

# A System of Profound Knowledge

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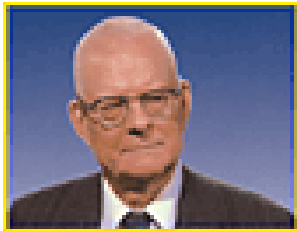
**Savannah River Nuclear Solutions, LLC**

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# A System of Profound Knowledge

- **Appreciation for a system**
- **Knowledge about variation**
- **Theory of Knowledge**
- **Psychology of people**

From The New Economics, Deming



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# Appreciation for a System

- **Pay attention to interactions more so than components**
- **Knowledge of statistical variation more so than discrete numbers**
- **Long term focus more so than short term**
- **Cooperation more so than fear, blame and internal competition**

# Appreciation for a System – Deming Quotes

- **“94% of the outcome of any organization comes from the processes used, not the people”.**
- **“A fault in the interpretation of observations, seen everywhere, is to suppose that every event is attributable to someone (usually the one closest at hand), or is related to some special event. The fact is that most troubles with service and production lie in the system and not the people”.**

# Analysis vs Synthesis

**Analysis** has been the essence of classical science. The scientific method assumes that the whole is nothing but the sum of the parts, and thus understanding the structure is both necessary and sufficient to understanding the whole.

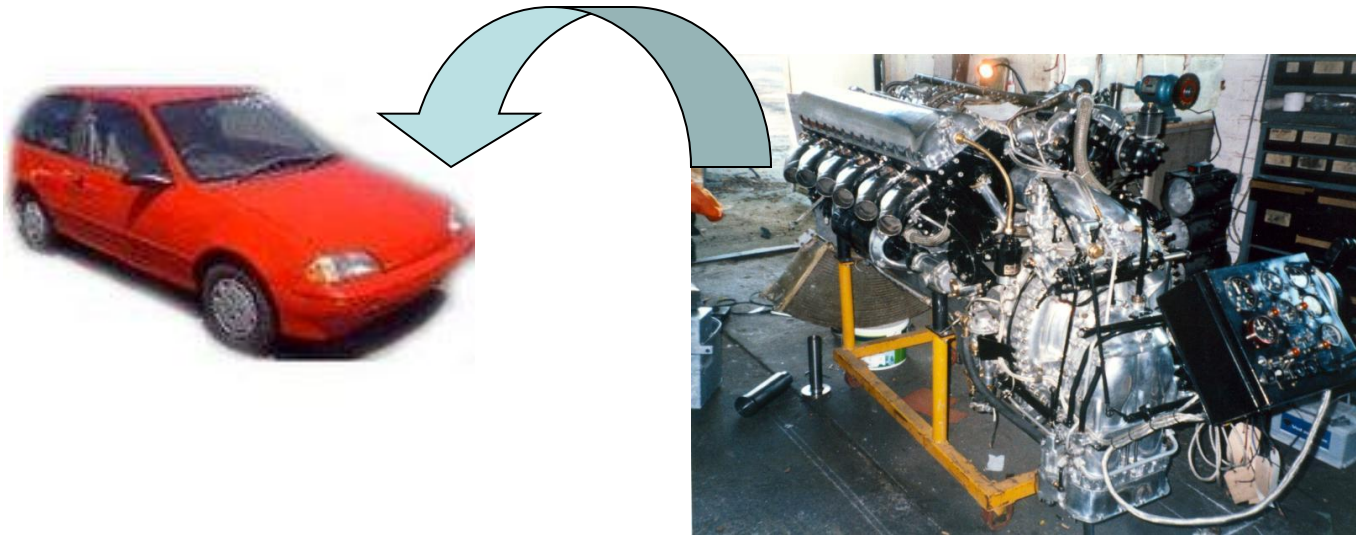
**Synthesis** has been the main instrument of the functional approach. By defining a system by its outcome, synthesis puts the subject in the context of the larger system of which it is a part, and then studies the effects it produces in its environment.

<http://www.acasa.upenn.edu/JGsystems.pdf>

Jamshid Gharajedaghi

# Systems Thinking Visualization

Would putting a Rolls-Royce engine in a Geo Metro make an improved automobile?



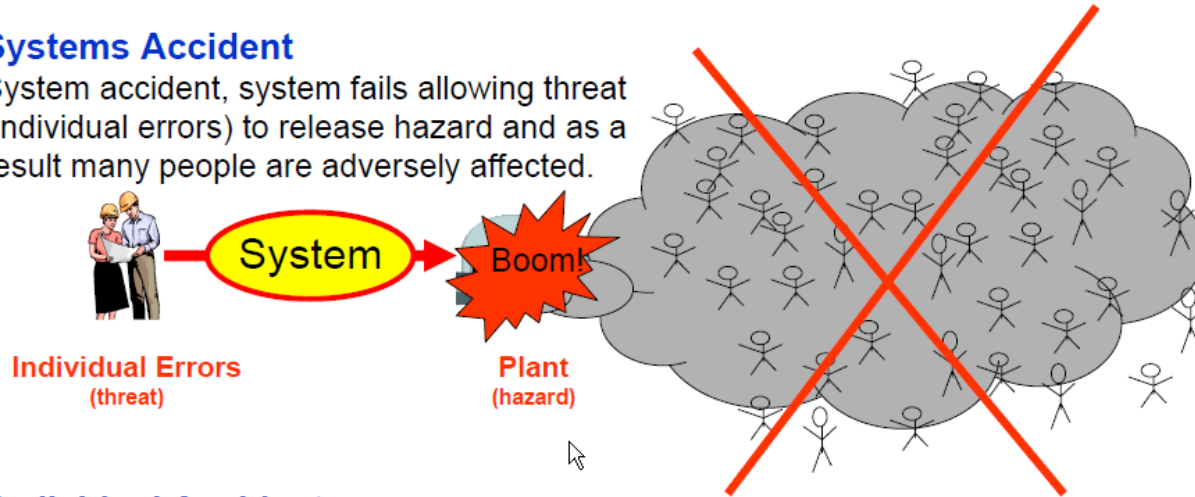
Nothing wrong with either, but the combination probably won't work (Russ Ackoff)

# Use of Systems Thinking at Pantex

## Systems Accident vs. Individual Accident

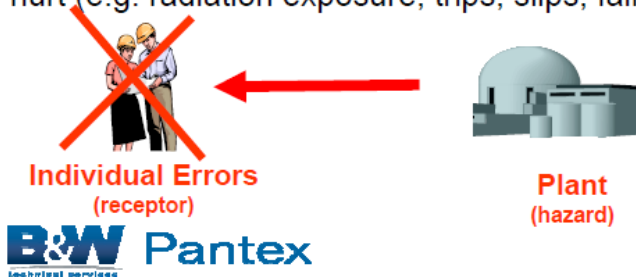
### Systems Accident

System accident, system fails allowing threat (individual errors) to release hazard and as a result many people are adversely affected.



### Individual Accident

Individual accident, the worker is not protected from the plant and the worker gets hurt (e.g. radiation exposure, trips, slips, falls, industrial accident, etc.).



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Richard S Hartley

[http://www.hss.doe.gov/HealthSafety/ism/workshop/2008Aug/TrackB/Thursday/930\\_1130/Causal\\_Factors\\_Analysis\\_Tool.pdf](http://www.hss.doe.gov/HealthSafety/ism/workshop/2008Aug/TrackB/Thursday/930_1130/Causal_Factors_Analysis_Tool.pdf)

# Knowledge about Variation

- **You have experienced the Red Bead Experiment**
- **The Theory of Variation was included in the Statistical Process Control discussion**
- **Dr. Deming's early works focused on statistical variation. He added the rest of the SOPK in the last 10 years of his life.**
- **Stable System versus Unstable System**



# Probabilistic vs. Deterministic

- **Deterministic** - linear, cause and effect sequences. If you do this, that will happen.
- **Probabilistic** - exact time, location, and effect is random. *e.g. Number of Red Beads.*
- Treating a probabilistic result as if it was deterministic will cause problems
- Past results may not guarantee future results



By <http://www.photos8.com>



# Predictions

- **Engineers often predict accidents. Their predictions are uncanny for correctness in detail. They fail in only one way – they can not predict exactly when the accident will happen.**
  - Dr. Deming, *Out of the Crisis* page 479
- **Calculations after the fact, using only data available prior to the disaster, showed there was greater than a 10% chance of the Challenger explosion occurring, given the pre-launch temperatures and prior history of O-ring burn through.**



# Theory of Knowledge

- **Knowledge is based upon prediction**
- **Knowledge is built on theory**
  - Chanticleer the barnyard rooster
  - Actions taken without theory lead to losses
- **Use of data requires prediction**
- **There is no true value of a measurement, it depends on methods, context, and use**
- **Operational definitions are necessary**

# More of Prediction and Knowledge

- If I use a test result, I am using it in the context of predicting the future
- Which route should you use driving home?
- A prediction has a risk of being wrong
- “Rational prediction requires theory and builds knowledge through systematic revision and extension of the theory based on comparison of prediction with observation.”

(Deming, The New Economics)

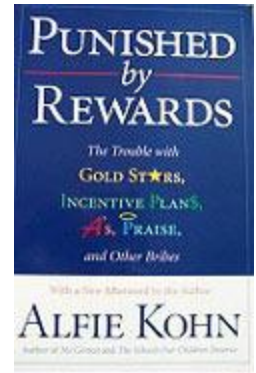
# Psychology

- **People will use the charts you make as a result of this class**
- **If you do not understand the people, understand psychology, the charts will be ignored**
- **Competition, fear, perceptions, loss of control change the data and the chart's message**
- **Extrinsic versus intrinsic motivation**

# Punished by Rewards

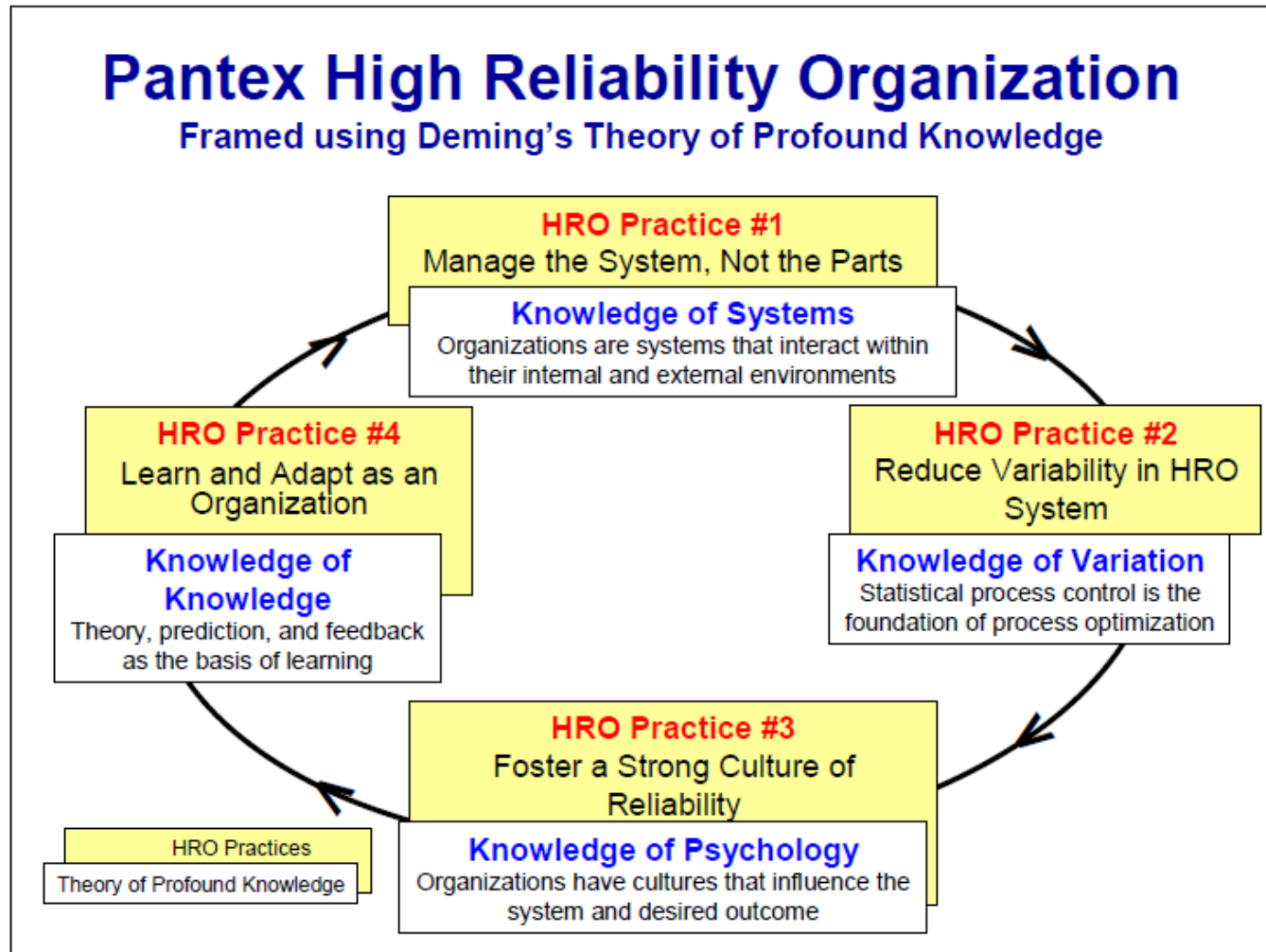
- Awards, bonuses, gold stars can actually have a detrimental impact
- For a person driven extrinsically, each subsequent reward must be larger in order to have the same impact
- Creation of winners and losers

<http://www.alfiecohn.org/index.html>



Alfie Kohn

# Use of SOPK at Pantex



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[http://www.efcog.org/wg/ca/events/fall08mtg/presentations/Intro\\_to\\_BW\\_Pantex\\_HRO\\_Program\\_10-08\\_b.pdf](http://www.efcog.org/wg/ca/events/fall08mtg/presentations/Intro_to_BW_Pantex_HRO_Program_10-08_b.pdf)