Go Back

Analysis of Dynamic Complexity of an IT Organization

by Gerd A.T. Müller

Abstract

This analysis was done as part of an organizational development in 1996. The European IT department of a computing manufacturer experienced quality and overload issues after a phase of cost reduction and centralization.

Several approaches to improve the situation with conventional methods failed. As a last step a structured process to understand the dynamic complexity of the organization was applied. The organizational dependencies were documented, analyzed and communicated.

Key leanings were that key dependencies in the organization crossed organizational boundaries. This created slow, loosely coupled feedback loops and prevented improvement of the situation. Underlying shifting the burden and accidental adversaries patterns were found. Based on the learning organizational changes and metrics were introduced which finally solved the problems.

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keywords dynamic complexity, organizational boundaries, influencing factors, cause effect net, shifting the burden, accidental adversaries, sensitivity

… or how to clean the Stable of Augias

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invent

The Problem

The European IT department experienced severe quality, customer satisfaction and overload issues after a phase of cost reduction and centralization.

Context

- The European organization was located in 5 major locations (Bristol, Brussels, Boeblingen, Grenoble, Milan), each location having full responsibility within its geographical area. Reporting was to European management.
- Management asked to reduce cost by 20%-25% by centralizing whatever is possible:
    - Central: service deployment and implementation, event detection and notification, predefined incident management
    - Remote: explorational incident management, operations bridge, problem management
- First implementation in one site

Observed Symptoms

Overload of people

- Not talking to each other
- Not pulling information
- Push emails with long TO, CC and BCC to blame others
- Priority conflicts
- Forget things, missing agreements
- Burnout

Complex, slow processes

- Many interfaces (takes 10 people to install a server)
- Re-re-re-acknowledgement

Knowledge

- Account Operation Manager doesn’t have expertise to specify request

Remote

- Not defined / ill defined service level agreements
- Mismatch between resources and workload
- unattractive working conditions
- can't obsolete things
- feel being victims, burnout

Central

- Missing engineering resources for improvements.
- Daily work prevents us from working on processes and projects (e.g. one engineering team spent 95% on ongoing work).
- Insufficient quality of platform services

Measurable Facts

		1996	2000	change
size	people	221	296	+34%
	flex force	32%	29%	
	server	800	1600	+100%
	sites	5	4	
	teams with 7x24 shift	3	3	
productivity	server / person	3.6	5.4	+50%
	incidents / server	5 .. 50	0.5 .. 11	-90% .. –80%
workload	overtime	~10 .. 20%	< 5%	-50% .. – 75%
	standby calls / night	~3	< 0.2	-70%

Attempts to Solve

Several conventional approaches to improve the situation with conventional methods failed.

Issue: Usually the situation is not analyzed from next levels of abstraction (look at larger system).

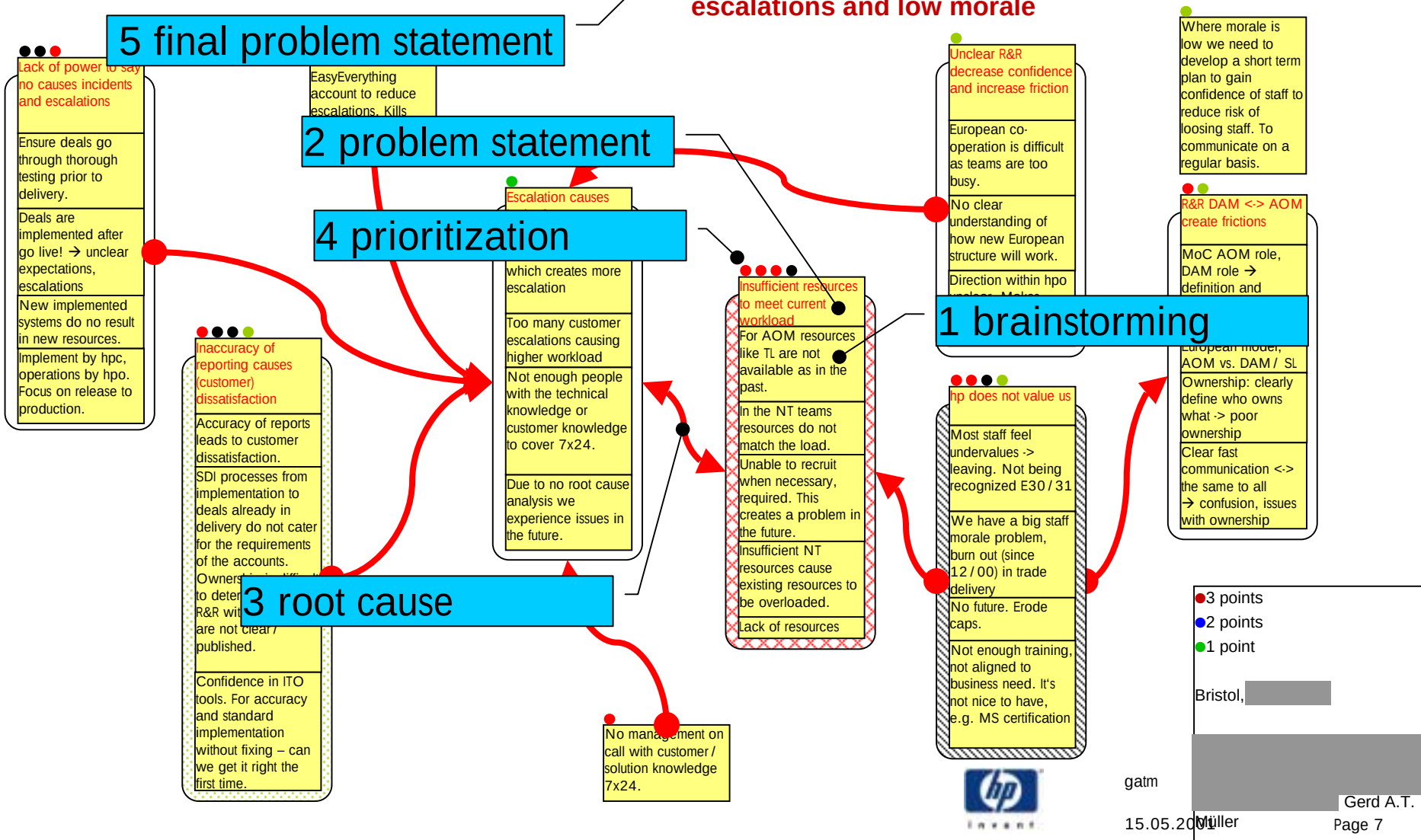
Repeating pattern for problem approach

- Team meets as problem becomes too large
- Problem statement is developed, typically language processing (LP) is used:
  - Identify underlying problems
  - Develop root-cause relation ships
  - Rate priority based on impact and feasibility
- Actions are initiated
- After few months no change of situation is observable

Language Processing

What are the most important and critical issues creating today's dissatisfactory situation?

Lack of resources and difficulties of working with SD&I (as an organization) causes most of our issues as escalations and low morale



7 Problem Analyses

	team	when	how	what
1	platform services	12/95	LP	Ill defined service level agreements, missing engineering resources for improvements, unclear responsibilities
2	production automation	12/95	LP	Too much daily business and old stuff, it's not clear to other what we do, unplanned requests
3	IT management	03/94	QMS review	No clear understanding of customer needs, no systematic improvement process, no performance measures guiding decisions
4	???	03/94	fish bone	Not leveraging our efforts , bad product introduction, disconnect between European Mgmt and country function, lack of ownership
5	HW	04/96	brainstorming	No clear understanding and documentation of process, very complex process.
6	event detection	04/96	LP	Dedicated resources to work on the operations monitoring process at each site.
7	engineering	04/96	brainstorming	If production environment is automated then less workload due to normal failures.

Systemic Approach

Needed to try something different – the standard method didn't succeed

Radical ideas are not bad ideas!

Steps To Do

- Identify targets to change, set objectives
- Identify key driver of the situation (influencing factors)
- Select few relevant drivers, shoot for 10 or less
- Describe cause-effect net of relevant drivers and their relationships
- Analyze the net for
  - Sensitivity
  - Effect spread out
  - Effect inclusion
  - Feedback loops
- Understand room to maneuver
- Set actions

Identify targets to change, set objectives

Be specific!

Availability of applications

- Which customer needs which availability for which application / environment?
- Which ones are most important? Why?

Productivity does not meet management and customer expectations

- Who are the managers having a problem?
- Who are the customers having a problem?
- What are their expectations?

Workload has reached an unacceptable level, overtime and rest time does not fulfill EHS requirements

- Working time must be controllable by employee down to legal conditions.
- Overtime should not average above 20h / week in a 12 months period. (What is the real legal requirement?)
- After a stand-by call people must rest for at least 11 hours.

Identify drivers of situation …

… from existing problem analyzes:

Ill defined service level agreements, missing engineering resources for improvements, unclear responsibilities. Too much daily business and old stuff, it's not clear to other what we do, unplanned requests. No clear understanding of customer needs, no systematic improvement process, no performance measures guiding decisions. Not leveraging our efforts , bad product introduction, disconnect between European Mgmt and country function, lack of ownership. No clear understanding and documentation of process, very complex process. …

… and select few key ones

Targets: workload, availability and productivity

Work within organization:

- Requests for implementation (engineering)
- Work orders (engineering)
- Release to production (engineering)
- Pre-defined incident management (platform services)
- Admin, explorational incident management, problem management

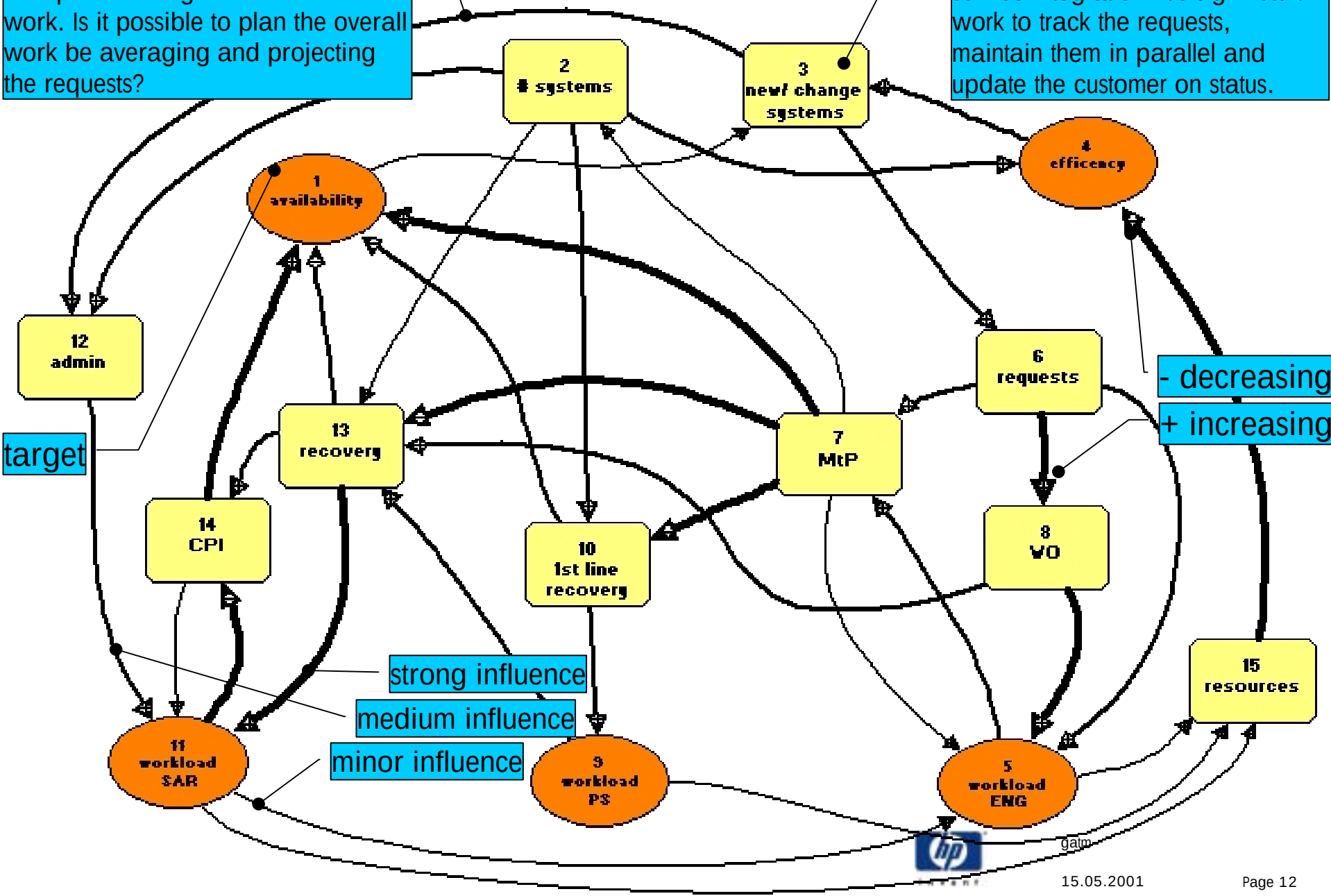
Trigger for activities: Customer requests (new, change)

Size of system: #systems, resources

Cause-Effect Net

relationship
A change or a new system generates a request with significant amount of work. Is it possible to plan the overall work be averaging and projecting the requests?

influencing factor
new/ change: Customer requests, service integration. It's significant work to track the requests, maintain them in parallel and update the customer on status.

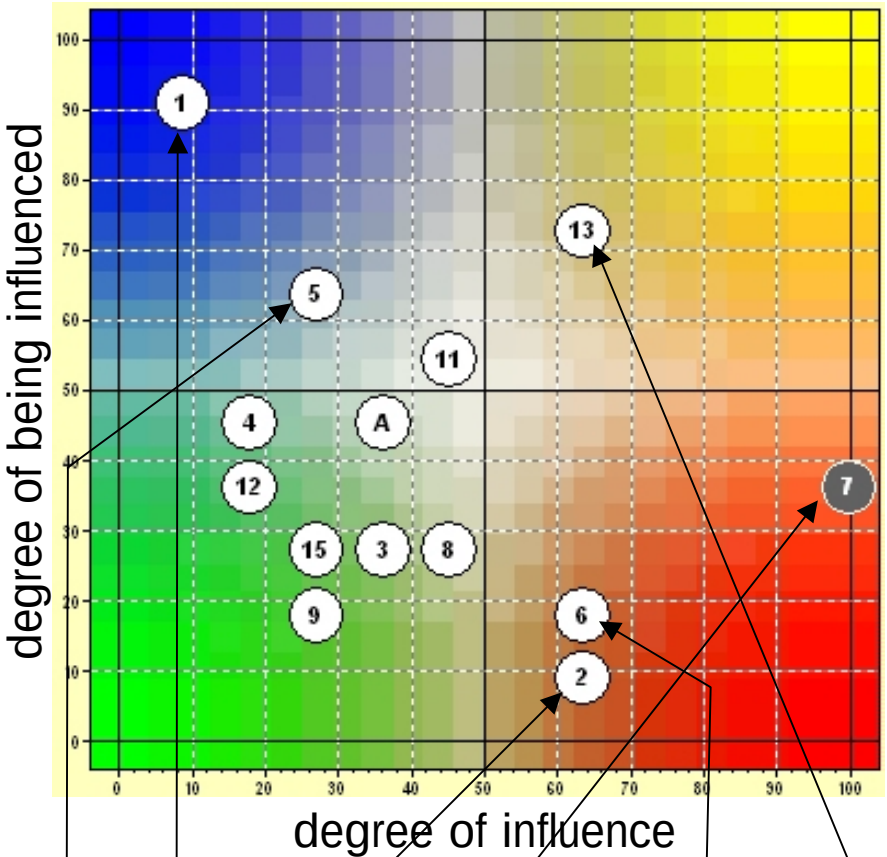


Sensitivity

Understand how to influence the system

- What are the powerful knobs to turn?
- What are the risk factors influencing and being influenced at the same time?
- What are most dependent factors?

Test the model by changing strengths of impact.



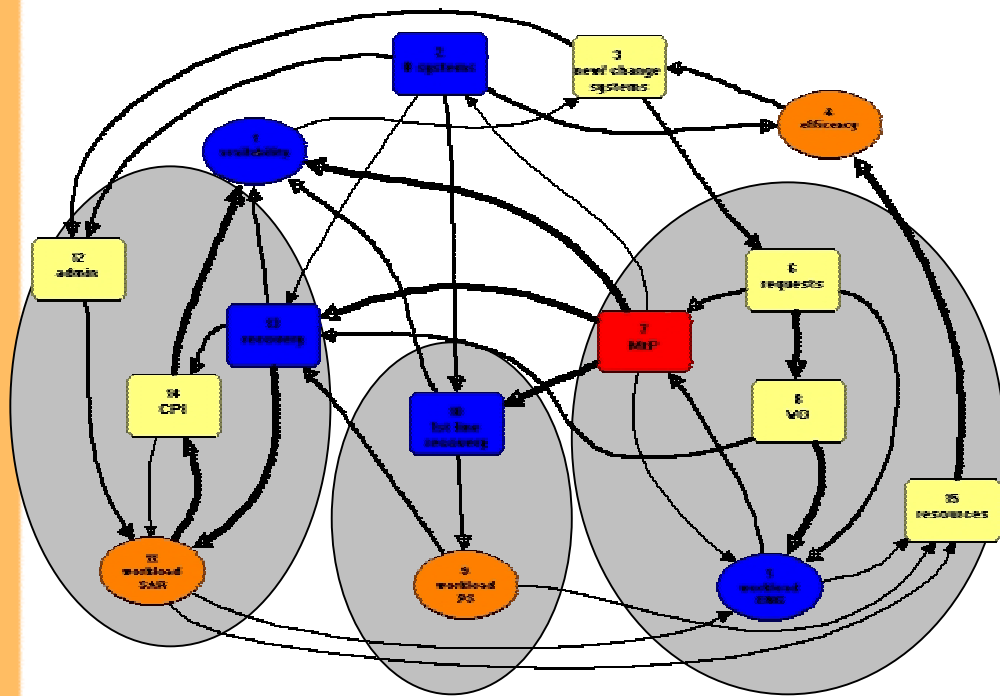
Release to Production (7) has the most influence on the organization, followed by #systems (2) and requests (6). Recovery (13) is in an instable situation as it is influencing and being influenced at the same time at a high degree. Availability (1) is mainly influenced as well as workload engineering (5) to a lower degree.

Spread Out of RtP

Release to Production (RtP) spread out shows that within 2 steps the whole net is impacted.

- RtP influences both other organizations without direct feedback, no incentive to make a good job.
- RtP influences workload in own organization unfavorably, incentive to save time.

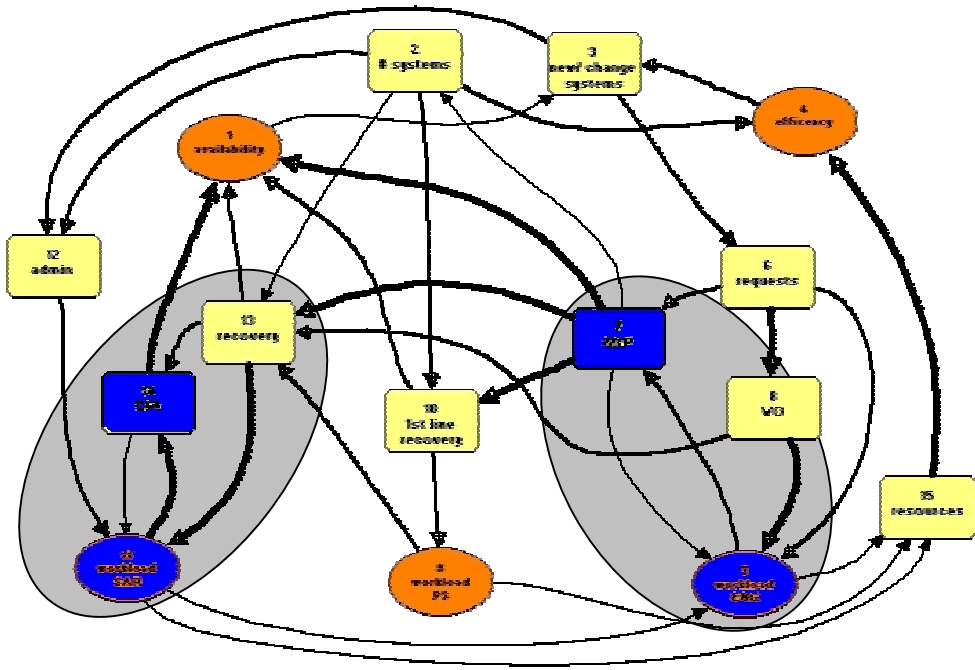
Underlying pattern: Accidental Adversaries



Feedback Loops

Release to Production (RtP) and Problem Management (PrM) are both on risk not to be done if the team is under heavy workload. In such a case resources are split among competing requests. Usually urgent requests are prioritizes against important ones (e.g. PrM against Incident Management, RtP against work order). If this happens the situation will become worse with a time delay of ~3 months through the enforcing feedback loops.

Underlying pattern: Shifting The Burden



Results

Organization stabilized after 6-12 months

- Step by step implementation of fixes
- First results visible after 3 months

Learning

- System thinking is a powerful tool to understand and document
- Too complex to communicate to management

Shifting the Burden

- Simulation for support environment developed
- Metric “incidents / (servers*day)” introduced
- Balanced scorecard implemented

Accidental Adversaries

- New organizational setup shoots for “autonomous cells” to have broad responsibility in one team
- Aligning metrics to have clear ownership

Next steps

- How do we broaden this knowledge in the organization?
- How do we deal with imposed organizational setup?