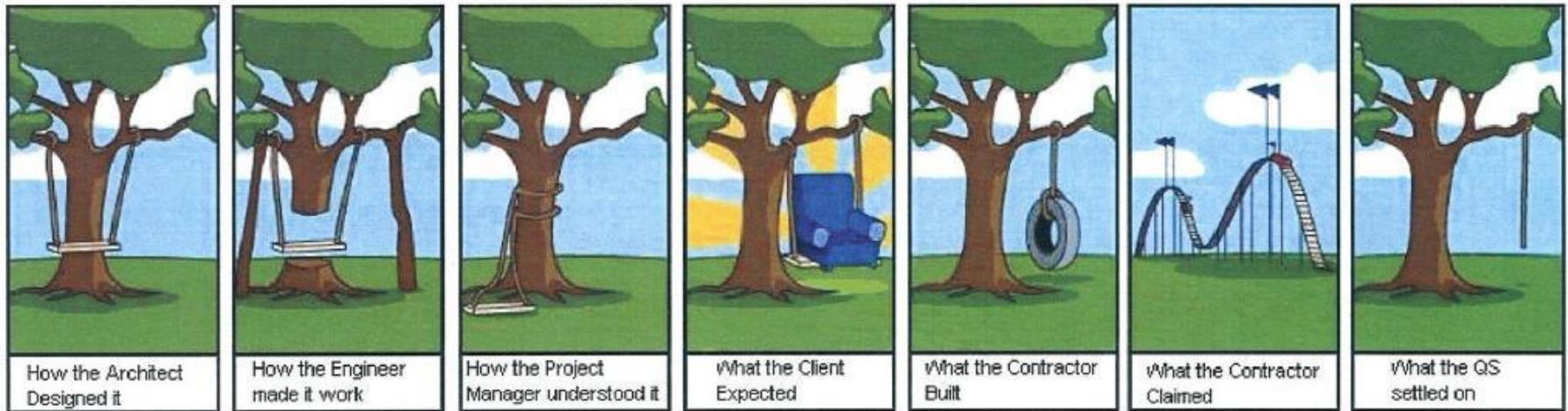


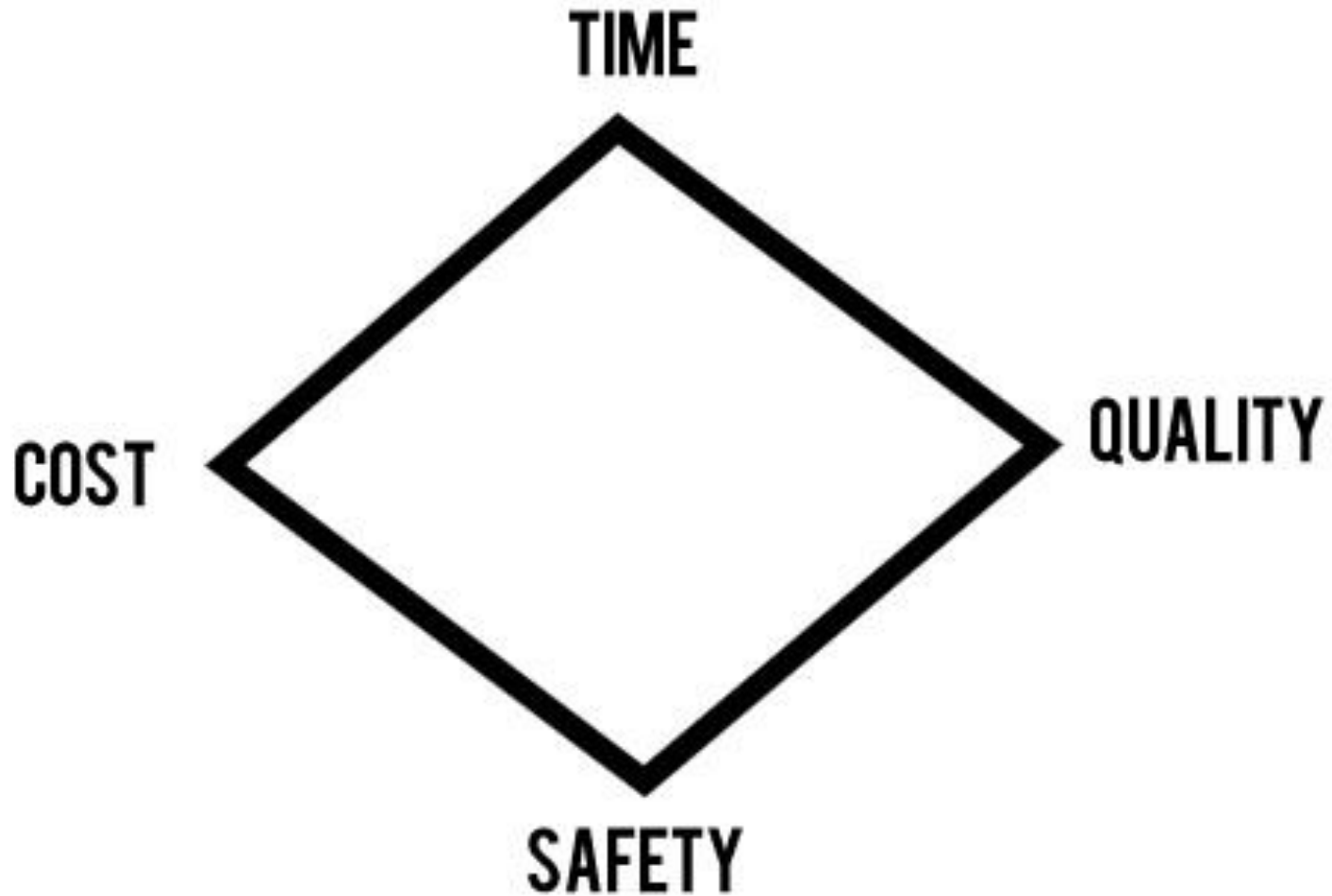
SIMILARITIES BETWEEN QUALITY & SAFETY IN CONSTRUCTION

Mark Stephens FIIRSM FInstLM FRSPH FISQEMA



THE CONSTRUCTION INDUSTRY EXPLAINED

Construction Project Success



Empirical Data

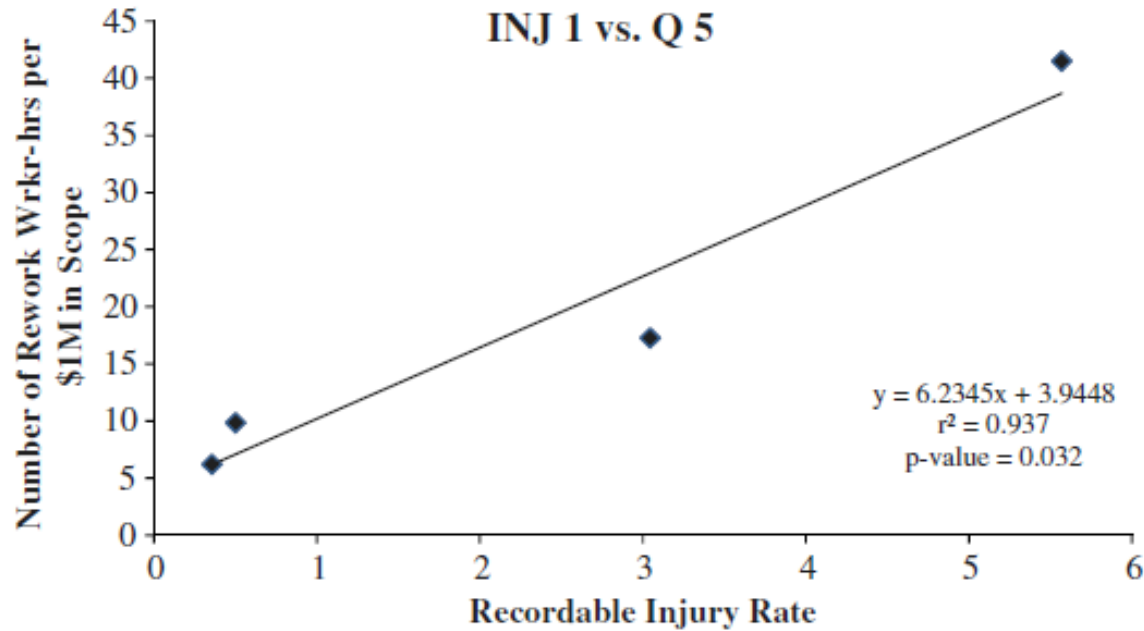


Fig. 1. Recordable injury rate per 200,000 worker-hours (INJ1) versus the number of worker-hours related to rework per \$1 million of scope of project completed (Q5)

Relationship between Construction Safety and Quality Performance

Successful Management Programs

Safety (OSHA)

Management Commitment
Employee Involvement
Hazard Identification
Control
Training
Accident Investigation

Quality (CQI)

Customer Satisfaction
Teamwork
Continuous Improvement
Training & Education
Employee Empowerment
Organizational Culture

Management System Requirements

| OHSAS 18001:2007 | | ISO 14001:2004 | | ISO 9001:2000 | |
|------------------|---|----------------|---|-------------------------------|--|
| — | Introduction | — | Introduction | 0 0.1 0.2 0.3 0.4 | Introduction General Process approach Relationship with ISO 9004 Compatibility with other management systems |
| 1 | Scope | 1 | Scope | 1 1.1 1.2 | Scope General Application |
| 2 | Normative references | 2 | Normative references | 2 | Normative reference |
| 3 | Terms and definitions | 3 | Terms and definitions | 3 | Terms and definitions |
| 4 | OH&S management system elements (title only) | 4 | Environmental management system requirements (title only) | 4 | Quality management system (title only) |
| 4.1 | General requirements | 4.1 | General requirements | 4.1 5.5 5.5.1 | General requirements Responsibility, authority and communication Responsibility and authority |
| 4.2 | OH&S policy | 4.2 | Environmental policy | 5.1 5.3 8.5.1 | Management commitment Quality policy Continual improvement |
| 4.3 | Planning (title only) | 4.3 | Planning (title only) | 5.4 | Planning (title only) |
| 4.3.1 | Hazard identification, risk assessment and determining controls | 4.3.1 | Environmental aspects | 5.2 7.2.1 7.2.2 | Customer focus Determination of requirements related to the product Review of requirements related to the product |
| 4.3.2 | Legal and other requirements | 4.3.2 | Legal and other requirements | 5.2 7.2.1 | Customer focus Determination of requirements related to the product |
| 4.3.3 | Objectives and programme(s) | 4.3.3 | Objectives, targets and programme(s) | 5.4.1 5.4.2 8.5.1 | Quality objectives Quality management system planning Continual improvement |
| 4.4 | Implementation and operation (title only) | 4.4 | Implementation and operation (title only) | 7 | Product realization (title only) |

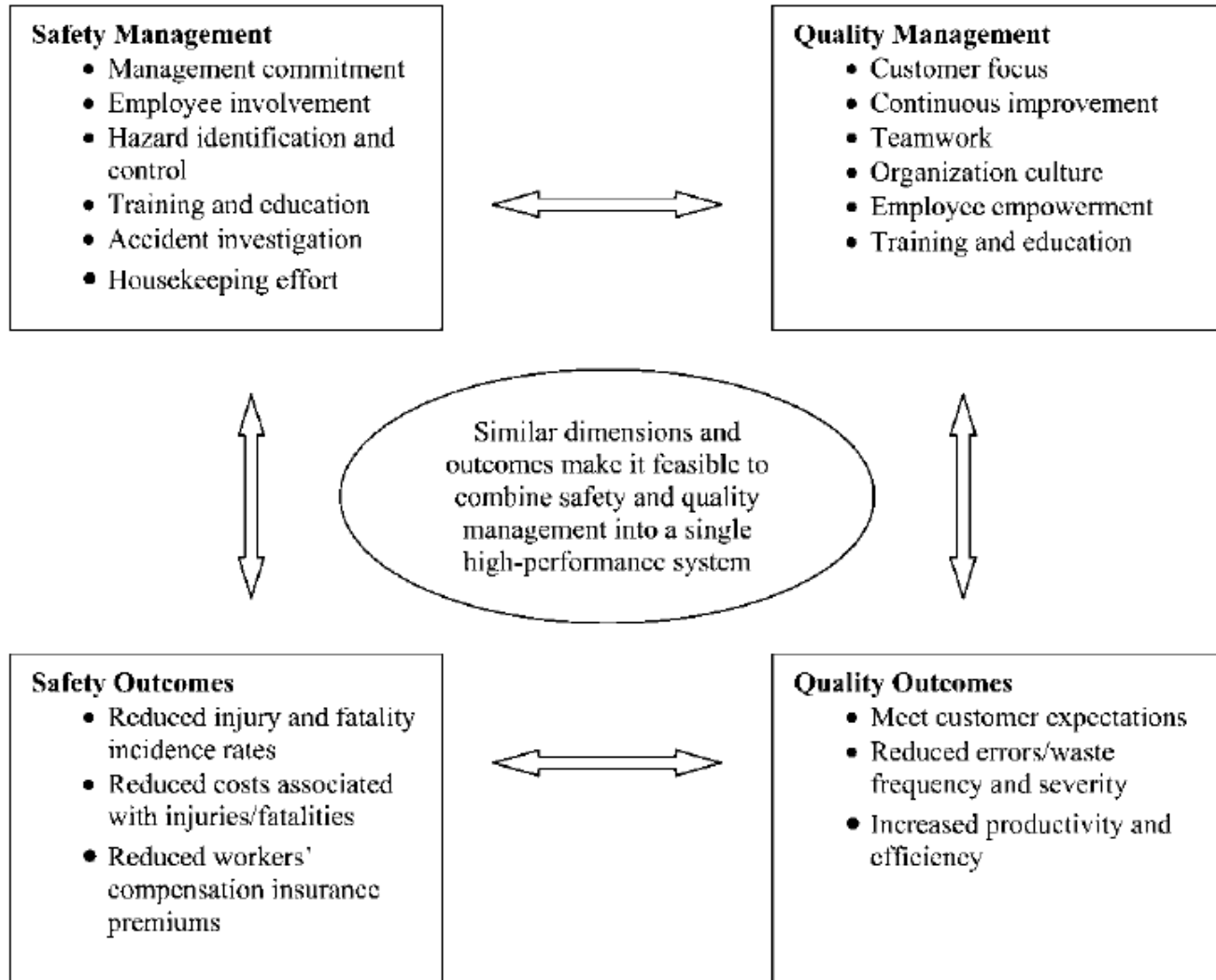
Management System Requirements

| OHSAS 18001:2007 | | ISO 14001:2004 | | ISO 9001:2000 | |
|------------------|--|----------------|--|--|---|
| 4.4.1 | Resources, roles, responsibility, accountability and authority | 4.4.1 | Resources, roles, responsibility and authority | 5.1 5.5.1 5.5.2 6.1 6.3 | Management commitment Responsibility and authority Management representative Provision of resources Infrastructure |
| 4.4.2 | Competence, training and awareness | 4.4.2 | Competence, training and awareness | 6.2.1 6.2.2 | (Human resources) General Competence, awareness and training |
| 4.4.3 | Communication, participation and consultation | 4.4.3 | Communication | 5.5.3 7.2.3 | Internal communication Customer communication |
| 4.4.4 | Documentation | 4.4.4 | Documentation | 4.2.1 | (Documentation requirements) General |
| 4.4.5 | Control of documents | 4.4.5 | Control of documents | 4.2.3 | Control of documents |
| 4.4.6 | Operational control | 4.4.6 | Operational control | 7.1 7.2 7.2.1 7.2.2 7.3.1 7.3.2 7.3.3 7.3.4 7.3.5 7.3.6 7.3.7 7.4.1 7.4.2 7.4.3 7.5 7.5.1 7.5.2 7.5.5 | Planning of product realization Customer-related processes Determination of requirements related to the product Review of requirements related to the product Design and development planning Design and development inputs Design and development outputs Design and development review Design and development verification Design and development validation Control of design and development changes Purchasing process Purchasing information Verification of purchased product Production and service provision Control of production and service provision Validation of processes for production and service provision Preservation of product |

Management System Requirements

| OHSAS 18001:2007 | | ISO 14001:2004 | | ISO 9001:2000 | |
|------------------|---|----------------|--|--|--|
| 4.4.7 | Emergency preparedness and response | 4.4.7 | Emergency preparedness and response | 8.3 | Control of nonconforming product |
| 4.5 | Checking (title only) | 4.5 | Checking (title only) | 8 | Measurement, analysis and improvement (title only) |
| 4.5.1 | Performance measurement and monitoring | 4.5.1 | Monitoring and measurement | 7.6 8.1 8.2.3 8.2.4 8.4 | Control of monitoring and measuring devices (Measurement, analysis and improvement) General Monitoring and measurement of processes Monitoring and measurement of product Analysis of data |
| 4.5.2 | Evaluation of compliance | 4.5.2 | Evaluation of compliance | 8.2.3 8.2.4 | Monitoring and measurement of processes Monitoring and measurement of product |
| 4.5.3 | Incident investigation, nonconformity, corrective action and preventive action (title only) | — | — | — | — |
| 4.5.3.1 | Incident investigation | — | — | — | — |
| 4.5.3.2 | Nonconformity, corrective and preventive action | 4.5.3 | Nonconformity, corrective action and preventive action | 8.3 8.4 8.5.2 8.5.3 | Control of nonconforming product Analysis of data Corrective action Preventive action |
| 4.5.4 | Control of records | 4.5.4 | Control of records | 4.2.4 | Control of records |
| 4.5.5 | Internal audit | 4.5.5 | Internal audit | 8.2.2 | Internal audit |
| 4.6 | Management review | 4.6 | Management review | 5.1 5.6 5.6.1 5.6.2 5.6.3 8.5.1 | Management commitment Management review (title only) General Review input Review output Continual improvement |

Integrated Management Systems



Large Contractor Perceptive

Company Characteristic

Safety

Quality

Organizational Culture
Management Commitment
Employee Involvement
Written Policy/Procedures
Well-defined Roles/Responsibilities
Communication (Man-Emp)
Sub-contractors Involvement
Training & Education
Regular Meetings
Clearly defined Goals & Objectives
Regular Inspections/Audits
Certification Bodies/Awards
Skilled Workforce
Pre-qualification Bidding Criteria
Incentives
Review/Analysis to improve performance

Large Contractor Perceptive

| Company Characteristic | Safety | Quality |
|--|--------|---------|
| Organizational Culture | | |
| Management Commitment | | |
| Employee Involvement | 1 | 1 |
| Written Policy/Procedures | | |
| Well-defined Roles/Responsibilities | | |
| Communication (Man-Empl) | | |
| Sub-contractors Involvement | | |
| Training & Education | | |
| Regular Meetings | | |
| Clearly defined Goals & Objectives | | |
| Regular Inspections/Audits | | |
| Certification Bodies/Awards | | |
| Skilled Workforce | | |
| Pre-qualification Bidding Criteria | | |
| Incentives | | |
| Review/Analysis to improve performance | | |

Large Contractor Perceptive

| Company Characteristic | Safety | Quality |
|--|--------|---------|
| Organizational Culture | | |
| Management Commitment | 2 | 2 |
| Employee Involvement | 1 | 1 |
| Written Policy/Procedures | | |
| Well-defined Roles/Responsibilities | | |
| Communication (Man-Empl) | | |
| Sub-contractors Involvement | | |
| Training & Education | | |
| Regular Meetings | | |
| Clearly defined Goals & Objectives | | |
| Regular Inspections/Audits | | |
| Certification Bodies/Awards | | |
| Skilled Workforce | | |
| Pre-qualification Bidding Criteria | | |
| Incentives | | |
| Review/Analysis to improve performance | | |

Large Contractor Perceptive

| Company Characteristic | Safety | Quality |
|--|--------|---------|
| Organizational Culture | | |
| Management Commitment | 2 | 2 |
| Employee Involvement | 1 | 1 |
| Written Policy/Procedures | | |
| Well-defined Roles/Responsibilities | | |
| Communication (Man-Emp) | | |
| Sub-contractors Involvement | | |
| Training & Education | 3 | |
| Regular Meetings | | |
| Clearly defined Goals & Objectives | | |
| Regular Inspections/Audits | | |
| Certification Bodies/Awards | | |
| Skilled Workforce | | 3 |
| Pre-qualification Bidding Criteria | | |
| Incentives | | |
| Review/Analysis to improve performance | | |

Large Contractor Perceptive

| Company Characteristic | Safety | Quality |
|--|--------|---------|
| Organizational Culture | | |
| Management Commitment | 2 | 2 |
| Employee Involvement | 1 | 1 |
| Written Policy/Procedures | | |
| Well-defined Roles/Responsibilities | | |
| Communication (Man-Emp) | 4 | 4 |
| Sub-contractors Involvement | | |
| Training & Education | 3 | |
| Regular Meetings | | |
| Clearly defined Goals & Objectives | | |
| Regular Inspections/Audits | | |
| Certification Bodies/Awards | | |
| Skilled Workforce | | 3 |
| Pre-qualification Bidding Criteria | | |
| Incentives | | |
| Review/Analysis to improve performance | | |

Large Contractor Perceptive

| Company Characteristic | Safety | Quality |
|--|--------|---------|
| Organizational Culture | 5 | |
| Management Commitment | 2 | 2 |
| Employee Involvement | 1 | 1 |
| Written Policy/Procedures | | |
| Well-defined Roles/Responsibilities | | |
| Communication (Man-Empl) | 4 | 4 |
| Sub-contractors Involvement | | |
| Training & Education | 3 | 5 |
| Regular Meetings | | |
| Clearly defined Goals & Objectives | | |
| Regular Inspections/Audits | | |
| Certification Bodies/Awards | | |
| Skilled Workforce | | 3 |
| Pre-qualification Bidding Criteria | | |
| Incentives | | |
| Review/Analysis to improve performance | | |

Large Contractor Perceptive

| Company Characteristic | Safety | Quality |
|--|--------|---------|
| Organizational Culture | 5 | 7 |
| Management Commitment | 2 | 2 |
| Employee Involvement | 1 | 1 |
| Written Policy/Procedures | 10 | 15 |
| Well-defined Roles/Responsibilities | 6 | 8 |
| Communication (Man-Empl) | 4 | 4 |
| Sub-contractors Involvement | 7 | 6 |
| Training & Education | 3 | 5 |
| Regular Meetings | 8 | 13 |
| Clearly defined Goals & Objectives | 9 | 9 |
| Regular Inspections/Audits | 12 | 11 |
| Certification Bodies/Awards | 14= | 16 |
| Skilled Workforce | 16 (0) | 3 |
| Pre-qualification Bidding Criteria | 14= | 14 |
| Incentives | 13 | 12 |
| Review/Analysis to improve performance | 11 | 10 |

Other Relationships

Scope of Project: Constant & Pervasive

The 5 Phases of Project Management

Project Life Cycle

The 5 Phases of Project Management is also called the **Project Lifecycle**. The 5 Phases of Project Management consist of:

- Project Initiation Phase
- Project Planning Phase
- Execution Phase
- Monitoring and Control Phase
- Project Closeout Phase

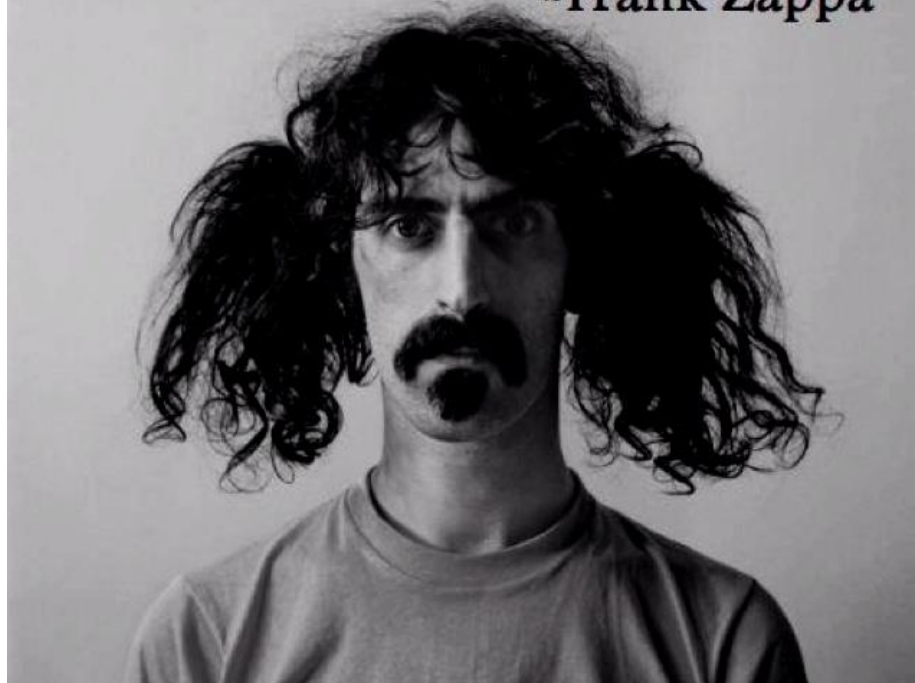


Other Relationships

Common Objective: No deviations

"Without deviations from the norm,
progress is not possible."

-Frank Zappa



Other Relationships

Laws of Probabilities



Other Relationships

Failures: Immediate or Delayed

FAILURES

are part of life.

If you don't fail,
you don't learn.

If you don't learn
you'll never change.

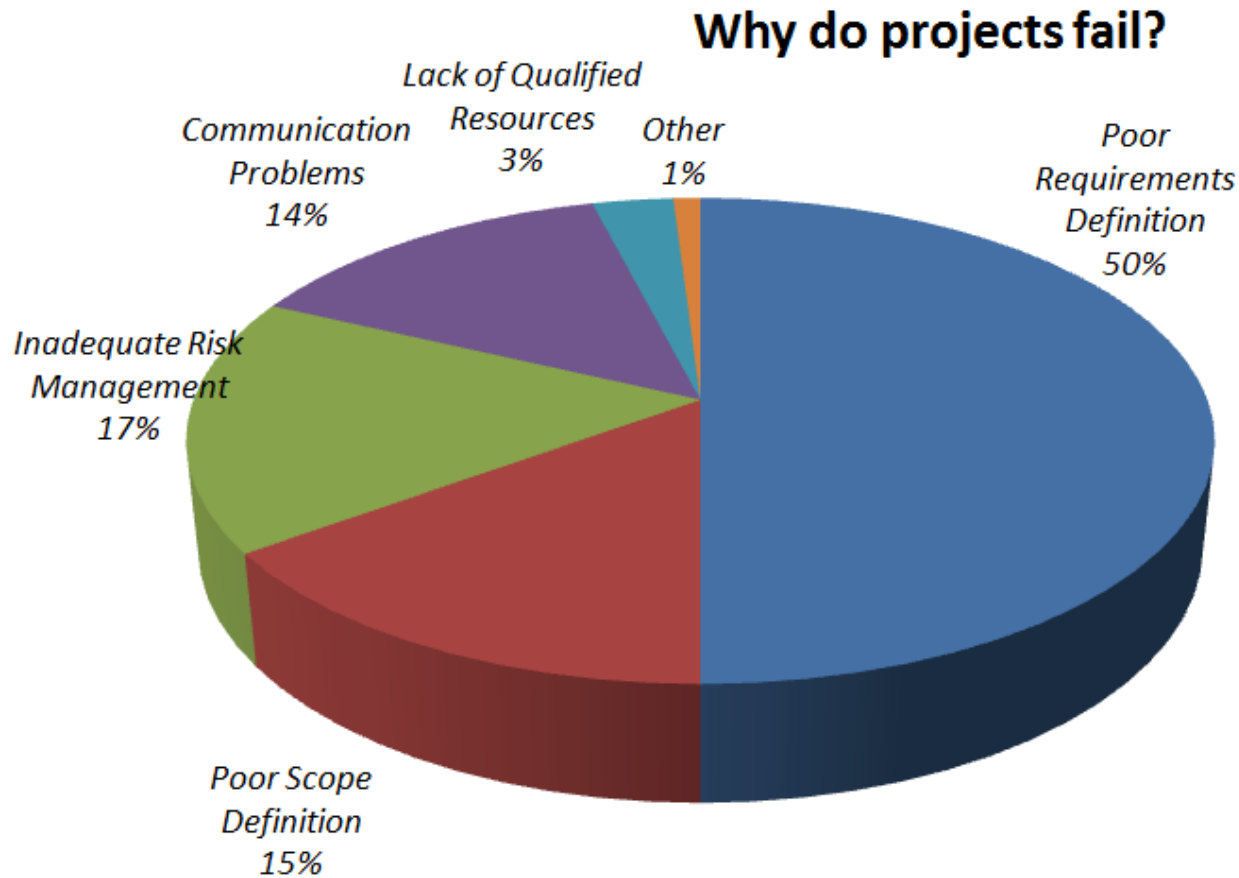
Other Relationships

Effects of Failure



Other Relationships

Systematic programs



Source: ESI International survey of 2000 business professionals, 2005

Other Relationships

Difficulty in optimizing programs



"Although it's nothing serious, let's keep an eye on it to make sure it doesn't turn into a major lawsuit."

Other Relationships

Success & Failure



SIMILARITIES BETWEEN QUALITY & SAFETY IN CONSTRUCTION

Any Questions ?

