SUB- THEME: EMBRACING CHANGE AND TRANSFORMATION FOR ECONOMIC RECOVERY

TITLE: STRUCTURING ORGANIC TRANSFORMATION OF THE MIND TO PROSPER AND BRING IN CASCADING ECONOMIC RECOVERY – the Kenyan contextual conundrum

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Abstract

Globally, the economies are at the cusp of debilitating macroeconomic fundamentals that have effectively destroyed livelihoods, societal families and more importantly childhoods. Delineating vividly the elements of these devastation shall ironically found the economic recovery and potentially create the blueprint for an integral across domains and peoples' processes.

The three key differentiating attributes for a transformative intervention in the context of Kenya would be **rapid knowledge capital proliferation** through practical demonstrative turnaround of the manufacturing sector domains that have prominence in Kenya. The variables of knowledge thresholds and capital formation are chronicled in this article.

The second differentiating intervention would be to **approach the business process in a stochastic or probabilistic reference frame of Bayesian relationships in a time series**. The private sector would be required to provide access to the body of knowledge experts to audit, evaluate and implement working solutions to raise the critical performance levels of the manufacturing industry. Demonstrative case studies for achieving the solutions has been chronicled through the pharmaceutical domain in this article besides highlighting the factors of the other domains as well.

The third and most important of the differentials for transformative interventions shall **be to achieve dynamic appraisals of the business process through a fundamental integration of product engineering and brand differentials as illustrated in the case studies in the article.**

1. DRIVER -1: TRANSFORMATION THROUGH THE MIND AND SPIRIT INTEGRALS – the management cohort

TABLE -1: SUSTAINABLE EXCELLENCE DRIVERS IN MANUFACTURING – the management cohort

JOB ROLE	DIFFERENTIAL	IMPACT DYNAMICS	PERFORMANCE

			CRITICALITY
	THRESHOLDS - 7 OF KNOWLEDGE CAPITAL FORMATION		
Management - Operations	Degree holders in engineering, post graduates in engineering and MBAs	Integral of process and core engineering	Sublimation
		Integrals of product engineering and brand differentials	
		Quality and cost sheet leadership through detailed engineering initiatives	
		Advanced research driven initiatives to publish findings on key derivatives	
	THRESHOLDS - 7 OF KNOWLEDGE CAPITAL FORMATION		
Management - corporate finance	CPA / CA / CFA / MBA - finance / First degree in Mathematics / statistics	Financial engineering through advanced mathematics	Sublimation
		Integration of operations in corporate finance	
		Dynamic cost sheet and EVA - economic value addition	
		Asset quality assessment and managing asset efficiency	
	THRESHOLDS - 7 OF KNOWLEDGE CAPITAL FORMATION		
Owner Director	Degree holders in engineering - minimum qualifications	Organic growth conceptualization	Sublimation
		Asset Efficiency models	
		Post 5 years of operations - a) Capex through internal accruals, b)zero working capital debt and c) long term debt at </=30% of summation of invested capital and built up equity	
		Deming's model assimilation	

KEY NOTES ON TABLE -1:

1.1. Knowledge capital formation is covered on a scale of 1-7 with 1 being the entry level of academic excellence expected for key roles within the manufacturing setup in either operations or in the realm of administration and corporate finance. The strategic needs for transformative structuring within the organizations depend on the progression through the scale; the implications of the scalar values of 1 through 3 are functional in nature whilst the thresholds of 4-7 are progressively exploratory and research driven to achieve the highest levels of known expertise and excellence in execution in the respective domains of engineering, finance and generic administration and corporate philosophy.

1.2. Sublimation of the spirit to dissolve for a higher order purpose is the key unifying factor for the realms of management interventions to bring about changes in the manufacturing landscape in the context of Kenya towards the aggregation for Vision -2030. The drivers of the business should be selfless and have the acumen and sagacity to mentor the stakeholders within the organization to perpetual higher levels of striving for knowledge acquisition, exploratory research and achieving the highest standards in each of the respective domains.

1.3. Research publications and showcasing the derivatives of the business processes in international forums shall herald an era of knowledge driven economy in Kenya; the precursor for sustained growth and excellence organically whilst leveraging global capital in information acquisition for each of the specific domains.

1.4. The qualifications meriting management positions are chronicled in the table for triggering positive knowledge driven impact in the economy.

1.5. Owner cohort should fundamentally be engineers if they are to drive manufacturing. Deming's philosophy is the gold standard in achieving product leadership in manufacturing globally and the owner stakeholders should ideally be wedded to the Deming's philosophy and seriously into implementing the same in the letter and the spirit across the organizations.

2. DRIVER -2: TRANSFORMATION THROUGH THE MIND AND SPIRIT INTEGRALS – the grassroots and middle management cohort

The skilling grid is of fundamental importance in achieving the desired turnaround in the industry. The skilling is a transformative intervention of the mind and intent. We need to have systems in place for training and skilling in the industry.

TABLE -2: SUSTAINABLE EXCELLENCE DRIVERS IN MANUFACTURING : SKILLING INITIATIVES

JOB ROLE	DIFFERENTIAL	IMPACT DYNAMICS	PERFORMANCE CRITICALITY
THRESHOLDS - 1-3 OF KNOWLEDGE CAPITAL FORMATION			
OPERATOR	Freshers from the Diploma schools - Lower diploma and Industrial training institutes	Steeper learning curves	Close supervision by line manager - typically bachelor's degree in engineering
		Multiskills on plant maintenance - mechanical / electrical	
		Multiskills on trouble shooting in Mechanical/ electrical / instrumentation/ process	
		Quality control function	
THRESHOLDS - 3- 5 OF KNOWLEDGE CAPITAL FORMATION			
LINE TECHNICIAN / SUPERVISOR	Diploma holders - High National Diplomas from reputed institutes and with 3-5 years of relevant experiences	Steeper learning curves	Close supervision by line manager - typically bachelor's degree in engineering
		Multiskills on plant maintenance - mechanical / electrical	

		Multiskills on trouble shooting in Mechanical/ electrical / instrumentation/ process	
		Quality control function	
THRESHOLDS - 5-7 OF KNOWLEDGE CAPITAL FORMATION			
FACTORY MANAGER	Degree holders in engineering	Steeper learning curves	The organizational appraisal index shall monitor performances real time
		Multiskills on plant maintenance - mechanical / electrical	
		Multiskills on trouble shooting in Mechanical/ electrical / instrumentation/ process	
		Quality control function	

KEY NOTES ON TABLE -2:

2.1. The Levels 1 through 3 in knowledge capital formation at the shop floor levels should be achieved through perpetual cycles of training, execution, troubleshooting and advanced training in a ripple effect.

2.2. The floor manager should be the mentor and trainer ideally to promote assimilation of ideas and higher level of cohesion of purpose and common ground.

2.3. The spirit of learning is built on humility and piety. These traits need to be cultured within the stakeholders assiduously across the organizations.

2.4. Trouble shooting is the key to promote skills and multi-tasking across he realms of process and core engineering should be the guiding principles of promoting excellence within the organization.

2.5. A flat or circular hierarchical structure should be the guiding principle in promoting camaraderie and an excellent learning milieu for achieving the transformative paradigms in manufacturing.

3. DRIVER -3: APPROACHES TO MANUFACTURING – THE ESSENTIALS OF STOCHASTIC PROCESSES ON A BAYESIAN REFERENTIAL FRAMEWORK

Illustrative Case study – the Pharmaceutical industry in the Kenyan context

TABLE -3.1.: MAPPING CRITICALITY OF THE PARAMETRIC ELEMENTS

CRITICAL ELEMENT	Impact in the process	Criticality number	Probability density on normalized distribution (without bias)	Probability density on normalized distribution (with Bayesian bias)	Influence number of impact

AUGMENTED PHARMACEUTICAL INGREDIENTS (APIS)	Miscibility	5	0.97	0.93	4.72
	Efficacy of dosage potency	5	0.98	0.95	4.80
	Compression miscibility	4	0.96	0.94	3.79
	Syrup efficacy	4	0.89	0.83	3.40
CONDITIONING OF THE APIS	RH/Temp	4	0.85	0.82	3.32
	Air velocity	5	0.92	0.88	4.47
	Air pressure	5	0.93	0.90	4.55
	Moisture grains per cubic feet of dry air	5	0.94	0.89	4.54
MOISTURE REDUCTION IN THE FBD	Particle freedom for absorption of heat into the substrates	5	0.97	0.92	4.69
	Ease of compression and syrup efficacy	5	0.95	0.91	4.62
	Weight variations in the tablet and dosage efficacy	5	0.95	0.93	4.69
	Friability	5	0.98	0.88	4.58
FRIABILLITY OF THE TABLETS IN COMPRESSION	tHD% / power quality aspects in the drive	5	0.94	0.97	4.80
	Burr in the pathways of the powder for compression	4	0.95	0.95	3.80
	Compression cylinder dimensional accuracy	5	0.93	0.98	4.81
	Equipment vibration at various rotational speeds and critical bearing point resolution	5	0.97	0.99	4.92
SYRUP FORMATION - MOISTURE REDUCTION AND MISCIBILITY	Drying curve	5	0.98	0.97	4.87
	Migration properties of the granules	5	0.96	0.96	4.80

STRIPS - POLYETHYLENE FILM STICKING	Moisture presence in the substrates and binding power	5	0.95	0.95	4.75
	Organoleptic properties after drying	5	0.97	0.98	4.88
	tHD% / power quality aspects in the drive	5	0.95	0.97	4.82
	Dimensional accuracy of all the mating elements in the equipment	5	0.94	0.96	4.77
	Polyethylene annealing and quality of heat transfers in the film formation	5	0.93	0.85	4.39
	Film tensile properties and work done to rupture	5	0.93	0.94	4.68

The manufacturing process is stochastic in nature and essentially establishes an overlap of rudimentary fundamentals that have significant influences on the quality and throughput of the process. Bayesian probability delineates the conditions in the process that are mathematically normalized but the data nevertheless drives the decisions in the process to bring in controls on a narrowing bandwidth of fluctuations.

Contributing factors have been mapped mathematically to deduce the moments of the coordinates of the elements of influences and home in on the probability density on both stand-alone mode as well as in the Bayesian reference frame. The aspects of clusters on the elements of impact have been evaluated heuristically on Bayesian reference frames to arrive at sub-optimal solutions. The essence of the interventions is in achieving the targeted productivity and quality bandwidths that are well within the regulatory norms.

TABLE 3.2. ANALYSIS OF CRITICAL POINTS OF CONTROLS IN THE PROCESS

CRITICAL ELEMENT	**CCP analysis**	CCP -1	CCP -2	CCP -3	Cluster influence
AUGMENTED PHARMACEUTICAL INGREDIENTS (APIS)	Criticality number of CCP	Power quality in the drives for the stirrer (4.5)	Granular compatibility for surface tension (4.7)	Chemical bonding compatibility for the polymeric chains in the APIs (4.8)	4.25

	PD (Bayesian biased)	0.93	0.88	0.92	
	Impact domain conditions	Physical homogeneity	Migration properties	Resistance to thermal and mechanical loads	
	Impact narrative	Ease of tablet and syrup formation			
CONDITIONING OF THE APIS	Criticality number of CCP	Poor conditioning impact increases affinity of the organoleptic ingredients to moisture (4.7)	Granular curvature with moisture is increasingly convex with trapped moisture in the field (4.8)	Moisture equilibrium across the microstructure of the APIs (5.0)	4.56
	PD (Bayesian biased)	0.92	0.95	0.96	
	Impact domain conditions	Physical homogeneity	Organoleptic changes triggered by migration, material flow rate and density	Resistance to thermal and mechanical loads	
	Impact narrative	Ease of tablet and syrup formation			
MOISTURE REDUCTION IN THE FBD	Criticality number of CCP	Granular migration and organoleptic properties (4.7)	Reducing the substrate dielectric field (4.8)	Cross-sectional density, bulk flow properties and material compressibility (4.8)	4.53
	PD (Bayesian biased)	0.94	0.94	0.97	
	Impact domain conditions	Bulk flow density	Compressibility and miscibility	Cross-sectional density, bulk flow properties and material compressibility	
	Impact narrative	Progression in the organoleptic properties is the key			
FRIABILLITY OF THE TABLETS IN COMPRESSION	Criticality number of CCP	Bulk flow density (4.6)	Compressibility and miscibility (4.7)	Cross-sectional density, bulk flow properties and material compressibility (4.8)	4.57
	PD (Bayesian biased)	0.98	0.98	0.96	
	Impact domain conditions	Friability	Mass deviations	Powder density	
	Impact narrative	Progression in the organoleptic properties is the key			
SYRUP FORMATION - MOISTURE REDUCTION AND MISCIBILITY	Criticality number of CCP	Migration of particles and miscibility (5.0)	Drying curve characteristics (4.8)	Bulk flow properties (4.7)	4.51
	PD (Bayesian biased)	0.93	0.95	0.92	

STRIPS - POLYETHYLENE FILM STICKING	Impact domain conditions	Molecular affinity and resistance to separation and particle freedom	Activation energies for compound breakdown into monomers	Retention of organoleptic properties of re-polymerization	
	Impact narrative	Structural equilibrium of the thermokinetic properties in the syrup			
	Criticality number of CCP	Annealing of the polyethylene film (4.9)	Tensile properties of the polyethylene film (4.9)	Clearance between film and the tablet / capsule in the mold (4.3)	4.44
	PD (Bayesian biased)	0.97	0.94	0.92	
	Impact domain conditions	Power transmission quality	Vibration and thermometry of the stripping equipment	Mechanical drive fidelity	
	Impact narrative	Sequential fidelity for continued processes			

TABLE-3.3. ANALYSIS OF THE IDEAL BALANCE SHEET OF THE PHARMACEUTICAL INDUSTRY

COMPONENT DERIVATIVES FOR MEASUREMENTS							
KSH	INVESTMENT @ 20% cost of capital and additional provisioning of 3 months' equivalent working capital as a summation of seed capital for the project funding paradigm		**0.75**	**1.25**	**VALUE IN Ksh (10 million units)**	**PEER**	**OPTIMIZED THROUGH EXPERTISE**
RATIOS ON THE SEED CAPITAL INVESTMENT	**CAPITAL COSTS**	Factory lease	0.12	0.12	0.15		0.46
		Administrative set-up and housing lease	0.09	0.09	0.1125		
		Technology	0.25	0.25	0.3125		
RATIOS ON THE SALES	SCM COSTS	Supply Chain provisioning for raw material	0.08	0.08	0.1	0.28	0.24
		Supply chain provisioning for distribution networks of finished products	0.08	0.08	0.1		
	OPERATING COSTS	Raw material APIs)	0.12	0.08	0.1		
		Manufacturing plant, warehousing and material handling	0.02	0.01	0.0125	0.11	0.061

		Plant maintenance and integrated inventory costs	0.03	0.01	0.0125		
		Labor costs	0.04	0.04	0.05		
		Energy costs - electrical and fuel as well as mechanical drives	0.02	0.001	0.00125		
	OVERHEADS	Sales costs - product warehousing, brand positioning and sales team logistics	0.1	0.1	0.125	0.15	0.15
		Administrative costs	0.05	0.05	0.0625		
KEY FINANCIAL INDICATORS	**GROSS MARGIN (operating profitability)**		**1**	**0.911**	**1.14**	**0.46**	**0.549**
	NET MARGIN (after provisioning for taxes and interest payout)					**0.276**	**0.329**

Balance sheet typically gives out 8-10% ROI on distress pricing mechanism. Kenya has a significantly augmented potential in the pharmaceuticals industry for generic drug manufacturing founded on sound engineering principles and mathematical models for establishing low costs of manufacturing thereby providing an avenue for mass employment.

KEY NOTES ON THE ILLUSTRATIVE CASE STUDY AS IN TABLES 3.1, 3.2 AND 3.3.:

3.1. The business process is a stochastic process implying a range of possibilities founded on empirical events and reactions to various stimuli to nurture growth and trouble-shooting paradigms that are fundamentally unique to the business entity and the Kenyan context but can also be extrapolated for a generic summarization on the global referential framework.

3.2. Bayesian reference frame is on a time series wherein the time series is essentially marked by similar features in the business process without as much as the presence of extraneous disruptive forces. The macroeconomic elements of interventions in the business processes are precluded in a time series feature.

3.3. Micro economics of the enterprises in a sector is the key reference frame in this study and consequently showcases the elements of differentiation and sustained growth with nigh insularity to the debilitating influences of policy making in the government and the macroeconomic impact.

3.4. Critical control points are appraised mathematically and the quality of interventions do yield mitigation of risk factors in the business aggregation thereby improving the fundamentals and strengthening the derivatives on a continuum.

3.5. Structural aspects of growth are a function of the micro economy and the enterprise itself.

4. DRIVER -4 : CASCADING EFFECTS ON THE KENYAN ECONOMY – the manufacturing solutions to the conundrum

TABLE -4: SUMMARIZING THE CRITICAL IMPACT OF FIVE CONTEXTUAL INDUSTRIES IN THE KENYAN MANUFACTURING LANDSCAPE

PRIORITY NUMBER	INDUSTRY	IMPACT IN KENYAN ECONOMY (on a scale of 1-5 with5 being highest)	PD of criticality	Sensitivity impact	CRITICAL DETERMINANTS	STATUS APPARAISAL
1	FMCG - edible oils and soaps – CORE INDUSTRY	**4.78**	**0.98**	**4.68**	**Thermal energy quality**	**Fuel efficiency and heat transfer fidelity**
		4.7	0.95	4.47	Young's modulus of the refractory	Poor
		4.9	0.99	4.85	Combustion quality	Poor
		4.7	0.99	4.65	Reticulate load percentage	High
		4.8	0.99	4.75	Specific heat at transfer coordinates	Low
		4.69	**0.96**	**4.50**	**Drive quality - electrical**	**Non - linear loads transmission**
		5	0.99	4.95	tHD%	>40%
		4.85	0.97	4.70	CF	>2.2
		4.55	0.95	4.32	Reactive power	High
		4.37	0.93	4.06	PF in drives	<0.6
2	Paper industry - Kraft / tissue – CORE INDUSTRY	**4.94**	**0.98**	**4.82**	**Thermal energy quality**	**Fuel efficiency and heat transfer fidelity**
		5	0.99	4.95	Young's modulus of the refractory	Poor
		4.97	0.99	4.92	Combustion quality	Poor
		4.95	0.97	4.80	Reticulate load percentage	High
		4.85	0.95	4.61	Specific heat at transfer coordinates	Low
3	Hot rolling mills – CORE INDUSTRY	**4.99**	**0.99**	**4.94**	**Reheating furnaces quality**	**Heat transfer and combustion**
		5	0.99	4.95	Young's modulus of the refractory	Poor
		5	0.99	4.95	Furnace Combustion quality	Poor
		4.95	0.99	4.90	Fuel combustion quality	Poor
		5	0.99	4.95	Heat losses	High
4	Dairy pasteurization – CORE INDUSTRY	**4.93**	**0.95**	**4.70**	**Thermal energy quality - pasteurization and UHT curve**	**Heat transfer and combustion**
		5	0.98	4.90	Heat transfer fidelity	Mediocre
		4.95	0.95	4.70	Heat transfer reproducibility	Poor
		4.85	0.93	4.51	Annealing curve and	Poor

					quality	
4A	Dairy processing – CORE INDUSTRY	**4.79**	**0.94**	**4.48**	**Drive quality - electrical - homogenizer and fermentation processes for substrates density and linearity**	**Non - linear loads transmission**
		4.95	0.98	4.85	tHD%	>40%
		4.87	0.95	4.63	CF	>2.2
		4.79	0.93	4.45	Reactive power	High
		4.53	0.88	3.99	PF in drives	<0.6
5	Food substrate drying – CORE INDUSTRY	**4.86**	**0.97**	**4.6992**	**Thermal energy for drying protein and carbohydrate rich compounds**	**Staggered and structured heat transfer**
		5	0.98	4.90	Pre-drying cooling for optimized activation energies	Non-existent
		4.75	0.95	4.51	Drying-dwell time curve fidelity founded on heat transfers	Random and not reproducible
		4.83	0.97	4.69	Reproducibility in lead time to curve saturation	Non-existent

The core industries need to be nurtured for continued excellence in the aspects of the major determinants that govern performances in the industry. The principles of engineering can create an enabling milieu for the industry to transcend the macroeconomic scenarios of potential weakening of aggregate purchasing and real incomes to flourish and create hope in the economy.

5. KEY FINDNGS OF THE RESEARCH DRIVEN EMPRICAL NOTES:

5.1.Transformative interventions in Kenya have to be isolated from the vagaries of policy making and the concomitant features of the macro economy as well as systemic shocks of the proverbial “Black swan” effects.

5.2. Insularity of the enterprise depends on mapping the process derivatives and achieving systemic excellence through an amalgam of the mind and the spirit in driving through the thresholds 1 through 7 of the knowledge capital formation.

5.3.The business process in a transformative referential framework can only be stochastic in treatment with Bayesian forum of treating events and processes with influence variables and parametric grid formation. The time series in the stochastic framework merits the retention of the identical process variables in influence clusters that might change in weights but nevertheless are in an identical functional group; the parameters being identical as well. The

essence is of improved product fundamentals at radically reduced cost sheet and lowered leveraging impact of debt.

REFERENCES:

A. STOCHASTIC PROCESSES

A.1. **https://www.sciencedirect.com/science/article/pii/S0304414921000995**
A.2. **https://www.sciencedirect.com/science/article/pii/S030441492100106X**
A.3. **https://www.sciencedirect.com/science/article/pii/S0304414921001009**
A.4. Stochastic Processes and their Applications | Vol 130, Issue 1, Pages 1-470 (January 2020) | ScienceDirect.com by Elsevier

B. DEMING'S PHILOSOPHY

B.1. Dr. Deming's 14 Points for Management - The W. Edwards Deming Institute

C. DR. DEBASISH BANERJEE CASE STUDIES IN KENYA

C.1. **https://blackstone-synergy.com/pharmaceutical-1-2/**
C.2. **https://blackstone-synergy.com/paper-2/**
C.3. **https://blackstone-synergy.com/fmcg/**