Can we create a sustainable government using the *INCOSE SE Measurement Primer*?

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Presentation Goals

- Introduce the concept of using systems engineering measurement protocols for the evaluation of lawmaking

- Show that the application of these protocols will be no different than the use of these protocols for the evaluation of any other system
  - The same practical approach to measurement that is used while creating airplanes or communication networks can be used in lawmaking

- Highlight the potential benefit systems engineers and a measurement system can make in government via the identification and removal of non-productive laws ***based on empirical evidence***

- Encourage further consideration of ways the systems engineering community can enhance lawmaking

Science of Laws Institute

- Founded in 1995 as California-based Non-Profit

- Mission: Establish the science and engineering disciplines of laws
  - Science – Measuring the structure and mechanics of laws
  - Engineering – Evolving tools and techniques for law design

- Hosts joint annual conference with San Diego INCOSE chapter

- Publishes *Science of Laws Journal*

Problem Statement

- In its current form, the U.S. government is *financial unsustainable*

- The US national debt is rising 36% faster than the economy and the current amount of that debt exceeds $21 trillion (Business Insider, March 2018)
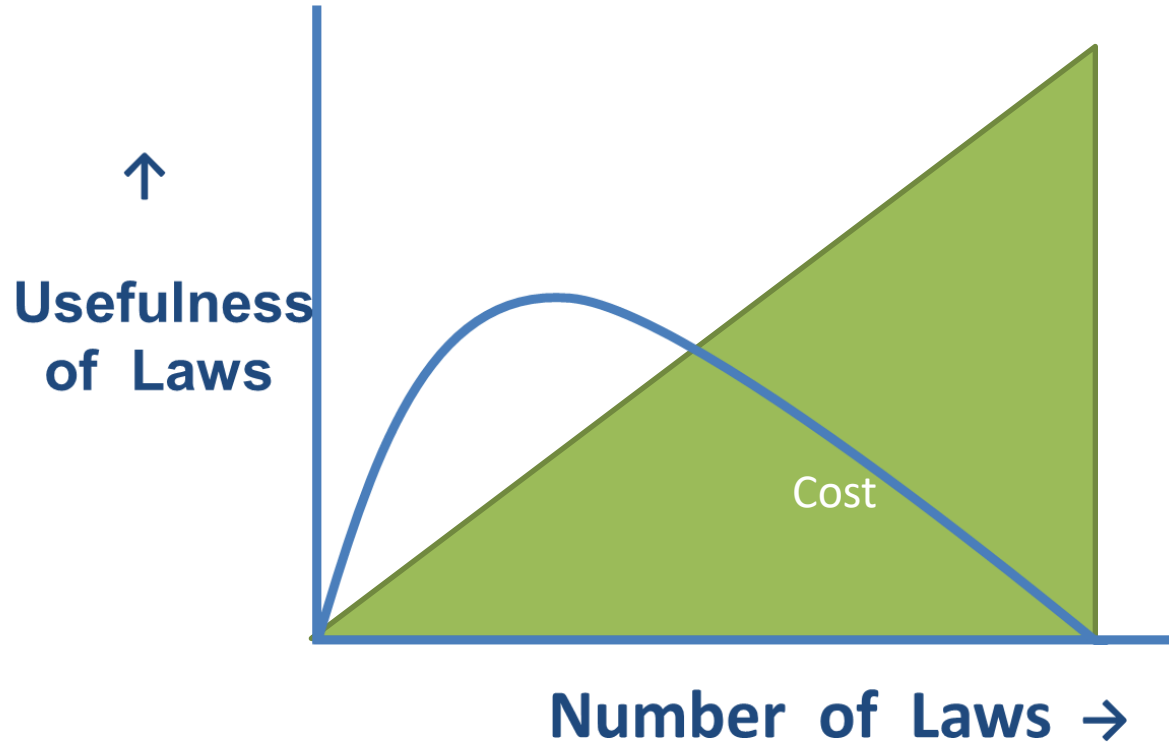
Research Area

- How might the U.S. government reconcile differences in societal needs and available budget?
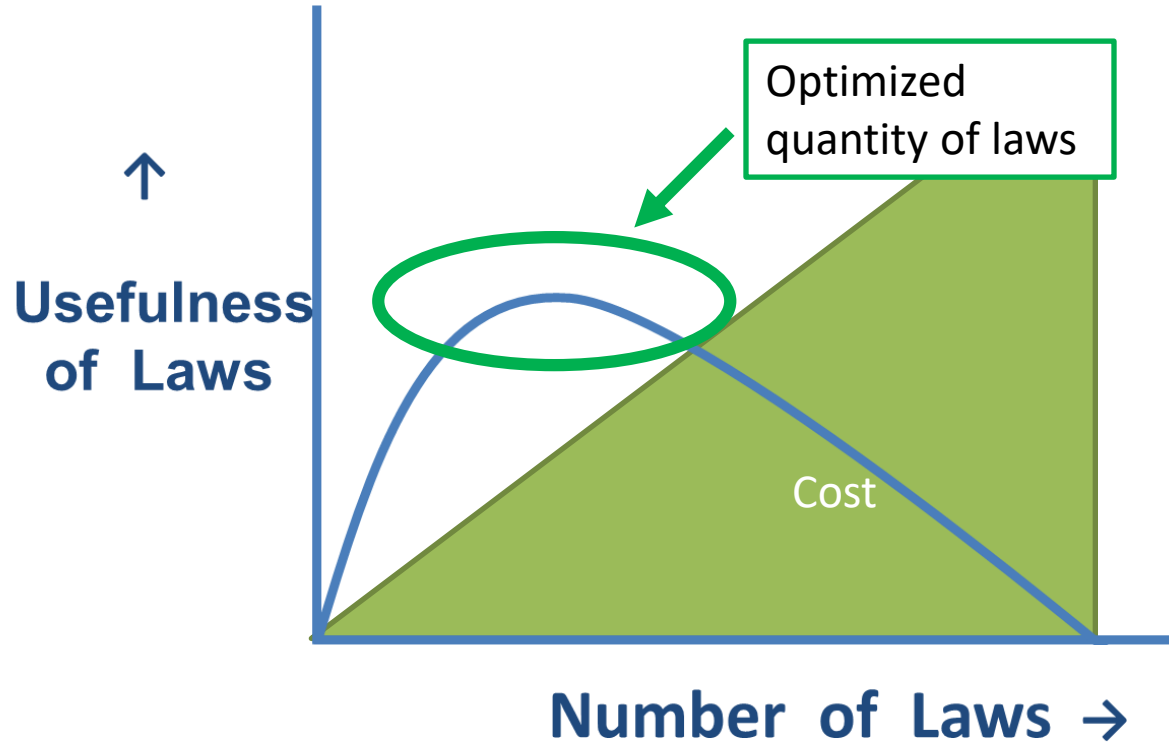
Utility Curve of Laws
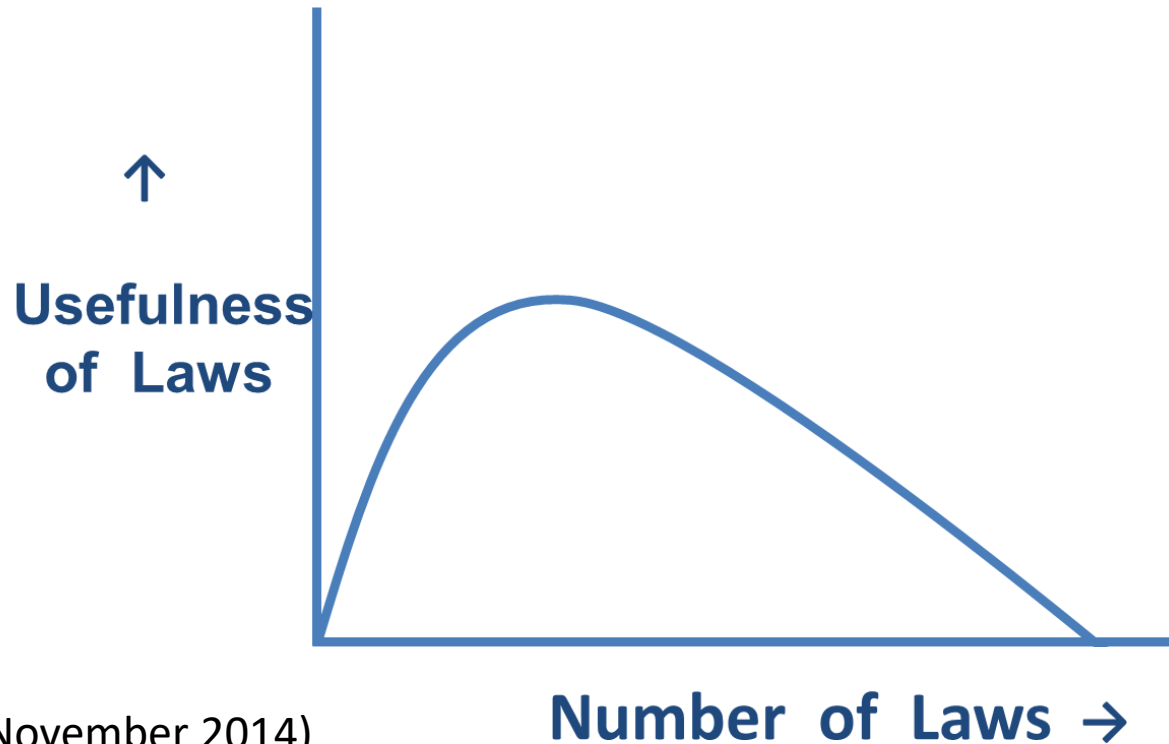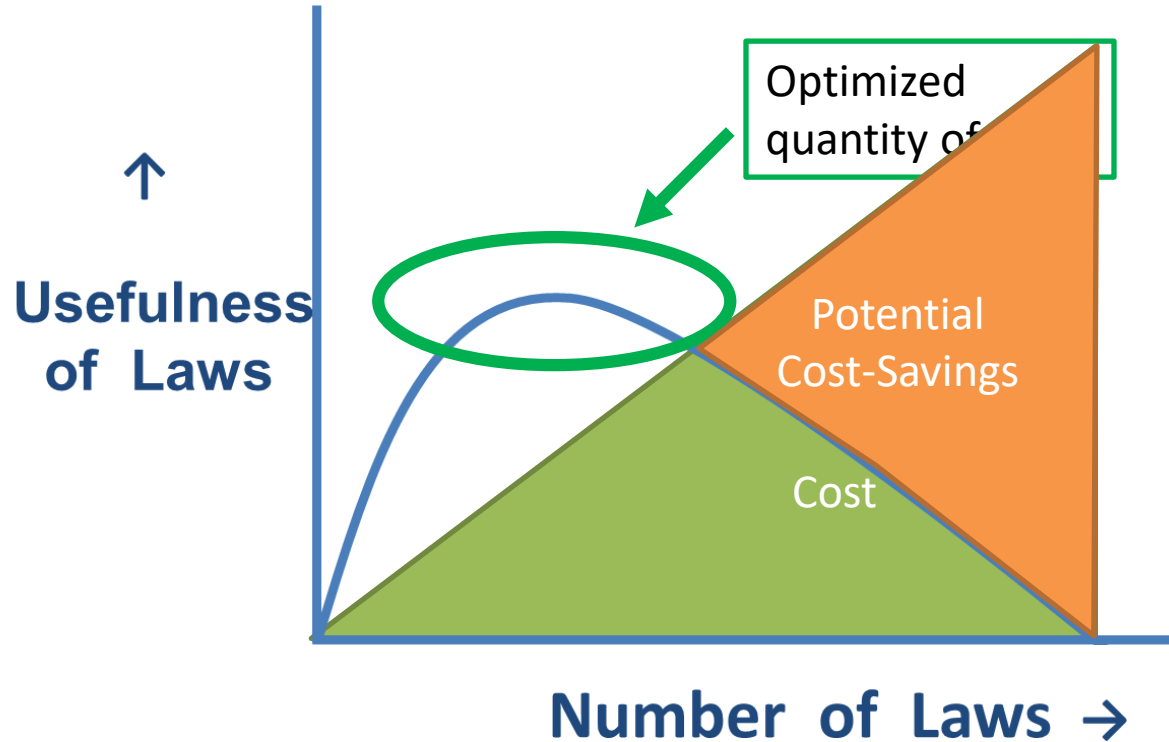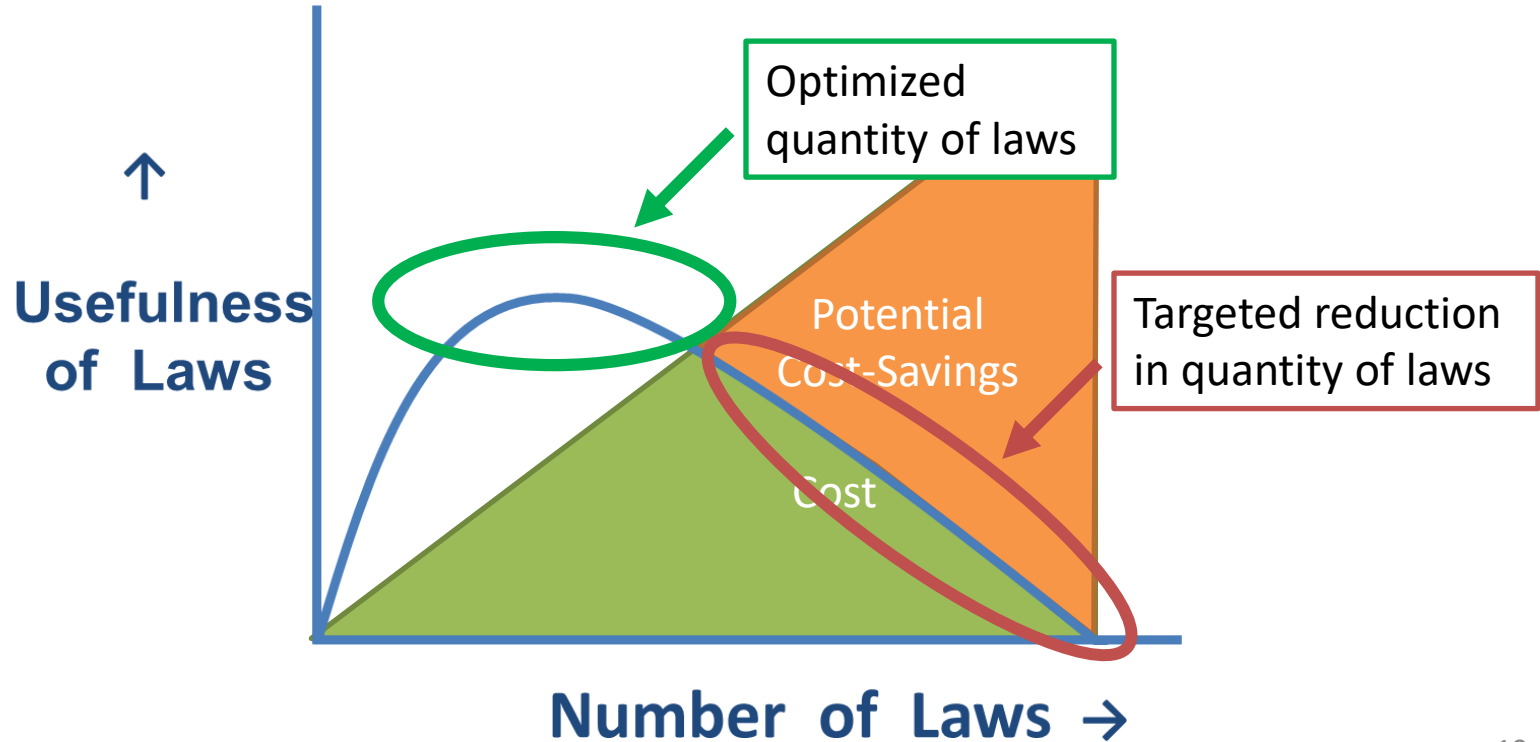

(Schrunk, November 2014)

Utility Curve of Laws

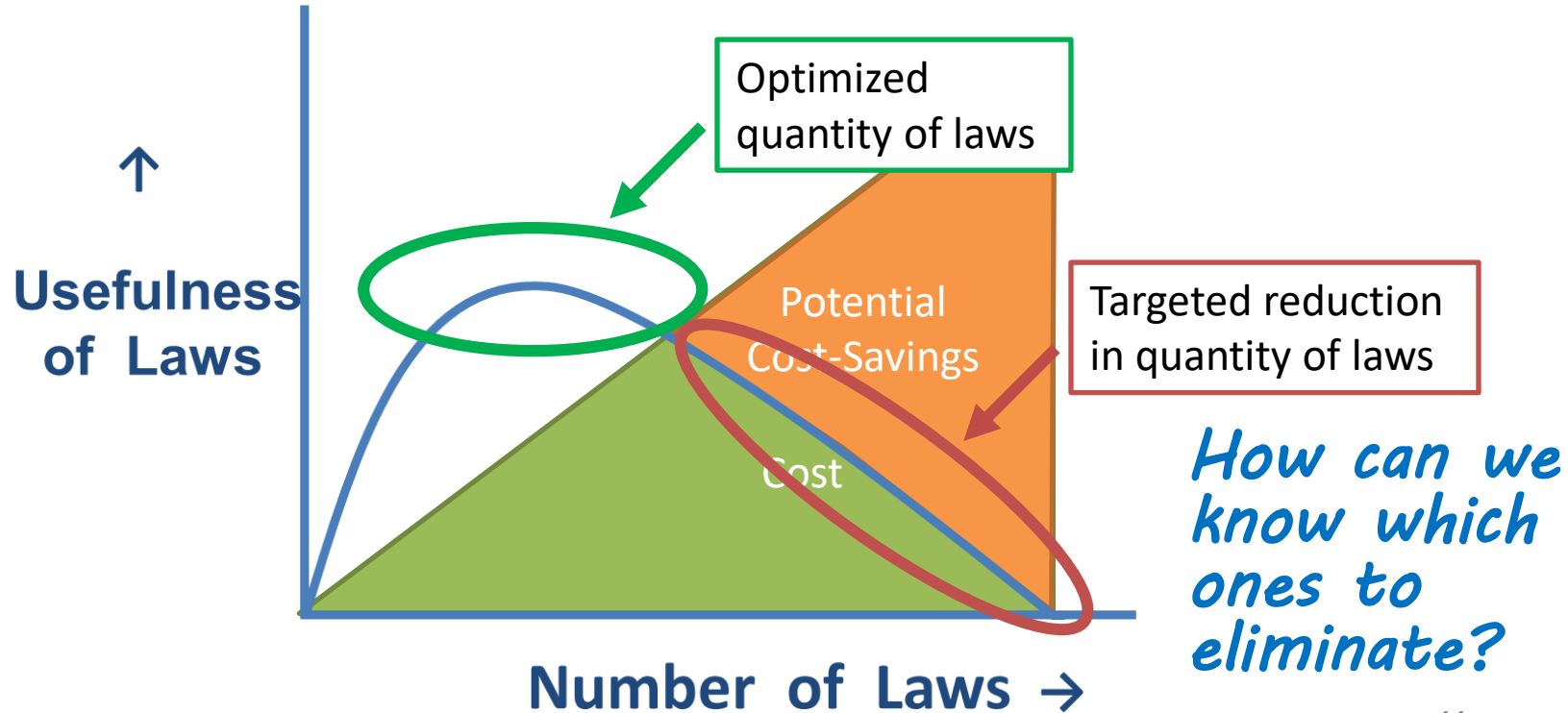# Utility Curve of Laws

Utility Curve of Laws

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Utility Curve of Laws

Hypothesis

- The U.S. government can reconcile differences in societal needs and available budget through the tailoring and adoption of the concepts detailed in the INCOSE *Systems Engineering Measurement Primer*.

    – Create a feedback control system for lawmaking

    – Institute quality assurance program for lawmaking

    – Modify or eliminate non-productive laws

INCOSE Systems Engineering Measurement Primer v2.0
Document No.: INCOSE-TP-2010-005-02
5 November 2010

Systems Engineering Measurement Primer

A Basic Introduction to Measurement Concepts and Use for Systems Engineering

Document No.:   INCOSE-TP-2010-005-02
Version/Revision: 2.0
Date: 5 November 2010
File: INCOSE Measurement Primer 2010-1105 FINAL.docx

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Why the SE Measurement Primer?

Per the primer:

- Measures offer the insight needed for planning, controlling, managing, and improving many aspects of projects and products including:
  - Adequacy of performance
  - Resources and cost
  - Growth and stability
  - Effectiveness
  - Customer satisfaction

Measurement as a Feedback Control System

Figure 2-1: Measurement as a Feedback Control System

Current Lawmaking

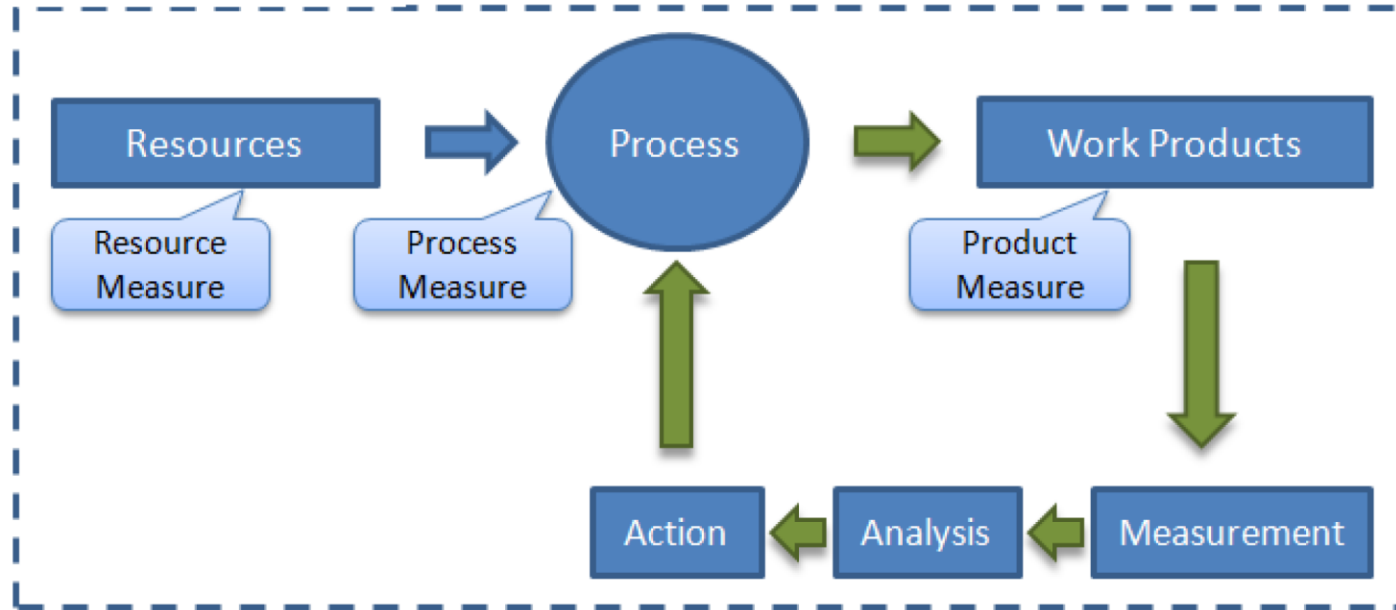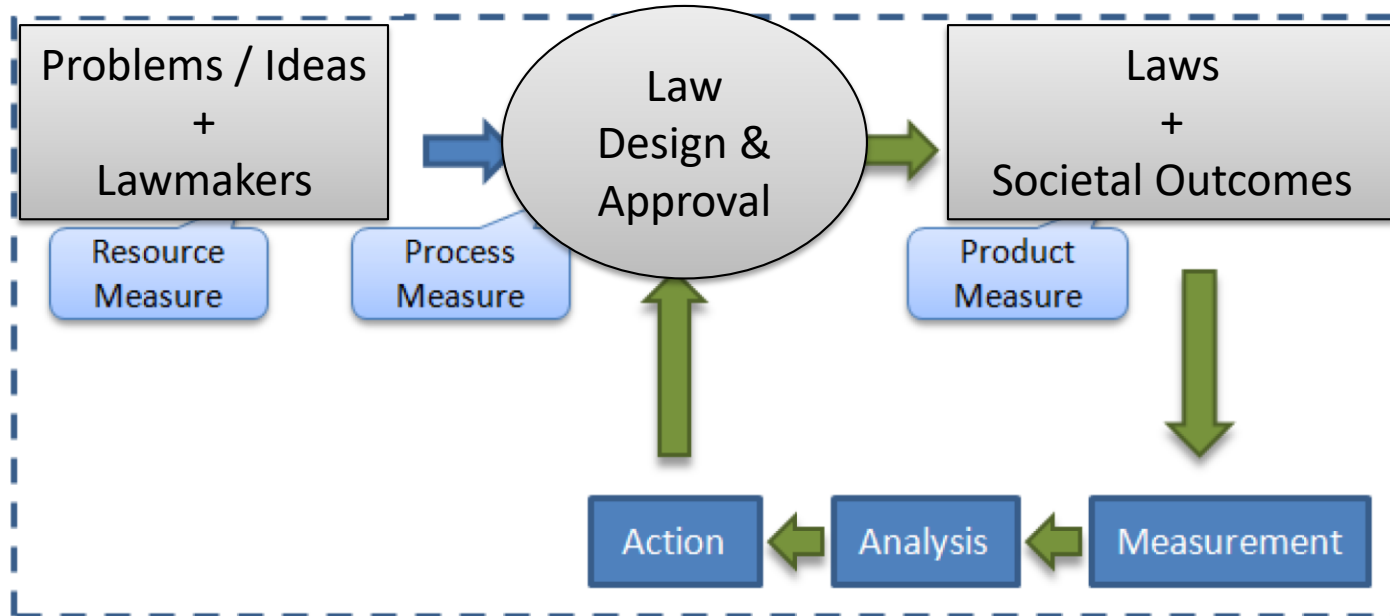**Figure 2-1: Measurement as a Feedback Control System**

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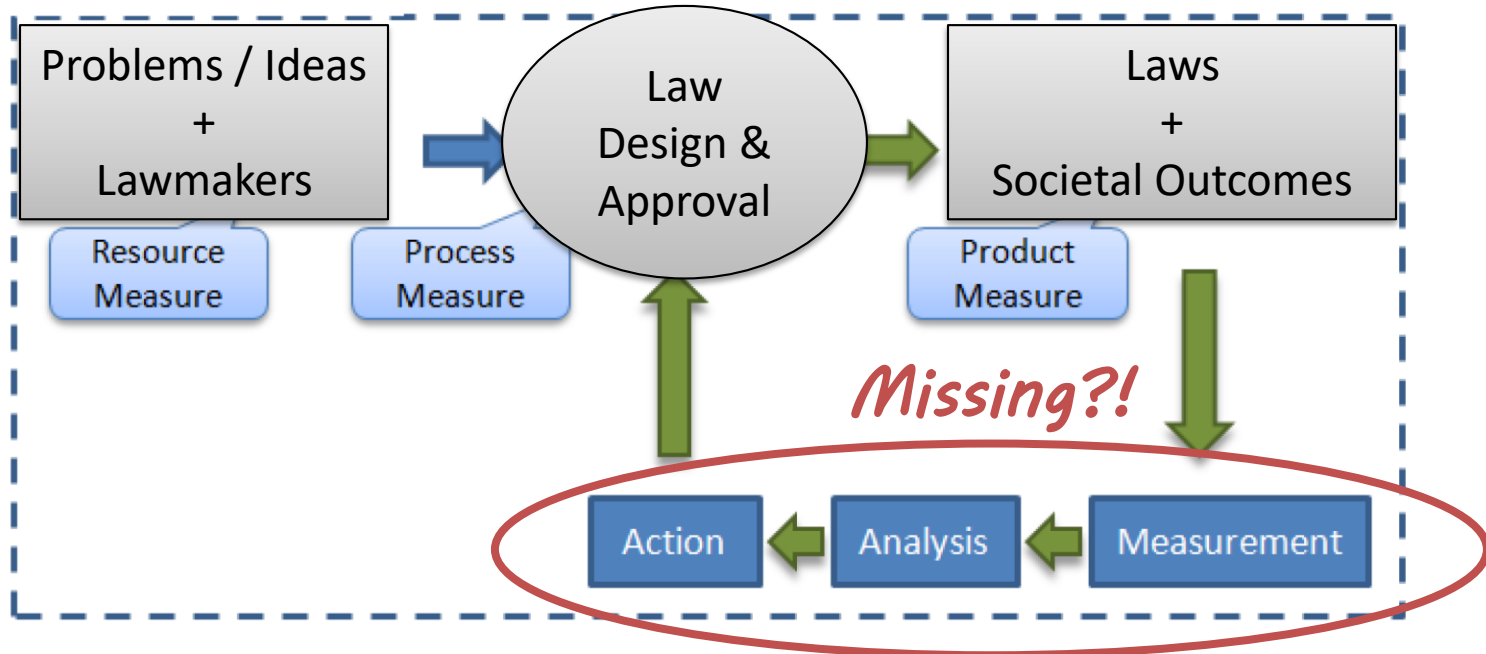
Figure 2-1: Measurement as a Feedback Control System

SE Measurement Primer Structure

1. Introduction
2. Business Value of Measurement
3. Measurement Process
4. Application Guidance and Lessons Learned
5. Example Measures
6. Summary
7. References
8. Key Measurement Terms
9. Feedback Form

SE Measurement Primer Structure

1. Introduction
2. Business Value of Measurement
    2.2 Purpose of Measurement
    2.3 Uses of Measurement
3. Measurement Process

} *Focus of this study*

4. Application Guidance and Lessons Learned
5. Example Measures
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Initial Analysis

- Evaluate if applicable to lawmaking:
  - 2.2 Purpose of Measurement
  - 2.3 Uses of Measurement

- Estimate level of difficulty to implement in lawmaking:
  - 3. Measurement Process

2.2 Purpose of Measurement

Purpose of Measurement

- Communicate effectively throughout the project organization
- Identify and correct problems early
- Make key tradeoffs
- Track specific project objectives
- Defend and justify decisions

Communicate Effectively Throughout the Project Organization

- Effective status reporting tool, especially in graphical form
- Provide quantified information related to process, progress, and/or product
- Increases awareness
- Reduce uncertainty and ambiguity
- Support risk analysis
- Introduce unique terminology for all concepts, activities, tasks, and entities

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Applicable to lawmaking?

If so, how?

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Applicable to lawmaking? Yes

If so, how?
- Stakeholders could benefit from common terminology and data when discussing:
  – Lawmaking process
  – Concepts and mechanisms for new laws
  – Proposed changes to existing laws

Identify and Correct Problems Early

- Identify problems
- Take action to limit impact
- Manage risks before they become issues
- Identify root cause to determine appropriate corrective and preventive actions
- Apply and use leading indicators and trends

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- Apply and use leading indicators and trends

Applicable to lawmaking? Yes

If so, how?
- Identify and correct:
  – Risks related to laws
  – Ineffective laws
  – Unanticipated consequences related to laws

Make Key Tradeoffs

- Aid in choosing between two or more alternatives

- Quantify different aspects (e.g., maintainability, design cost, reuse) of each alternative

- Base decisions on credible facts rather than subjective opinions

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- Base decisions on credible facts rather than subjective opinions

Applicable to lawmaking? Yes

If so, how?

- Support tradeoff decisions, including:
  - Differing approaches to solving same societal problem
  - Choosing which laws to enact and/or retire to remain within budget

Track Specific Project Objectives

- Understand current progress towards objectives

- Decide whether to continue with current plans or make revisions

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Applicable to lawmaking? Yes

If so, how?

- Understand current state of lawmaking process

- Understand current progress towards objective(s) of a law

Defend and Justify Decisions

- Useful for informed decision making
- Can be used to later defend or justify decisions made

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Applicable to lawmaking? Yes

If so, how?

- Defend and justify:
  - Keeping or removing laws based on performance
  - Keeping or removing laws based on burden vs. benefit

Summary of Findings

Measurement Purpose	Applicable?
Monitor the progress and performance of activities	Yes ✓
Communicate effectively throughout the project organization	Yes ✓
Identify and correct problems early	Yes ✓
Make key tradeoffs	Yes ✓
Track specific project objectives	Yes ✓
Defend and justify decision	Yes ✓

2.3 Uses of Measurement

Uses of Measurement

- <u>Characterize</u>: Gain Understanding of Products and Processes

- <u>Improve</u>: Identifying and Evaluating Improvement Opportunities

- <u>Predict</u>: Facilitating Projections and Planning

- <u>Evaluate</u>: Providing Feedback and Status

Characterize: Gain Understanding of Products and Processes

- Measure process performance
  - Efficiency
  - Effectiveness
- Measure technical performance
  - Measure areas where performance is critical
  - Compare value to expected value over time

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- Measure technical performance
  - Measure areas where performance is critical
  - Compare value to expected value over time

Applicable to lawmaking? Yes

If so, how?
- Measure duration from problem identification to enacted law
- Measure effects of laws
  - Intended
  - Unintended

Improve: Identifying and Evaluating Improvement Opportunities

- Analyze and combine measures to form indicators for improvement opportunities
- Identify variance
- Quantify improvements made
- Enable quantitative process management
  - Establishing goals for performance of processes
  - Collecting and analyzing the measures of process performance
  - Making adjustments to maintain process performance within acceptable limits

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Applicable to lawmaking? Yes

If so, how?
- Identify and evaluate improvement opportunities related to:
  - Efficiencies in lawmaking process
  - Effectiveness of laws
  - Side effects of laws
  - Financial burden of laws

Predict: Facilitating Projections and Planning

- Improve predictions and planning through use of historical data

- Formulate statistical and causal models for predictions

- Aid in budgeting, scheduling, and planning new projects

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Predict: Facilitating Projections and Planning

- Improve predictions and planning through use of historical data
- Formulate statistical and causal models for predictions
- Aid in budgeting, scheduling, and planning new projects

Applicable to lawmaking? Yes

If so, how?
- Predict effectivity of laws
- Predict time required to observe positive effect of law
- Predict financial burden of law
- Predict needs and costs of supporting infrastructure (e.g., permitting office to review building codes)

Evaluate: Providing Feedback and Status

- Provide feedback to team or customer
  - Customer satisfaction
  - Product penetration
  - Team effectiveness

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Applicable to lawmaking?

If so, how?

Evaluate: Providing Feedback and Status

- Provide feedback to team or customer
  - Customer satisfaction
  - Product penetration
  - Team effectiveness

Applicable to lawmaking? Yes

If so, how?
- Provide feedback related to:
  - Citizen satisfaction
  - Penetration of law within citizenry
  - Penetration of law within enforcement agencies
  - Effectiveness of law-design team

Summary of Findings

Measurement Use	Applicable?
Characterize: Gain Understanding of Products and Processes	Yes ✓
Improve: Identifying and Evaluating Improvement Opportunities	Yes ✓
Predict: Facilitating Projections and Planning	Yes ✓
Evaluate: Providing Feedback and Status	Yes ✓

3. Measurement Process

Measurement Process

- Establish Commitment
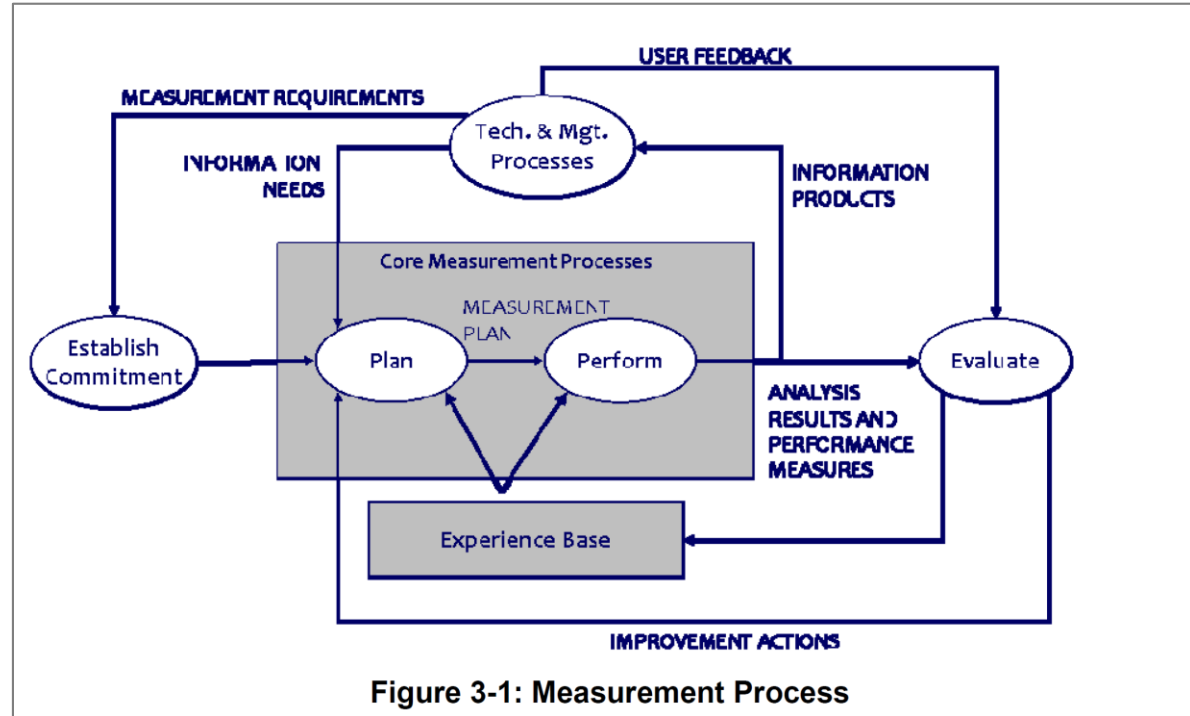- Plan
- Perform
- Evaluate

Figure 3-1: Measurement Process

Establish Commitment

- Understanding change required in organizational culture and infrastructure
- Defining focus and scope of the measurement program
- Providing funding, resources, and training
- Participating in the process as a measurement user

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Level of difficulty in lawmaking?

Resource needs?

Establish Commitment

- Requires change in organizational culture and infrastructure
- Defining focus and scope of the measurement program
- Providing funding, resources, and training
- Participating in the process as a measurement user

Level of difficulty in lawmaking? High

Critical needs?
- Measurement tools and techniques
- Training
- Funding

Plan

- Align measurement with organizational needs
- Identify and prioritize information needs
- Specify measures that satisfy information needs
- Define data collection, analysis, storage, and reporting
- Define criteria for evaluating the measurement plan
- Allocate resources to measurement
  - Must account for cultural and organizational change
- Acquire and deploy supporting technologies

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Level of difficulty in lawmaking?

Critical needs?

Plan

- Align measurement with organizational needs
- Identify and prioritize information needs
- Specify measures that satisfy information needs
- Define data collection, analysis, storage, and reporting
- Define criteria for evaluating the measurement plan
- Allocate resources to measurement
  - Must account for cultural and organizational change
- Acquire and deploy supporting technologies

Level of difficulty in lawmaking?
Medium

Critical needs?
- Agreement on measures, especially those related to effectiveness of laws and financial burden of laws
- Measurement tools and techniques
- IT infrastructure to support

Perform

- Integrate measurement into relevant project processes
- Collect, process, store, and verify measurement data
- Analyze data and develop information products
- Document, make recommendations, and communicate results to measurement users

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- Collect, process, store, and verify measurement data
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- Document, make recommendations, and communicate results to measurement users

Level of difficulty in lawmaking?

Critical needs?

Perform

- Integrate measurement into relevant project processes
- Collect, process, store, and verify measurement data
- Analyze data and develop information products
- Document, make recommendations and communicate results to measurement users

Level of difficulty in lawmaking? Low

Critical needs?
- Data collectors
- Reporting network
- Skilled analysts

Evaluate

- Measure performance of measurement process
- Evaluate feedback from measurement users

Evaluate

- Measure performance of measurement process
- Evaluate feedback from measurement users

Level of difficulty in lawmaking?

Critical needs?

Evaluate

- Measure performance of measurement process

- Evaluate feedback from measurement users

Level of difficulty in lawmaking? Low

Critical needs?

- Tools and techniques

Summary of Findings

Measurement Process	Level of difficulty?	
Establish commitment	High	🔴
Plan	Medium	🟠
Perform*	Low	🟢
Evaluate	Low	🟢

*Note: Perform in this context relates to measuring lawmaking factors and creating information products to support decision making. It does not include the decision making.
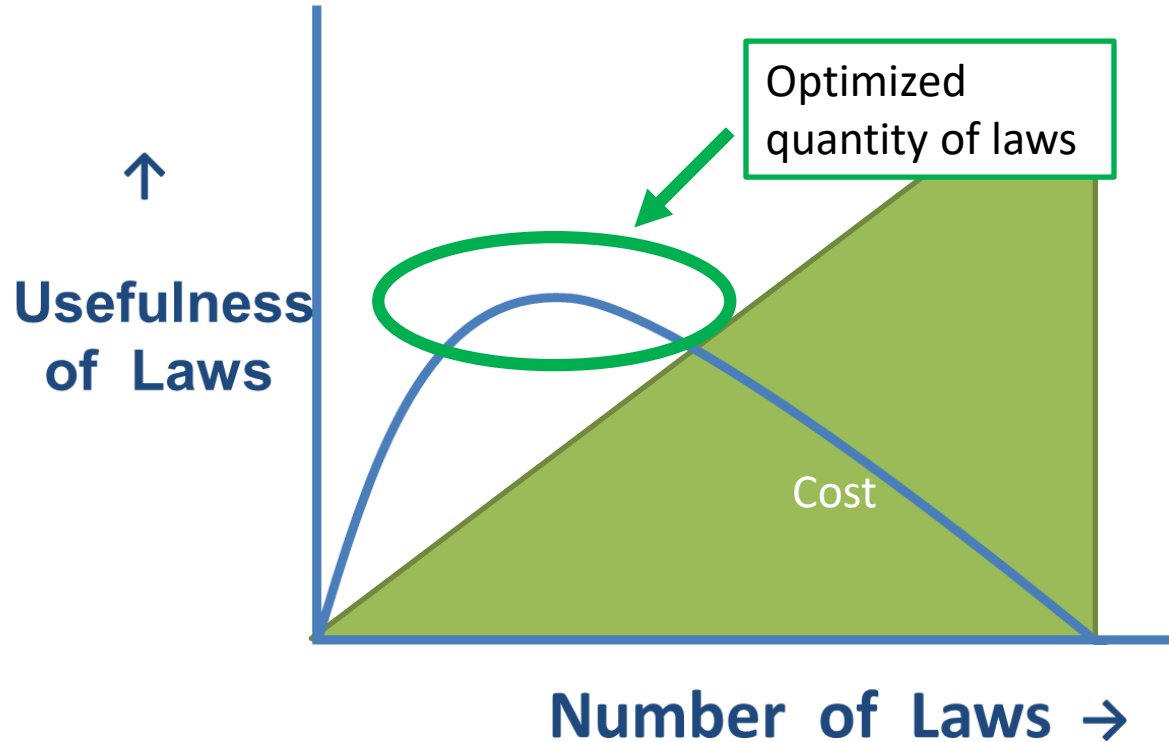
Conclusions and Next Steps

Conclusions

- The purpose and uses of measurement as described within the INCOSE SE Measurement Primer *are applicable to lawmaking*

- Introduction of a Measurement System would require:
  - Science – Measuring the structure and mechanics of laws
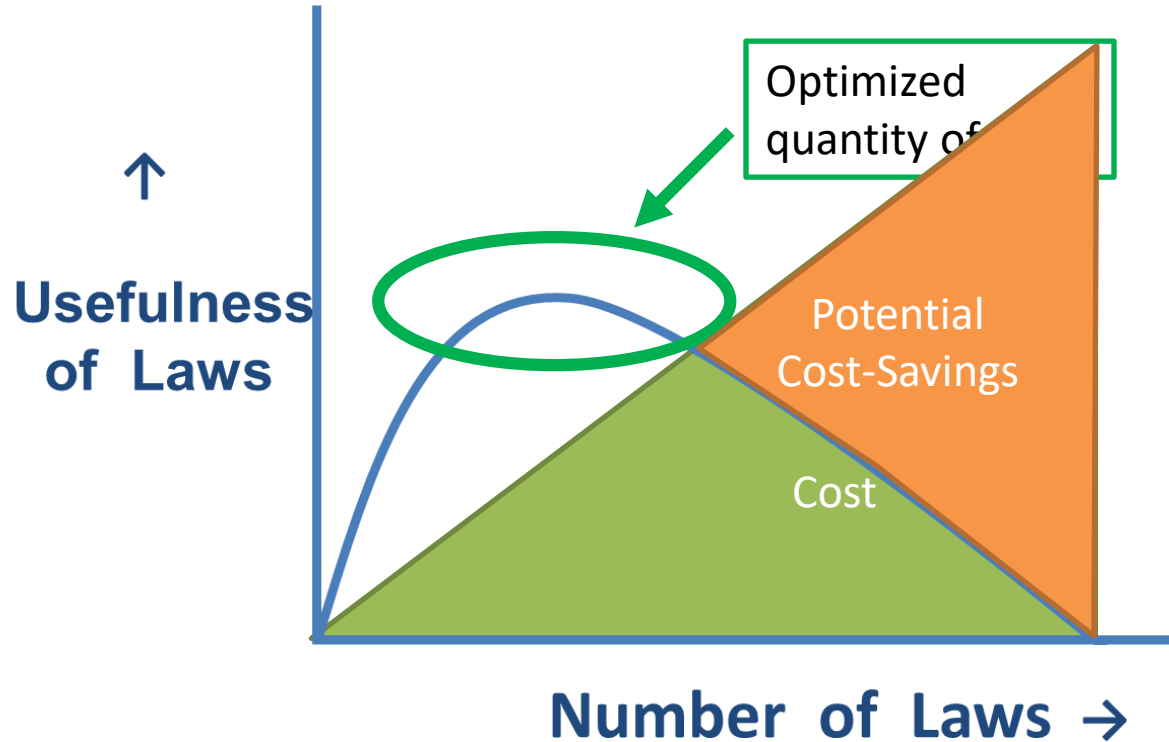 - Engineering – Maturing tools and techniques for law design
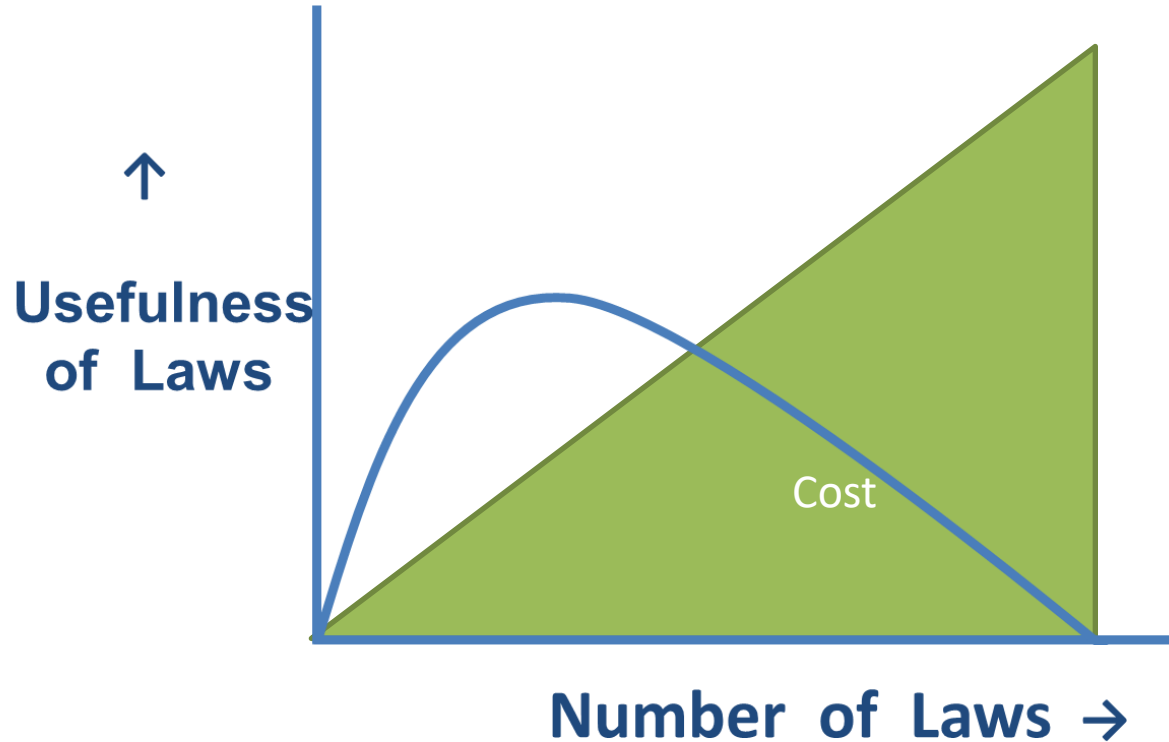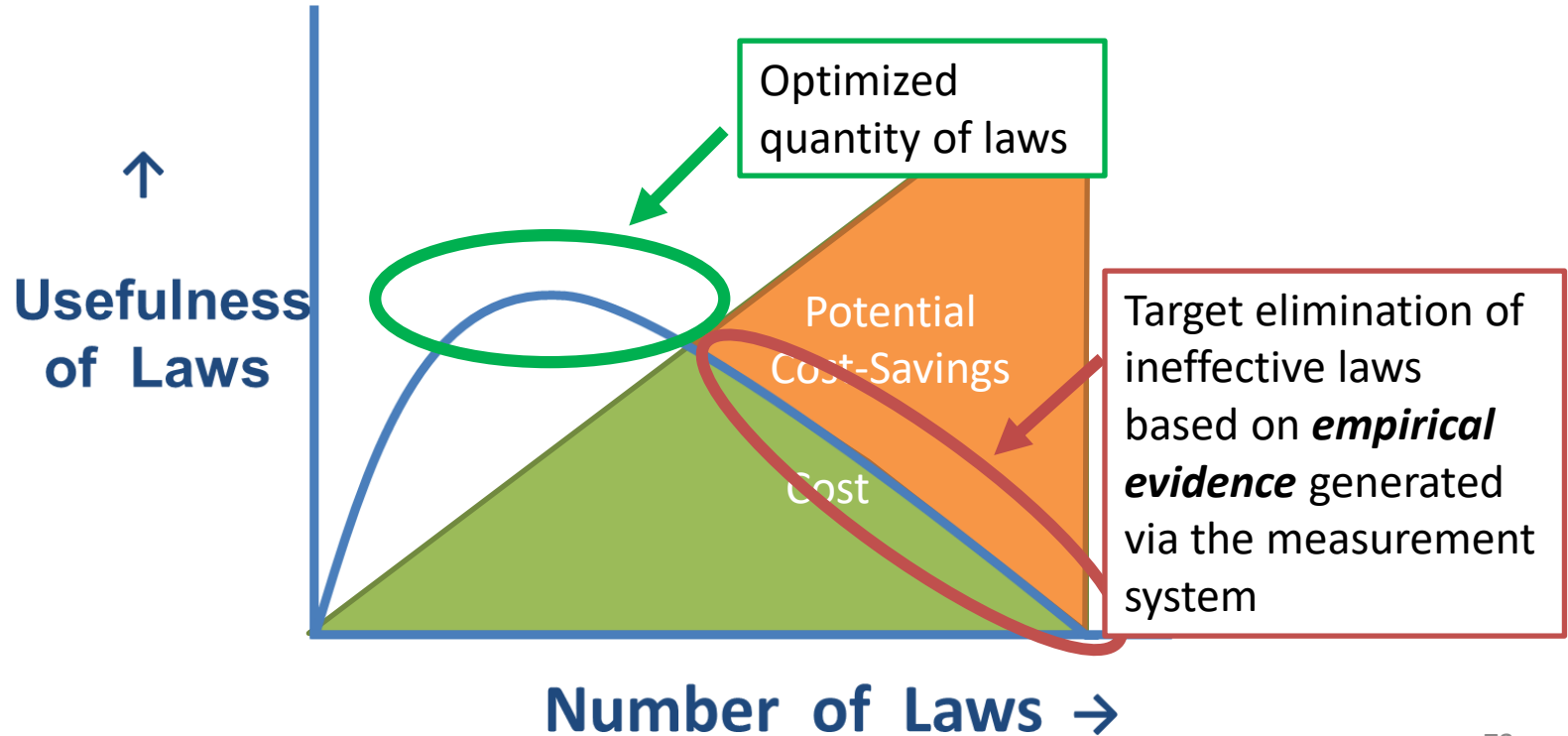
Path to Sustainability

Path to Sustainability

Optimized quantity of laws

Usefulness of Laws

Cost

Number of Laws →

Path to Sustainability

Usefulness of Laws

Optimized quantity of

Potential Cost-Savings

Cost

Number of Laws →

Path to Sustainability

Optimized quantity of laws

Potential Cost-Savings

Cost

Target elimination of ineffective laws based on *empirical evidence* generated via the measurement system

Usefulness of Laws

Number of Laws →

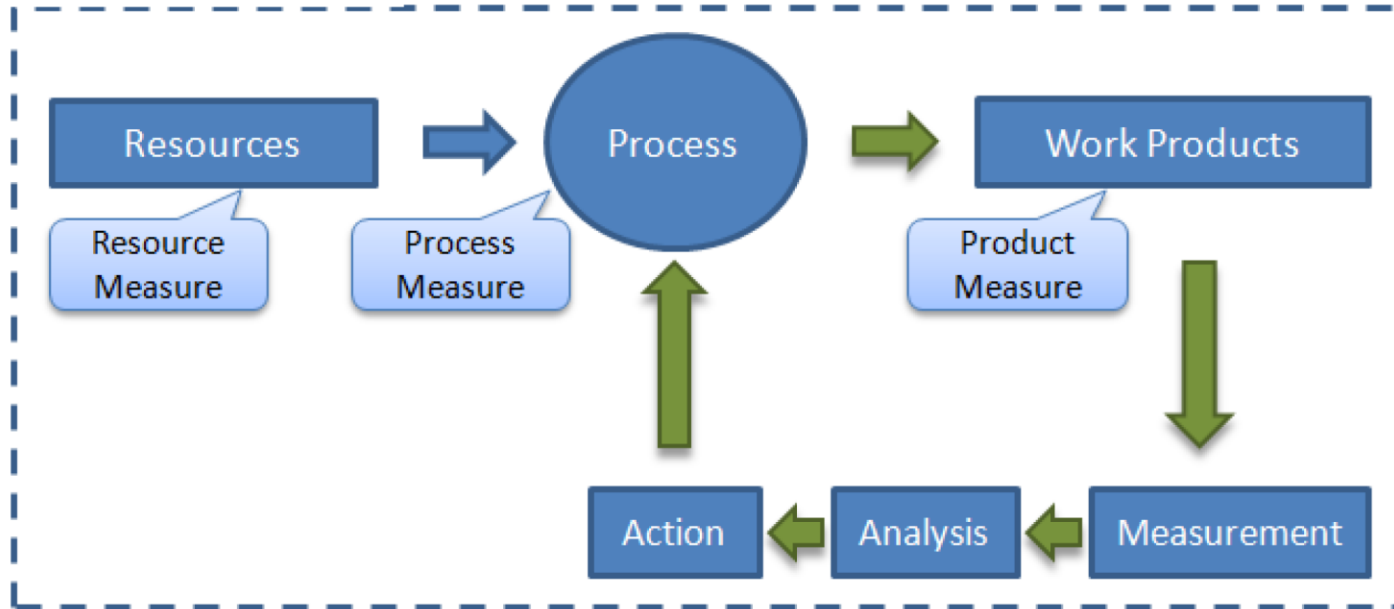73

Measurement as a Feedback Control System

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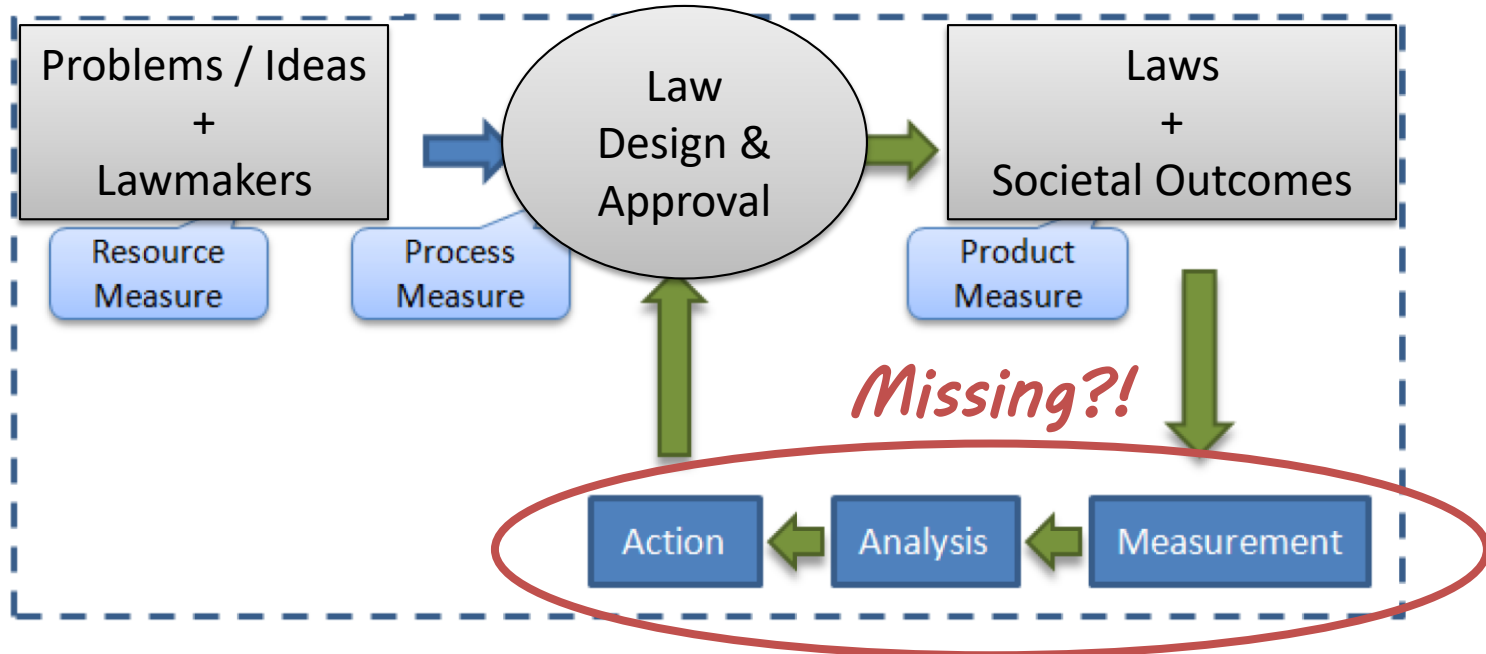
Current Lawmaking

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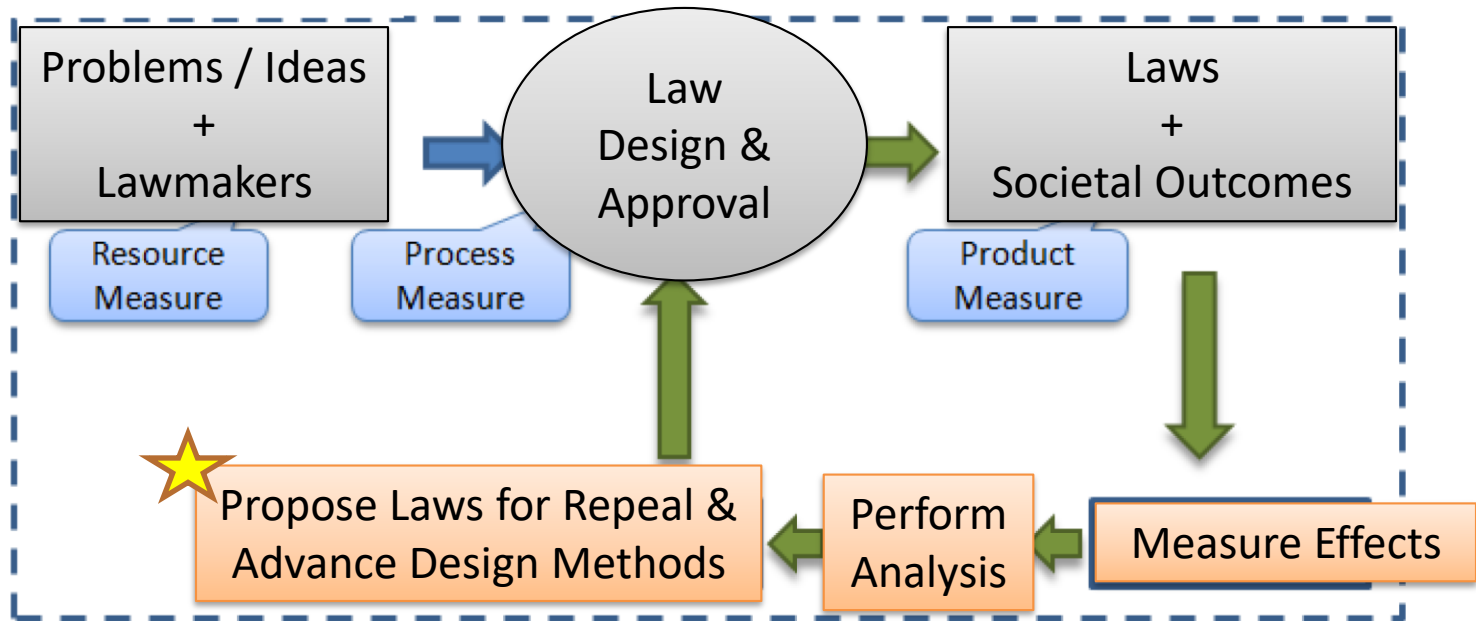
Future Lawmaking

Figure 2-1: Measurement as a Feedback Control System

Path to Sustainability

- Employ a measurement system for lawmaking

- Use measurement as a feedback control system
  - Identify poor performing laws (***based on empirical evidence rather than conjecture***)
  - Modify or repeal poor performing laws
  - Gain understanding in how to create high performing laws

- Over time, the body of laws will be optimized for the given constraints (***including available budget***), leading to a sustainable government

Next Steps

- Identify lawmaking body interested in employing measurement

- Educate and train relevant stakeholders

- Execute the planning process

- Perform and evaluate

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- Execute the planning process

- Perform and evaluate

- ***Document and publish findings along the way!***

Volunteers Needed

- Authors/Researchers
  - Conference submissions
  - Journal submissions
- Journal
  - Editor
  - Peer-reviewers
  - Technical writers
- Conference
  - Technical program chair
  - Review committee

- Outreach
  - Communications director
  - Student chapter development
  - Government liaisons
- INCOSE Working Group
  - Facilitator
  - Members

Contact Information

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Thank you!