Transformative dynamics through realization of market potential and product engineering differentiation – the Kenyan context

- KEY DRIVER -1: Training the mind and driving excellence through the spirit
- KEY DRIVER -2: Core product engineering differentials
- KEY DRIVER -3: Mathematical modeling to arrive at solutions in a maze of overlapping problem statements and stochastic processes established in the mechanism

DRIVER -1 EXCELLENCE GRID OF THE MIND – SPIRIT INTERFACE

- Skill building and motivational drivers

SUSTAINABLE EXCELLENCE DRIVERS IN MANUFACTURING			
JOB ROLE	**DIFFERENTIAL**	**IMPACT DYNAMICS**	**PERFORMANCE CRITICALITY**
OPERATIONS MANAGEMENT - 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	
CORPORATE FINANCE AND CONTROL - 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	
OWNER MANAGEMENT - 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	

MANUFACTURING EXCELLENCE – the Kenyan transformation script – DRIVER -1- the operations management

- Operations Management – the skill sets and domain knowledge to drive excellence founded on research derivatives; a continuum innovation cycle in place for achieving sustained growth
- Corporate financial management: driving growth through organic equity build up and aggressive liquidation of debt; both long term and working capital

MANUFACTURING EXCELLENCE – the Kenyan transformation script – DRIVER -1- owner management

- Owner management need to be from an engineering background to appreciate the nuances of the manufacturing process
- The 14-principles of Deming that have been the foundation of the coveted Deming's award for quality around the globe should be the mainstay passion of business owners in the manufacturing landscape

SUSTAINABLE EXCELLENCE DRIVERS IN MANUFACTURING			
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 Mechanial/ 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 Mechanial/ electrical / instrumentation/ process	
		Quality control function	
THRESHOLDS - 5-7 OF KNOWLEDGE CAPITAL FORMATION			
Factory Manager	Degree holders in engineering	Steeper learning curves	The organizational apparaisal index shall monitor performances real time
		Multiskills on plant maintenance - mechanical / electrical	
		Multiskills on trouble shooting in Mechanial/ electrical / instrumentation/ process	
		Quality control function	

MANUFACTURING EXCELLENCE – the Kenyan transformation script – DRIVER -1- shop floor

- Level 1 through 3 pertaining to domain skills and functional implementation should be the guiding philosophy for achieving sustainability and organic growth
- Mentoring and training with demonstrative skills for trouble shooting are the functional requirements of the knowledge capital formation in this cohort group
- Building cross functional skills and convergence of ideas drawn in from core ad process engineering are the requirements

Stochastic process

Pharmaceuticals grid

Manufacturing excellence in Kenya– the executive summary

Pharmaceuticals industry has been illustrated as a detailed case study in the Kenyan context

Stochastic derivatives in a business process

- Criticality ranking of major parameters and the cluster variables of influence have to essentially be overlapping for convergence of impact variables
- Bayesian reference frames help converge the cluster variables having higher impact on the parameters
- Stochastic process is a normalized distribution of probabilistic occurrences in a pure time series
- A pure time series is isolated from the macroeconomic fundamentals largely and is a representation of shifts in process paradigms with a strict event bias as engineered on time

Structuring the business process – risk assessment

- Ranking the criticality of the process is the fundamental step
- Ranking is done on empirical evidence and the domain expertise at the disposal of the business and common ground of appreciation
- Probabilistic density is on a stand alone in a normalized distribution as well as Bayesian in nature as influenced by past events and related moment
- The PD function defines the criticality ranking and the concomitant action plans for mitigating process risk

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

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
Moisture reduction in the FBD	Particle freedom for absorption of heat into the susbtrates	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 bearig point resolution	5	0.97	0.99	4.92

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
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
	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
Strips - polyethylene film sticking	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

Structuring the business process – control points

- The control points are structured for each of the risks in the process hazards matrix
- The iterations in the process must be validated over a time series coordinates for efficacy in mitigating the risks. In case of failure of reduction in the critical risks, the variables of influences shall change in morphology and action orientation
- The iterations continue in the process till validation in independent training sets are arrived at
- The influence variables thought to be most effective are clustered to constitute a new matrix for implementation and process IPRs

Critical Element	ANALYSIS OF CRITICAL POINTS OF CONTROLS IN THE PROCESS				
	CCP analysis	CCP -1	CCP -2	CCP -3	Cluster influence
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			

Critical Element	ANALYSIS OF CRITICAL POINTS OF CONTROLS IN THE PROCESS				
	CCP analysis	CCP -1	CCP -2	CCP -3	Cluster influence
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	
	Impact domain conditions	Molecular affinity and resistance to separation and particle freedom	Activation energies for compound breakdown into monomers	Retention of organoleptic properties of repolymerization	
	Impact narrative	Structural equilibrium of the thermokinetic properties in the syrup			
Strips - polyethylene film sticking	Criticality number of CCP	Annealing of the polyethylene film (4.9)	Tensile properties of the polyethylene film (4.9)	Clearance between film and thetablet / 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			

EXCELLENCE GRID

- Financial Engineering

ANALYSIS OF THE BALANCE SHEET OR S

PEER FUNDAMENTALS

OPTIMIZED

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
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		
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	0.11	0.061
	Manufacturing infrastructure for the plant, warehousing and material handling	0.02	0.01	0.0125		
	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		
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**

PAYBACK AND ROI DYNAMICS				
Payback elements - key financial indicators	Peer performance syndrome - distress market scenario	Optimized performance - distress market scenario	Peer performance syndrome - median matrix market scenario	Optimized performance - median matrix market scenario
Gross margin (operating profit)	0.299	0.357	0.368	0.494
Net Margin	0.179	0.214	0.264	0.296
Equity	0.108	0.128	0.158	0.178
Apportioning for liquidating investment	0.072	0.086	0.105	0.119
Payback in months	**16.4**	**13.7**	**11.2**	**9.9**
ROI	**6.10%**	**7.28%**	**8.96%**	**10.08%**

Managing profitability – Driver -2 – illustrative case study derivatives

- Cost sheet management through productivity, CBM and reduction of rejects in the process
- Integration of the process derivatives into the balance sheet elements is of vital importance
- Brand differentials and product engineering gets factored into the balance sheet for a predictably higher ROI
- Insularity from the vagaries of "Black Swan" effects and macro economic weaknesses can be assured throughthis integration

EXCELLENCE GRID

- Core industries in Kenya – Driver 3

Managing profitability – Driver -3 focus on core industries in the Kenyan context

- Thermal energy and core engineering factors related to managing heat can bring in major transformations of the Kenyan manufacturing landscape
- Electrical drives and qualitative improvements on the transmission of force couples in the equipment shall be the structural foundation for lasting improvements and changes in paradigms of performances
- Mitigating the assessed risks through the CCP – critical control points routing are the answers in the immediate as well as in the continuum

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	**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

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
2	Paper industry - Kraft / tissue	**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	**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

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
4	Dairy pasteurization	**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 quality	Poor
4A	Dairy processing	**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	**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

EXCELLENCE GRID

- CONCLUDING REMARKS

MANUFACTURING EXCELLENCE – the Kenyan transformation script

- KEY DETERMINANT -1: Wisdom triggered skill upscaling
- KEY DETERMINANT -2: Creation of the critical coordinates for determining changes and qualitative monitoring of the process
- KEY DETERMINANT - 3:Managing the balance sheet at distress prices through productivity triggered qualitative changes at low cost sheets

FINAL CONCLUDING REMARKS ON CASCADING LASTING SUCCESS

- Business owners and the lending consortium should collaborate with industry experts, academia and the government representatives to create a think tank
- Strategic partnership should audit the business processes without emotion and founded on sound management practices as well as engineering principles
- Decisions should be taken based on pilot plant interventions and cascaded across the domain