

Unintended Consequences of Measurement

Causes and Cures

*SEPG Conference
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You Will Walk Away With...

- ▶ An understanding of the relationships between measurement, behavior, practice and results
- ▶ Added knowledge of the cause-and-effect nature of measurement
- ▶ Techniques to minimize unintended consequences and maximize intended results
- ▶ An understanding of what motivates and de-motivates people.

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What is the Relationship Between Measurement and Behavior?

- ▶ **Key Advantage:** Measurement Changes Behavior
- ▶ **Problem:** People change behavior in unintended and negative ways
- ▶ **Challenge:** Measure in such a way as to motivate good behavioral choices.

The Causal Continuum

Values → Motives → Behaviors → Practices → Results → Goals

- ▶ **The Causal Continuum** shows the cause-and-effect relationships that drive results and goals
- ▶ **Value:** A principle, standard, or quality considered worthwhile or desirable
- ▶ **Motive:** an emotion, desire, physiological need, or similar impulse that acts as an incitement to action
- ▶ **Behavior:** an observable action performed by an individual
- ▶ **Practice:** a habitual behavior performed by an individual or group
- ▶ **Result:** an observable, relatively enduring achievement
- ▶ **Goal:** a high-level, fundamental characteristic that defines success.

Additional Factors

▶ Consequences, Good and Bad

- An instruction or order does not motivate unless a meaningful consequence is expected for compliance or non-compliance
- A consequence is meaningful if one ...
 - **receives what one wants or fears,**
 - *or else* **what one wants or fears is withheld**
- The intensity of the want or fear will also affect the ability of the consequence to motivate
- A person can grant one's own consequences.

Measurement Risks and Benefits

Measuring Results ...

- ▶ **Key Advantage:** Goals are often expressed in terms of results
- ▶ **Problem:** There are many paths to a measured result, many of which defeat other goals, and some of which achieve the measure without achieving the goal
- ▶ **Challenge:** Increase the motivation to choose desirable paths and decrease motivation to choose undesirable paths
 - Brainstorm likely paths to results, good and bad
 - Play devil's advocate (“how can this go wrong?”)
 - Think back through behaviors, motives and values.

Identify Practices Known to Achieve Good or Bad Results

- ▶ “What do you believe are the top three to five *worst practices* whereby, if we could just stop doing them, we would stop shooting ourselves in the foot?”
- ▶ “What do you believe are the top three to five *best practices* which, if we consistently applied them, would most enable us to be successful? These have to be what we do, not what we need to stop doing.”

Warning: Measuring People

The Measurement Analyst must be seen as the people's advocate, not the secret police



Measure Practices

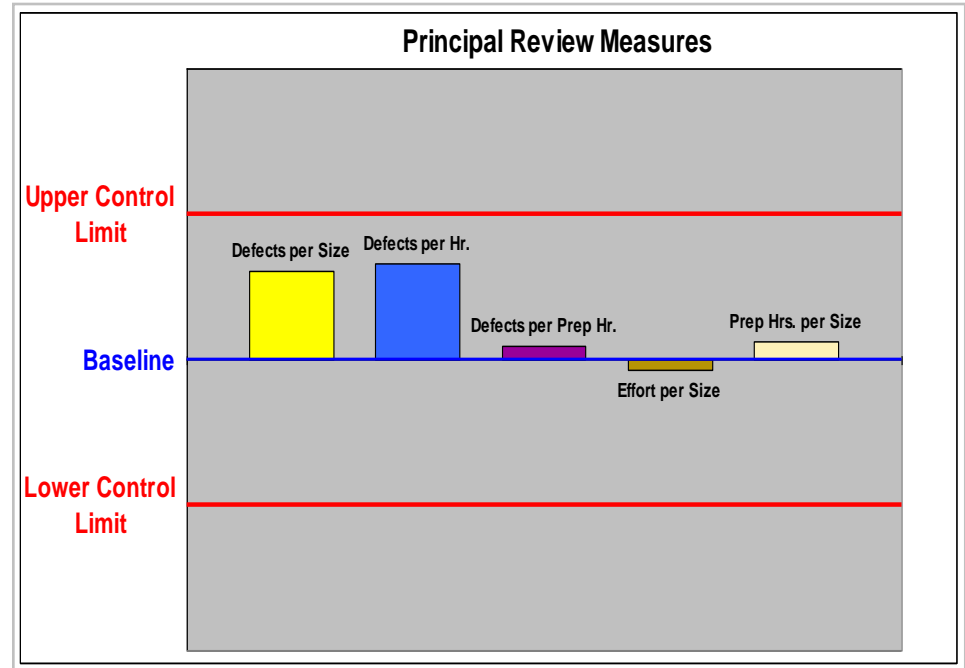
- ▶ Practices are habitual behaviors, aggregated to protect individuals. Therefore practices correlate more consistently to results
- ▶ Measuring practices avoids targeting individuals, while still measuring that which is under direct, human control

Aggregate Attributable Measures

- ▶ Group data by appropriate, organizational or process categories
- ▶ Use mean or median, counts and sums of groups of data
- ▶ Do not report if the sample size is small enough or the characteristics distinctly personal enough to allow someone to derive individual performance.

Aggregate Behavior Into Practices

- ▶ **Example:** Data was collected from individual behavior (e.g. review preparation time), but summed and graphed to show variance from the median
- ▶ “Law of large numbers” minimizes the risk of being misled by variations in data
- ▶ Aggregation protects individuals
- ▶ Aggregation more accurately reveals true measures.



Identifying What Are Behaviors and Practices

▶ The “Hey, Dad” Test (AKA The “Hey, Mom” Test)

- “Hey, Dad! Watch me _____!”
- If you cannot visualize what this sentence means to convey after completing it with the activity you intend to measure, it is likely not a behavior

▶ Which of these are behaviors?

1. Be more sincere
2. Reduce defects
- ★ 3. Spend more than average time preparing for a peer review
- ★ 4. Close each request within its required time
5. Improve quality 25%.

Identifying What Are Behaviors and Practices

▶ **The Dead Person's Rule**

- If a dead person can do it, it is not a behavior
- “Not doing something” is not a behavior
- Reverse such descriptions and use techniques that reduce behavior

▶ **Which of these fail(s) the Dead Person's Rule?**

1. Stop reading and sending email messages during meetings
2. Leave no child behind
3. Produce no defects
- ★ 4. Produce defect-free software
- ★ 5. Arrive on time at least 95% of the time.

Positive and Negative Reinforcement, Extinction, Penalty



The “Hidden” Incentive Systems

- ▶ Naturally-occurring incentive systems are always in place
- ▶ Incentives and disincentives, when used in this sense, are consequences that follow or accompany behavior. They resonate or “dissonate” with a person’s values
- ▶ Incentives create and direct motives
- ▶ Those in place naturally and informally are a major cause of measurement side-effects.

The Motivation Matrix

	<i>... What Is Wanted</i>	<i>... What Is Feared</i>
<i>Give ...</i>	= Positively Reinforce	= Penalize
<i>Withhold ...</i>	= Extinguish	= Negatively Reinforce

Penalty and Extinction Reduce Behavior

▶ **Penalty**

- When a person *receives something that is feared*, as a consequence of doing *what the giver did not want done*, this is called **penalty**
- Behavioral psychology uses the terms “punish” and “punishment”

▶ **Extinction**

- When a person fails to receive what is wanted, and this failure is a consequence of doing something the potential giver did not want done, this is called extinction
- In psychology, extinction is the effort to eradicate, rather than the final result.

Penalty Example

- ▶ **Example:** An employee who breaks the law or violates the company's ethical standards can expect to be fired
- ▶ **Behavior:** specific violation of law or ethics
- ▶ **Penalty:** termination of employment, and possibly other civil and criminal consequences
- ▶ The expectation of the consequence reduces the likelihood the behavior will occur.

Extinction Example

- ▶ **Example:** The Boy Who Cried “Wolf”
- ▶ **Behavior:** Coming in answer to cries for help
- ▶ **Positive Reinforcer:** Save the flock and member of the community

Repeated failure to receive the expected consequence decreases the likelihood the behavior will occur

The day came when his cries did not produce the expected response. The boy had been extinguishing the rescue behavior

That was an unintended consequence of the boy meeting his own desire for entertainment or attention.

Negative and Positive Reinforcement Increase Behavior

▶ Negative Reinforcement

- When a person ***avoids*** receiving what is feared, as a consequence of doing what the potential giver wants done, the withholding of that feared consequence is called a negative reinforcement
- Negative reinforcement can only occur when there is an expected penalty for the behavior's opposite

▶ Positive Reinforcement

- When a person ***receives*** what one wants as a consequence for doing something the giver wants done, that process, and that which is given and received, are called positive reinforcement
- It is more effective in motivating behavior than negative reinforcement.

Reinforcement Example – Income Tax

▶ **Negative Reinforcement**

- Behavior: pay income tax due by the filing deadline
- Potential penalty: late fees and interest
- The expectation of the negative consequences increases the likelihood the preventive behavior will occur

▶ **Positive Reinforcement**

- Behavior: file income tax forms early
- Reinforcement: receiving one's refund
- The expectation of the positive consequence increases the likelihood the behavior will occur
- Positive reinforcement encourages early performance.

Unintended Consequences of Late Payment Penalties

- ▶ Penalties decrease behavior
- ▶ Once the deadline passes, paying on time is not possible
- ▶ The only possible, desired behavior after the deadline is paying late
- ▶ Paying late is penalized
- ▶ Possible result: not paying at all.

Intrinsic and Extrinsic Reinforcement

- ▶ A person's thoughts, hopes, fears and values can motivate and incentivize behavior. This inner motivation is called ***intrinsic reinforcement***. The strength of such intrinsic reinforcement varies greatly
- ▶ When the motivation comes from outside the person, such as payment, promotion, applause, recognition, etc., this is called ***extrinsic reinforcement***
- ▶ Common Mistakes in Understanding
 - One-Size-Fits-All
 - Reinforcers are only extrinsic
 - Reinforcers are only tangible.

More on Why Unintended Consequences Occur

- ▶ Delayed reinforcement allows other behaviors to intervene, which may seem to be reinforced
- ▶ Reinforcement is strongest when delivered ...
 - immediately,
 - intermittently,
 - and in varying intervals
- ▶ These factors are reasons why unintended consequences are so durable ... informal, natural reinforcement systems possess those three characteristics
- ▶ Make sure your measurements do not reinforce bad behaviors and penalize desired ones
- ▶ ***Anecdotal Example: Schedule Quality.***

Why Understand Behavioral Psychology?

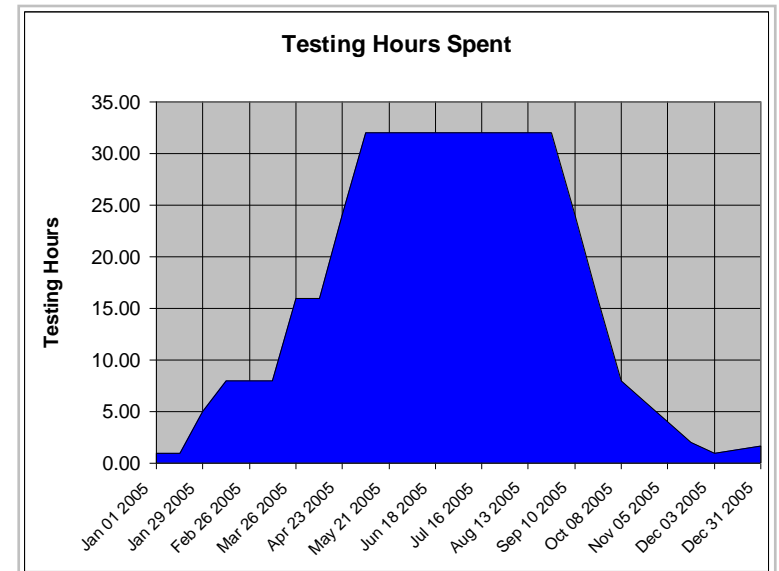
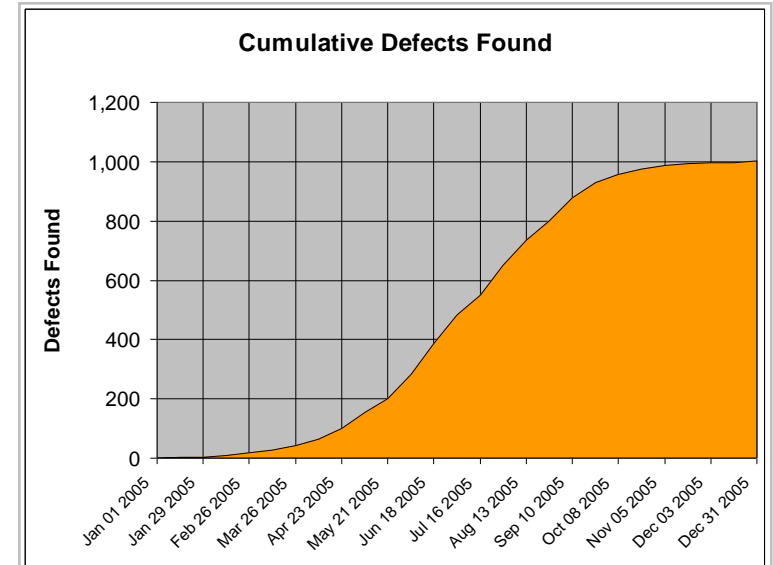
- ▶ Not to make you feel you should set up such a program, ...
- ▶ ... but to help you understand that such dynamics already exist naturally in a social environment
- ▶ Understanding these will explain behaviors that otherwise seem to come out of nowhere, and will guide your efforts
- ▶ Reporting and displaying measures reinforces or penalizes what people are doing; not doing so can extinguish desired behaviors
- ▶ Achieving the desired measure values can be intrinsic motivation
- ▶ Measure that on which you want people to focus attention
- ▶ Make sure to measure things under their control (practices).

Triangulate

▶ Triangulate to Increase Measurement Depth Perception

▶ *Example*

- Defect Density
- Defect Detection Effort
- Others could be used, too:
 - *Test Coverage*
 - *Defect Detection Effectiveness.*



Preserving Innovation

- ▶ Misapplication of process and measurement methodology can extinguish innovation
- ▶ Continual improvement must be a measured goal, otherwise, innovation will cease
- ▶ Require the organization to document all planned and attempted improvements, including failed experiments
- ▶ Impose no penalty for well-documented, approved failures, otherwise:
 - undocumented, poorly-designed variations will be attempted
 - failures will be repeated
 - some innovations will not be attempted.

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