Indian Pharmaceutical Alliance

IPA
Innovation, Quality and Global Reach

"Emergence without Emergency"
Build and Maintain an Effective pQMS

Ajaz S. Hussain, Ph.D.

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DG Shah: Indian pharma loses a significant voice on international trade and policy

PT Jyothi Datta | Mumbai | Updated on February 22, 2019 | Published on February 22, 2019

DG Shah passed away on Friday(file photo)

The Indian pharmaceutical industry's annual conclave next week will miss a significant voice following the passing of DG Shah on Friday.

"The topic is perfect. The "maintenance" is more challenging and needs expert insight." Dilip

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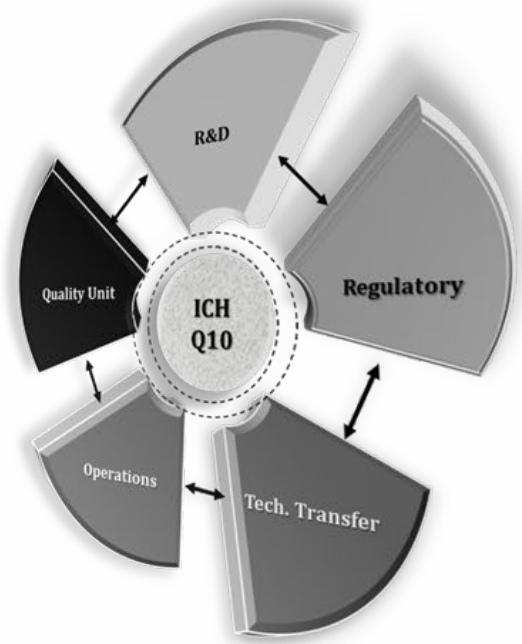
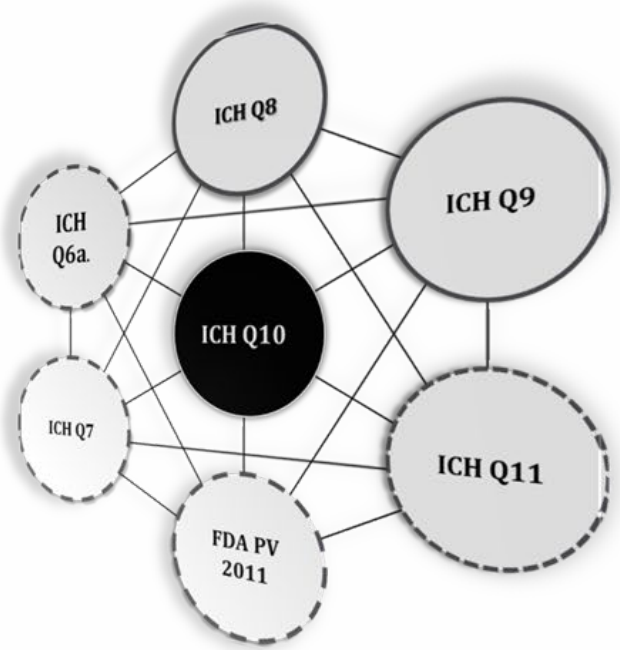
It's not the years in life that count; it's the life in years.



Work and collaborate in cross functional teams



Function efficiently and independently in a constantly evolving environment.

In a fast pace, dynamic team setting.

Selected guidelines are Illustrative

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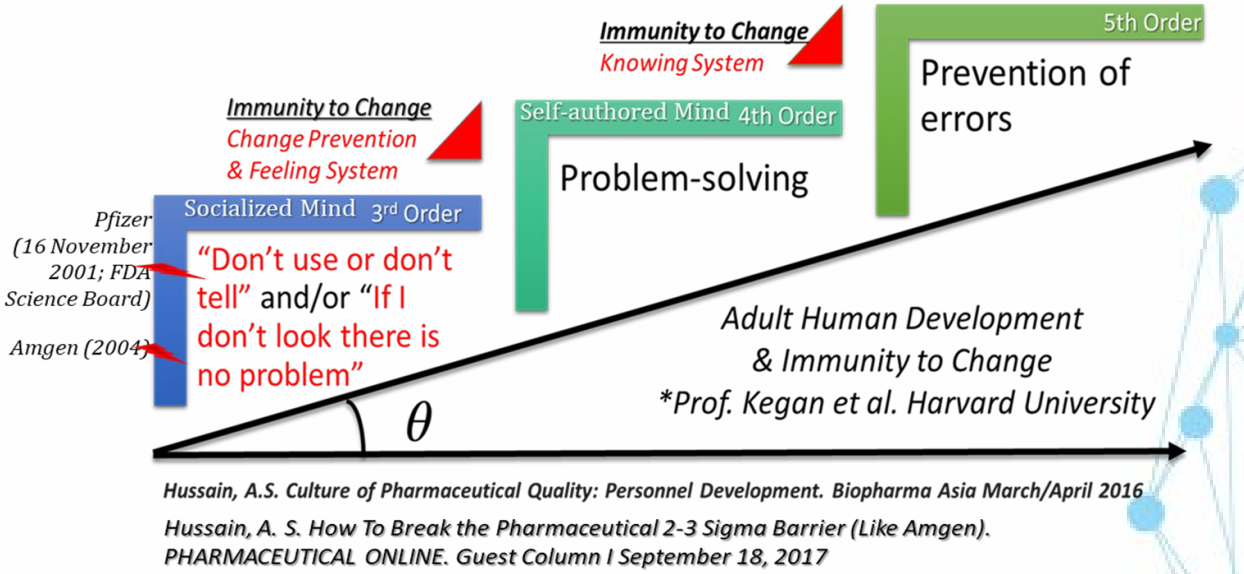
Education, training & experience

- Level of "Assurance" determines what we experience; including therapeutic outcomes
- To assure others one must be self-assured
- Experiential learning is a path to adult development
- Objective self-authorship at every level of a system provides subjective self-assurance to all its stakeholders
- System responsiveness is a stage in collective human (adult)development – Order of Consciousness



Hussain, A.S. Culture of Pharmaceutical Quality: Personnel Development. Biopharma Asia March/April 2016

Hussain, A. S. How To Break the Pharmaceutical 2-3 Sigma Barrier (Like Amgen). PHARMACEUTICAL ONLINE. Guest Column I September 18, 2017

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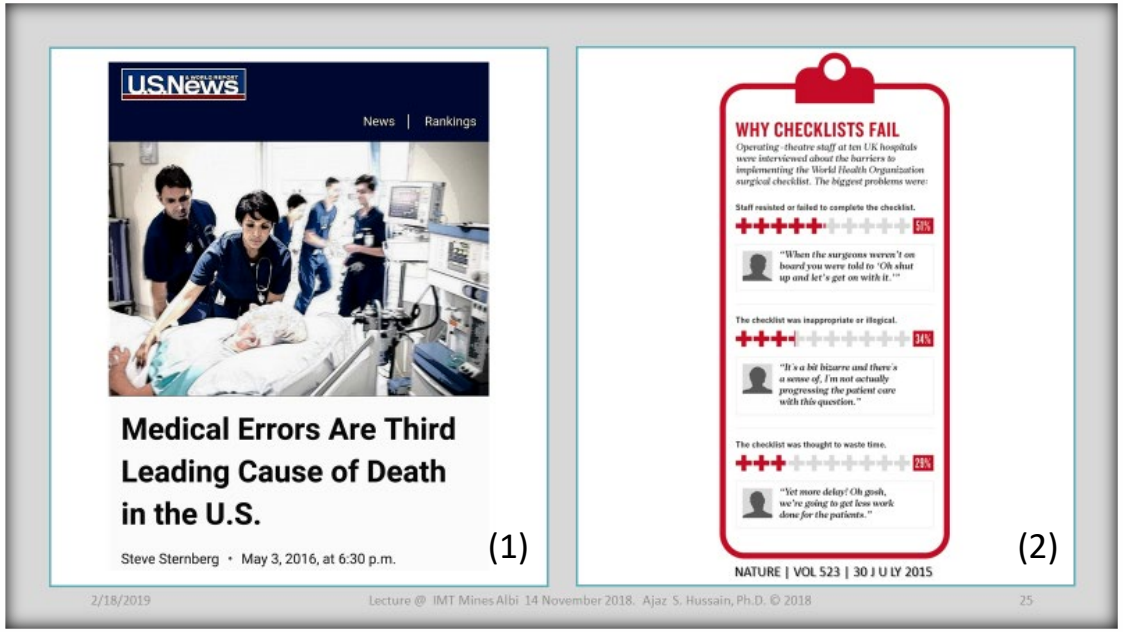

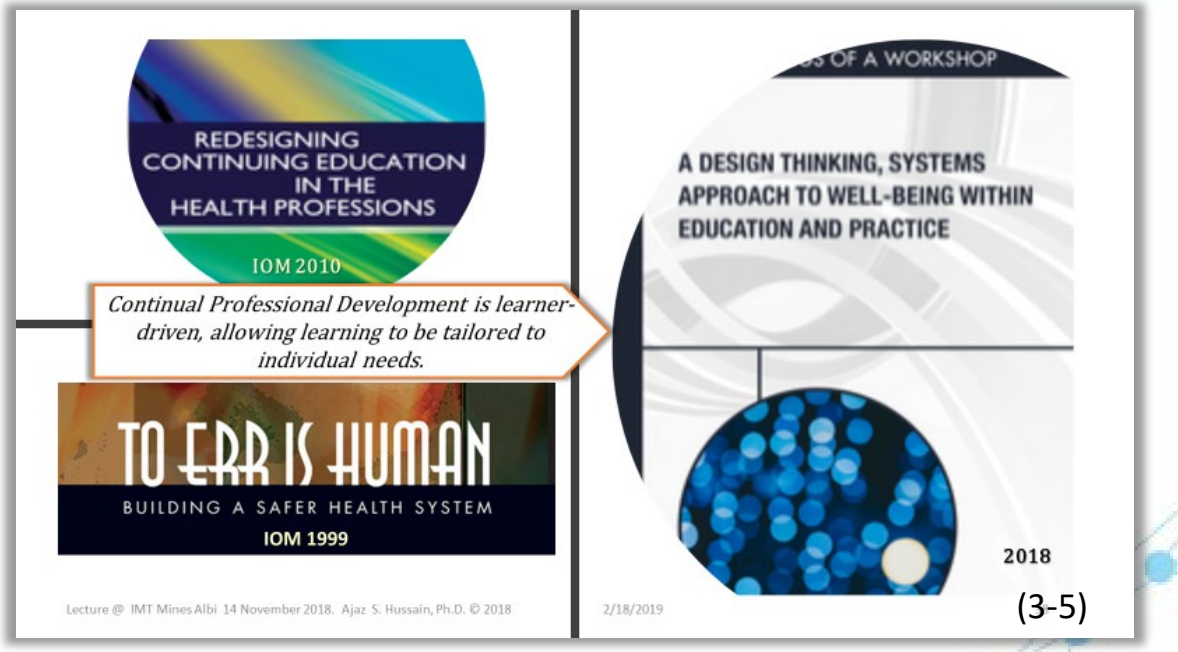

Why metamorphosis to meaningful experience necessary

To err is human, professional development via design & systems thinking

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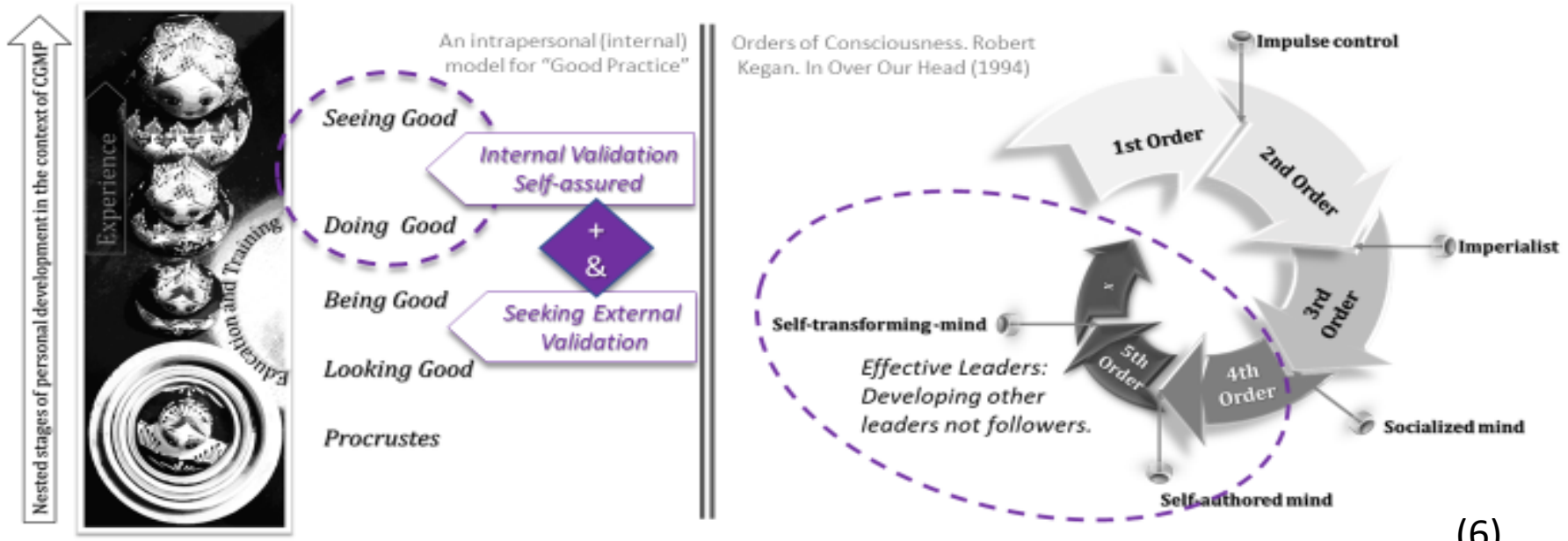

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Our development occurs in multiple dimensions: Cognitive, Inter- and Intrapersonal proficiencies.

What is Good Practice?

"All models are wrong, but some are useful" George Box (1978)

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Observations of recurring errors and root cause “unknown”: “Common Cause”

	FY06	FY14	FY15	FY16	FY17
1	211.22(d)	211.22(d)	211.22(d)	211.22(d)	211.22(d)
	Responsibilities & Procedures for the QA Unit are not in writing or fully followed				
2	211.110(a)	211.160(b)	211.160(b)	211.160(b)	211.160(b)
3	211.192	211.192	211.192	211.192	211.192
4	211.160(b)	211.100(a)	211.113(b)	211.100(a)	211.100(a)
5	211.100(a)	211.67(b)	211.100(a)	211.42(c)(10)(iv)	211.67(b)

https://www.xavierhealth.org/news3/2018/6/20 (7)

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Time to reduce error rate to “3.4 dpm” (Amgen)

How to break the 2-3 sigma barrier?

In 2015 FDA “informally” identified few companies, including Amgen (8)

Amgen (Martin VanTrieste) described path to 3.4 dpm, for every “CQA” and “CPP”; their journey took ~ **10 years** (9)

Note: Before FDA push (2004) to “QbD”, Amgen using “QbD” tools (10)

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Guest Column | September 18, 2017

How To Break The Pharmaceutical 2-3 Sigma Barrier (Like Amgen)

By Ajaz S. Hussain, Ph.D.

A recent U.S. FDA publication entitled *The Future of Pharmaceutical Quality and the Path to Get There* suggested that the future of pharmaceutical quality is Six Sigma, meaning that no more than 3.4 defects occur per million opportunities (at every manufacturing facility). The way to achieve this goal is to move from the current *management standards* to *performance standards*. The need for an additional incentive — the *economic driver* — was also recognized in the publication. The proposed path forward aims to achieve the long-standing vision of the FDA's Center for Drug Evaluation and Research (CDER): “a maximally efficient, agile, flexible pharmaceutical manufacturing sector that reliably produces high-quality drugs without extensive regulatory oversight”.[1]

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In summary

What Amgen did (beyond QbD in R&D)) to reduce their error rate to 3.4 dpm

- Extensive analytical characterization of raw materials, manufacturing processes, and products; not just in the development phase but also, as needed, in the commercial setting (synthetic drug sector often scared of additional testing)
- Will of the management and their involvement to identify, track and control variation via process capability assessment
- Continually monitoring to ensuring robust analytical methods, manufacturing processes, and products (e.g., using industry benchmark for analytical variability and decreasing assay variability; relevant to Invalidated OOS Rate discussion to follow)
- Training, Qualification, Certification and Mentoring support to ensure flawless execution, and
- Focus on the supply chain - controls and confidence (not purchase department finding the cheapest “Certificate of Analysis”).

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Human Performance: Evidence based performance, performance based management, pay for performance not just “results”

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- Martin graciously reviewed and confirmed its accuracy. He suggested that it would be useful to add - on human performance - that a lot of the system incorporated learning from systems used by the United States Nuclear Navy (7 August 2017)

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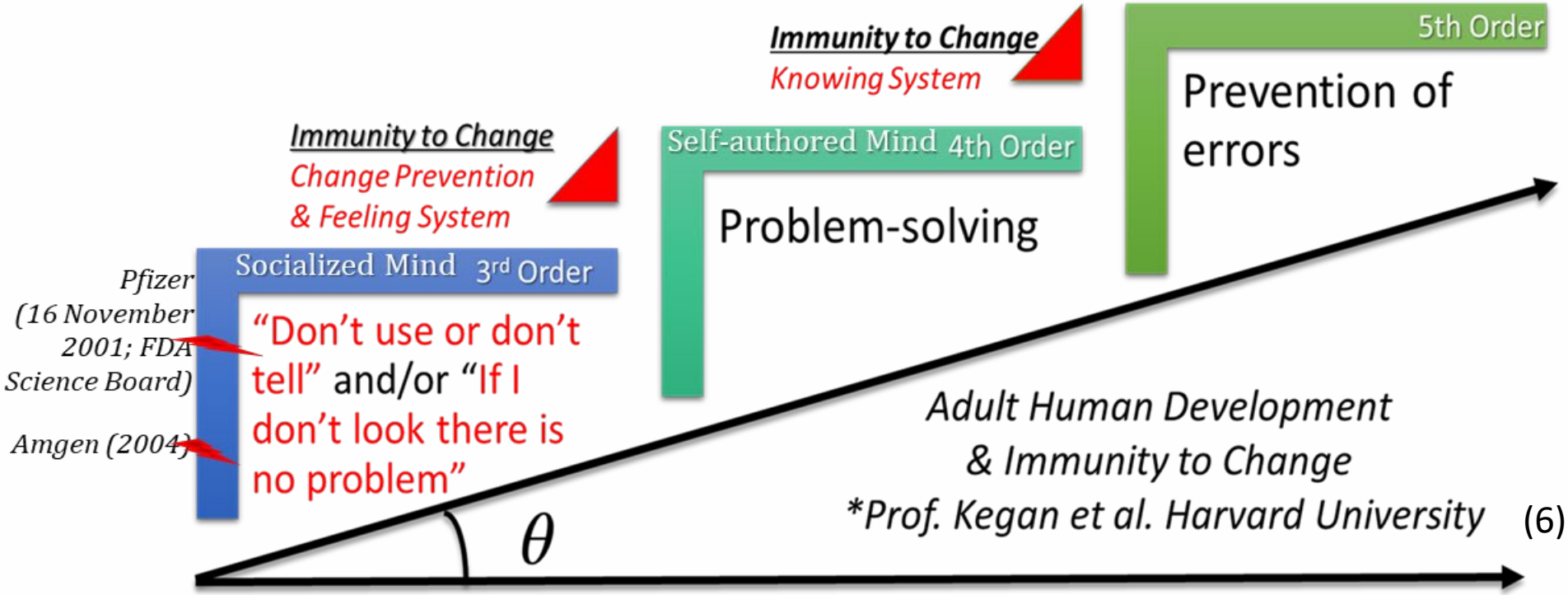
System responsiveness is a stage in adult development!



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Dogmas & assumptions: Variable awareness

Errors of commission and errors of omission

- We say we approve a drug (when we actually approve a drug product); NDA, ANDA. We have been making “pills” for thousands of years; why need Development Report (ICH Q8)?
- “Pivotal” clinical and bioequivalence; trumps pharmaceutical equivalence. SUPAC Defaults are justified knowledge, e.g., 10X scale-up factor.
- We believe excipients are “Inactive Ingredients”; compendial purity and impurity profiles sufficient for ‘Certificate of Analysis” while most dosage form manufacturing is a “physical” process.
- USP monograph sufficient prior knowledge to develop generics; “attractor” - file first for 180-day exclusivity (an important “attractor” in our system)
- We believe verification criteria for Compendial test methods, particularly for physical attributes, ensures their stability and capability in a QC laboratory
- That traditional 3-batch “Process Validation” (PQ) ensured processes are “stable and capable” (while we struggle to implement FDA’s 2011 Guidance, in part, because of dogmas in CMC Review)
- We discount the impact of Recalls, Warning Letters and Import Alerts on patients, because we believe they cause no adverse effects to patients, and placebo and nocebo effects are “removed” during clinical trials and, therefore, irrelevant in real-world

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Examples: Awareness – disorienting dilemma


The New York Times

The Generic Drug Scandal

NY Times 2 October 1989

Expert Witness for the Prosecution (1995-1996)

A system too dependent on "whistleblowers"


Fentanyl Patch Can Be Deadly to Children

Subscribe: FDA Consumer Health Information

Adhesive failure and accidental deaths due to Fentanyl TDS (1995-)

"Check-the box"; adhesive not critical for an "adhesive" TDS!


More Malaria For Liberia Marines

"...three possible reasons for the [malaria] outbreak: .... or the drug had gone bad or been manufactured incorrectly.;." (2003)

Unverified assumption in "validated" analytical methods

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FDA Science Board 9 April 2002

FDA Regulation of Drug Quality: New Challenges

Janet Woodcock, M.D.
Director, Center for Drug Evaluation and Research, Food and Drug Administration
April 9, 2002

EXAMPLE

- Assuming normal distribution, with mean 100% and sigma = 6%,
- Probability (batch passes USP) = 0.957
- Means about 4% of batches fail although they are no different than the passing batches

Major Barrier to Adoption:

- Industry Concern About Regulatory Implications of Results
- Closer scrutiny will reveal variations in existing products missed by sampling
- Delay in approval of new product

Regulation of Drug Quality: Opportunity

- Empirical methods are probably approaching their theoretical maximum effectiveness
- New scientific understanding & new technologies can provide science-based approaches
- Plan: Use PAT as model

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pQMS connects practice, research, policy & power to "Do Good"

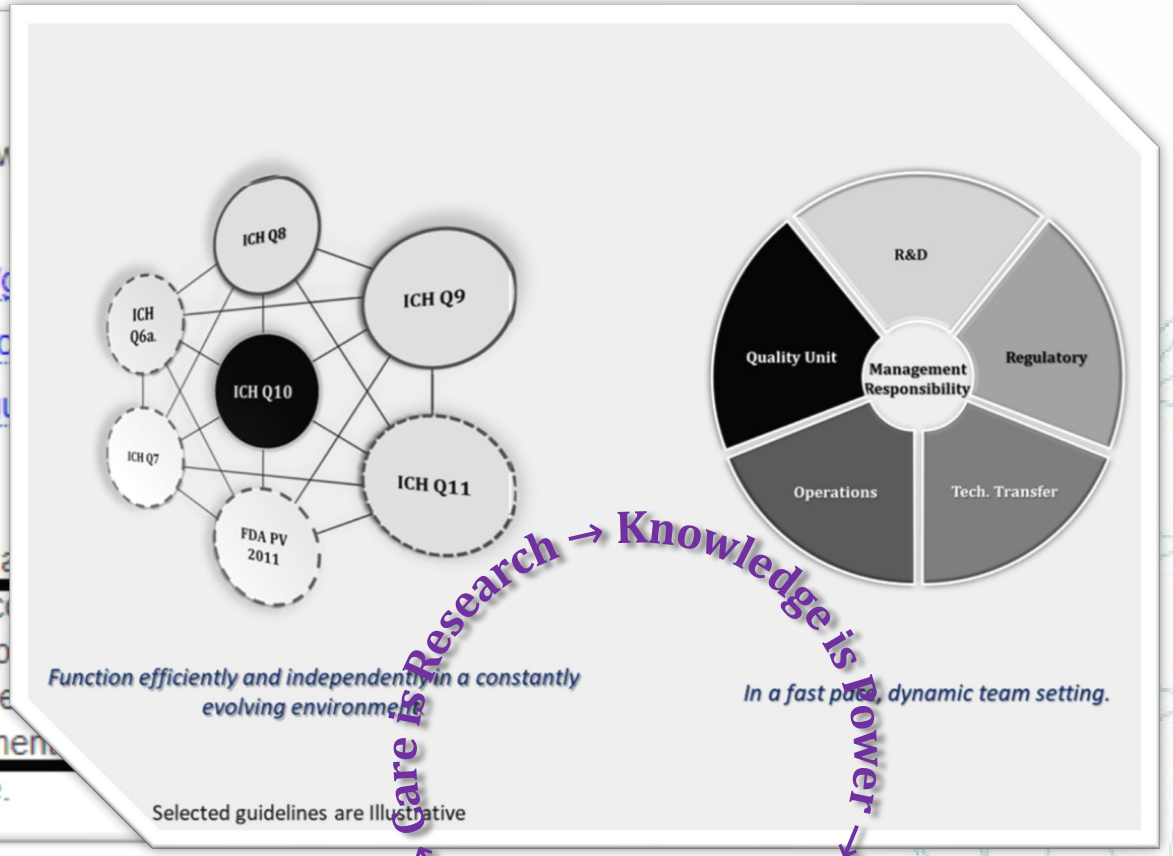
Quality Systems

Your firm's quality systems are inadequate. For guidance on establishing and follow
systems, see FDA's guidance for industry:

- *Q8(R2) Pharmaceutical Development*, at https://www.fda.gov/downloads/drugs/
- *Q9 Quality Risk Management*, at https://www.fda.gov/downloads/Drugs/Guidanc
- *Q10 Pharmaceutical Quality System*, at https://www.fda.gov/downloads/drugs/gu

CGMP Consultant Recommended

Because you failed to correct repeat violations, we strongly recommend engaging a
forth in 21 CFR 211.34, to assist your firm in meeting CGMP requirements. We rec
consultant perform a comprehensive audit of your entire operation for CGMP comp
completion and effectiveness of corrective actions and preventive actions. Your use
relieve your firm's obligation to comply with CGMP. Your firm's executive managemen
resolving all deficiencies and systemic flaws to ensure ongoing CGMP compliance.



Care is Research → Knowledge is Power → Wisdom is in Practice →

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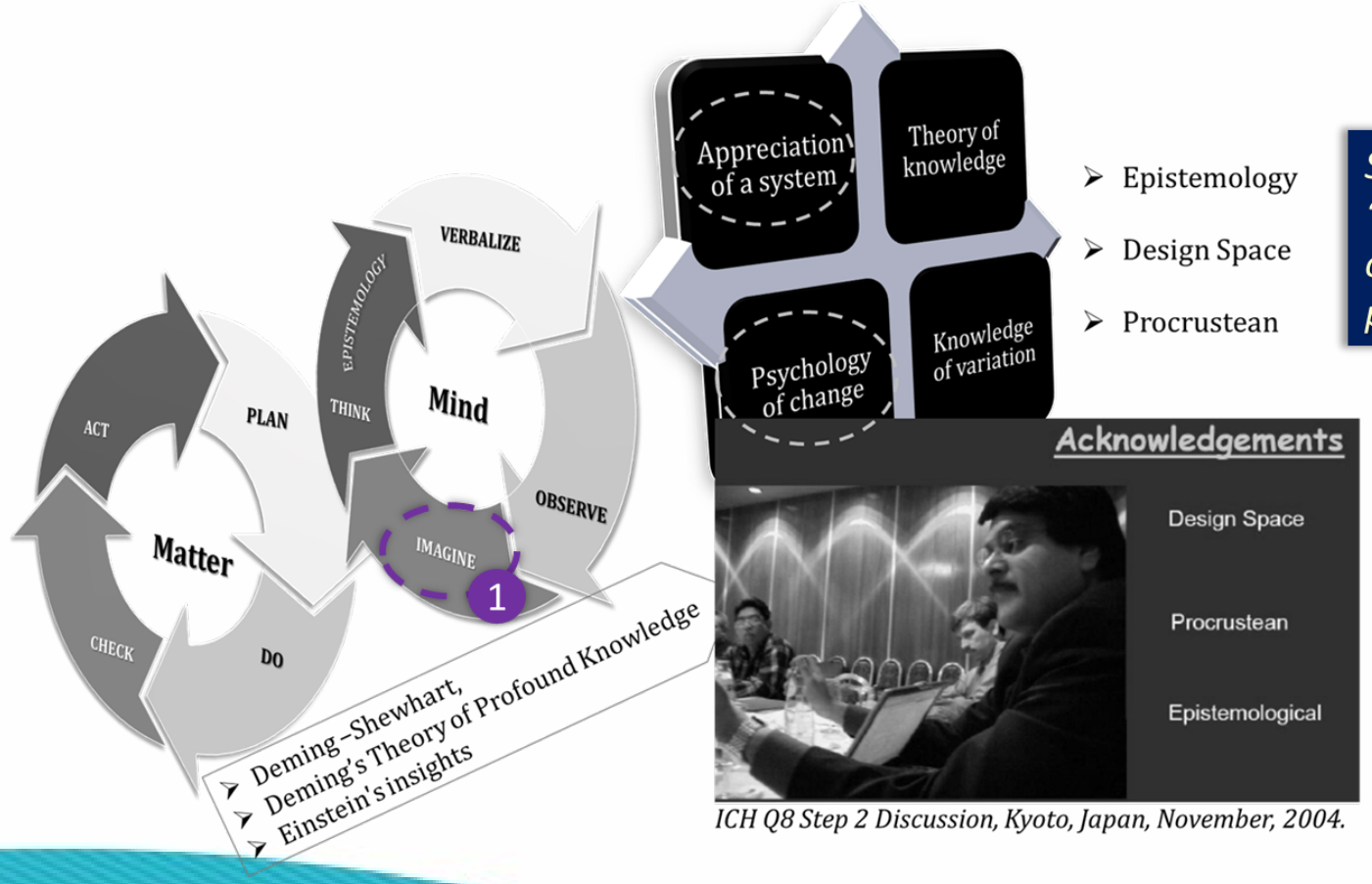
Where ontological conflicts exists attention to representational practices and epistemology, however important, are insufficient.



- Epistemology
- Design Space
- Procrustean

ICH Q8 Step 2 Discussion, Kyoto, Japan, November, 2004.

Simultaneously removing "blindfolds" and raising "Order of Consciousness" – designing a personal Learning Space!

Mind is as important as Matter: Internal & External Validation: 21 CFR 211.25: Education, Training & Experience; ICH Q10 personalized for individual knowledge and risk management; to give Assurance one must be self-assured; Assurance is a CQA!

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The Nation Needs a Comprehensive Pharmaceutical Engineering Education and Research System

Ajaz Hussain

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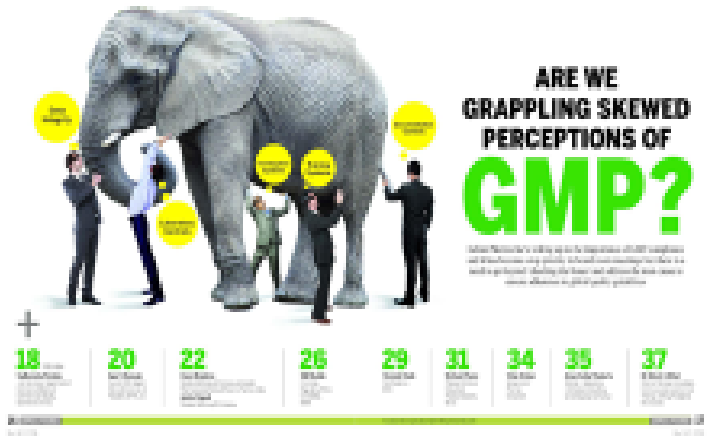
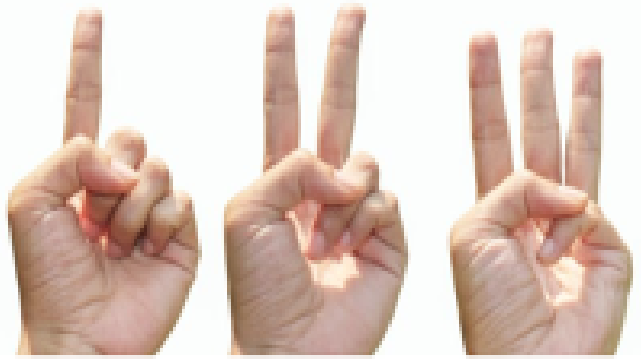
is not simply an academician's [or a regulator's] lament; the cost of [pharmaceuticals] is enormous and the risk to public safety daunting.

"And like the heroes of the French Revolution, we look to a future that will bring us everything or nothing, depending on the public trust" (9).

Pharmaceutical Technology SEPTEMBER 2005 121

2005: "Engineered System"





Education, Training, Experience & 21 CFR...

March 24, 2016

99 likes · 23 comments · 8 shares

Systems thinking a stage in adult development!

2016: Ecological System

My experiential learning

Inability to measure is a powerful reason to believe and say "it is not my problem!"

Where ontological conflicts exists attention to representational practices and epistemology, however important, are insufficient.

Education, Training, & Experience: Professional Development

Unverified Assumption in the US Regulations (21 CFR 211.25), and broadly

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Marketing Authorization plus "Good Practices"

Primum non nocere: First, to do no harm.

Common sense | **"Disciplined" Education, Training and Experience** | **Creativity, Jugaad**

01

Simple system

- Best practices

Cause → Effect: Self-evident

02

Complicated system

- Good practices

Cause & Effect: Expertise

03

Complex system

- Research, experimentation

Cause ? Effect: Experiments

04

Chaotic system

- Attractors with a "line in the sand"

Innovation, Butterfly Effect"

Errors of commission. *Errors of ommission.*

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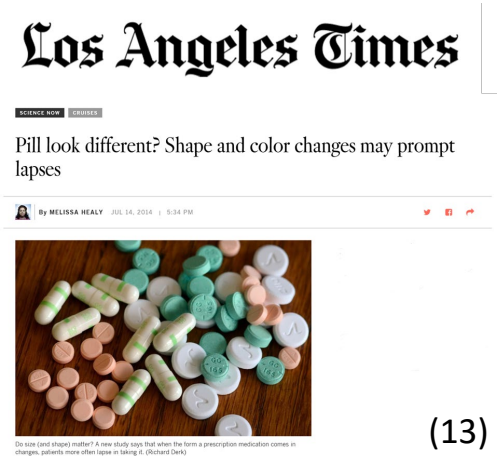
Therapeutic Equivalence & Therapeutic Outcomes

- *By definition Therapeutic Equivalence is an "expectations" - four parts, pharmaceutical equivalence, label, CGMP, when necessary bioequivalence*
- *"Pivotal bio" mindset is "common" and a reason for recurring errors which erode trust patients*
- *Understanding and practicing "totality of evidence" is difficult for many*
- ***A systems or "Totality of Evidence" mindset, not "pivotal bio", can and must be the path forward!***
- ***QbD = Pharmaceutical Equivalence → reproducible BE & Process Validation → repeatable CGMP → Continuous Improvement → 6 σ***


Los Angeles Times

SCIENCE NOW | CRUISES

Pill look different? Shape and color changes may prompt lapses

By MELISSA HEALY | JUL 14, 2014 | 5:34 PM

Do size (and shape) matter? A new study says that when the form a prescription medication comes in changes, patients more often lapse in taking it. (Richard Derk)

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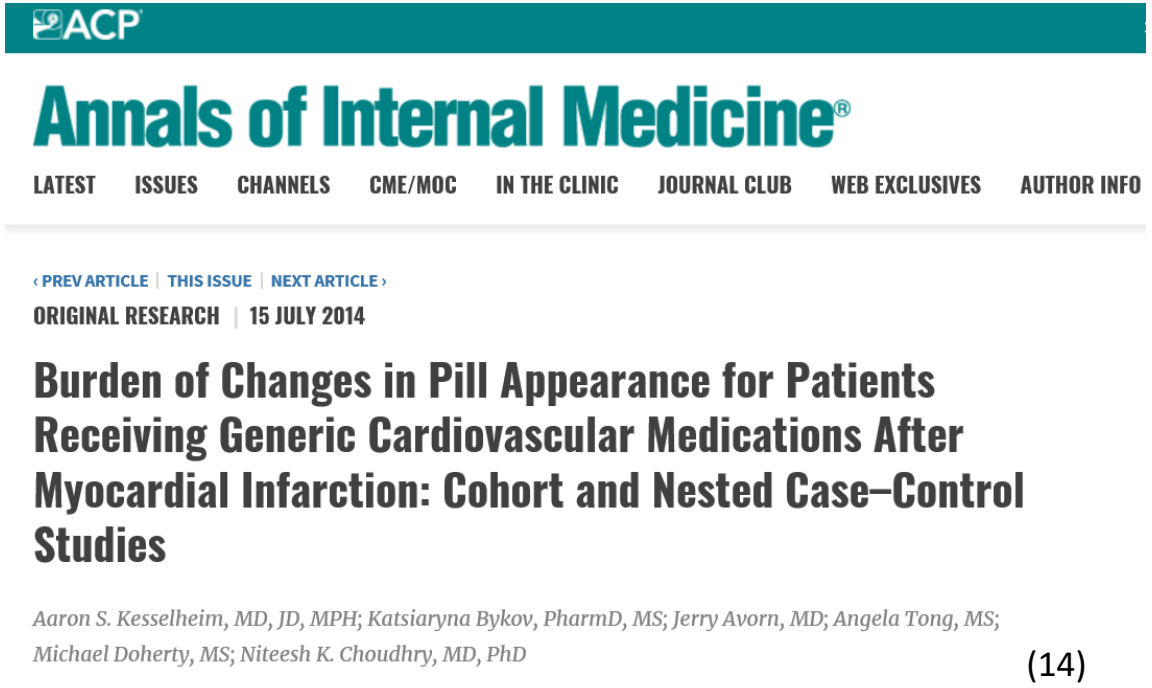
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ORIGINAL RESEARCH | 15 JULY 2014

Burden of Changes in Pill Appearance for Patients Receiving Generic Cardiovascular Medications After Myocardial Infarction: Cohort and Nested Case–Control Studies

Aaron S. Kesselheim, MD, JD, MPH; Katsiaryna Bykov, PharmD, MS; Jerry Avorn, MD; Angela Tong, MS; Michael Doherty, MS; Niteesh K. Choudhry, MD, PhD

(14)

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Forbes Billionaires Innovation Leadership Money Consumer Industry Lifestyle

6,105 views | Oct 7, 2015, 08:00am

Why Is The Placebo Effect Exploding In The U.S. But Nowhere Else?

David DiSalvo Contributor
Pharma & Healthcare

The placebo effect is getting stronger – but only in the United States. That's the finding of new research that analyzed the results of 84 clinical drug trials from 1990 to 2013 for medications prescribed to treat chronic pain.

(15)


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SHARE January 28, 2015 EDITORIAL

The pharmacodynamics of placebo

Expectation effects of price as a proxy for efficacy

Peter A. LeWitt, Scott Kim

First published January 28, 2015, DOI: https://doi.org/10.1212/WNL.0000000000001294

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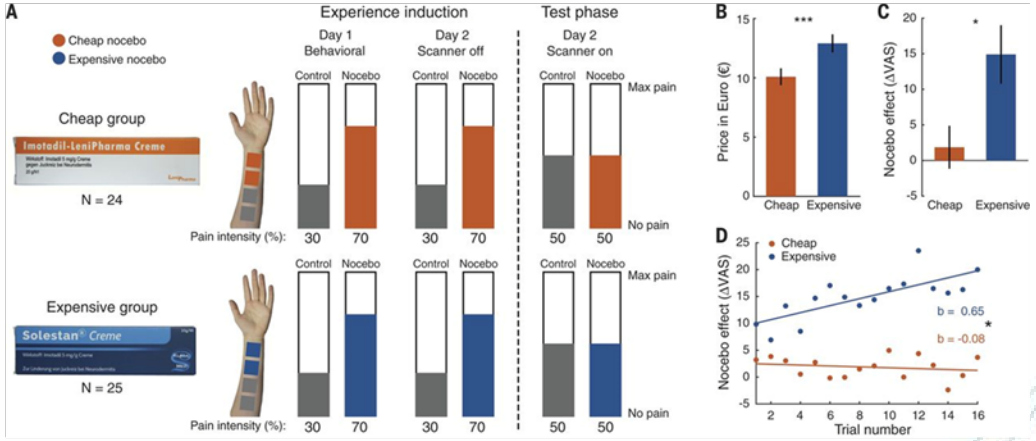

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Science. Vol. 358, Issue 6359, pp. 105-108. 06 Oct 2017 (17)

Value information about a drug (such as the price tag) can strongly affect its therapeutic effect.

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Assurance of Therapeutic Equivalence

In the 21st century, real-world evidence will matter more and more

Common cause: To be satisfied

- "Today, patients feel like guinea pigs"
  - "Since the beginning, Merck explains that they reformulated this medication at the request of ANSM ..." (18) https://www.marieclaire.fr/levothyrox-justice-action-collective-christophe-leguevaques,1268287.asp (16 February 2019)
- A "canary in the mind"
  - On-going saga – "levothyroxine"

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"Several European countries have seen major health issues after a switch from one levothyroxine brand to another, as well as following the introduction of several levothyroxine formulation changes.

…..increased prevalence of side effects as well as increased prevalence of biochemical signs of inadequate dosing, and result in increased health-care consumption and health-care expenses.

Testing bioequivalence does not guarantee continued euthyroidism after a formulation change of levothyroxine.

In at least 3 European countries, formulation changes have been introduced by manufacturers without adequate communication….."

(19)

Joint position statement of European Thyroid Association and Thyroid Federation International. European Thyroid Journal. 2018;7(5):1-5.

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Reducing "~~information~~ understanding asymmetry"

In the experience economy, the more you know, the more you NO!

SHAUNA.SOWERSBY@THENEWSTRIBUNE.COM (20)

Common cause: To build trust

- Trust
  - To accept a vulnerable position, assuming the best interests and competence of the other.
- Mind is as real as matter
  - Common sense is not so common

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A canary tweeting in my mind!

- "With U.S. Generic Drug Market in Chaos, Indian Upstarts Rise".
  - Bloomberg, 2017 (21)
- We are surrounded by "Fake News", Conspiracies and the Matrix memes:
  - *Red Pill: Brutal truths of reality, knowledge, freedom, …*
  - *Blue Pill: Blissful ignorance of illusion, false sense of security, ..*

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One size fits all → Personalized

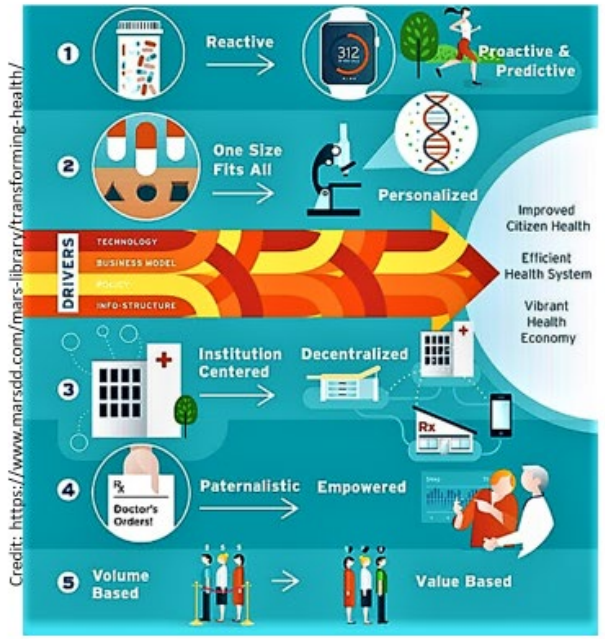
Paternalistic → Patient empowerment

Volume based healthcare → Value based healthcare

Reactive care → Proactive and Predictive care

Centralized → Decentralized

2/18/2019



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Indian Pharmaceutical Alliance

Observations of recurring errors and root cause "unknown": "Common Cause"

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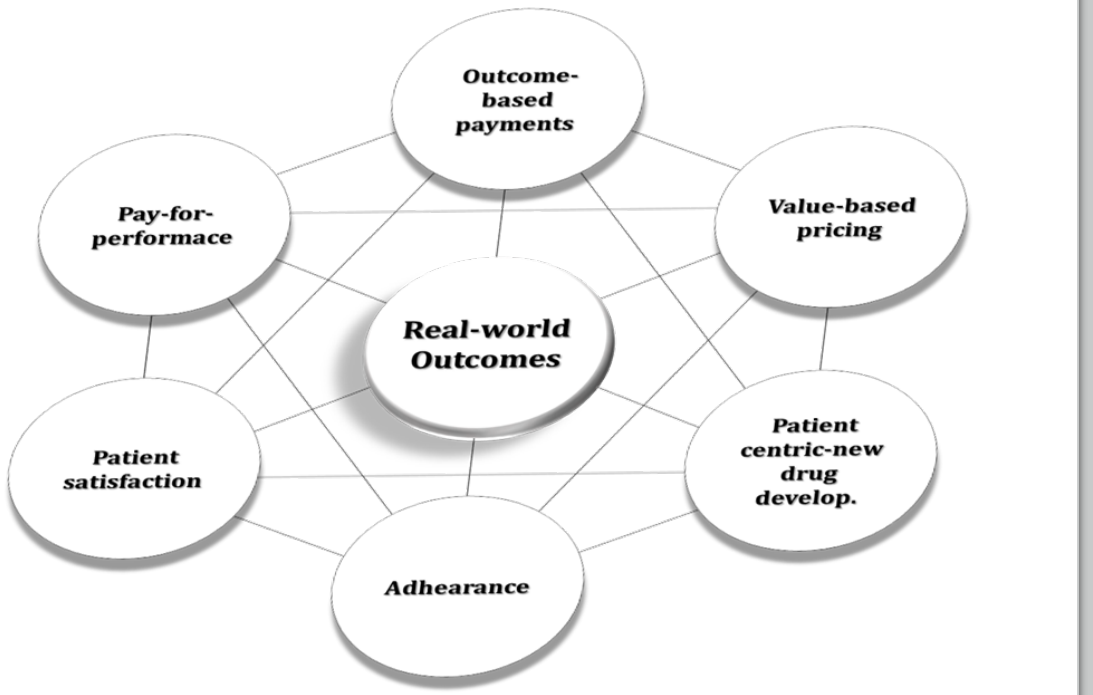
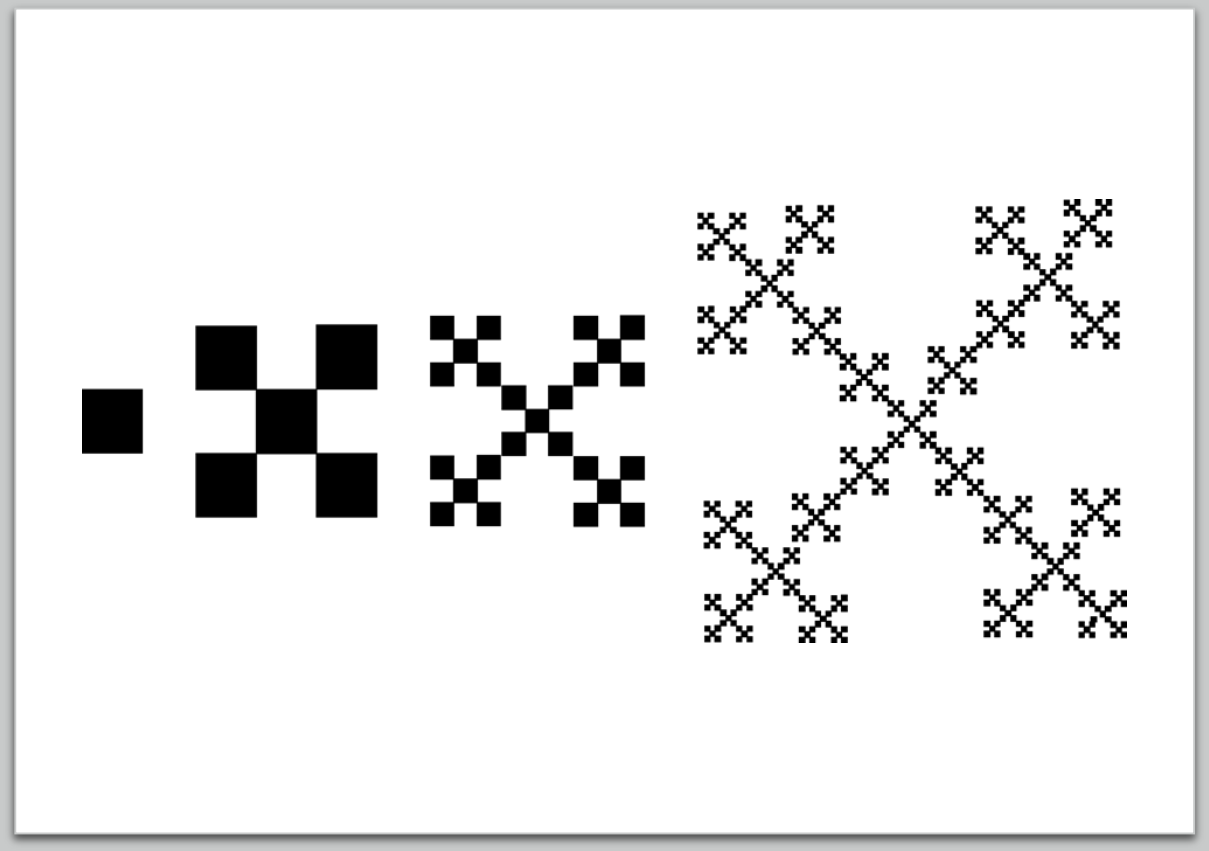
https://www.xavierhealth.org/news3/2018/6/20

Brands personalizing & "Indian Upstarts Rise"

Personalize professional development to reduce errors of commission & omission!





Chaos is not disorder, patterns, beyond average, not predictable (sensitivity to initial conditions), “strange attractors”: “Adherence” a fractal?

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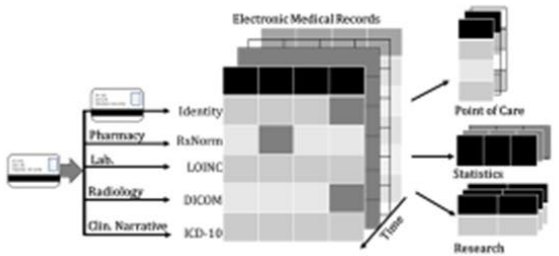
Chaos and complexity: Fractals, Emergence and Emergencies

Healthcare sectors

- Electronic Medical Records
- Quality improvement programs
  - Example – fractal-based quality management infrastructure, lean six sigma, at Johns Hopkins
- Patient satisfaction, outcome and sustainability metrics
- Professional Development
  - *Need to change the current culture of continuing education to focus on Continuous Professional Development* (IOM, 2010)



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9/6/2018 ©Copyright 2017-2018 Ajaz S. Hussain, Ph.D. 19

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"relmagine"

The case of a "Indian upstart" company

- January 07, 2015: A upstart sought advice on "Proactive assurance of data integrity"; no Warning Letter, their previous FDA inspection was in 2012.
- Through data forensics audit by external experts
- Self-author follow-up evidence based CAPA and solutions, i.e., no "CGMP Consultants"
- The MD and leadership to undergo Culture of Quality Training, sign Code of Conduct and Pledge, "no finger pointing", draw a "line in the sand" to move ahead

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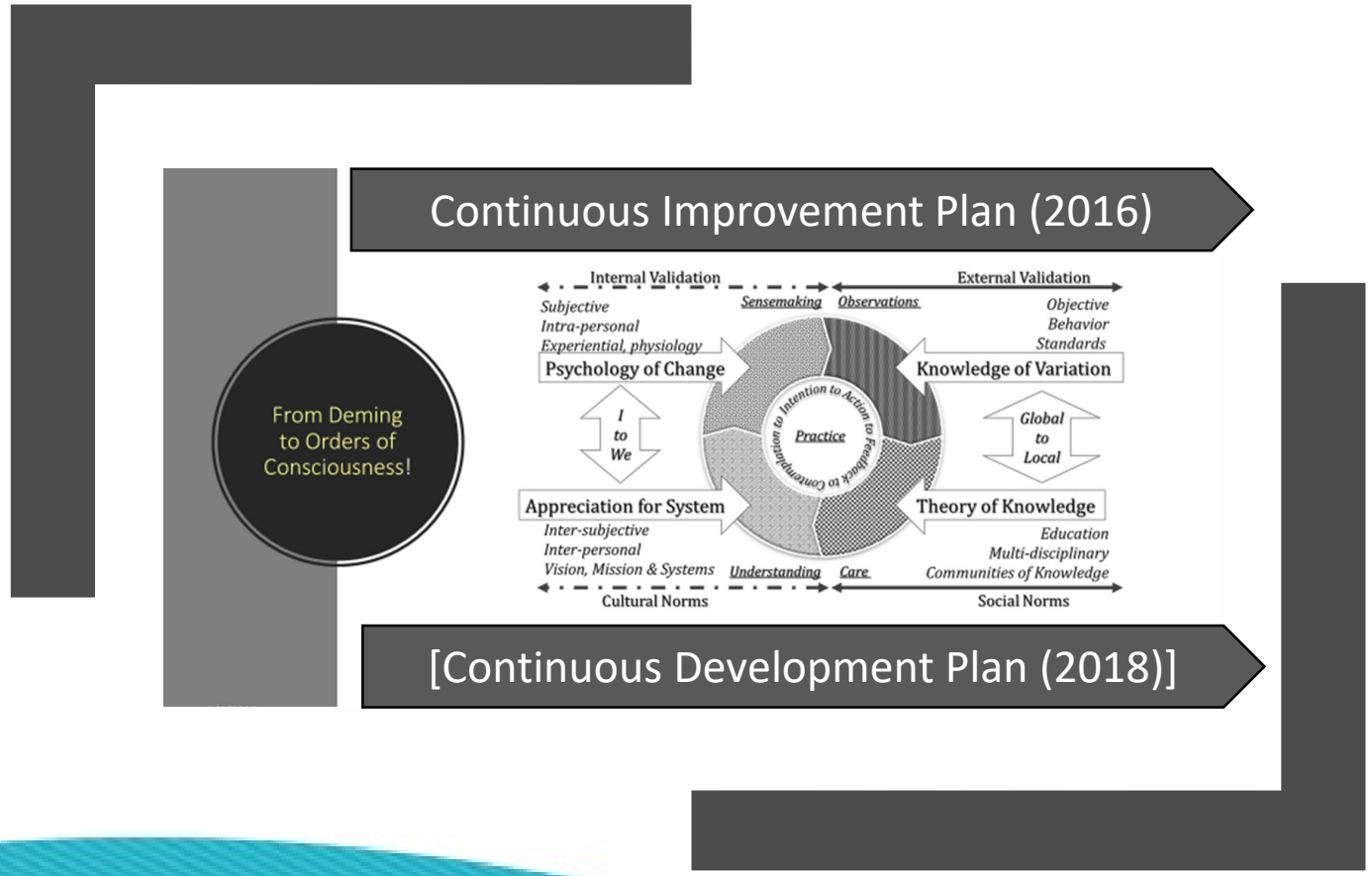
reImagine a bigger box: "In the Box Thinking"



- US FDA Inspections: Operations
  - 2015: No observations (investigator informed of on-going metamorphosis)
  - 2018: No observations
- US FDA Inspections: R&D
  - 2016: 5 Observations, addressed rapidly + CIP
  - 2019: No observations
- Current state
  - Confidence building, but an FDA inspection still is a "major event". Target it should be a routine, i.e. no additional preparation needed, a reconfirmation.
  - Increased business complexity, continual staff turn-over, palpable stress

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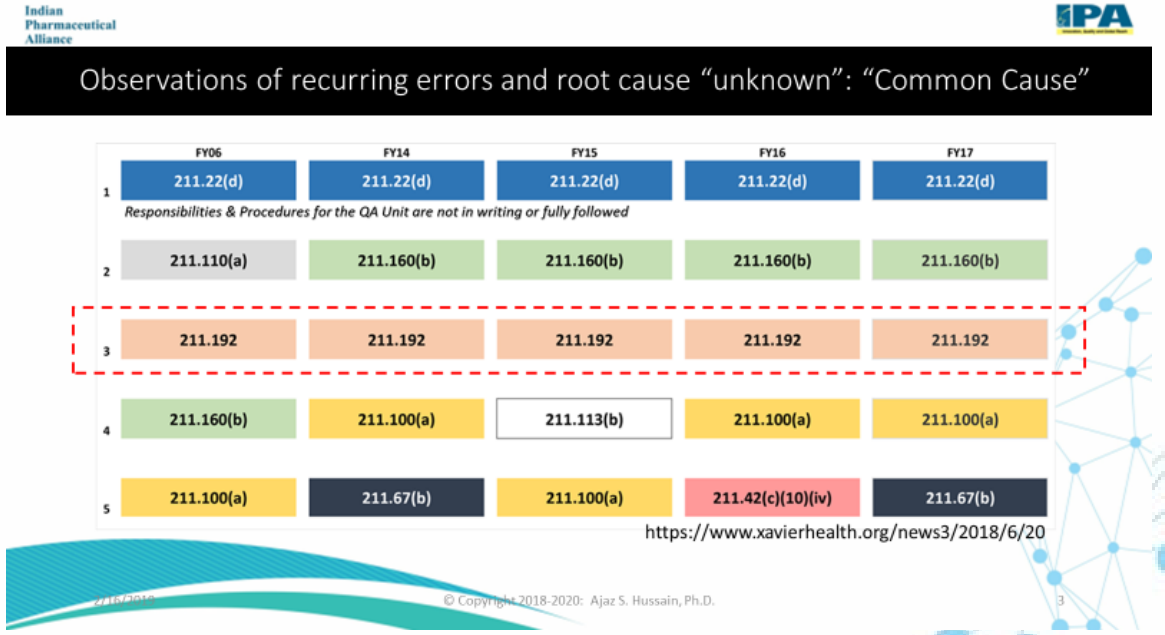

Errors of commission: doing something that should not have been done.
Errors of omission: not doing something that should have been done.

Organizations fail or decline more frequently because of what they did not do than because of what they did. Russell L. Ackoff

In budget and time constraints, we must expand the scope (of projects & responsibilities) to minimize errors of omission in all functions: New + "New Prior Knowledge"

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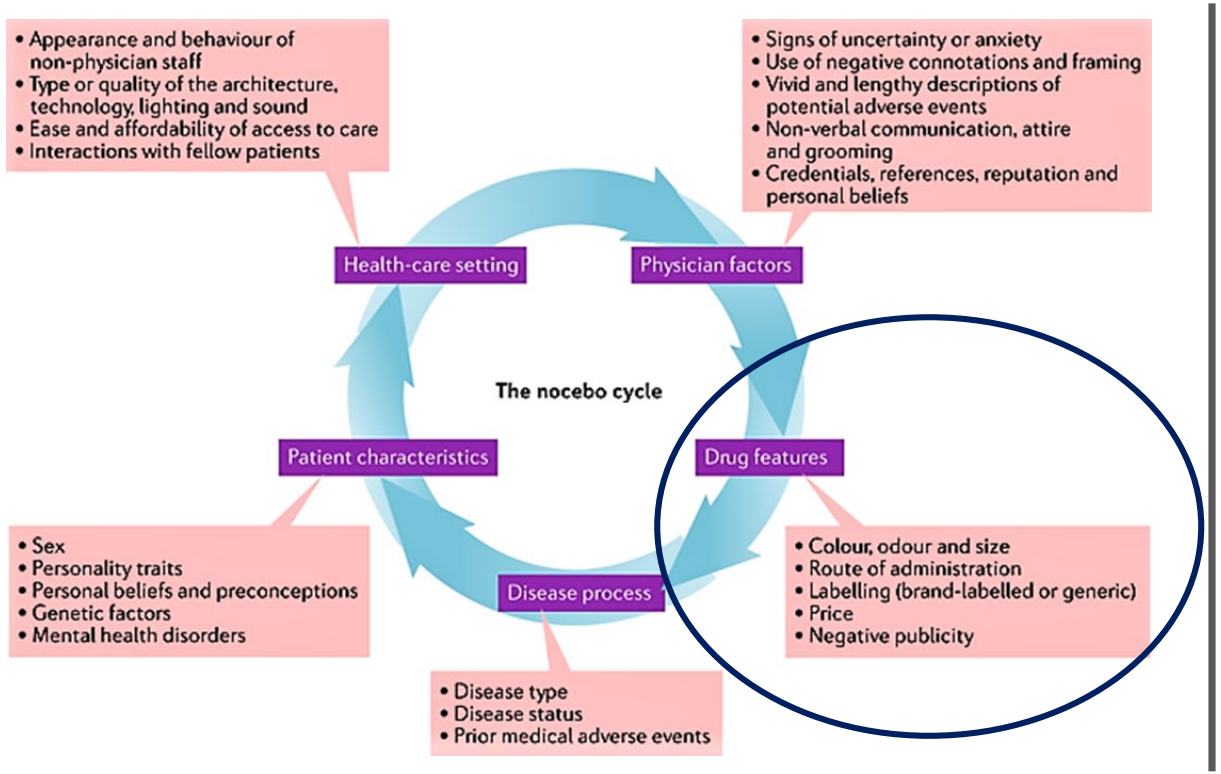
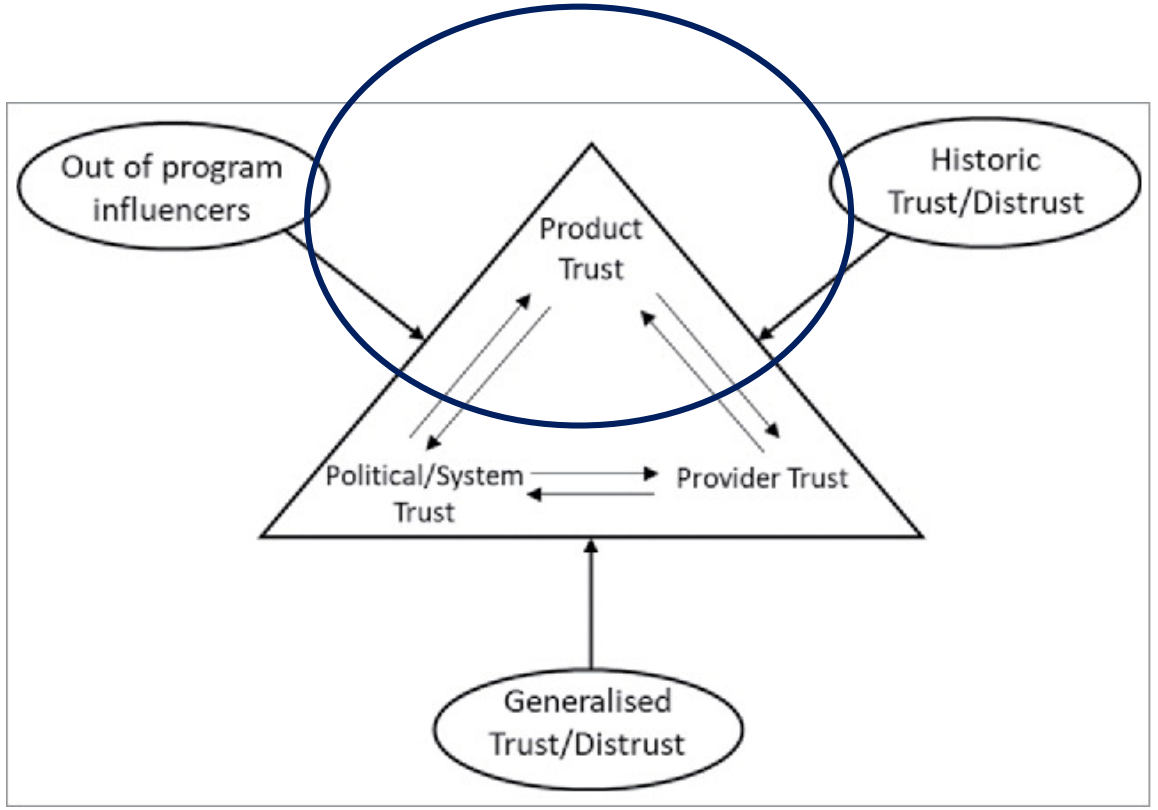


Nature Reviews Rheumatology (2018) (24)



Human Vaccines & Immunotherapeutic (2018) (25)

Build trust relationships

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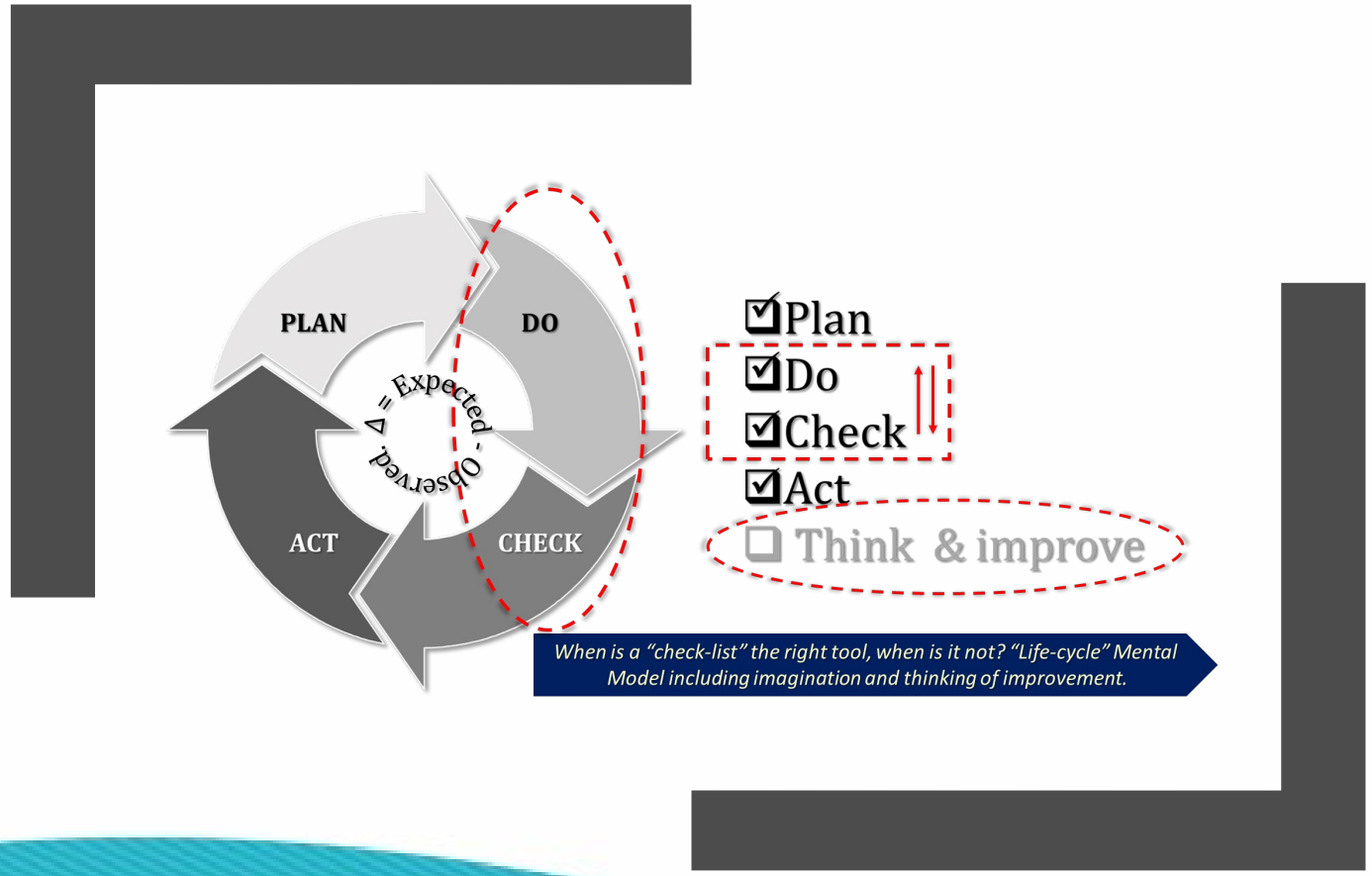
Continuous Improvement & Development?

Mind is as real as matter: Personalize "PDCA" cycle to "PDSA" spiral



- Appreciation for systems requires a higher "Order of Consciousness" (6)

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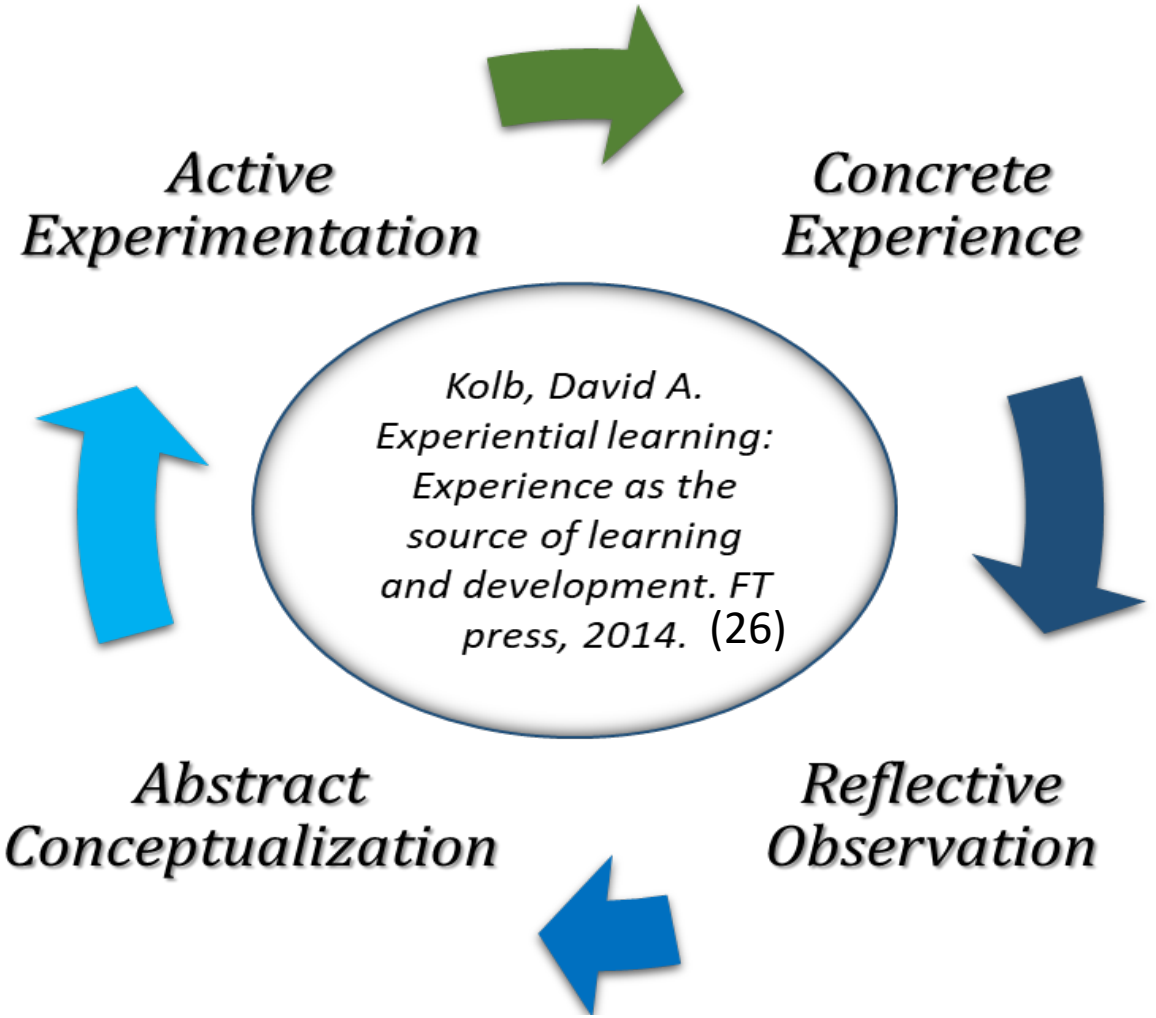

Experiential insights not illusions: Experiential learning!

Experience (noun) is practical contact with events and objects in the "real world"; experience (verb) is to feel (emotions)

But, feelings (of emotions) are personal - "not professional"!

Disorienting dilemma induces dissonance and sparks awareness of a need to do; to act.

To engineer a solution one must be able to measure. Inability to measure becomes an excuse for inaction.

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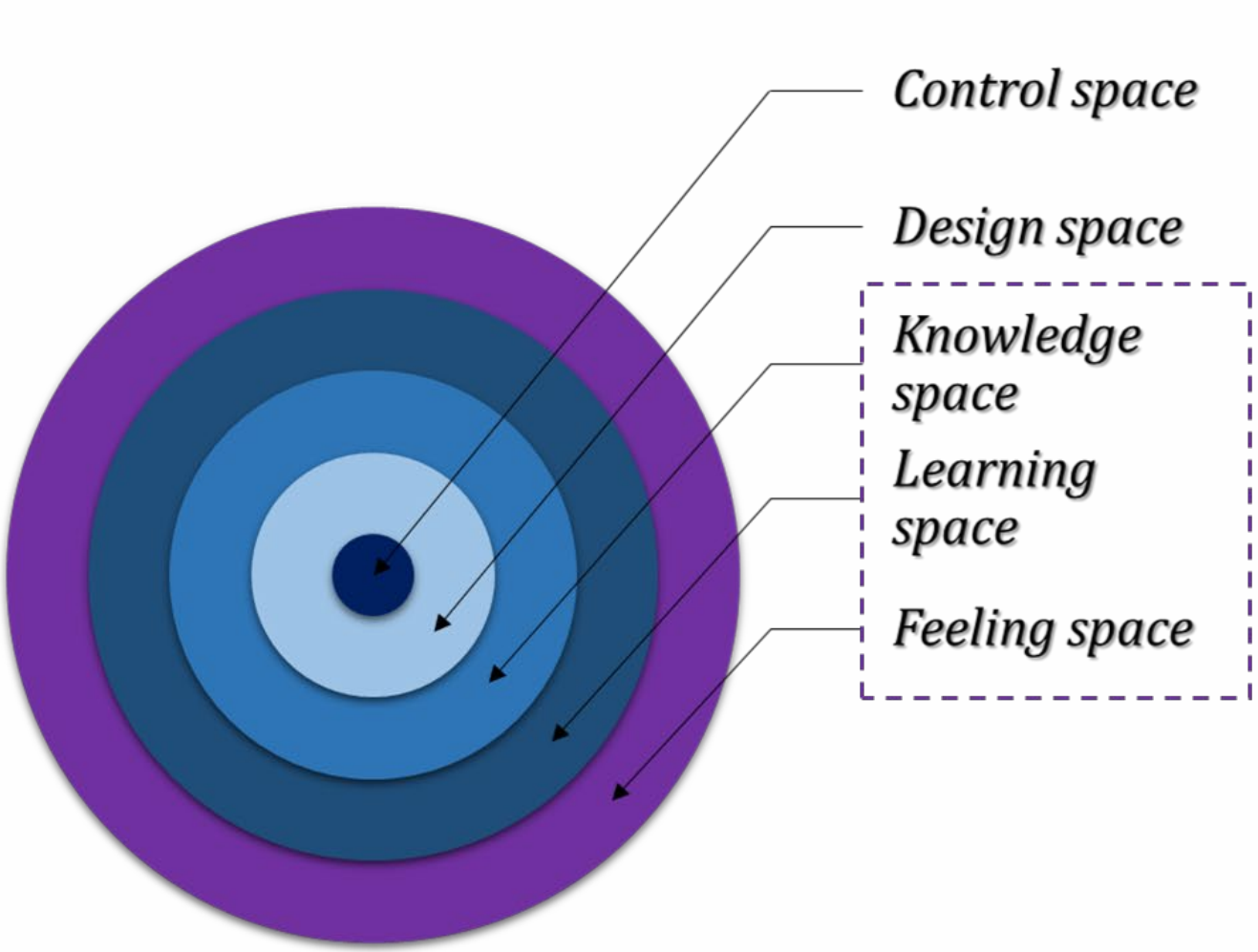

- Statistical Process Control: US FDA PAT (2004) & Process Validation (2011) Guidance
- Design & Systems Thinking: ICH Q8 – 11 Guidelines
- Experiential learning by improving awareness of how we accumulate *knowledge* by creating *learning space* in our *feeling space*
- Inspiration, in parts, from Rumi's Elephant in the Dark, Dr. Deming's contributions, the Institute of Medicine (USA) reports starting with to Err is Human (1999), Fractal Approach to Quality Management System @ Johns Hopkins in Baltimore, and Prof. Kegan's Orders of Consciousness as introduced his book "In Over our Head" (1995) .

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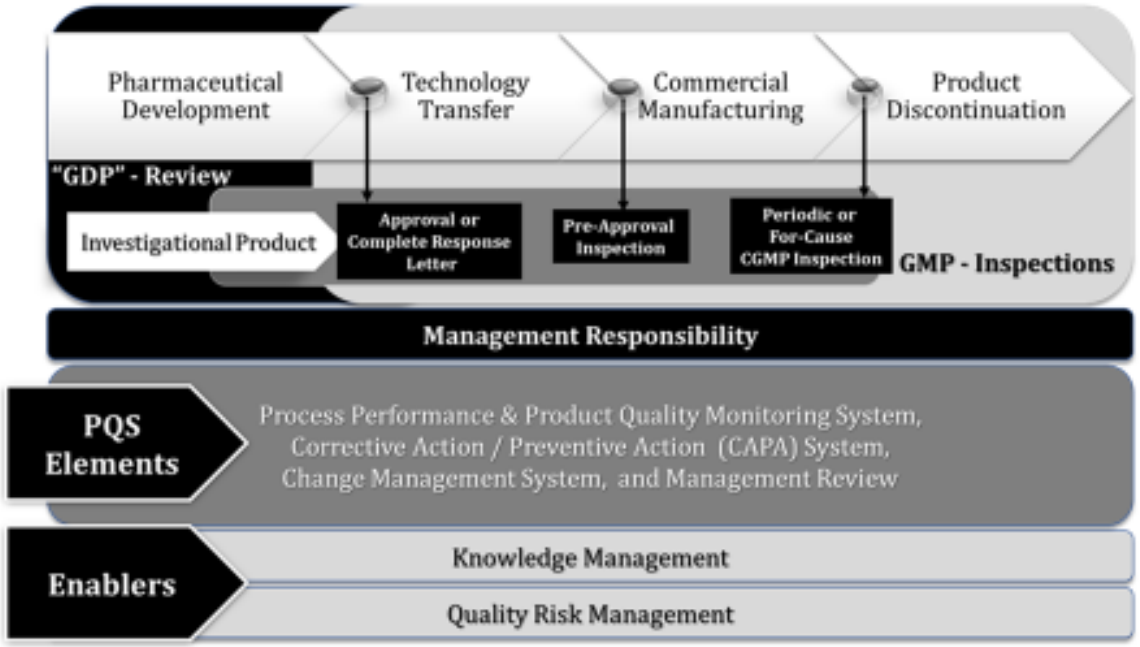

Product Life-cycle Approach
Professional Life-spiral

Good X Practices (regulations)
Good Practitioner

Knowledge Transfer

My Responsibility

Errors, Mistakes, Failures
Dissonance & Crisis
. Reevaluate beliefs/assumptions
Critical reflection, Change Behavior

3rd Enabler:
Satisfaction Management

A Model of Pharmaceutical Quality System:

ICH Q 10 Guideline in EU and Guidance in the US: "Current Thinking"
Adopted in EU 2008, US 2009, Japan 2010, Canada 2016

"My Responsibility"

Personalize Development: Satisfaction Management

2/19/2019 Lecture @ IMT Mines Albi 14 November 2018. Ajaz S. Hussain, Ph.D. © 2018 52

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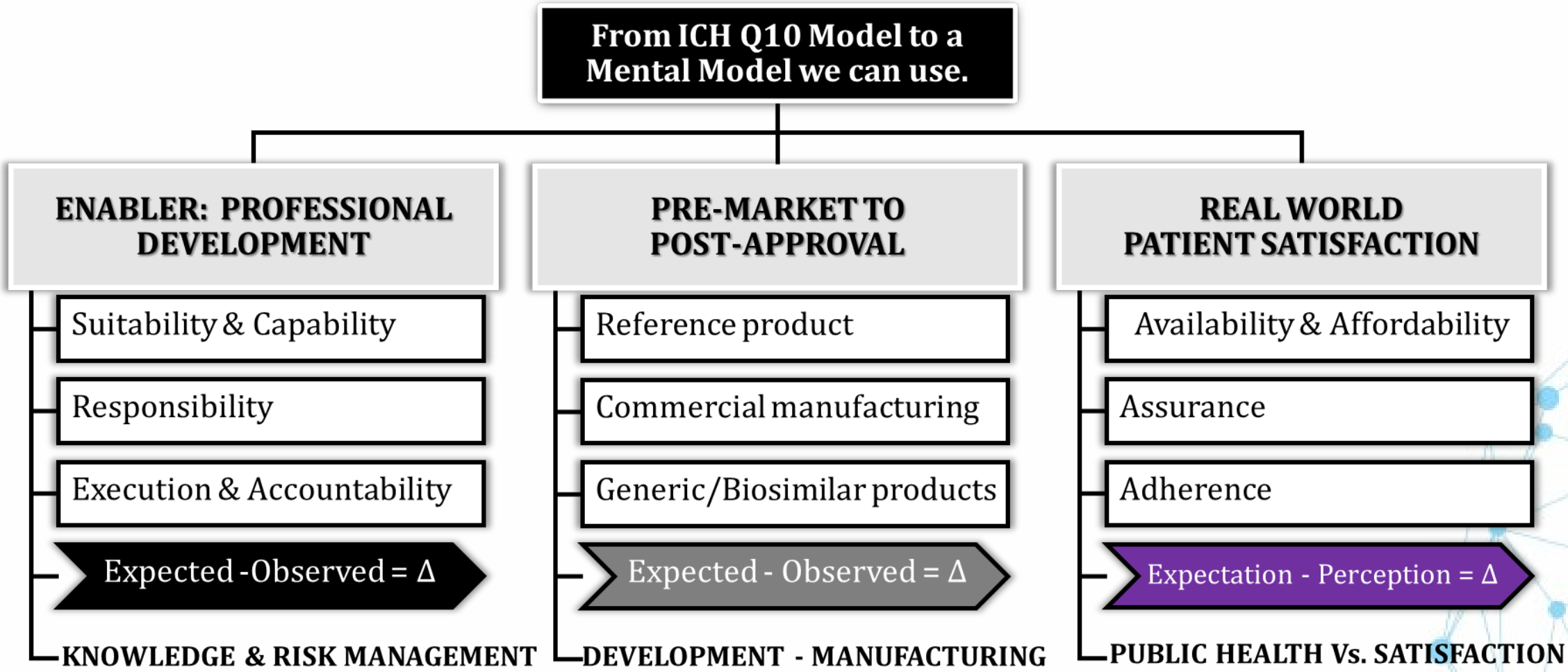

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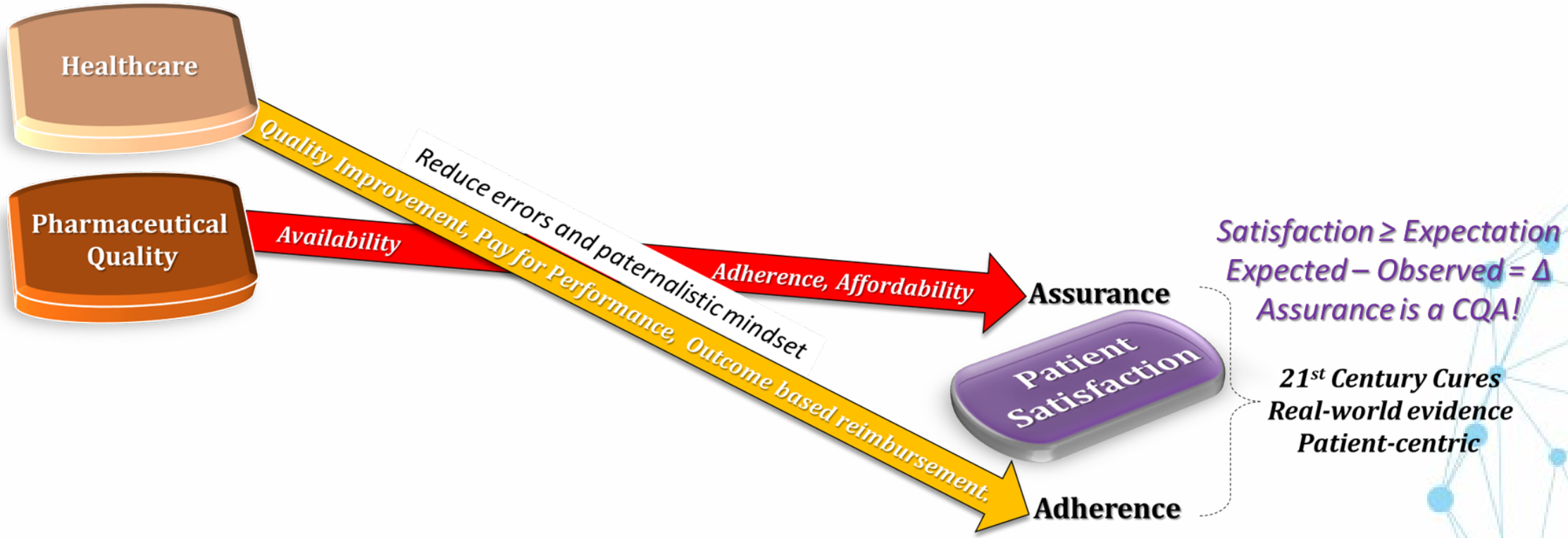
Satisfaction in adherence when compliance is to self-authored routines and SOPs!



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India's aspiration to be the 'Pharmacy of the World' is credible, palpable and indispensable!

- India already is and will continue to progress as one of the major economies of the world
- Let this journey accelerate
- Pharma quality assurance in 21st century: Sharper focus needed on education, training and experience (27)

Express Pharma: 2 November 2013 ***Express Pharma: 15 May 2016***

Insight 2013 [8]	Where are we in 2016?
Perceptions about quality can change efficacy and safety of a drug product via placebo and nocebo effects	Evidence on the significance of perception factors, and placebo/nocebo effects, emerged very prominently, particularly in the US, and the US FDA had to issue a final guidance highlighting the importance of colour and shape of tablets have on adherence rates [9,10].
Remediation of cGMP issues is often difficult and is an expensive challenge	CGMP remediation, particularly as it relates to US FDA Warning Letter and Import Alerts, are on-going with very few exceptions and other companies have been added to this list.
Leaders should consider working together in pre-competitive space to strengthen training and education, and, for creating venues for dialogue with regulators to improve understanding and to seek out solutions to common challenges.	Leaders of India's pharma sector have taken significant steps to collaborate and to engage with global regulators and are outlining a plan- "Quality Excellence"[11].
With the active encouragement of the US FDA, there is visible progress in the area of continuous monitoring and manufacturing of pharma APIs and products in an integrated manner – a potential shift in paradigm in the making.	Automated continuous manufacturing is now rapidly becoming a reality in the US and Europe, tipping point was reached in 2015. Significant collaborations have been announced among major companies[12].
Increasingly patients across the globe will ask the question "who makes the drug I take"; and trust and credibility will be critical.	Media coverage of FDA Warning Letters and Import Alerts have continued to be a source of concern [13].

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Learning to experience: Actions and Reactions

Input, Processing, Output with Feedback

- Insights that can be useful to build and maintain pQMS in the real world context of 21st Century Quality and Cures
- Insights gathered from a conscious personal journey and contemporaneously noted, much shared in mainstream and social media starting with: “Strategies for making high pharma quality affordable.” Express Pharma. 2 November 2013 (28) and “Schrödinger's Cat & My Journey From 2015 to 2020.” LinkedIn 23 December 2014 (29)
- The journey began in India in 2013, to date involved learning interactions with over 10,000 pharmaceutical practitioners in India, North and South America, Europe, Middle-east, Africa, Japan, South Korea, and China
- Stations included BAD-I Warning Letters, Import Alerts, Dispute Resolutions, Expert Witness Testimonies, Culture of Quality, CRLs, Quality by Design and Professional Development

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As the 2015-2020 journey ends: Motivation

I wish for a "Butterfly Effect": "Satisfaction in Adherence" is a common "adult" fractal

- A self-organizing system that manages pharmaceutical quality and gives assurance to patients and supports organizational learning and empowers professional development.
- From the fractal patterns of snowflakes to cellular lifeforms, complex patterns emerge.
- "Emergence" describes the ability of individual components of a large system to work together to give rise to dramatic and diverse behaviour (30).
- Creating a fractal-based quality management infrastructure (at Johns Hopkins Hospital System) (22).

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Vice President &
Global Head
Biopharmaceutical
Development. 5th
EGA Symposium on
Biosimilars, London.

Summary: Manage variability, uncertainty and science & technology

Mode of Response	Key Focus Areas	System Modification	
		QbD	Flexibility
Operational	CAPA, Efficiency, etc. – Learning to R&D	Control of excipients and other sources of "common cause" variability	Reduce CGMP Risk Classification – Continuous Improvement of Quality System
Tactical	Statistical Process Control (Technology & Knowledge Transfer)	Critical Control Points - Robust process end-point Reg. Spec – material attributes	"Design Space" Real –Time Release, Modular Validation Reg. CMC Approval
Strategic	Science of Design Technology Management Business Case	Sci. & Tech. Integration – Continuous Learning & Improvement Regulatory Communication	Integrate Sci - Enabling Technology Platform – "Plug & Play" "Time to Market" + "Production Efficiency"

About a decade ago.

SANDOZ

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Invest in continual human development, professional development can be personalized by internalizing in our mind what we do to ensure our processes are suitable and capable. Improve design and systems thinking which are key to success in the revolution -Industry 4.0 or SmartFactory!

- As Dicken's noted - *This can be the age of wisdom or the age of foolishness, … a season of light and season of darkness, the spring of hope and the winter of despair, ….*
- *And like the heroes of the French Revolution, we look to a future that will bring us everything or nothing, depending on the public trust.*

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To give assurance one must be self-assured

- Quality by Design, Quality System & Continual Improvement linked to Continuous PD
- Internal and External (real world) Validation
- First in, last out (market) with evidence of “Six Sigma Quality” (3.4 dpm) is sustainable success

- Education, training and experience
- Experience (feeling and learning hour by hour; not “years of experience”) is the key to PD
- Systems orientation is a stage in adult development

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pQMS

Pharmaceutical Quality Management System

- A rule-based corporate system, nested within other hierarchical systems, that is built and maintained to consistently provide pharmaceuticals conforming to regulatory specifications with the assurance needed to continually reaffirm claims endorsed by public health officials to satisfy expectations of profit seekers, patients, public, and professional practitioners
  - Quality assurance allows patients to accept a vulnerable position by assuming their best interests and competence of professional practitioners and public health officials
  - Evidence based rules and practices curtail human irrationality
  - Education and training of adults is diverse and their experiences personal
  - Asymmetries of information, knowledge, and understanding of reality will persist (increase)
  - Beyond continuing education and training is adult & professional development (PD): Self-authorship to be self-assured in increasing complexity

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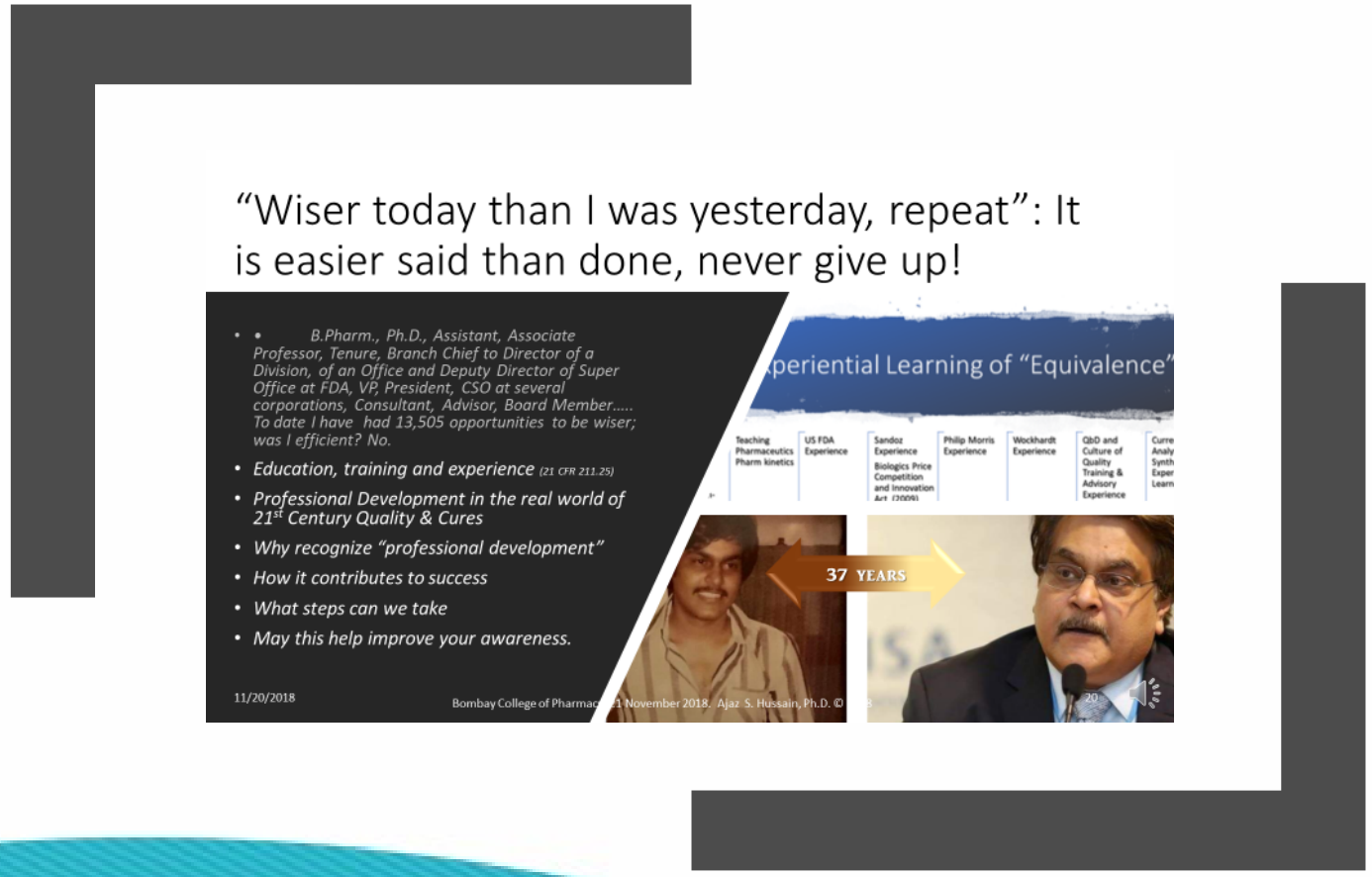
For additional information



- The refences cited, (1) to (30), are available on the internet. When requesting additional information on a particular refence please specify its number in email.
- ajaz@ajazhussain.com

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