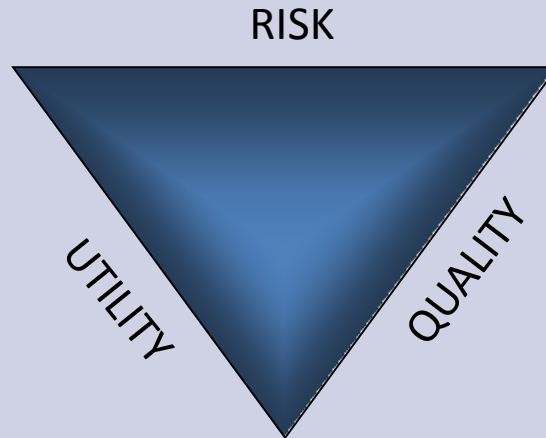



THE POWER OF KNOWLEDGE MANAGEMENT



Mark Gusack, M.D.

President

 **MANX Enterprises, Ltd.**®

DIAGNOSTIC ERROR IN MEDICINE CONFERENCE

6 NOV 2016

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SPECIAL THANKS TO

Mark Graber, M.D.

Laura Zwann, PhD.

Robert El-Kareh, M.D.

Janice Kwan, M.D.

For allowing this time with you 'hear' today.

ACKNOWLEDGEMENTS

William S. Yamamoto, M.D. as mentor and inspiration in medical informatics and artificial intelligence

Barry W. Walcott, COL MC, RET as mentor and teacher in medical systems and heuristics

AND THERE ARE MANY OTHERS I OWE MY STATE OF KNOWLEDGE



WHO AM I?

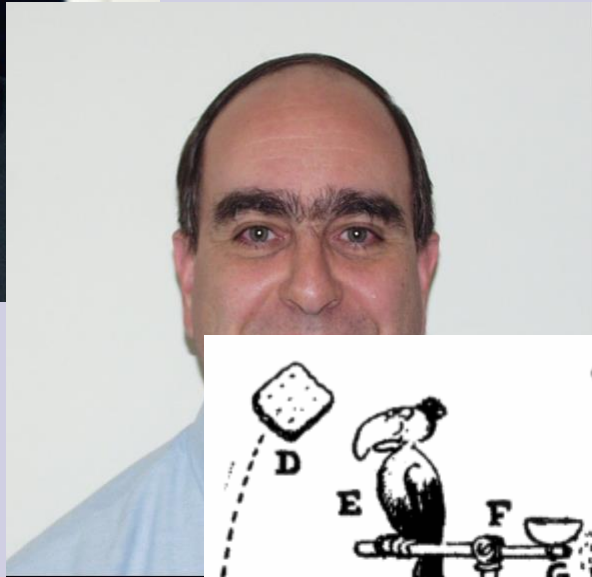
THIS IS HOW I SEE
MYSELF!

WHO AM I?

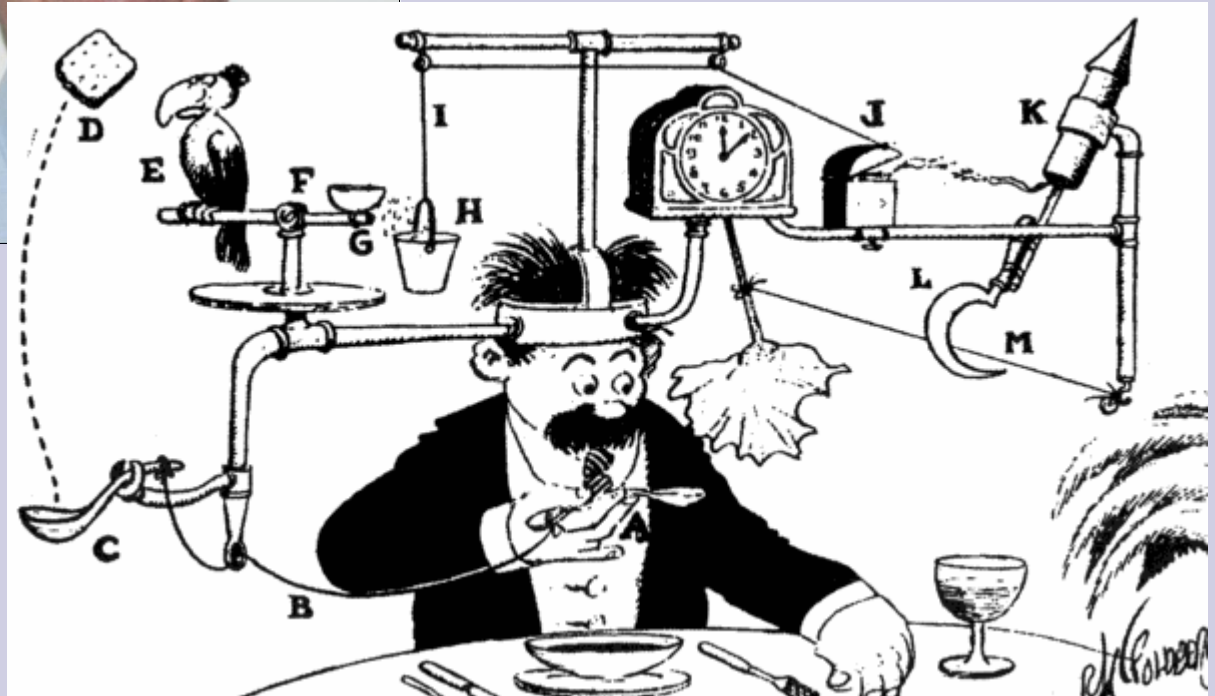


THIS HOW I USED TO
LOOK...

WHO AM I?



AFTER READING THE PRESENTATION, THIS IS HOW YOU WILL SEE ME...





PRESENTER

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AVAILABLE TO CONSULT TO YOUR NEEDS

Dr. Gusack has over 45 years experience in the Laboratory field starting as a Nuclear Medicine Technologist in the early 1970's, then working as a clinical engineer, and then becoming a physician and pathologist. He is AP/CP boarded, has held positions in a variety of hospital and reference based laboratories as a medical director and as staff pathologist. During this time he has also been a consultant and practiced as a Licensed Health Care Risk Manager in Florida. Dr. Gusack has been involved with all aspects of laboratory development and management including startup, licensing, as well as designing integrated management systems for clinical laboratories.

The opinions expressed in this presentation are those of the author and do not necessarily represent those of anyone else on Earth

SITUATION PART I

*“...the vast scale of political, economic, social, and technological change confronting modern organizations is placing unprecedented information-processing burdens on the individuals and groups working within them.”**

*Hodgkinson, GP Healey, MP **Cognition in Organizations**; The Annual Review of Psychology 2008. 59: 387-417.

SITUATION PART II

- ➔ Accelerating improvements in healthcare have created a paradox of **increased capability** offset by **increased complexity**.
- ➔ This has challenged our **cognitive capabilities** to understand and control the behavior of the **complex systems** we have put into place to deliver healthcare.
- ➔ This has increased **latent** organizational **systems problems** that impact **cognition** during the diagnostic process.
- ➔ **Taxonomy** that **addresses systems and cognition separately** leads to inherent weakness in the creation of knowledge as well as its organization limiting its usefulness.
- ➔ The result; a body of work regarding diagnostic error **lacking a unified architecture** that hinders the **Reduction of Diagnostic Error in Medicine**.
- ➔ And this has led to the increased **Perception of error** on the part of the patient and of a society whose expectations have grown with the rise of modern medicine.

As the recent Institute of Medicine [IOM] report of September 2015 Improving Diagnosis in Health Care notes, the present approach to managing this complexity to reduce error has not been successful.

HOW DO WE GAIN CONTROL OVER THIS COMPLEXITY?

BUT BEFORE WE GO FURTHER THERE'S THE BUG-A-BOO OF **PRECISION MEDICINE**

Today there is a lot of talk about “**Precision Medicine.**” However, articles attempting to define what this means fail miserably.

In a recent Perspective article in the New England Journal of Medicine David Hunter quotes a recent National Academies Press work by the Committee on **A Framework for Developing a New Taxonomy of Disease** and notes that the term Precision is used:

“...in a colloquial sense to mean both ‘accurate’ and ‘precise’”

he notes this **implies a high degree of certainty** and then shows this is **just the opposite of the truth** which is that it leads to *greater uncertainty.*

The Early Bird Poster Illustrates this problem when highly sensitive screening modalities are employed

WE NEED TO DO BETTER THAN THIS

SO, HOW DO WE PROCEED?

BEFORE WE CAN SOLVE THE PROBLEM OF DIAGNOSTIC ERROR WE NEED TO AGREE ON:

TERMINOLOGY DEFINITIONS OF MEANING OF WORDS DESCRIBING DIAGNOSTIC ERROR

TAXONOMY ORGANIZE OUR KNOWLEDGE ABOUT DIAGNOSTIC ERROR EFFECTIVELY

“Careful and correct use of language is a powerful aid to straight thinking, for putting into words precisely what we mean necessitates getting our own minds quite clear on what we mean.”

WILLIAM IAN BEARDMORE BEVERIDGE

I HUMBLY PROPOSE SOME TERMINOLOGY

DIAGNOSIS

Classification based on specified clinical criteria

A classification founded upon a set of observable **patient characteristics** that describe at least one **pathophysiologic state** associated with a single **underlying cause**.

DIAGNOSTIC CRITERIA

Observable patient characteristics used in classifying a patient's state of health

A set of generally agreed upon metrics that define a **Medical Decision Point** based on observable patient characteristics that describe a single diagnosis.

DIAGNOSTIC PROCESS

Seeking a set of patient characteristics that reliably classify this state

A methodology **founded upon** inductively established relationships between **prior observations** that provide a means for **applying** deductive and abductive logic **to a set of future patient centric observations** leading to a **reliable classification of their clinical state** as the outcome of at least one **pathophysiologic state** and at least one **underlying cause**. [There may be many diagnoses]

DIAGNOSTIC ERROR

Inaccurate/imprecise observation or erroneous decision making ⇔ DX error

Inaccurate/imprecise observation of patient **clinical state** and/or **decision** as to **pathophysiologic state(s)** and/or **underlying cause(s)** for correctly observed patient clinical state(s).

DIAGNOSTIC FAILURE

Error leading to an unacceptable patient outcome

Diagnostic error that leads to an **unacceptable** state of patient safety, quality of life, cost.

Unacceptable to whom?

WE CAN ARGUE OVER THESE DEFINITIONS BUT AT LEAST THEY FORM A BASIS FOR THIS

I PROPOSE SOME MORE DEFINITIONS

DIAGNOSTIC ACCURACY: [Another way to define diagnostic error]

Of all the most likely diagnoses – based on our observations of the patient’s clinical state – the correct one is chosen to a degree *acceptable* to the:

- ➔ Patient
- ➔ Clinicians
- ➔ Society [Oversight Institutions/Regulatory Agencies]

DIAGNOSTIC PRECISION:

Given an accurate diagnosis, characterization of that particular instance in a single patient regarding subtype, severity, extent, prognosis, stage, etc. is correct to a degree *acceptable* to the:

- ➔ Patient
- ➔ Clinicians
- ➔ Society [Oversight Institutions/Regulatory Agencies]

DIAGNOSTIC TIMELINESS:

The time taken to arrive at an accurate and precise diagnosis so as to avoid, prevent, or mitigate:

- ➔ **RISK:** A serious adverse outcome *unacceptable* to the patient/clinicians/society
- ➔ **QUALITY:** Undue Suffering of the patient *unacceptable* to the patient/clinicians/society
- ➔ **UTILITY:** *Unacceptable* cost for the patient/healthcare facility/society

So now we see that we need to define a process by which we establish what is acceptable and what isn’t.

WE CAN ARGUE OVER THESE TOO!

ANOTHER WAY TO LOOK AT WHAT A DIAGNOSIS IS!

PROBLEM IDENTIFICATION

If we cannot reliably identify patient problems we can never solve them except by accident

PROBLEM SOLVING

If we cannot reliably solve problems then we cannot help our patients achieve optimal health

PREDICTING THE FUTURE

The ability to speculate on what might happen based on planned actions allowing us to choose between diagnoses to achieve the best outcomes

Acquisition of knowledge based upon factual information allows for a number of very beneficial capabilities that leads to a reduction in **DIAGNOSTIC ERROR IN MEDICINE**.

Therefore, given the incredible complexity of our field of endeavor:

- ➔ Scientifically
- ➔ Technologically
- ➔ Legally
- ➔ Regulatory

WE MUST PUT INTO PLACE EFFECTIVE KNOWLEDGE MANAGEMENT ACTIVITIES

BEFORE WE CAN PROCEED WE NEED TO DEFINE OUR MISSION

TO CARE FOR OUR PATIENTS

AND OUR GOALS?

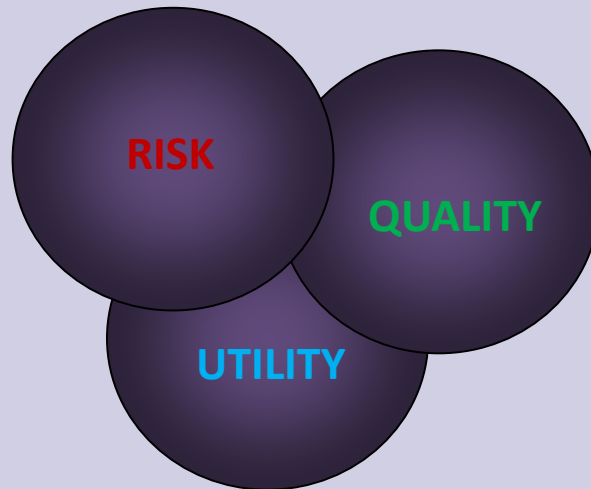
RISK *Maximize patient safety* with accurate, precise, and timely diagnoses

QUALITY *Minimize pain and suffering* from inaccurate and/or imprecise, and/or delayed diagnoses

UTILITY *Minimize expenditure* of scarce resources through cost effective diagnostic processes

HOW DO WE APPROACH THESE?

THESE THREE FULLY DEFINE
ANY ACTIVITY WE PURSUE
AND PROVIDE A MEANS OF
COMPLETE ASSESSMENT



THEY CAN ACT
SYNERGISTICALLY OR...
THEY CAN CONFLICT WITH
EACH OTHER

INTEGRATED SYSTEMS MANAGEMENT

THE POWER OF KNOWLEDGE MANAGEMENT

1. Describe how knowledge management is at the core of solving the problems we face in the highly complex activity such as health care.
2. Explain how use of a Relational Database Management System [RDMS] to implement an electronic Knowledge Repository provides a means of implementing this knowledge management.
3. Discuss how an Associative Data Model [ADM] to structure the eKR provides a flexible means of classifying, investigating, and solving Diagnostic Errors

WHAT IS KNOWLEDGE

SIGNALS

Physical phenomena in our environment that impinge upon our senses or retrieved memories that recapitulate these phenomena

PERCEPTION

How we convert this phenomena into neural activity that can be stored

MEMORIES

What is stored in either short term working or long term memory

SYMBOLS

What we form to interpret internal or external signals such as images, characters, sounds, etc.

INFORMATION

Simple combinations of symbols that have meaning such as words, time, place, objects, descriptions of specific objects, etc. **FACTS**

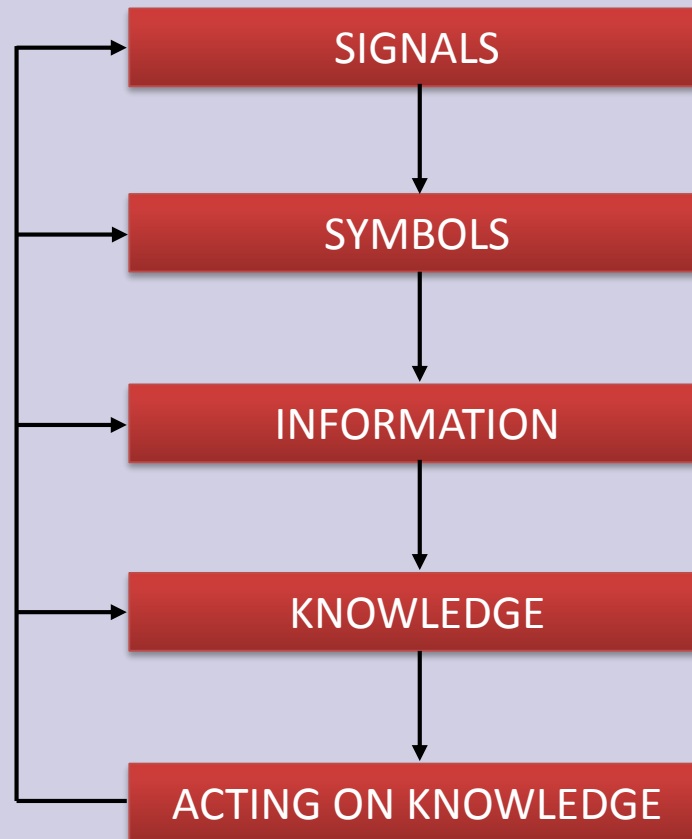
KNOWLEDGE

Complex combinations and associations that include what, how, and why that allows the formation of cause-effect pairs

Acquisition of knowledge based upon factual information allows for a number of very beneficial capabilities that separate us from most other life on this planet.

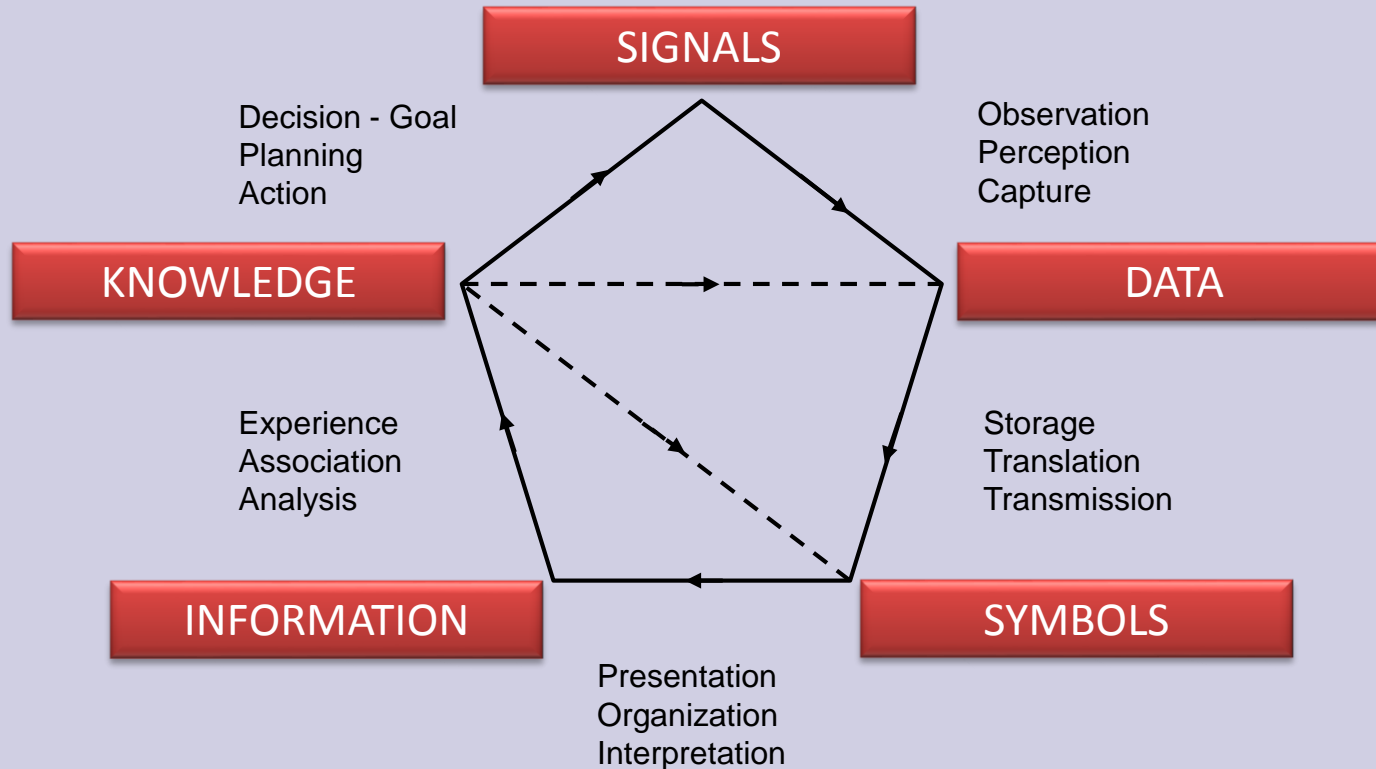
THAT IS, IF IT IS PROPERLY ACQUIRED AND APPLIED

THE PROCESS OF KNOWLEDGE FORMATION - SIMPLIFIED



- ➔ Transformation of signals to knowledge is effected through some form of cognitive logic/process.
- ➔ This logic uses a variety of rules that, are both visual and related to language.
- ➔ There is no definitive boundary between what constitutes symbols, information, and knowledge.
- ➔ We make this distinction for the purpose of defining an effective knowledge management system.

KNOWLEDGE CREATION AND USE IS ACTUALLY MORE COMPLEX



OUR BRAINS CANNOT RETAIN AND RETRIEVE ALL THIS – WE NEED A REPOSITORY!

TWO MAIN TYPES OF KNOWLEDGE

KNOWLEDGE: is created through association of informational symbol sets into taxonomies, chronologies, and logical relationships between objects and actions.

These sets describe a plurality of [event – outcome pairs] that define two types of knowledge:

➔ MECHANISMS [When, Where, What] and

Empirical or Tacit Knowledge also known as rules of thumb [**Heuristics**]. This knowledge is based on repeated observations that allow the creation of rules. Empirical knowledge allows us to keep an activity running smoothly by responding to known events using a set of rules with high degree of predictive power.

➔ CAUSES [How and Why]

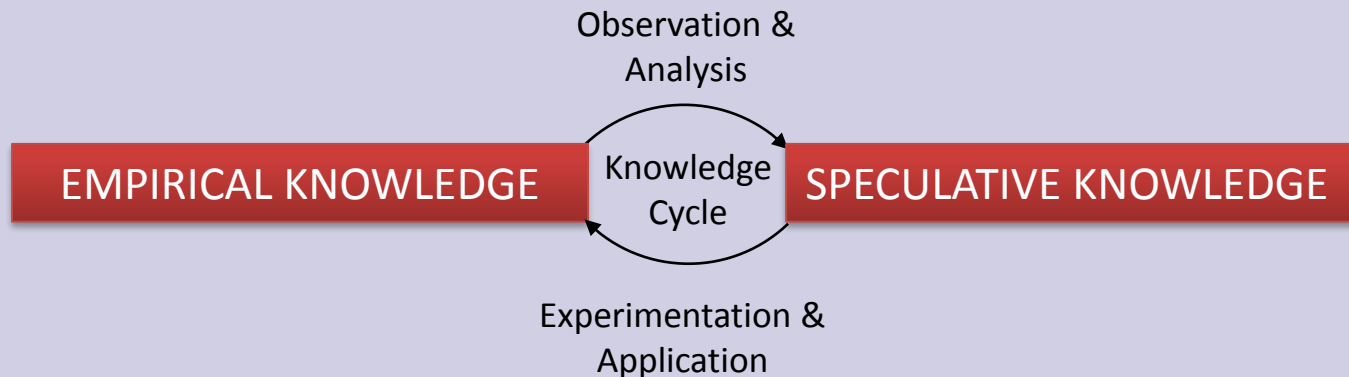
Speculative or Theoretical Knowledge is based on the formulation and testing of hypotheses as to the cause behind our observations. Speculative knowledge provides a means of generalizing our response to unexpected events.

HOW ARE THESE TWO FORMS OF KNOWLEDGE RELATED?

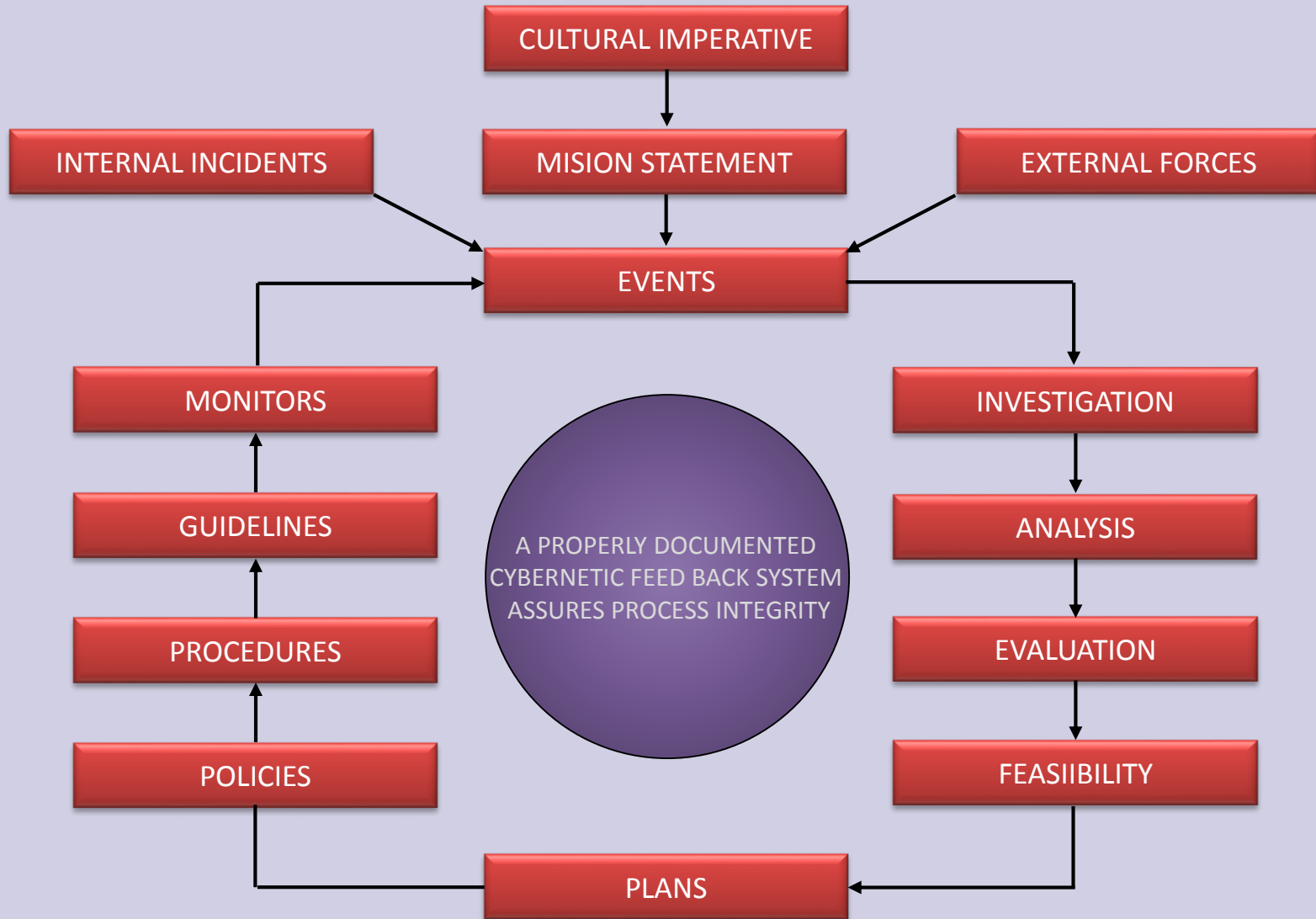
IMPLICATIONS

EMPERICAL KNOWLEDGE IS LIMITED, INFLEXIBLE WHERE AS SPECULATIVE KNOWLEDGE:

- ➔ Assures the development of responses that help prevent future adverse events or mitigate their effects with a high degree of certainty.
- ➔ Provides a means of designing and implementing new activities with a high degree of confidence in their success.
- ➔ Often leads to the development of additional empirical knowledge through new observations and more effective analysis of information gained through them.



PUTTING IT ALL TOGETHER – CREATION AND MANAGEMENT OF KNOWLEDGE



ALL OF THIS MUST BE PROPERLY STORED, CLASSIFIED, AND AVAILABLE

NEED CONSULTING SERVICES?

I have extensive experience and knowledge in the following areas:

- ➔ Laboratory Medicine – 45 years
- ➔ Anatomic Pathology – 38 years
- ➔ Risk Management/Quality Management/Resource Management [ISM] – 35 years
- ➔ Failure Mode and Effect Analysis [FMEA] – 20 years
- ➔ Information Management – 50 years experience including computer programming
- ➔ Document Management – 35 years
- ➔ Knowledge Management – 25 years
- ➔ ISO 15189 Assessments – 1 year (Oh well...have to start somewhere)

Contact me at

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AVAILABLE TO CONSULT TO YOUR BOTTOM LINE; NOT OUR BOTTOM LINE

ALLOW ME TO HELP YOU APPLY INTEGRATED SYSTEMS MANAGEMENT [ISM]