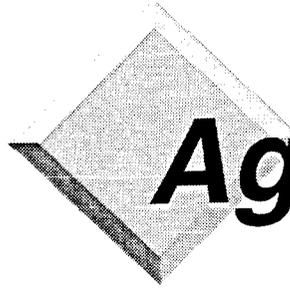# *Practical Process Engineering*

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Managing by Process
Institute for International Research
January 30, 1997

Agenda

- Definitions
- Benefits to a Systems Approach
- Two Essential Parallel Tracks
- Process Engineering Program
- Systems Approach to Process Engineering
- Lessons Learned
- Positive Side Effects
- Key Elements

Definitions

- ## *System Engineering*
  Systems Engineering is "an interdisciplinary approach encompassing the entire technical effort to evolve and verify an integrated and life-cycle balanced set of system people, product, and process solutions that satisfy customer needs.*

- ## *System*
  A system is a set of interrelated components which interact with one another in an organized fashion toward a common purpose. The components of a system may be quite diverse, consisting of persons, organizations, procedures, software, equipment and/or facilities.**

- ## *Process*
  A process is simply a structured, measured set of activities designed to produce a specified output for a particular customer or market. It implies a strong emphasis on *how* work is done within an organization, in contrast to a product focus's emphasis on *what.****

' Electronic Industries Association Systems Engineering, EIA/IS-632, 1994
* NASA Systems Engineering Handbook SP-61 05, 1995
'** Thomas H. Davenport, Process Innovation, Harvard Business School Press, 1993

Benefits to a Systems Approach to Process Engineering

- Provides a rigorous approach to designing processes
- Enables concurrent engineering
- Spans entire project lifecycle, allowing successive refinement
- Scales in many domains:
    - Business and technical processes
    - Industry, academic, and research laboratory environments
    - Large and small projects
- Uses standard systems engineering terminology
- Uses computer-assisted process engineering tools
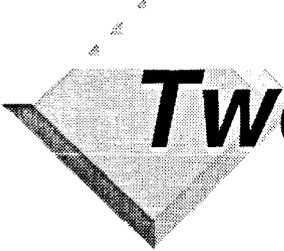
Two Essential Parallel Tracks

1. Change Management

- Build sponsorship
- Actively manage employees' concerns about the change in their work
- Ensure input from all parts of the organization
- Ensure employee understanding and acceptance of changes
- Answer questions about individual careers
- Ensure adequate communication and coordination among teams throughout the change process, especially feedback

2. Process Engineering

- Apply systems engineering to process design.
- Use systems engineering because it is a well understood discipline.
- Ensure well designed process.
- Ensure adequate documentation to allow for understanding and future changes.

A Systems Engineering Approach to Process Engineering

1 Change approach definition

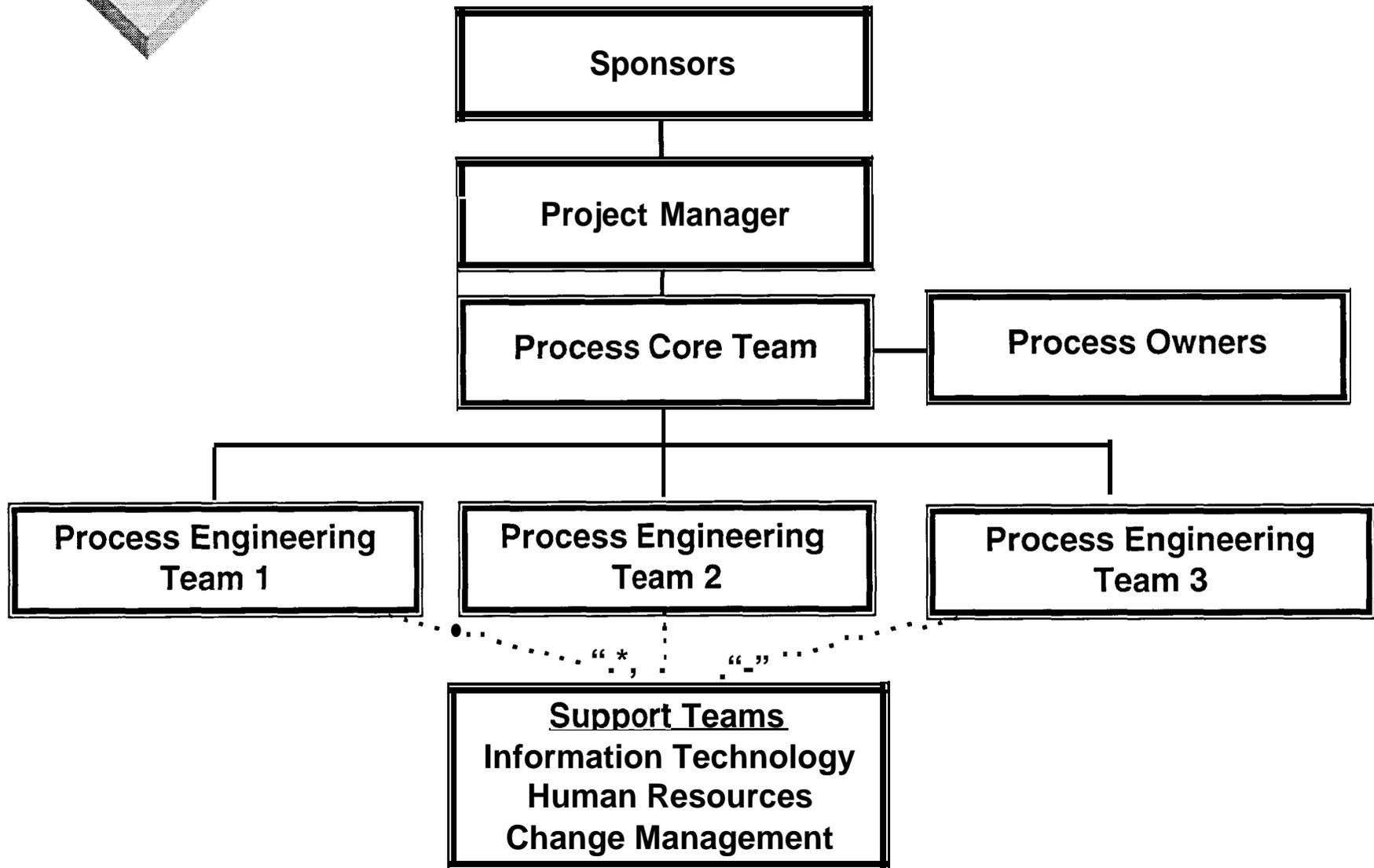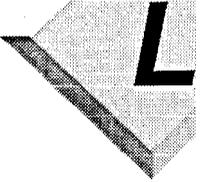1.1 Build & disseminate case for change

1.2 Assess environment

1.3 Build sponsorship

1.4 Develop change plan

Change elements that apply throughout Process Engineering

Communication planning and implementation

Employee Involvement

2 Synthesis & analysis

2.1 Model current process & alternative processes

2.2 Benchmark best practices

2 Build target & change agent support

2.1 Develop change agents

2.2 Assess & develop target readiness

1 System definition

1.1 Define environment, constraints & resources

1.2 Establish process map & identify critical processes

1.3 Select process

[1.4 Select and train team(s)

3 Design

3.1 Develop to-be requirements

3.2 Develop preliminary design

3.3 Develop final design

3 Integrate change into culture

3.1 Develop cultural fit

3.2 Set goals and performance measures

4 Deployment

4.1 Prototype process & technology

4.2 Customize technology

4.3 Test & pilot process & technology

4.4 Deploy process & technology

4 Deploy change incentives

4.1 Implement performance measures

4.2 Provide coaching & feedback

4.3 Training

Change Management

Process Engineering

Metrics

5 Operations & sustaining engineering

5.1 Monitor process metrics

5.2 Watch for process engineering trigger]

5.3 Implement continuous incremental improvements

Change in conditions u

Time

(parallel tracks for other processes)

Process Engineering Program

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                    ┌─────────────────────┐
                    │      Sponsors       │
                    └─────────────────────┘
                               │
                    ┌─────────────────────┐
                    │   Project Manager   │
                    └─────────────────────┘
                               │
        ┌─────────────────────┐      ┌─────────────────────┐
        │  Process Core Team  │──────│   Process Owners    │
        └─────────────────────┘      └─────────────────────┘
                    │
    ┌───────────────┼───────────────────────────┐
┌──────────────┐ ┌──────────────┐ ┌──────────────┐
│   Process    │ │   Process    │ │   Process    │
│ Engineering  │ │ Engineering  │ │ Engineering  │
│   Team 1     │ │   Team 2     │ │   Team 3     │
└──────────────┘ └──────────────┘ └──────────────┘
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┌─────────────────────────────┐
│   Support Teams   │
│   Information Technology   │
│   Human Resources   │
│   Change Management   │
└─────────────────────────────┘

Lessons Learned

Leadership

- Clear, coordinated leadership
- Clearly defined team scope

Teams

- Team leader who has strong leadership skills
- Correct level of team members for both breadth of view and skill set necessary for PE work
- Team members with time dedicated (50 - 100%) to PE
- Backup support in normal jobs for team members
- Training on process engineering and its methodology
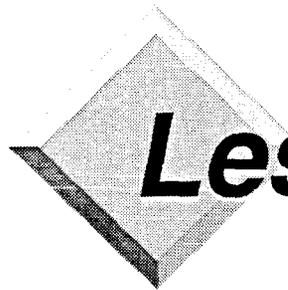
Lessons Learned

Communication
- Communication from Core PE Group and Management to entire organization
- Regular communication between teams, Process Owners, and Core PE Group

Technology
- Technology is an enabler, not a driver
- Leading edge, not bleeding edge of technology
- Iteration between process design and technology capabilities

Tools & Support
- Work place dedicated to PE teams and correctly equipped
- Correct set of tools to enable teams to perform work
  - Benchmarking
  - Administrative / clerical support
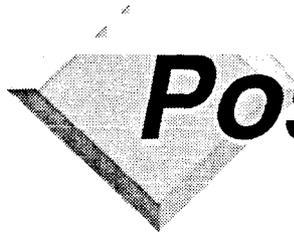
Positive Side Effects

- Working on cross-functional teams opens communication channels between departments
- When working on cross-functional teams, members from different parts of the organization learn to work together with a process orientation
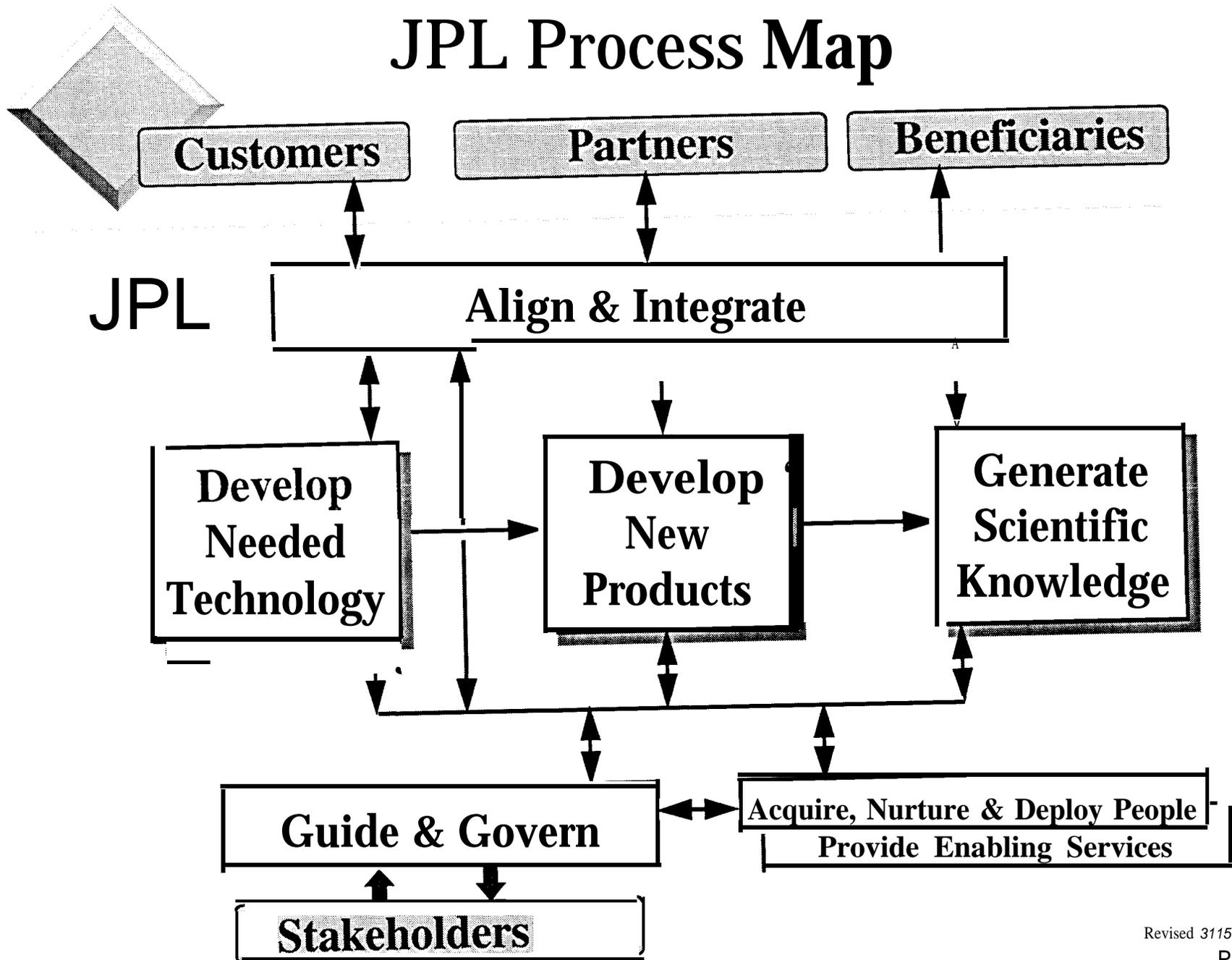- Teams learn that many processes are more similar than unique
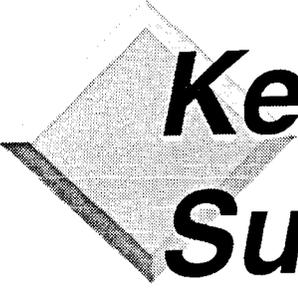
Key Elements of a Successful Program

- Management of both parallel tracks: change management and process engineering
- Top management sponsorship
- Process engineering training
- Cross-functional teams
- Communication and feedback throughout organization
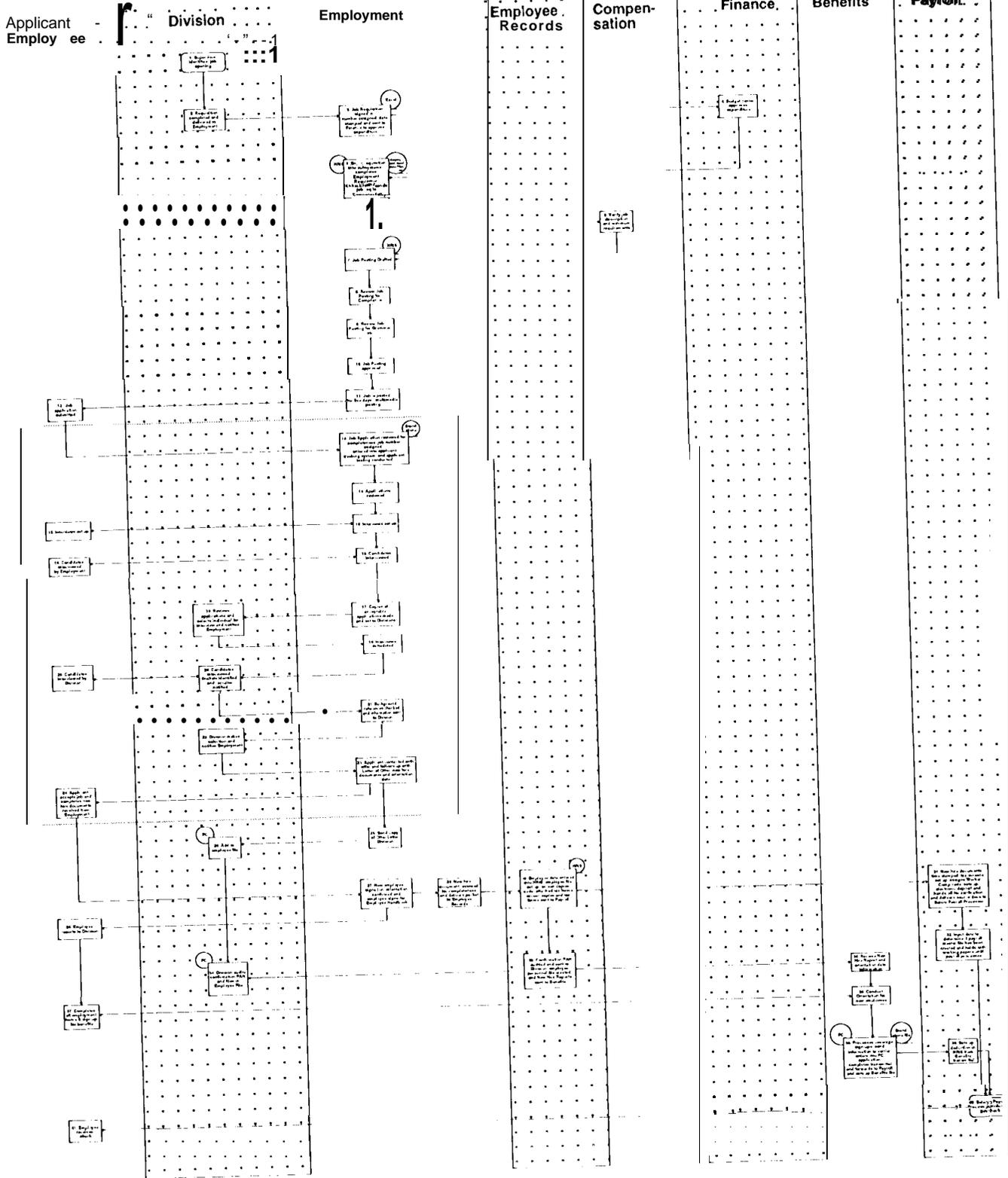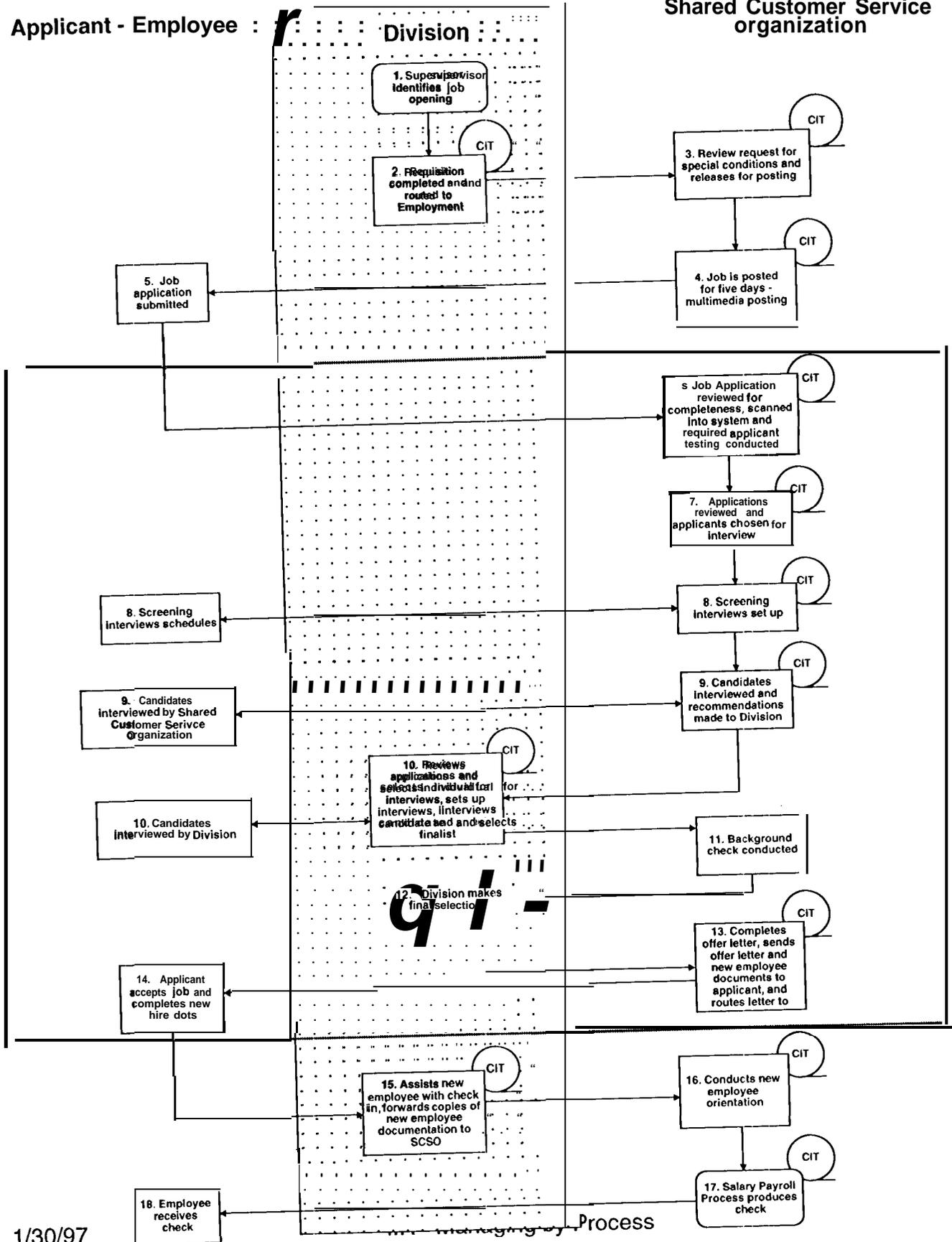- Employee training for new responsibilities
- Metrics

IIR - Managing by Process
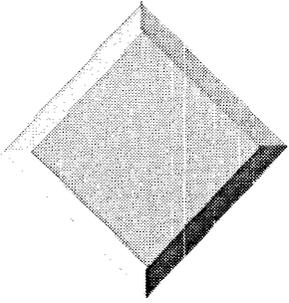
Back-up Slides

JPL Process Map

Customers   **Partners**   **Beneficiaries**

JPL | Align & Integrate |

| Develop Needed Technology | | Develop New Products | | Generate Scientific Knowledge |

| Guide & Govern | | Acquire, Nurture & Deploy People |
                    | Provide Enabling Services |

Stakeholders

"AsIs" New Hire Process - Salaried Staff Example

Applicant - Employee	Division	Employment	Employee Records	Compen-sation	Finance	Benefits	Payroll

IIR - Managing by Process

SHRPP New Hire Vision - Salaried Staff Example

Applicant - Employee   **Division**   **Shared Customer Service organization**

1. Supervisor Identifies job opening

CIT

2. Requisition completed and routed to Employment

CIT

3. Review request for special conditions and releases for posting

CIT

4. Job is posted for five days - multimedia posting

5. Job application submitted

s Job Application reviewed for completeness, scanned into system and required applicant testing conducted

CIT

7. Applications reviewed and applicants chosen for interview

CIT

8. Screening interviews schedules

8. Screening interviews set up

CIT

9. Candidates interviewed by Shared Customer Serivce Organization

9. Candidates interviewed and recommendations made to Division

CIT

10. Reviews applications and selects individual for interviews, sets up interviews, interviews candidate and selects finalist

CIT

10. Candidates interviewed by Division

11. Background check conducted

12. Division makes final selection

13. Completes offer letter, sends offer letter and new employee documents to applicant, and routes letter to

CIT

14. Applicant accepts job and completes new hire dots

15. Assists new employee with check in, forwards copies of new employee documentation to SCSO

CIT

16. Conducts new employee orientation

CIT

17. Salary Payroll Process produces check

CIT

18. Employee receives check

Process

Process GAP Analysis

Customer Performance Objectives	Current Process Measures	Best Practices Measures	GAP	Performance Requirements
What customer wants	What current process provides	What is currently the best possible	GAP between what is, what can be & what is wanted	Requirements for new process
Example				
Fast turn around	30 days* 6 days	1 day	29 days	2 days
Eliminate redundant data	3 databases	1 database	2 databases	1 database
1 point of contact	4 phone contacts	1 point of contact	3 contact points	1 contact point

Process Requirements

NASA FORM 1018 PROCESS FUNCTIONAL REQUIREMENTS DOCUMENT
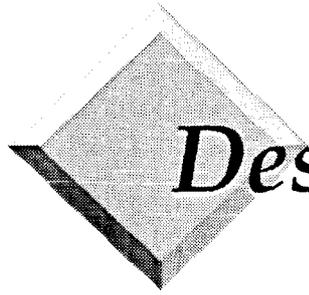
Design Opportunity Trade-offs

Opportunity	Change	Difficulty	Benefits	costs	Support	Risks
What is possible - the breakthrough design concept	What is the change reuqired toreach that new goal - the "Gap"	What stands in theway of getting there - cultural, technology, resources	What will be gained - what is the difference between what the old process provides and what the new process will offer	What will it cost to get there - in terms of dollars time & people	Whatsupport do we have in place or what will be needed- people included	What are the risks we will be taking

From *The Reengineering Handbook* by Manganelli and Klein

Process Engineering &
Continuous Improvement
Complementary Processes

Process Performance (vertical axis)

Time (horizontal axis)

Continuous Improvement

Process Engineering

Continuous Impr ovement

Process Engineering

Continuous Improvement

Process Engineering"

Continuous Improvement

Process Engineering

Continuous Improvement
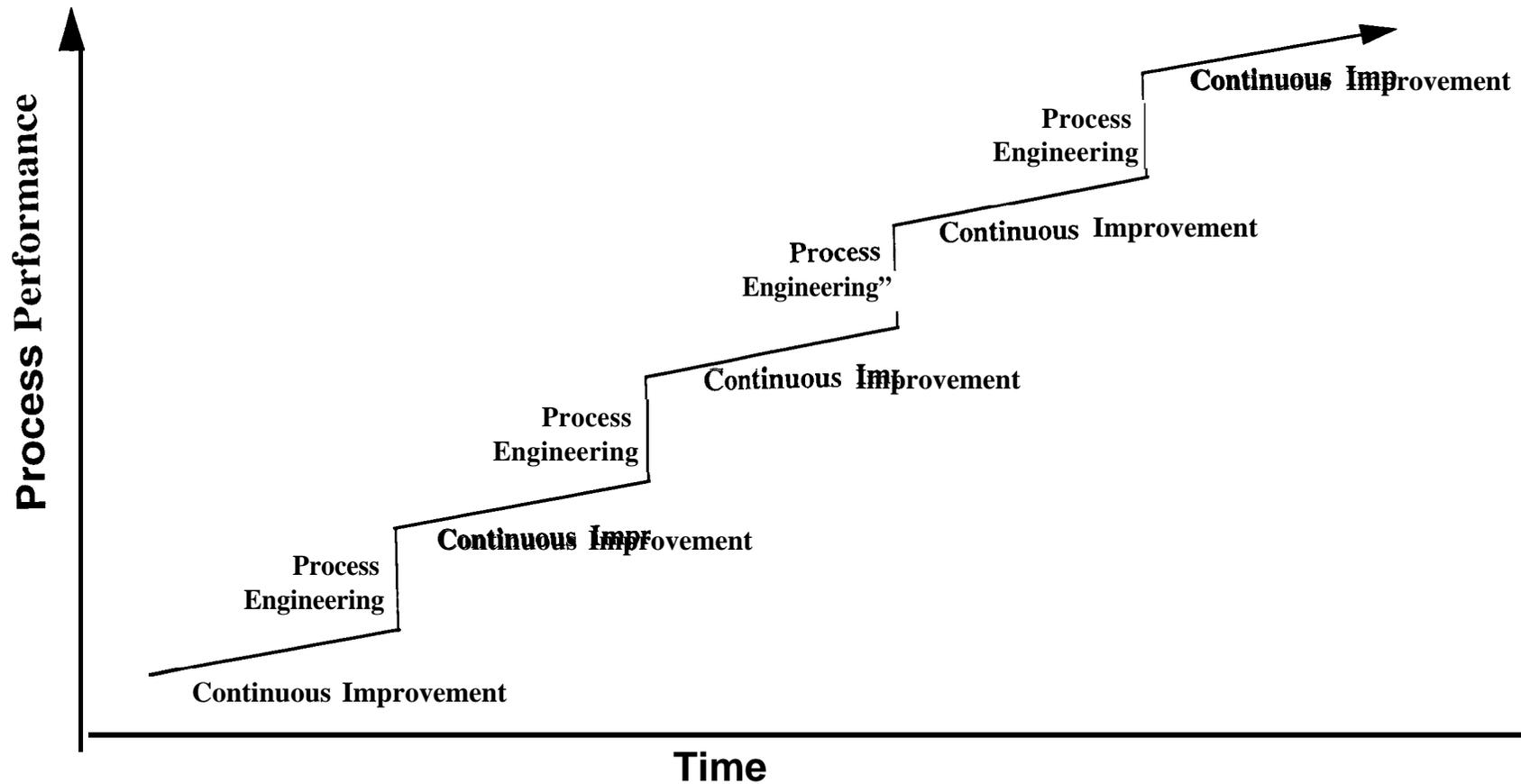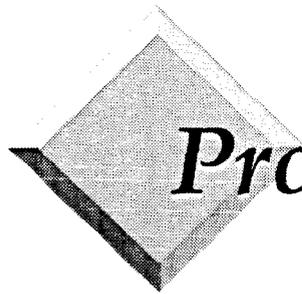
Process Owner

- Has authority and accountability for current as well as for newly developed processes
- Creates and charters team based on organization's business goals
- Appoints Team Leader
- Provides resources necessary to perform work (funding, materials, facilities)
- In conjunction with Team Leader and Process Engineer sets schedule for team
- Provides guidance, information and support to team
- Meets periodically with Team Leader for team status
- Informs other parts of organization about team's work
- Stays informed of activities happening elsewhere that may impact team's activities and coordinates between team and those activities
- Is Number One Cheerleader for team
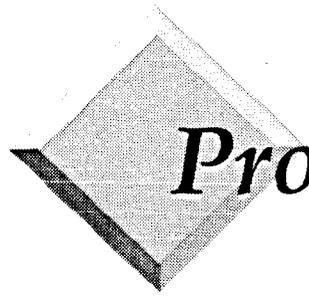
Process Engineering Team

- Primary assignment (50 -1 00% of time)
- Long-term commitment (18 -24 months)
- Abandoning organizational loyalties
- Co-location for team work
- Cross-functional representation

Process Engineering Team - Leader

- Keeps Process Owner informed via regular meetings and memos
- Coordinates and presents, with team, management briefings
- Coordinates and presents, with team, stakeholder briefings
- Supports and enables Team Members to perform team tasks
- Arranges and administers meetings
- With Process Engineer, designs and conducts work sessions
- Delegates duties to Assistant Leader as appropriate
- Mediates conflicts
- Ensures team tasks are documented
- Fulfills duties of Team Member