Competitive Advantage through Mastering Complexity

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What is Complexity?



In general usage, **complexity** tends to be used to characterize something with many parts in intricate arrangement.

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Complexity in product development

BUSINESS INFLUENCES

	Targets	Research	Targets	Regional	Build to stock
EXTERNAL	Wants	Product	Risk	National	Engineer to order
INFLUENCES	Needs	Process	Partners/ JV	National plus	Assemble to order
INDUSTRY	Usage	IP	Volume /Forecasts	Global	Order to re-order
TRENDS	CUSTOMER	INNOVATION	BIZ. MODEL	GEOGRAPHY	BIZ. PROCESS

PRODUCT DEVELOPMENT (physical)

(Focus On Design For X: Appeal, Functions, Cost, Manufacturability, Serviceability,

Environment. Performance)					
PEOPLE	PRODUCT	VALUE STREAM	TECHNOLOGY	П	
Culture	Functions	System. Eng.	Mechanical	Authoring Tools	
Dispersion	Parts	Design for X	Electronics	Collaboration	
Skills	Variants	Mfg. Eng.	Software	Knowledge Mgmt.	
Attrition	Platforms	BOM / Docs	Electro- Mech.	Business Systems	
PROGRAM MANAGEMENT, INTEGRATION,					

PROCURE	BUILD	DISTRIBUTE	SUPPORT	END OF LIFE
Direct	Assemble	Sales	Install	Regulations
Indirect	Manufacture	D. Models	On-line	Take back
CAPEX	Equipment / Tools	Logistics	Service	Recycle
Services	Plants/Factories	Warehousing	Returns	Discard

OPERATIONS INFLUENCES (physical)

INTERNAL INFLUENCES LEAN COMMONALITY AUTOMATION OUTSOURCING **SUPPLIERS** RELATIONSHIP COLLABORATION COMPLIANCE

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STDS. / REGULATIONS

COMPETITION

SUSTAINABILITY

CORPORATE

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COST QUALITY

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Pictures of the future



..Life in 2050

Industry	Multi-domain convergence, Energy efficiency, environmental footprint drives product cost, GHG neutral energy; Lights out fab,
Environment	Raw Materials availability, Loss of Top soil, Water a critical resource, 9B population, Weather, GHG concentration, Regulations Recycling: Business, Automated, D2R, 90% recycling content
Value chain	Micro structured, Security, Open communities, Digital infrastructure, High automated supply chain
Technology	Ubiquitous computing and network, Invasive HMI, Remote automation, Bionics, Nano and Bio materials
Economy	Virtual worker, Virtual shopping, Oil substitution, Transparent organizations
Society	Social divide (dominance of creative class), Work/Home, acceptance of genetically engineered food; virtual and real societies; Law and enforcement, Liquid fertilizer fields
Bio Tech	Chemical to Bio; Engineering based on bio and nature models, Agriculture automation
All Electric world	Smart Power grids; Electricity as the main energy carrier; Energy trading

Product complexity

...a contributor to prosperity

Economic complexity matters: it affects a country's level of income per capita and drives its future growth

Economic complexity is directly related to <u>complex products</u> produced by a country

Increased economic complexity is necessary for a society to be able to hold and use a larger amount of productive knowledge

Economic complexity is not just a symptom or an expression of prosperity: it is a driver.

<u>Conclusion</u>: managing complexity is directly related to prosperity



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Masters of Complexity

Todays Asian Heroes



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Complexity Management



Complexity management is a business methodology that deals with the analysis and optimization of <u>complexity</u> in enterprises. Effects of complexity pertain to all <u>business processes</u> along the <u>value chain</u> and hence complexity management requires a <u>holistic</u> approach. Effective complexity management is based on four pillars: a sound **strategy** alignment with the overall company strategy, **transparency** over all costs and values of complexity, an approach which identifies the optimization benefits, related measures and management of the <u>trade-offs</u> between the **total value chain** functions, and finally ensuring **sustainable** infrastructure such as IT tools, incentives and processes.

Complexity management recently emerged at top of the agenda due to new **technology enablement**, leading to detailed analytics and simulation of complexity optimization measures and their related domino effects within the entire value chain

Complexity Management Objective



Minimize value-destroying complexity and efficiently control value-adding complexity in a cross-functional approach

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TECHNOLOGY ENABLED COMPLEXITY MANAGEMENT



Customer Success Ford Motor Company



Results:

- Reduced repair and upgrade costs
- Fewer unnecessary repairs
- Enhanced ability to re-use software components



"...in three years, we've avoided more than one hundred million dollars worth of module replacements..."

Martin Baker, Ford Motor Company

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Customer Success Haier Group

Results:

- 15% faster to market
- Increased quality
- Virtually eliminate rework
- 29% part reduction through re-use
- 80% reduction in non-value add collaboration
- Improved profitability





Haier has reduced the number of parts by 29% and accelerated the process of part verification and validation by 50%. The company is saving money in purchasing because it can buy parts in higher volumes.

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Customer Success BAE Systems Military Air Solutions



Results:

- Collapsed lead times
- Lower development costs
- Tighter supplier integration
- Lower total cost of ownership



"... it provides easy access from the customer and supplier point of view... we are finding benefits there in terms of sharing information and drastically collapsing the lead time"

Graham Malley, BAE Systems Military Air Solutions

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