



# Data Driven Decision-Making

# Contents

- Who is SIMCON?
  - Our team and mission – why work with us?
  - Our services – what we do and how we create value
- Modeling and Simulation
  - General approach
  - Project structure
- Project Examples
  - Simulation: Facility design and operational decisions
  - Simulation: Guest experience
  - Statistical Data Analysis: Risk assessment

# Who is SIMCON?

- Small business based in Dallas, TX (Est. 2013)
- Unique expertise supporting complex decision making:
  - Simulation modeling and statistical analysis
  - Software development for unique engineering challenges
- Simio Authorized Services Provider
- Diverse, agile, highly educated team
- Excellent record and experience across multiple industries:
  - Nuclear Energy
  - Oil and Gas
  - Mining
  - Manufacturing
  - Printing
  - Healthcare



# Who is SIMCON?

- **Our Mission:**
  - Help clients build better decisions by assessing operational strategies and system performance with cutting edge mathematical modeling and visualization techniques.
- **Our Core Values:**
  - Quality
  - Transparency
  - Communication

# Why Work With Us?

- Dedicated Team
  - Diverse industry experience, backgrounds, and specialties
  - Advanced degrees in technical fields
  - Partnerships and technical oversight
- Record: Exceeding client expectations
- Passion: We believe in what we do
- Small: You are our top priority
- Lean: Competitive rates



# How We Create Value

## Our #1 Goal:

**Make your complex decisions simple.** Let us do the math.

- **Reduce operating costs** associated with production planning, scheduling, and inventory control
- **Quantify impact of uncertainty** on current and future system operations
- **Optimize resource management**, including staff and equipment
- **Evaluate performance** of current and proposed system configurations
- **Support management decision making** with state-of-the-art tools and analysis. No more guessing.
- **Bolster stakeholder buy-in** (internal and external) on projects
- **Provide ongoing support** and training

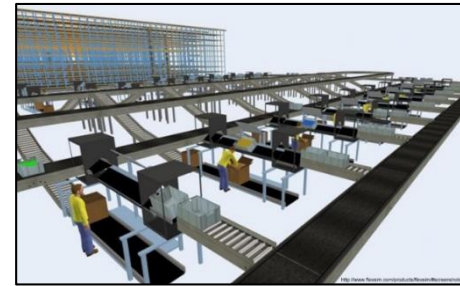
## Our Results:

- **Deliver excellent ROI** of 10:1 or better



# Core Services

- **Computer Simulation Modeling**
  - Mathematical modeling and visualization tool
  - Plays out real-world systems over time
  - Predicts and analyzes outcomes
- **Statistical Data Analysis**
  - Collect and organize data
  - Implement statistical modeling techniques
  - Analyze, interpret, and communicate results
  - Front and back end to most simulation projects
- **Custom Software Development**
  - Develop easy-to-use software programs for client-specific engineering applications



```
successful business
#include "Investment.h"
#include "MyProjects/Startup/Success.h"
#include "MyProjects/Startup/Business.h"

template< typename BusinessStrategy, typename Investment >
class Business: public BusinessStrategy
{
    Business( Investment& MyInvestment );
    virtual Business():
```

# Our Methodology

Methodology

Define business question(s) to be answered

Where are the bottlenecks in our process and how can we increase efficiency?

Collect data and develop a conceptual model

Define data sources, gain access to data, define assumptions

Services

Determine the appropriate method to be used

Computer Simulation, Statistical Data Analysis, or combination of both

Develop model

Test

Validate

Adjust as needed until results are accurate

Outputs

Quantitative results and system visualization

Functioning model of system / data  
KPI estimates under alternative configurations  
Implementation recommendations & estimated ROI



# Software Proficiency

## Simulation



## Statistics



## Programming



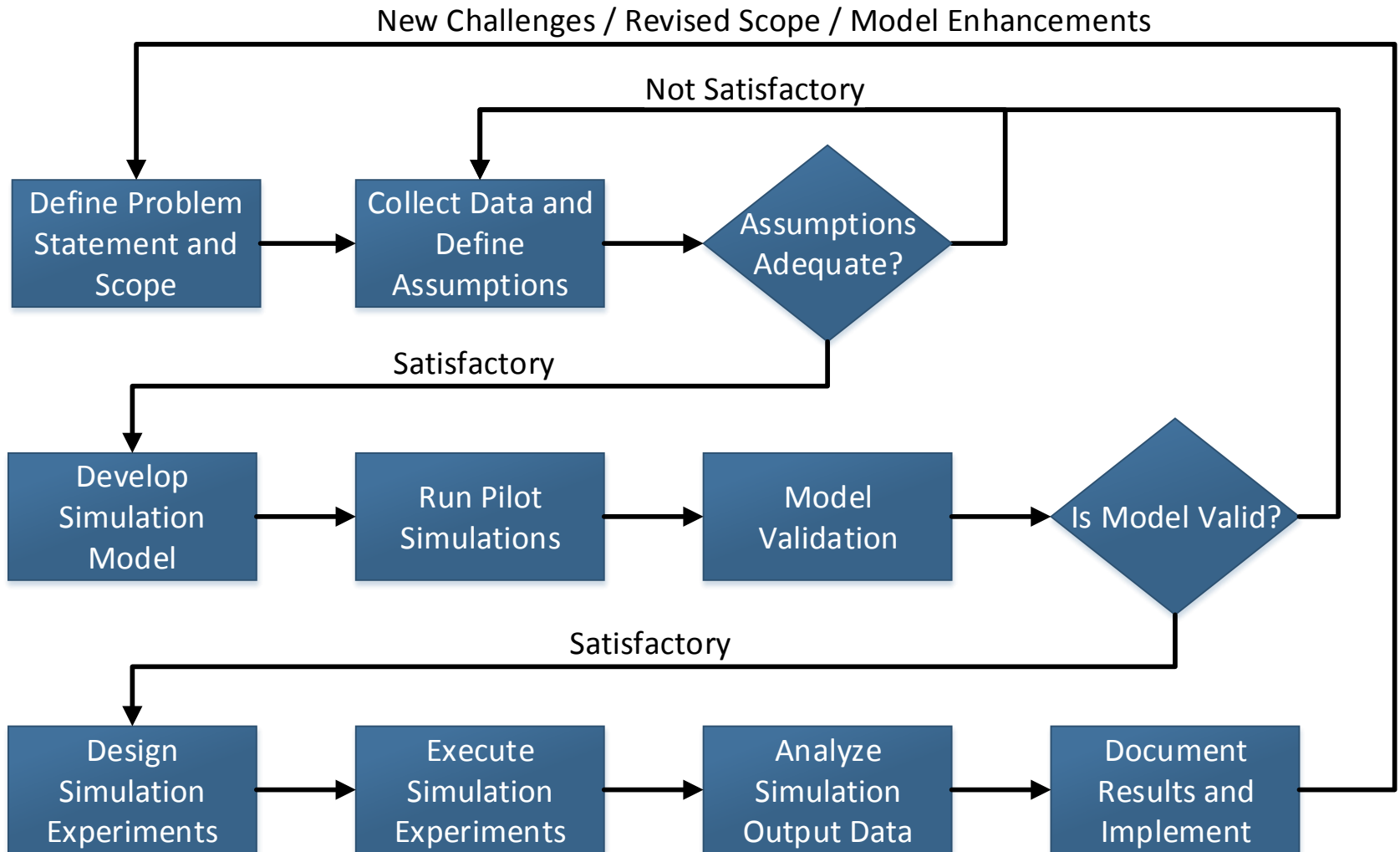


# Modeling and Simulation

# SIMCON Simulation Projects

- General principles:
  - Start with a “simple” model and enhance as needed to meet stated project objectives
  - Interact with client key personnel frequently throughout all phases of the project (meeting rhythms)
    - Multiple interim meetings where intermediate simulation model(s) and results are presented and feedback is solicited
  - Leverage object-oriented programming paradigm to create custom model building blocks as needed
    - Easier to debug, test, and verify
    - Facilitates faster future model development
  - Create user-friendly model interface so clients can perform some experimentation with Simio Personal Edition (free)
    - Train client key personnel to use simulation model if desired

# SIMCON Simulation Projects



# SIMCON Simulation Projects

- Define problem statement and scope
  - Overall objectives
  - *Specific* questions to be answered
  - Performance measures for evaluating system performance
  - Project scope, system configurations of interest, timeframe
- Collect data and define assumptions
  - System structure (components, resources, entities, etc.)
  - Data for model parameterization (inputs)
  - Data for current system performance if available (outputs)
  - Determine level of detail for both quantitative modeling and animation based on project objectives, data availability, time and budget constraints, and client preferences
  - Written assumptions document
- Review and approval of assumptions

# SIMCON Simulation Projects

- Develop simulation model
  - Software determination
  - Simulation model development
  - Verification (debugging)
- Run pilot simulations
  - Designed for validation
  - Preliminary sensitivity analysis to determine system parameters having greatest impact on performance
- Determine if the model is valid
  - Compare results to existing system (if possible)
  - Present results to key stakeholders for feedback and approval

# SIMCON Simulation Projects

- Design simulation experiment
  - Alternative scenarios (alternative system configurations)
  - Optimizations
  - Simulation parameters (run length, number of replications, etc.)
- Execute simulation experiment
  - Store results of all simulations and optimizations
- Analyze simulation output
  - Determine both absolute performance and relative performance of each system configuration
- Document results and implement best strategies
  - Assumptions, simulation experiments, results
  - Present model and results with key stakeholders



## Project Examples



# Project Examples and Case Studies

- Simulation Projects using Simio
  - Facility Design and Operational Decisions
    - Construction Equipment Manufacturing
  - Guest Experience
    - Emergency Department
- Statistical Data Analysis
  - Oil and Gas: Pipeline Rupture Analysis
- Other Projects
  - Open Discussion / Backup Slides

# Construction Equipment Manufacturer

- Client Challenges:
  - New production facility – no existing system in place
  - Estimating in-process inventory to determine space requirements for large machines in-transit
  - Determining optimal system configuration
    - Operators, vehicles, part batches, routings, and release rates
  - Can demand be met with current plan?
- SIMCON Proposed Solutions:
  - Simulation model of proposed system
  - Experimentation including optimization
    - Optimize batch sizes to minimize in-process inventory

# Construction Equipment Manufacturer

- **Key Results:**

- Optimal batch sizes, part routings, part release times, number of operators and vehicles

<b>System Configuration</b>	<b>Max Inventory</b>	<b>% Reduction</b>	<b>Est. Annual Holding Cost Savings</b>
Original Plan	5112.8	-	-
Optimized Original Plan	2278.1	55%	\$5,170,000
Optimized Reconfigured Plan	695.1	86%	\$8,060,000

- **Deliverables:**

- Technical report
  - Model assumptions, analysis of results, implementation plan
- Simio simulation model
- Results spreadsheet

# Emergency Department

- Client Challenges:
  - Demonstrate capabilities of simulation in healthcare
  - Develop a visualization tool to facilitate understanding of patient experience, operations, and interplay
  - Sensitive data – work performed without actual data
- SIMCON Proposed Solutions:
  - Simulation model demonstrating hospital operations
    - Priority on animation, visualization, and example statistics
    - Drive model with theoretical data
  - Experimentation with theoretical scenarios

# Emergency Department

- Key Results:
  - Theoretical system performance under alternative configurations and assumptions

System Configuration	Total Waiting Time (mins)	Total Time in System (hrs)	Avg. Patient Turnaround
Baseline	67.107	3.41	6.29 / day
Additional Staff	53.026	2.92	3.10 / day
Additional Demand	99.416	4.51	29.61 / day
Additional Demand and Staff	94.992	3.77	14.95 / day

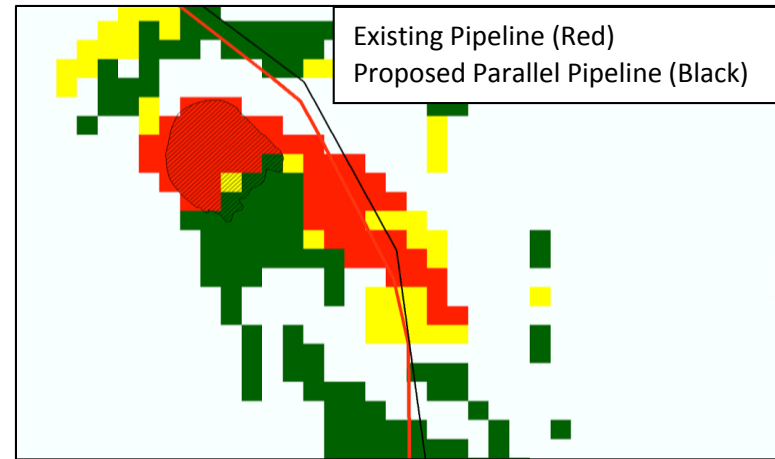
- Deliverables:
  - Technical report
    - Model assumptions, analysis of results
  - Video featuring Simio simulation model
    - Extensive 3D animation, statistics dashboards

# Oil & Gas: Pipeline Rupture Analysis

- Client Challenges:
  - Pipeline ruptures are costly and difficult to predict
    - Primarily caused by landslides
    - Product loss, repair costs, environmental damage, human life
  - Delineating landslides is costly and time-consuming
  - Desired statistical model for landslide risk
- SIMCON Proposed Solutions:
  - Identify available landslide predictor data
  - Determine suitable statistical modeling strategies
  - Evaluate predictive models for landslide risk
  - Recommend and implement best model

# Oil & Gas: Pipeline Rupture Analysis

- Key Results:
  - Optimal landslide prediction model
  - Risk scores for all grid squares in the region of interest (confidential)
- Deliverables:
  - Documentation of methodologies, results, and conclusions
  - Results formatted for input into GIS system



# Contact Us

- Interested in learning more, discussing your project or challenge, or working with us?

SIMCON Solutions, LLC

Jeremy J. Tejada, Founder and President

Phone: (512) 693-8280

Email: [jjtejada@simcon-solutions.com](mailto:jjtejada@simcon-solutions.com)

Web: <http://simcon-solutions.com>





Backup Slides

# SIMCON Key Personnel

Name	Education	Industry Areas of Focus
<b>Dr. Jeremy Tejada</b> <i>Founder &amp; President</i>	B.S. Industrial Engineering M.S. Industrial Engineering Ph.D. Industrial Engineering	Nuclear Safety, Healthcare, Manufacturing, Oil and Gas, Research, Education & Training
<b>Matthew Ballan</b> <i>Industrial Engineer</i>	B.S. Industrial Engineering M.S. Industrial Engineering	Nuclear Safety, Printing, Manufacturing, Logistics, Scheduling
<b>Dr. Benjamin Lobo</b> <i>Consultant</i>	B.S. Mathematics M.S. Operations Research Ph.D. Industrial Engineering	Logistics, Scheduling, Inventory Control, Production, Maintenance
<b>Dr. Sean Carr</b> <i>Consultant</i>	B.S. Industrial Engineering M.S. Industrial Engineering Ph.D. Industrial Engineering	Healthcare, Manufacturing, Architecture, Facility Layout and Design

# Clients and Industries

- Manufacturing
  - North Carolina Construction Equipment Manufacturer
  - North Carolina Diesel Engine Manufacturer
- Nuclear
  - Utilities: STP, Callaway, Palisades, Cooper, Vogtle, Diablo Canyon
  - Owners Groups: PWROG, BWROG
- Oil & Gas
  - Williams – Ohio Valley Midstream
- Engineering Services Firms
  - Alion Science & Technology
- Others
  - Ohio Natural Resources (Mining) Company
  - Colorado Pharmaceutical Automation Solutions Company

# Testimonials

- “I don’t know how we ever planned a new production facility without using a simulation model. The insights this model provided will save us significant time and money. This is amazing.”
  - Lead Production Engineer, Construction Equipment Manufacturer
- “SIMCON is very good at finding innovative solutions.”
  - Bruce Letellier, Principal Scientist, Alion Science & Technology
- “I am personally a workaholic and about 5 times as productive as the next person in the room and Jeremy blows me away. Frankly it’s frightening how much work Jeremy and his team at SIMCON can accomplish in a short period of time.”
  - Bruce Letellier, Principal Scientist, Alion Science & Technology
- “You guys get work turned around so quickly.”
  - Dominic Munoz, Project Manager, Alion Science & Technology
- “Thank you guys again for an extraordinary job! Very impressive.”
  - Consultant, Pharmaceutical Automation Solutions Provider
- “90% of new landslides are in areas the model identified as medium or high risk. Using the model in conjunction with LiDar is a powerful combination.”
  - Jonathan Bell, Engineer, Williams Strategic Sourcing Company

# Pharmaceutical Automation

- Client Challenges:
  - Enhance an existing simulation model for an prescription order fulfillment and sortation system
- Solution Approach:
  - Enhanced existing simulation model
  - Evaluated throughput for conveyor system
  - Programmed system controls
  - Evaluated alternative operating configurations
- Key Results & Deliverables:
  - Enhanced simulation model with improved sortation logic
  - Accompanying users guide
  - Recommendations for system configurations



# Open-Pit Mining Operation

- Client Challenges:
  - Develop a communication tool to garner internal and external stakeholder support for planned chromite mining operations
- Solution Approach:
  - Developed dynamic simulation model for each of 5 supply chain stages
  - Analytically modeled all mining operations, from ore mining to ferrochrome production to shipment
  - Built 3D visualization of system infrastructure and operations to scale
- Key Results & Deliverables:
  - Five simulation models for planned mining operation
  - Marketing videos derived from visual components of simulation models



# Nuclear Safety: LOCA Analysis

- **Client Challenges:**
  - All U.S. plants must address new NRC regulations related to General Safety Issue 191 (GSI-191): Loss of Coolant Accidents (LOCAs)
- **Solution Approach:**
  - Statistical data analysis for numerous physical tests
  - Quantified uncertainty associated with all aspects of LOCA events
  - Enhanced existing simulation software by adding several new analysis features, assisting with commercialization, and implementing software quality assurance
  - Methodological developments such as the R-over-D resolution approach
  - Represented multiple utilities in defending work to the NRC
- **Key Results & Deliverables:**
  - Commercially viable simulation program (CASA Grande)
  - Other custom engineering simulation software tools (WCAP-17788 Calculator)
  - Numerous formal reports, including methodology reports, results presentations, software quality assurance documentation, technical reports, and memos

# Nuclear Safety: Flood Hazard Analysis

- **Client Challenges:**
  - Nuclear utilities located near large bodies of water must assess and mitigate flood-initiated plant failure
  - Dam failures are the key driver of flood-initiated plant failures
- **Solution Approach:**
  - Develop a working knowledge of hydraulic flow simulation software
  - Design, execute, and manage large-scale simulation experiments
  - Perform statistical analysis on simulation output
- **Key Results & Deliverables:**
  - Results for suite of simulated dam failure scenarios
  - Statistical regression models for key performance measures
  - Software tool for quickly predicting the impact of upstream dam failures
  - Technical reports documenting methodologies and results

