B	
	73,114,655	1,956,875	2.68	0%		
	440,943	0	0.00	7.3%	Gate C	
	61,299	0	0.00	49.7%	Gate C	
	1,269,353	0	0.00	16%	Gate B	
	122,298	0	0.00	70.9%	Gate A	
	1,104	0	0.00	0%	Gate A	
	1,104	0	0.00	0%	Gate A	
	1,472,040	0	0.00	52.6%	Gate B	
	2,556,245	0	0.00	64.2%	Gate B	
rsion	1,271,603	0	0.00	61.6%	Gate B	
	100,000	8,125	8.13	20.6%	Gate A	
	187,840	15,375	8.19	76.5%	Gate B	
	616,862	28,750	4.66	84.1%	Gate B	
	357,121	42,625	11.94	85.6%	Gate B	
	9,177,092	56,750	0.62	84.9%	Gate C	
	16,841,142	320,750	1.90	84.3%	Gate C	
	38,638,609	1,484,500	3.84	41.9%	Gate B	

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Risk Management governance and reports



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Monthly Director level report by Programme Manager

Probability											Probability															
↓											↓															
UH				SB							TR	SB,JN								UH						
VH				TR																VH						
EH			COB														COB			EH						
H																	DL,BF			H						
M			SS														MB			M						
L							JN													L						
EL																				EL						
VL							MB													VL						
UL																				UL						
Negligible																				Negligible						
	Negligible	UL	VL	EL	L	M	H	EH	VH	UH	UH	VH	EH	H	M	L	EL	VL	UL	Negligible						
Cost →	Negative Impact (Threats)										Positive Impact (Opportunities)										← Cost					
	SPM	Project Name						Threat Risk Name						SPM	Project Name						Opportunity Risk Name					

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Module	Score	Exposure	F...	Alliance Ris.	Respons...	Active Re...	Activities	Description	Notes
to 20...	7	28-Mar-22...			0	✓	A12610	Bedford...	Respo...
to 10.0d	5	28-Sep-23...			0	✓	A12710	An archa...	An arc...
to 50.0d	20	19-Aug-22...			0	✓	A12710	The cond...	Respo...
to 50.0d	20	19-Aug-22...			0	✓	A12710	Over the ...	Respo...
to 20...	10	03-Oct-22...			0	✓	A1256...	Therajo...	Respo...
to 50.0d	24	27-Jun-22...			0	✓	CT-AH...	There is ...	Respo...
to 40.0d	24	19-Jun-18...			0	✓	Design...	Engagem...	Respo...
to 5.0d	40	30-Apr-18...			0	✓	Design...	Commerc...	Respo...
to 40.0d	1	28-Mar-22...			0	✓	A12610	In order L...	Whist...
to 40.0d	24	11-Jul-18...			0	✓	OP&C3...	Establish...	Respo...
to 40.0d	6	30-Jan-18...			0	✓	Design...	Circuit sp...	Respo...
to 40.0d	28	22-Jul-22...			0	✓	A1498...	Interdepe...	Respo...
to 40.0d	28	27-Jun-22...			0	✓	CT-AH...	Outage a...	Respo...
to 40.0d	28	23-Dec-22...			0	✓	A2360...	Impact of...	Respo...
to 40.0d	4	16-Apr-18...			0	✓	Design...	Flood risk...	Respo...
to 5.0d	20	23-Dec-22...			50,000	✓	A1695...	Inadddio...	Respo...
to 40.0d	22				0	✓	A2360...	Absence...	Respo...
to 40.0d	22				0	✓	A15000	Generalis...	Respo...
to 40.0d	22				0	✓	A1500...	NG have...	Respo...
to 40.0d	22				0	✓	A15000	National ...	Respo...
to 40.0d	13				0	✓	ADM-0...	The deve...	Deviat...
to 40.0d	13				0	✓	ADM-0...	Submissi...	Design...
to 40.0d	13				0	✓	Design...	Submissi...	Design...
to 40.0d	13				0	✓	A2460...	Submissi...	Design...
to 40.0d	13				0	✓	A12710	Construc...	Respo...
to 40.0d	10	28-Sep-23...			0	✓	Gate-C...	Effect of ...	Enviro...
to 40.0d	7	27-Jun-22...			0	✓	CONS...	Wood ide...	Enviro...
to 40.0d	14	27-Jun-22...			0	✓	A1261...	Wood ide...	Survey...
to 40.0d	14	27-Jun-22...			0	✓	CONS...	Wood ide...	Survey...
to 40.0d	64	28-Sep-23...			0	✓		Complex ...	Respo...
to 40.0d	28	28-Sep-23...			0	✓		McNichol...	Cannot...
to 40.0d	10	28-Sep-23...			0	✓		McNichol...	Revie...
to 40.0d	42	28-Sep-23...			0	✓		McNichol...	McNich...
to 40.0d	18	28-Sep-23...			0	✓		McNichol...	McNich...
to 40.0d	2	28-Sep-23...			0	✓		McNichol...	McNichol...
to 40.0d	10	28-Sep-23...			0	✓		McNichol...	McNichol...
to 40.0d	7	28-Sep-23...			0	✓		McNichol...	McNichol...
to 40.0d	3	28-Sep-23...			0	✓		McNichol...	McNichol...
to 40.0d	6	28-Sep-23...			0	✓		McNichol...	McNichol...
to 40.0d	28	28-Sep-23...			0	✓		McNichol...	McNichol...
to 40.0d	18	28-Sep-23...			0	✓		McNichol...	Tolerat...
to 40.0d	18	28-Sep-23...			0	✓		McNichol...	Tolerat...

Linking risks to activities

ID	Type	Name	Cost	Probability	Exposure	Schedule	Score	Exposure F...	Alliance Risk Class	Activities	Act on Prog	Response Tot.	Notes
1001	N	Non availability of initial budgets	VL (1.00 to 140.00)	L (50% to 100%)	14,750	VL (1.00 to 140.00)	14,750	VL (1.00 to 140.00)	M (40% to 50%)	110,250	VL (1.00 to 140.00)	14,750	Why do we have this risk? Is it really a risk? Should we be using B&C?
1002	N	Construction from uncertainty	UL (Up to 20,000)	L (30% to 40%)	1,500	UL (Up to 20,000)	1,500	UL (Up to 20,000)	L (30% to 40%)	3,500	UL (Up to 20,000)	1,500	Very late
1003	N	Construction from uncertainty	UL (Up to 20,000)	L (30% to 40%)	1,500	UL (Up to 20,000)	1,500	UL (Up to 20,000)	L (30% to 40%)	3,500	UL (Up to 20,000)	1,500	
1004	N	Construction from uncertainty	VL (70,000 to 140,000)	EL (10% to 20%)	61,250	VL (70,000 to 140,000)	61,250	VL (70,000 to 140,000)	EL (10% to 20%)	26,250	VL (70,000 to 140,000)	61,250	
1005	N	Construction from uncertainty	VL (70,000 to 140,000)	EL (10% to 20%)	26,250	VL (70,000 to 140,000)	26,250	VL (70,000 to 140,000)	EL (10% to 20%)	113,750	VL (70,000 to 140,000)	26,250	
1006	N	Construction from uncertainty	L (140,000 to 210,000)	VH (60% to 70%)	113,750	L (140,000 to 210,000)	113,750	L (140,000 to 210,000)	VH (60% to 70%)	11,250	L (140,000 to 210,000)	113,750	
1007	N	Construction from uncertainty	EL (20,000 to 70,000)	VL (20% to 30%)	11,250	EL (20,000 to 70,000)	11,250	EL (20,000 to 70,000)	VL (20% to 30%)	0	EL (20,000 to 70,000)	11,250	
1008	N	Construction from uncertainty	L (30% to 40%)	L (30% to 40%)	0	L (30% to 40%)	0	L (30% to 40%)	L (30% to 40%)	20,000	L (30% to 40%)	0	
1009	N	Construction from uncertainty	VL (20% to 30%)	VL (20% to 30%)	0	VL (20% to 30%)	0	VL (20% to 30%)	VL (20% to 30%)	50,000	VL (20% to 30%)	0	
1010	N	Construction from uncertainty	L (30% to 40%)	L (30% to 40%)	0	L (30% to 40%)	0	L (30% to 40%)	L (30% to 40%)	1,500	L (30% to 40%)	0	
1011	N	Construction from uncertainty	VH (60% to 70%)	VH (60% to 70%)	0	VH (60% to 70%)	0	VH (60% to 70%)	VH (60% to 70%)	20,000	VH (60% to 70%)	0	
1012	N	Construction from uncertainty	L (30% to 40%)	L (30% to 40%)	0	L (30% to 40%)	0	L (30% to 40%)	L (30% to 40%)	40,000	L (30% to 40%)	0	
1013	N	Construction from uncertainty	VL (20% to 30%)	VL (20% to 30%)	0	VL (20% to 30%)	0	VL (20% to 30%)	VL (20% to 30%)	40,000	VL (20% to 30%)	0	
1014	N	Construction from uncertainty	H (50% to 60%)	H (50% to 60%)	0	H (50% to 60%)	0	H (50% to 60%)	H (50% to 60%)	30,000	H (50% to 60%)	0	
1015	N	Construction from uncertainty	M (40% to 50%)	M (40% to 50%)	0	M (40% to 50%)	0	M (40% to 50%)	M (40% to 50%)	5,000	M (40% to 50%)	0	
1016	N	Construction from uncertainty	VL (20% to 30%)	VL (20% to 30%)	0	VL (20% to 30%)	0	VL (20% to 30%)	VL (20% to 30%)	10,000	VL (20% to 30%)	0	
1017	N	Construction from uncertainty	L (30% to 40%)	L (30% to 40%)	0	L (30% to 40%)	0	L (30% to 40%)	L (30% to 40%)	10,000	L (30% to 40%)	0	
1018	N	Construction from uncertainty	EL (10% to 20%)	EL (10% to 20%)	0	EL (10% to 20%)	0	EL (10% to 20%)	EL (10% to 20%)	10,000	EL (10% to 20%)	0	
1019	N	Construction from uncertainty	EL (10% to 20%)	EL (10% to 20%)	0	EL (10% to 20%)	0	EL (10% to 20%)	EL (10% to 20%)	20,000	EL (10% to 20%)	0	
1020	N	Construction from uncertainty	M (40% to 50%)	M (40% to 50%)	0	M (40% to 50%)	0	M (40% to 50%)	M (40% to 50%)	20,000	M (40% to 50%)	0	
1021	N	Construction from uncertainty	VL (70,000 to 140,000)	M (40% to 50%)	47,250	VL (70,000 to 140,000)	47,250	VL (70,000 to 140,000)	M (40% to 50%)	47,250	VL (70,000 to 140,000)	47,250	
1022	N	Construction from uncertainty	VL (70,000 to 140,000)	M (40% to 50%)	47,250	VL (70,000 to 140,000)	47,250	VL (70,000 to 140,000)	M (40% to 50%)	47,250	VL (70,000 to 140,000)	47,250	

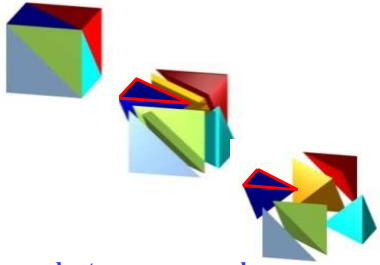
Submission to the Risk Advisory Board

Risk exposure is £103,250 (5.03% of £2,053, Schedule contingency buffer is 25 days

Risk response total cost is £0

project budget) not correctly entered so only approximate ?

Total risk response cost is £50,000

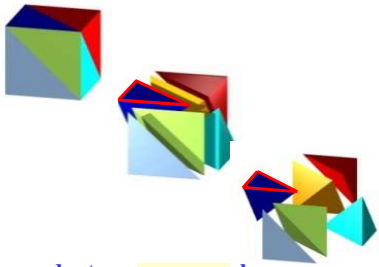


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The issues



- Compliance at all levels
- Adherence to IRM guidelines
- Standardisation
- Data integrity by transferring data to excel
- Commercial process issues
- The proper implementation of collaboration processes
- Understanding of the use of various tools e.g. buffers
- Behaviours
- Follow up
- Interfaces
- The initial conditions
- Integration of corporate tools

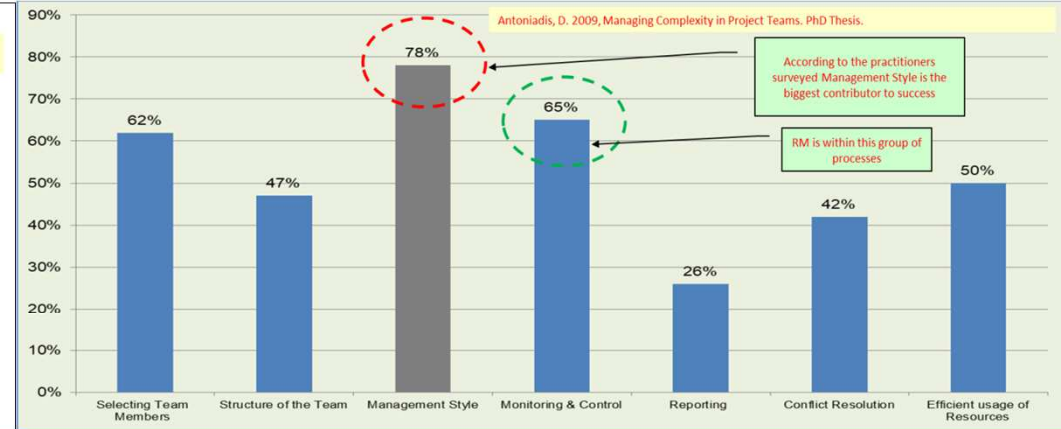
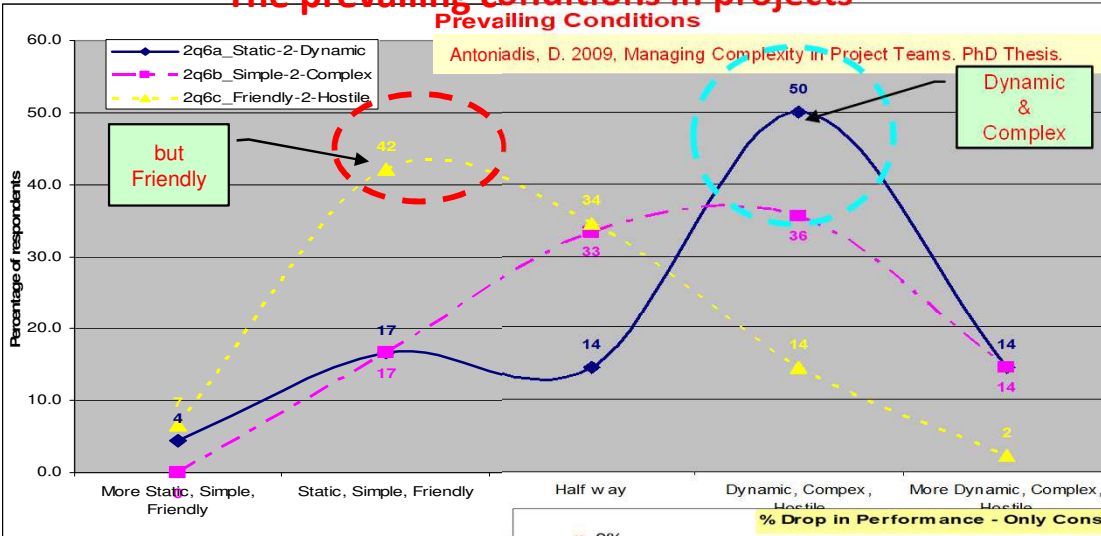


Results - 1

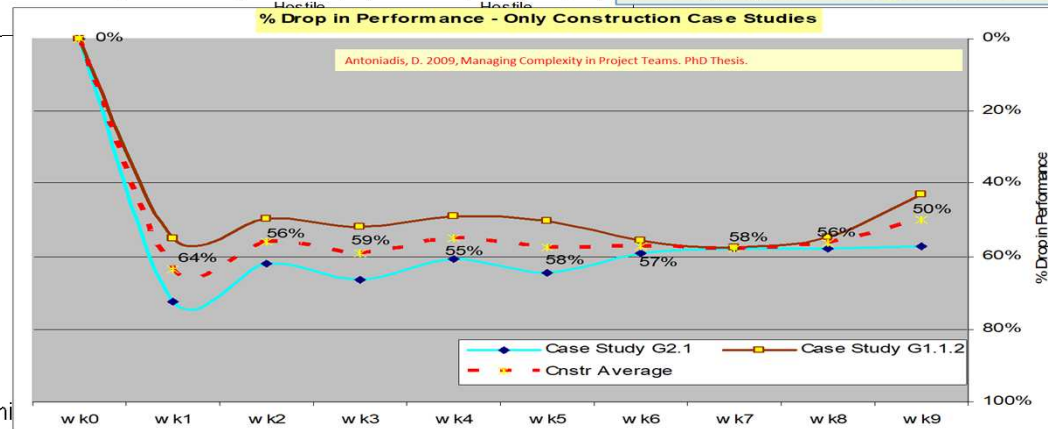


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The prevailing conditions in projects

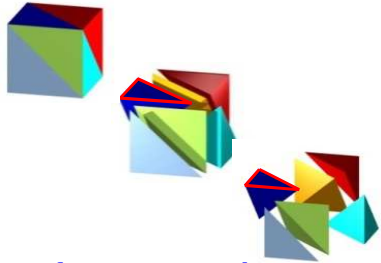


Contribution of project management sub-processes to the success of the quality of the project management for levels – Substantial to Excellent



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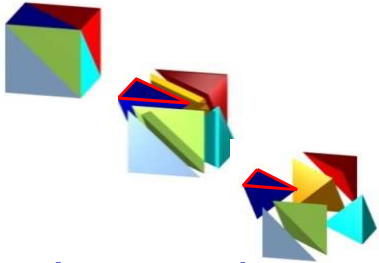
Results - 2



Results from a relevant IUK survey are telling us that:

- The initial conditions
- Roles and responsibilities
- Selection of team members
- Team Structure
- Leadership
- Behavioural changes
- Data and information integration
- Systems and processes
- Performance





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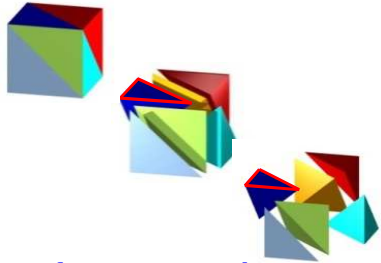
Rethinking the approach



Since projects and programmes are defined as a temporary endeavour in a dynamic environment project management can be defined as:

The management of ~~transient, dynamic and complex adaptive systems/agents~~, so as to deliver the expected change within certain parameters that are established by seemingly ordered and stable environments. (Antoniadis, 2009)

Therefore, we need to change our mode of thinking and consider project and programme management, especially in a collaborative environment, under a different view point and in the context of complexity. But first we need to look at the definition.



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Complexity under consideration



Complexity is defined as '*the dealing with interconnections between dynamic systems*' and has characteristics (as defined by C.Lucas of CalTech).

Classification of complexity characteristics by type (Antoniadis, et al., 2006)

Conditional:

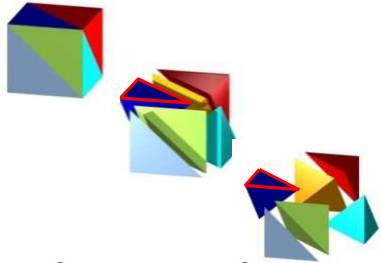
Autonomous Agents, Instability, Non-equilibrium, Non-linear, Attractors

Developmental:

Co-evolution, Self-modification, Downward causation, Mutability, Non-uniform, Emergence, Phase changes

Behavioural:

Unpredictability, Non-standard, Undefined values



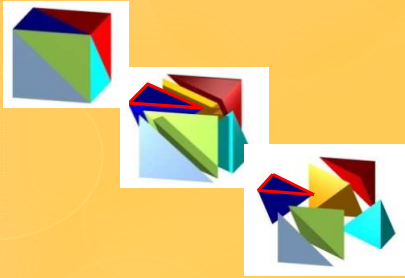
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What needs to be considered



With Complexity we need to consider:

- Importance of initial stages,
- Minimise the introduction of '*pathogens*',
- By understanding the length of the pathogens' incubation period and when they are likely to occur, we should be able to manage their effect and therefore the threats,
- Manage collaborative work and its risks through the management of complexity,
- Implement enablers through integration of data – in a **truly** open and transparent environment,
- Look at the monitoring activities and make these as less intrusive as possible,
- How do we manage the effects of complexity through its characteristics on the specific process(es) as well as the compound effect of these.



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Conclusion and suggestions

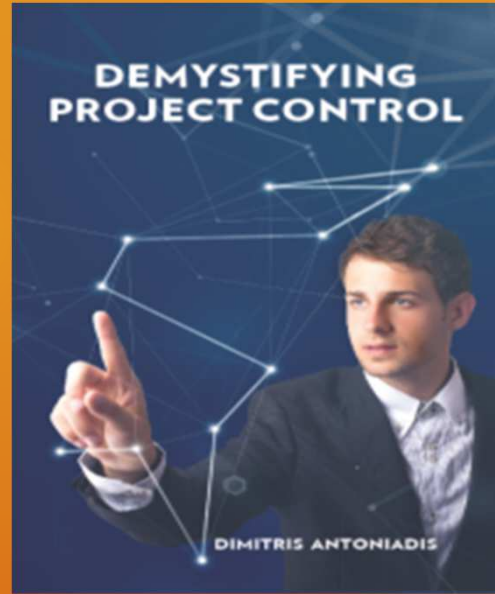


To improve the link between Complexity and RM we need to:

- Identify the Complexity characteristics that affect the Risk Management process,
- Develop a framework (a working tool) that will enable the project teams to work through and take the right steps to deliver the process,
- Improve the integration of the cost loaded schedule with the threats and opportunities – no more segregation of data,
- Educate the project teams about the importance of the interfaces with others and the effects of these on the threats / opportunities,
- Improve the environment within which the project teams are attempting to implement the risk management process (using the complexity framework)



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Thank you

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Complexity Characteristics

Autonomous Agents

Complex systems are generally composed of independent or autonomous agents. All of these agents are regarded as equally valuable in the operation of the system

Non-Equilibrium

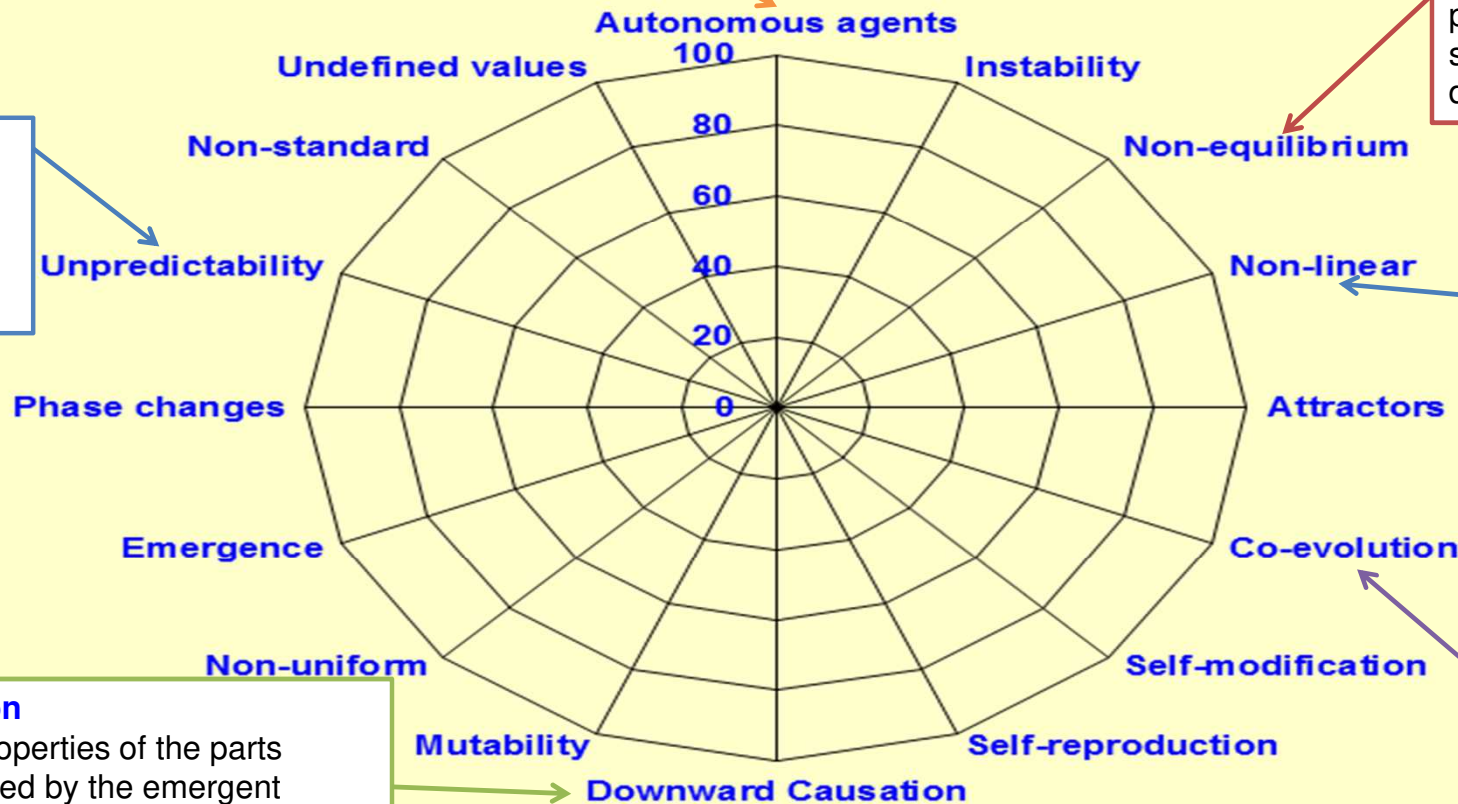
Energy flows will drive the system away from an equilibrium position and establish semi-stable modes as dynamic attractors

Unpredictability

In interacting systems a chaotic sensitivity to initial conditions can occur

Non-linear

Complex system outputs are not proportional to their inputs

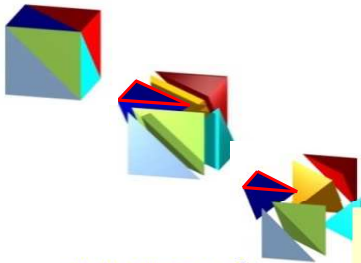


Downward Causation

The existence and properties of the parts themselves are affected by the emergent properties (or higher level systemic features) of the whole

Co-evolution

The parts are regarded as evolving in conjunction with each other in order to fit into a wider system environment

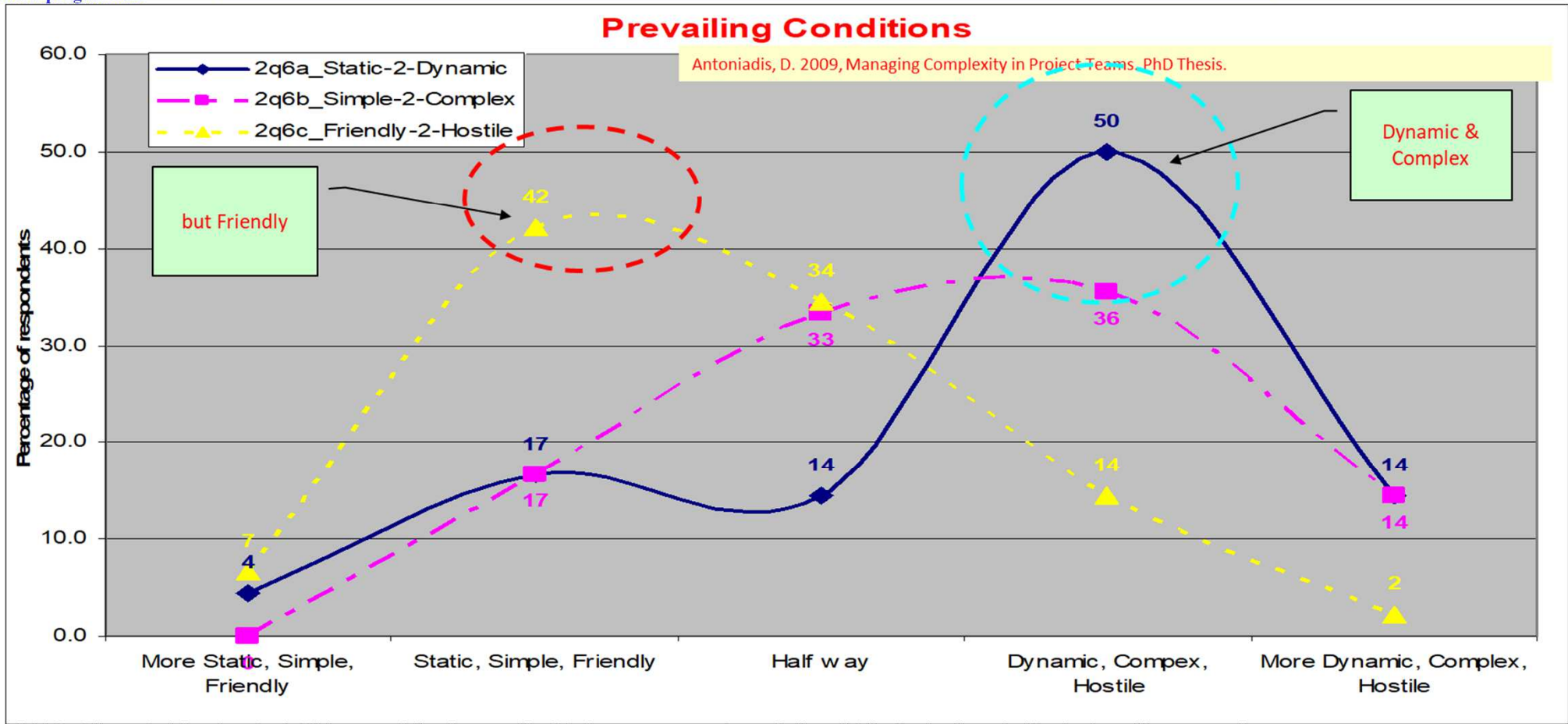


Results – 1a

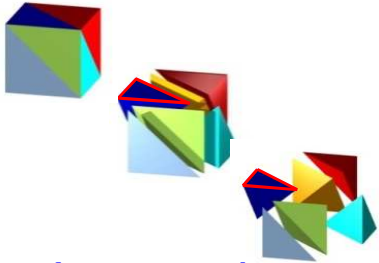


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The prevailing conditions in projects



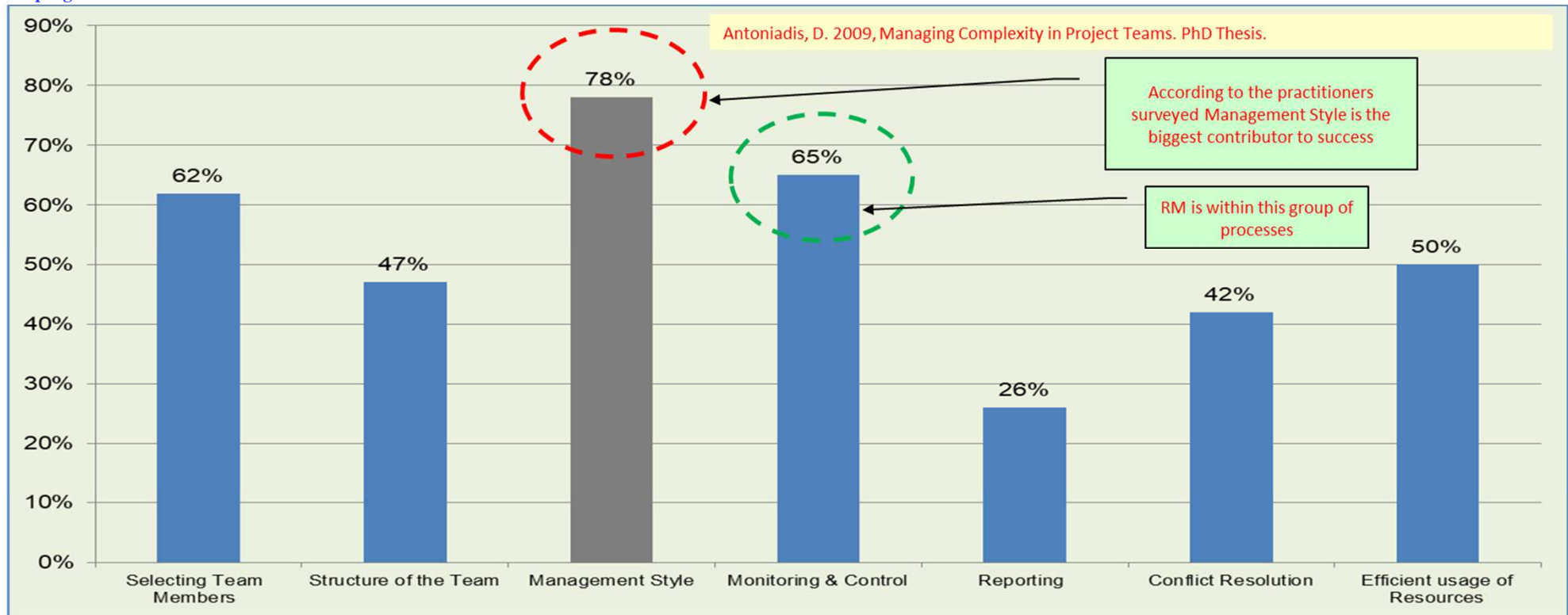
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Results – 1b

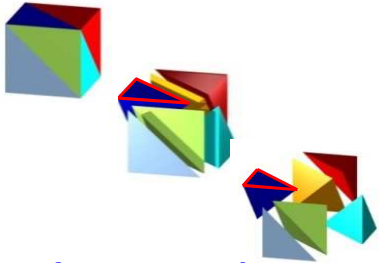


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Contribution of project management sub-processes to the success of the quality of the project management for levels – Substantial to Excellent

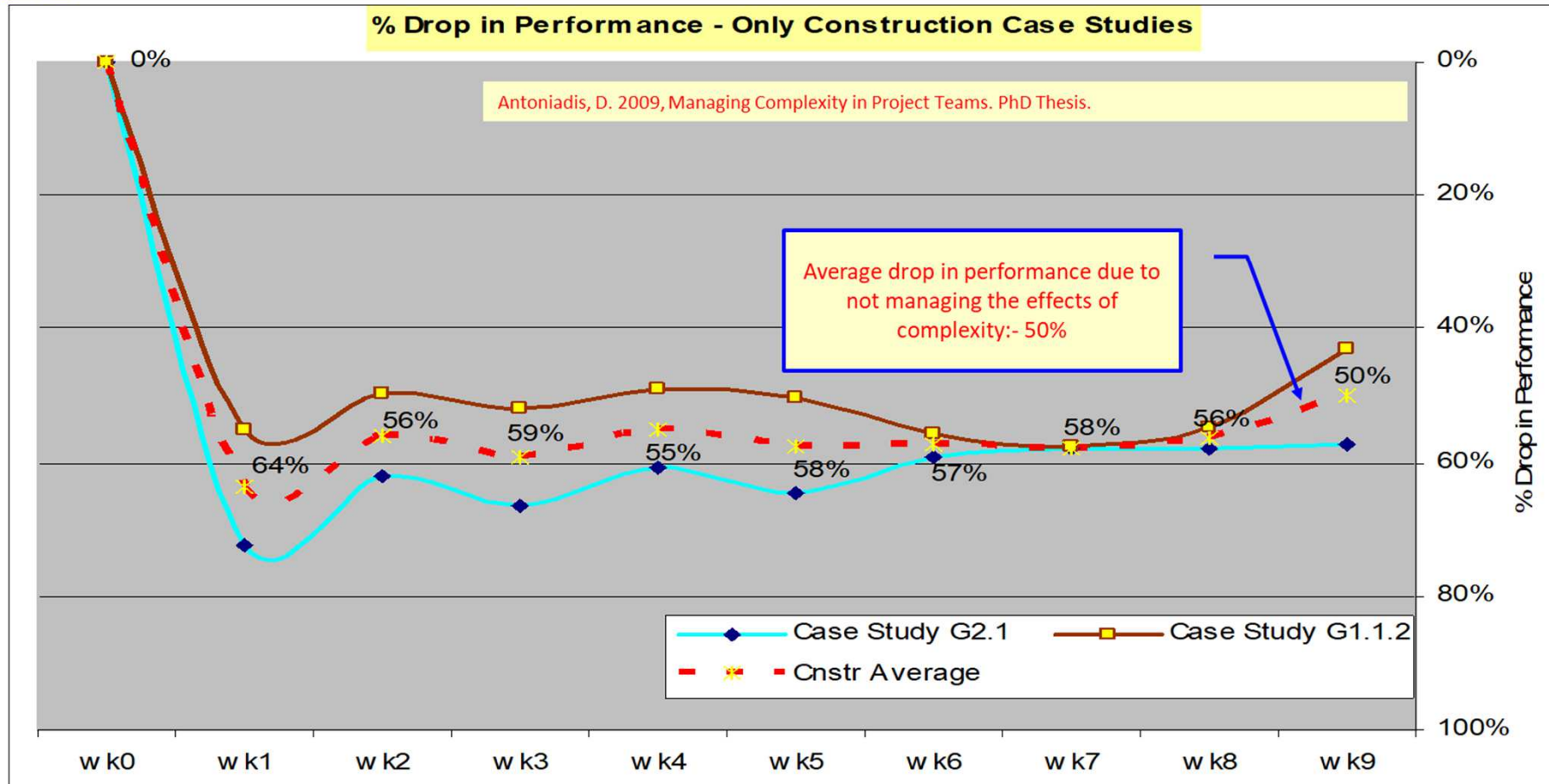
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Results – 1c



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