



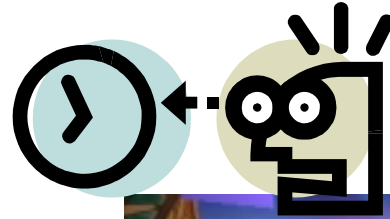
# Using TSP in a Systems Engineering Environment

## "Lessons from the front"



Dan Wall



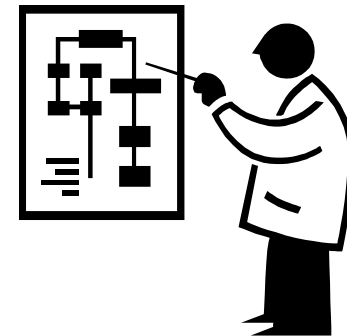


# Problem





- n Systems Engineering / TSP
- n Game Development Challenges
- n Anatomy of a Game
- n Lessons Learned
- n Summary



- n Consumer expectations
  - n Bigger, better, innovation (graphics, game play)
- n Competitive environment
  - n Large multi-discipline, multi-team projects
  - n Development is riskier than ever
  - n Fixed dates
  - n Limited resources
- n Game development culture
  - n Immature practices
  - n “In the garage” development mentality
- n Evolving Hardware

# Anatomy of a Game

## Lifecycle

Proposal

Pre-production

Production

1<sup>st</sup> playable

Alpha

Beta

Lot check

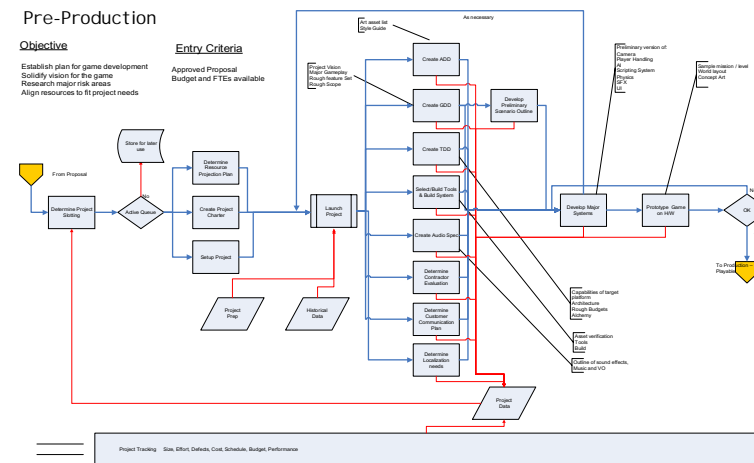
## Four distinct disciplines

Animation

Art

Design

Engineering



## Systems Engineering

"The interdisciplinary approach governing the total technical and managerial effort required to transform a set of customer needs, expectations, and constraints into a product Adaptation and support that Adaptation throughout the products' lifecycle. This includes the definition of technical performance measures, the integration of engineering specialties towards the establishment of a product architecture, and the definition of supporting lifecycle processes that balance cost, performance, and schedule."

CMMI glossary

## TSP

The Team Software Process (TSP) is an integrated set of practices for developing software.

TSP is an effective adaptation to common software engineering and management issues.

- n cost, schedule, productivity, and quality management
- n software project management
- n security and safety
- n acquisition and contract management

## n Setup

- n Training
- n Measurement Framework
- n Support Tools

## n Practice

- n Implementing
- n Making it work

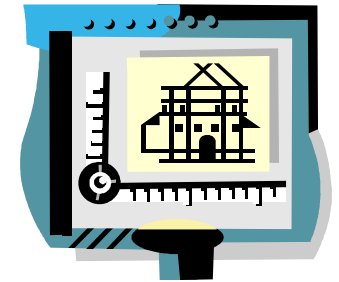
# Training

PSP and TSP training material was not created with other disciplines in mind



Concepts and principles still apply

- n Exercises not designed for these disciplines
- n Terminology mismatches
- n Required

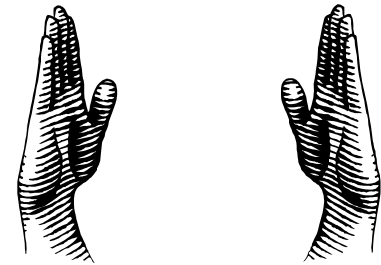




# Measurement Framework

Need to create a new framework that supports all disciplines

- n Existing TSP Measurement Framework will not work for other disciplines
- n Non trivial exercise
  - n Involve users
  - n Takes more time than you think
  - n Not easy to understand for non process types
  - n Will require several iterations
    - n Difference between process and framework
  - n Has data analysis implications



Tool is crucial to a successful implementation

## Tool

- n instantiates the TSP process, concepts and principles
- n captures data
- n provides project status

## Need a tool that supports

- n multiple disciplines,
- n multiple user types,
- n varied processes,
- n measures, and
- n data analysis

Useable, scalable, and customizable

- n Standard TSP introduction strategy is not enough.
  - n Needs modification, expansion for non software disciplines
  
- n Practice basic software process improvement
  - n Levels of maturity by discipline
    - n Basic project mgmt, std processes, quantitative ...
  - n Need to involve the whole organization
  - n Stepwise improvement
  - n Communication, communication, communication

- n Diffuse Concepts to other projects
  - n Project Kick-offs and/or “reality checks” use
    - n Mtg1
    - n Mtg3 to review conceptual design
    - n Planning with reality
    - n Cross-functional check for dependencies
    - n Risks – what worries you about this project
  - n Project Reviews and Post-mortems
  
- n Wag the dog
  - n Use Test group to help drive quality goals
    - n Leverage data, focus on high cost problems

## Challenges

- n Multiple discipline in one project
- n Unique aspects of each additional discipline
- n Discovery aspect of Game Development
- n Using only a small portion of the TSP  
e.g. Quality Plan, Role Managers

## Multiple disciplines

### Adaptation

- n Multi-team launch preparation
- n Normal Multi-team launch sequence, with the following changes
  - n Mtg. 2 – break into groups by discipline to define sub-group goals, group review; additional/different Role Managers
  - n Mtg. 3 – break into groups by discipline to define processes, work products, group review.
  - n Mtg. 4 – sub-groups estimate work, full group review of cross discipline tasks and dependencies
  - n Mtg. 5 – focus on several key defect types
  - n Mtg. 6 – workload balance within discipline

## Multiple disciplines

## Adaptation

- n Additional and different Role Managers
  
- n Multiple views of project information
  - n Ability to have multiple WBS hierarchies
  - n Rollups by discipline, by milestone, by project
  
- n Occasional discipline team meetings
  - n Leads
  - n Teams

## Unique aspects of each discipline

Difficulty with consistent data collection throughout the lifecycle

Defining size

Defining defects

## Adaptation

- n Set clearer expectations
  - n Discipline specific training
  - n Team member coaching, weekly workbook review
  - n Exec Producers review team data and collection compliance
- n Capture data and analyze it
  - n Require Personal post-mortems
- n Defects
  - n Work with each to fine a common definition



## Discovery aspect of game development

Continual prototyping

## Adaptation

- n Shortened planning cycles
  - n 4-6 weeks instead of 8-12 weeks
  - n Personal and team post-mortems before next cycle relaunch or plan
- n Refined game development process definitions
  - n Multiple passes

Using only a small portion of the TSP

All disciplines are not ready for the full TSP

e.g. size measures, lack of historical data, planning guidelines

## Adaptation

- n Use a phased introduction of PSP concepts
  - n TSP0, TSP0.1, TSP1, TSP1.1, TSP2, TSP
- n Introduce new concepts when personal and project post-mortems indicate the team is ready



## Contact Information

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1952 1st game

1961 Spacewar

1970s PONG, Asteroids, Zork, Adventure, ...

1980s Space Invaders, Donkey Kong, Tetris, ...

1990s Doom, Myst, ...

2000s Call of Duty, GTA, ...

\$11.5B spend US in 2005

More \$\$ spent on games than movies

Average age of a "gamer" 29

## Software Process

- n Varies

## Activities

- n Low level H/W manipulation
  - n Error handling
  - n RAM, ROM, CPU, GPU
  - n Memory allocation
  - n Timing
  - n Read / write storage
- n UI
- n Input controls
- n File Management system
  - n Progression
  - n Data (de) compression
- n Physics
- n Localization
- n Camera
- n Lighting
- n Rendering
- n Collision
- n Handling
- n Replay capabilities
- n Game modes
- n Special FX
- n Optimization
- n Networking
  - n Peer to Peer
  - n WiFi
  - n External online services
- n Tools
  - n Scripting language
  - n Art and Animation
    - n Conversion
    - n Import / Exporters
    - n Level Development