INF5181: Process Improvement and Agile Methods in Systems Development

Lecture 07:

Problem Solving and Improvement - by Individuals and in Groups

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Dr. Dietmar Pfahl

email: dietmarp@ifi.uio.no

Structure of Lecture 07

- Hour 1:
  - Problem Solving – Basics
  - The “People Framework”
- Hour 2:
  - Working in Groups
  - Motivation
- Hour 3:
  - Exercises
  - Question/answer session about project

Example of a Problem Solving Strategy: “Divide and Conquer”

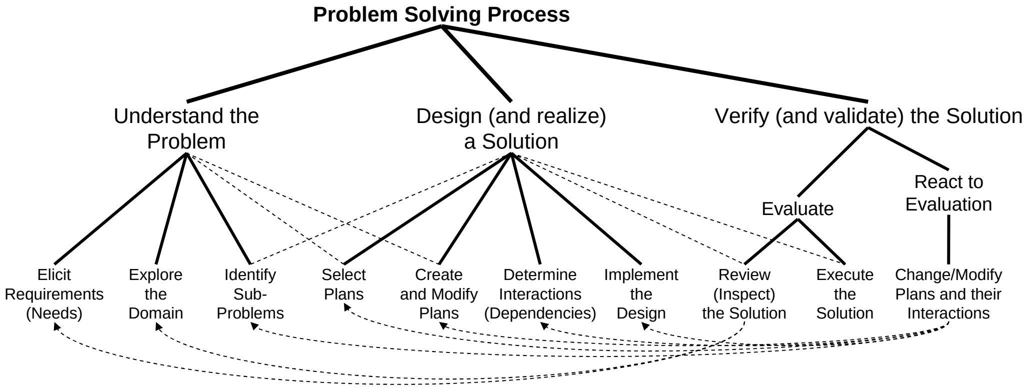
- A problem can always be split into sub-problems which can further be split etc...
- Splitting-up increases the level of detail which, in turn,
  - increases accuracy
  - slows down progress

- Process for “divide & conquer”:
  1. Define the problem
  2. Split-up the problem into sub-problems which can be solved, and

     repeat this until all sub-problems can be solved
  3. Integrate sub-solutions so that it solves the original problem

Universal Process for Problem Solving

[Hohmann]



- **Problem Solving Process**
  - Understand the Problem
    - Elicit Requirements (Needs)
    - Explore the Domain
    - Identify Sub-Problems
  - Design (and realize) a Solution
    - Select Plans
    - Create and Modify Plans
    - Determine Interactions (Dependencies)
    - Implement the Design
  - Verify (and validate) the Solution
    - Evaluate
      - Review (Inspect) the Solution
      - Execute the Solution
    - React to Evaluation
      - Change/Modify Plans and their Interactions

Problem Solving Methods

Provide structures that:

- “automate” parts of the problem solving process
  - e.g. standardized refinement into sub-problems via “architectural styles” and design patterns
- facilitate collaboration during the problem solving
  - e.g., by dividing the development into phases, and by using interface descriptions and coding standards
- counteract typical “weaknesses” in humans
  - e.g., it is tempting to directly jump to the problem solution (the code) before the problem is understood (the analysis)
- simplify reuse of experience
  - e.g., by making everyone use the same development models and coding standards, and perhaps pair-programming and formal inspections

Problem Solving Method

- Method = “a disciplined **process** for generating a set of models that describe various aspects of a software system under development, using some well-defined notation.” (Booch)
- Notes:
  - It is nonsense to say that one method is (always) better than another
    - NB: The appropriateness of a method is problem, situation, and person dependent.
  - Within a project (or organization) only one (most appropriate) method should be chosen.
    - This is sometimes not easy to achieve.
    - The worst thing is to let choose everybody their own method. (Question: Why?)

Problem Solving – Mental Models (Plans)

- Problem solving can be regarded as searching, selecting, modifying, using and reusing of **plans** for different purposes.
  - Experience and the ability to solve problems is largely determined by the amount (and quality) of such plans.
- ***Plan*** = stereotype solution to a problem.
  - It is also a **private** solution that only exists in the head of a person who has solved similar problems before (→ ***Mental Model***).
- ***Pattern*** = an **externalized** and **generalized** plan (→ ***Conceptual Model***)
  - *Design Patterns* are just this: experts used time and effort to describe solutions to classes of (similar) design problems that developers repeatedly encounter.

Examples of Software Engineering Models

- Design Patterns (Gang of Four, 1994)
  - Singleton, Façade, Iterator, …
- Architectural Styles (Garlan & Shaw 1994)
  - Pipes and Filters, Layered, Event-Based, …
- Frameworks
  - Ruby on Rails, .NET, …
- UML Models
  - Use case diagram, Sequence diagram, Class diagram, etc.)
- Communication Protocols
- PPD-Models (→ PROFES method)
- …

Product-Process-Dependency Model

- PPD Example taken from: D. Hamann, D. Pfahl, J. Järvinen, R. van Solingen (1999) “The Role of GQM in the PROFES Improvement Methodology”, in: Proceedings of 3rd Conference on Quality Engineering in Software Technology (CONQUEST 1999), pp. 64-79.

PPD Model 1.3.1	Technology Application Goal	
Technology	**Software Inspections**	
Product Quality	**Reliability**	
Process	**ENG.3 Software Requirements Analysis**	
	Technology Application Context	
CF.1	Experience of inspection team	low average ***high***
CF.2	Management commitment	low ***high***
CF.3	Overall time pressure	***low average*** high
CF.4	Module affected by new hardware	old_hw ***new_hw***
CF.5	Module developed externally	internally ***externally***

CF = Context Factor

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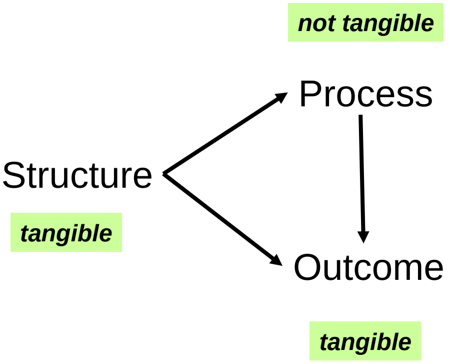
The Importance of Structure



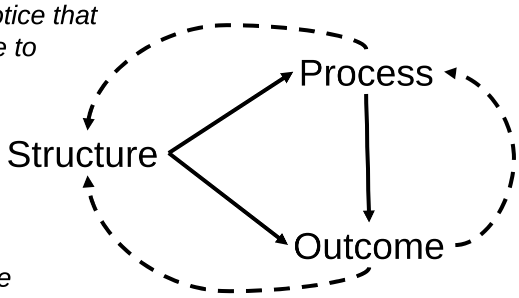
- <u>Structure</u> *defines* the form and content of <u>outcomes</u>

  and

  supports the <u>processes</u> we use to create them

The Importance of Feedback

As (planned) Processes are carried out, one might notice that adjustments have to be made



Processes adapt to (previously produced) Outcomes - partly due to convenience, partly to optimize

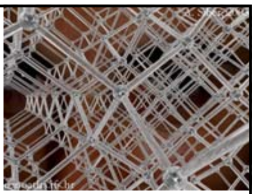
As (planned) Outcomes are Implemented, one might notice that adjustments have to be made

The Purpose of Structure

- Structure aims to balance between:
  - supporting preferred working manners
  - reducing the damaging effects of preferred working manners

Come, I will show you something interesting ...
I don't have time, I have to work!

Structure – How much and what?

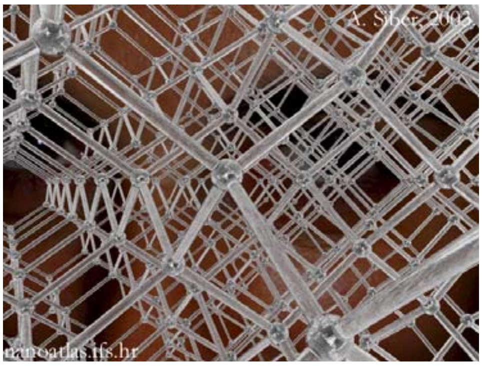


- Depends on problem and person(s):
  - Bigger and more complex problems typically need more structure
  - Experienced people need other types of structure than inexperienced
  - …
- The more structure, the more standardization:
  - Standardization facilitates reuse of experience (cf. “design pattern”)

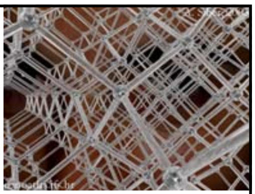
How Much Structure?

Factors that determine how much structure is appropriate:

- Experience
- Organisation/Project/Group size
- Culture/personality
- Age
- Problem complexity
- Product requirements
- Project duration
- …



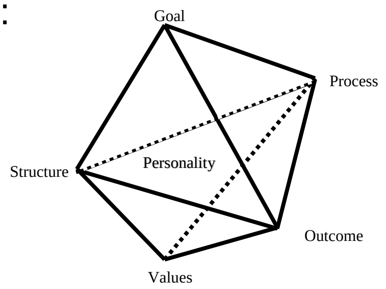
Structure – How to introduce it?



- Direct supervision and monitoring
  - by someone who knows the processes and products)
- Using prescriptive standards
  - of the processes (process handbooks)
  - of the outcomes (product specifications)
- Standardizing skills (→ training)
- Mutual adoption, e.g.
  - Structures that facilitate collaboration are introduced and agreed upon ad-hoc
  - Continuing interchange with the customer defines the product structure
- …

Expanding the SPO-Framework

- Since the key element in software/systems development are people, the SPO-framework must be expanded to include several ”softer” factors that govern human behavior:
  - Goals
  - Values
  - Personality



Goals

- Have long-term influence on our behaviour
- Knowing the goals of those involved in (affected by) process improvement activities are important for several reasons:
  - Process changes should be streamlined to help people achieve their goals (or at least not impede the achievement of their goals)
  - An organization works best when there is “a match” between personal and organizational goals
    - It is too narrow to look at salary as the only (and possibly not the most important either) goal for a developer.
    - Equally important: recognition, professional pride, team experience, etc.

Values

- In the SPO-context values are:
  - Concepts or principles that are
    - deemed worthy or important for concrete choices (e.g., of methods)
    - not supported by (rational) arguments or perhaps not even articulated
  - What takes over when rational decisions cannot be made (e.g., two methods seem to be equally good)
- None of the descriptions on the left are precise or especially complete.
  - But: It should still not be difficult to agree that values (with an intuitive understanding) are important for process improvement

Values – Examples

- “No one should be forced but convinced through argumentation”-value:
  - Often present in companies with consensus-culture (→ e.g., Japan)
  - Might make a good improvement proposal fail because it wasn’t possible to get everyone to agree
- “Leaders should make quick decisions”-value:
  - Often, managers with this value start too many improvement activities at once

Personality

- “A personality is a complex set of relatively stable behavioral and emotional characteristics that can be used to uniquely identify a person.” (Hohmann)
- “Personality represents those characteristics of the person that account for consistent patterns of behavior.” (Pervin, “Personality”).

Elements:

- Cognitive style
- Mental set
- Self-efficacy
- Assertive/Passive
- Tolerance of anxiety
- Tolerance for ambiguity
- etc…

Myers-Briggs Type Indicator (MBTI)

- 16 Personality Types: http://www.myersbriggs.org

- Attitudes: Extraversion vs. Introversion (E – I)
- Information-gathering function: Sensation vs. Intuition (S – N)
- Decision-making function: Thinking vs. Feeling (T – F)
- Lifestyle: Judging vs. Perceiving (J – P)

ISTJ	ISFJ	INFJ	INTJ
ISTP	ISFP	INFP	INTP
ESTP	ESFP	ENFP	ENTP
ESTJ	ESFJ	ENFJ	ENTJ

Myers-Briggs Type Indicator (MBTI)

- **Attitudes: Extraversion vs. Introversion (E – I)**
  - Extraversion relates to the external world of behavior, action, people and things
  - Introversion relates to the internal world of ideas and reflection
- **Information-gathering function: Sensation vs. Intuition (S – N)**
  - These functions describe how new information is understood and interpreted.
- **Decision-making function: Thinking vs. Feeling (T – F)**
  - Both Thinking and Feeling types strive to make rational choices, based on the data received from their information-gathering functions
- **Lifestyle: Judging vs. Perceiving (J – P)**
  - individuals seem to have a preference to show either their Judging function (T or F) or their Perceiving function (S or N) when relating to the outside world. Myers and Briggs called this a person's "ambassador," that is, the one sent forth to deal with the world.
- Personality type tests use these dimensions to uncover “personality profiles” (see, e.g., http://www.humanmetrics.com/)

  See also: http://en.wikipedia.org/wiki/Myers-Briggs_Type_Indicator

Originally introduced by Carl Gustav Jung (1875 – 1961)

… addition made by Catherine Cook Briggs (her daughter, Isabel Briggs Myers, continued this work)

Myers-Briggs Type Indicator (MBTI)

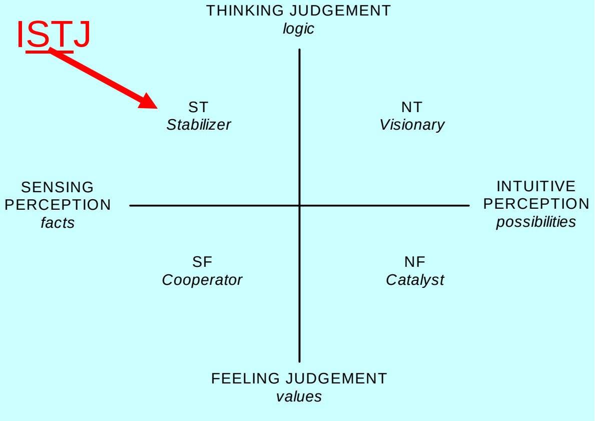
- **Attitudes:** **Extraversion vs. Introversion (E – I)**
  - E-types draw energy from action: they tend to act, then reflect, then act further. If they are inactive, their level of energy and motivation tends to decline
  - I-types become less energized as they act: they prefer to reflect, then act, then reflect again
- **Information-gathering function:** **Sensation vs. Intuition (S – N)**
  - S-types prefer to trust information that is in the present, tangible and concrete
  - N-types tend to trust information that is more abstract or theoretical, that can be associated with other information (→ holistic)
- **Decision-making function:** **Thinking vs. Feeling (T – F)**
  - T-types prefer to decide things from a more detached standpoint, measuring the decision by what seems reasonable, logical, causal, consistent and matching a given set of rules
  - F-types prefer to come to decisions by associating or empathizing with the situation, looking at it 'from the inside' and weighing the situation to achieve, on balance, the greatest harmony, consensus and fit, considering the needs of the people involved
- **Lifestyle:** **Judging vs. Perceiving (J – P)**
  - Types ending in J show the world their Judging function - either T or F. So TJ types tend to appear to the world as logical, and FJ types as empathetic. J-types types prefer to have matters settled (→ results-oriented)
  - Types ending in P show the world their Perceiving function - either S or N. So SP types tend to appear to the world as concrete, and NP types as abstract. P-types prefer to keep matters open (→ process-oriented)
- **Important: Test results indicate PREFERENCE not APTITUDE!**

Personality Types based on MBTI – Example

ISTJ:

- Quiet, serious, earn success by thoroughness and dependability.
- Practical, matter-of-fact, realistic, and responsible.
- Decide logically what should be done and work toward it steadily, regardless of distractions.
- Take pleasure in making everything orderly and organized – their work, their home, their life.
- Value traditions and loyalty.

Information-gathering (S-N) combined with Decision-making (T-F)



ISTJ

THINKING JUDGEMENT
logic

ST
Stabilizer

NT
Visionary

SENSING PERCEPTION
facts

INTUITIVE PERCEPTION
possibilities

SF
Cooperator

NF
Catalyst

FEELING JUDGEMENT
values

Conclusions

People are not equally comfortable with certain degrees of structure.

- New and innovative organizations, attract a special type of people (creative innovators who thrive in little structure). These people may have adaptation problems in a bigger and older organization with greater need for structure.
  - For example, a company founder is often not the best choice to lead the company after it has grown big (often, however, the founder himself/herself has difficulties to realize this).
- Bigger, older IT-organizations (typically government administration, bank/insurance, defense sector etc..) are often more plan-driven and documentation-heavy and want to attract confidence-seeking persons who thrive best with predictability.

Conclusions (cont’d)

Not everybody is like you

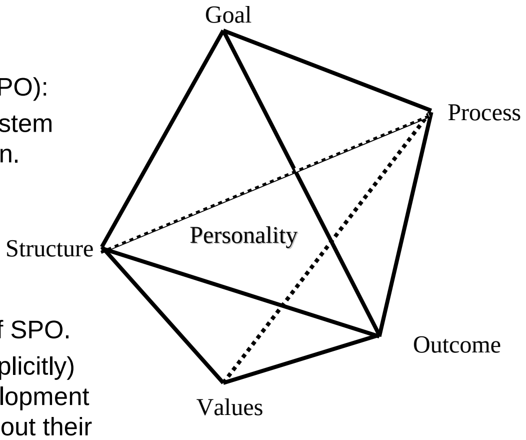
- It is easy for us to assume that others like the same and react equally as we do.
  - For example, if a process improver prefers a high degree of structure he/she could easily assume that others also do, and react irrationally (“they work against me”) if resistance is big.
- We like those who are like us, and devalue those who are different.
  - As a consequence, we have a tendency to collaborate with those who have similar preferences regarding structure than we have.

Conclusions (cont’d)

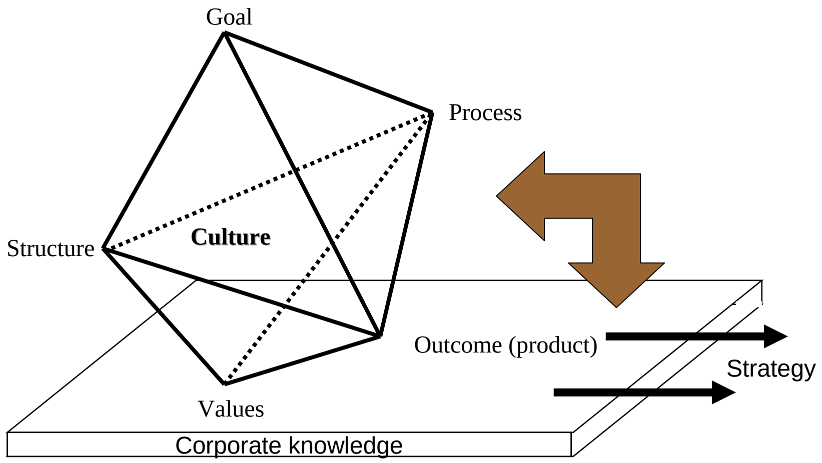
- Process improvement teams should be composed of persons with different personalities.
- A successful process improvement team or system development team may need:
  - Renewers/innovators (specially important in the start phase)
  - Researchers/launchers (specially important in the start phase)
  - Surveyors/developers (specially important in the start phase)
  - Pursuers/organizer (specially important in introduction and the follow-up phase)
  - Completers/producers (specially important in the introduction phase)
  - Informers/advisers (specially important in the introduction phase and the follow-up phase)
  - Supporter/maintainer (specially important in the introduction phase and the follow-up phase)
  - Controller (specially important in the follow-up phase)

The “People Framework”

- Structure – Process – Outcome (SPO):
  - It is these elements that sw/system development methods focus on.
  - Focus on control, support and standardisation.
- Values – Personality – Goals:
  - Represent the “human side” of SPO.
  - These elements are rarely (explicitly) considered in sw/system development methods and little research about their effects on sw/system development has been conducted.



The “People Framework” for Organisations



Quality and Culture – Example

[“Strategic alliances” by P. Lorange]

A story from Japan (from Fuji Xerox):

450 people with suits. The manager Tony Kobayashi arrives. In unisono: “good morning”. TK explains with pictures “pyramids were built over long period of time by many people”, “camels go slowly but surely”, “the hare and the tortoise”. Finally all stand up and sing “the quality circle song”.

<u>THE QUALITY CIRCLE SONG</u>

With radiant smile to one another, friends united with keen spirits.
Oh!, the friends speak about the new dreams, about quality control.
And struggle with the objectives clearly, quality circles filled with light.
With an all-time increasing morale, the days become full of systematic works
Oh!, this time is wonderful, promising businesses that flourish.
They struggle for tomorrow’s ideas, quality circles filled with motivation.
By communicating with one another, this way will choose good means
Oh!, this way means luck, further growth of Japanese culture
Powerful and influential, quality circles filled with future.

BTW, IBM had a strong culture of song singing from the 1930s to the 1950s!

Different Company Cultures expressed in Songs

- **Fujitsu company song:**

Verse 1:
Let's run out now, to greener fields, where shines a splendid Sun.
We have a dream, a wondrous dream, that gets the best things done.
A wide blue sky is in our heart now,
Open-ness in our soul,
We'll run together going onwards now,
On towards our goal.

Chorus:
Ahhhh Fujitsuuuuu, oh tomorrow is our goal.
.
Verse 2:
Lets join our hands, with everyone, and smile at each new hour.
We have a dream, an endless dream, of youthful love and power.
We want to use all our skill now,
All the strengths unfurled,
We plan uniting all our new techniques,
Over all the world.

Chorus:
Ahhhhh Fujitsuuuuu, forges links all over the world.

Verse 3:
Let's make a bond, from heart to heart, throughout the human race.
An unseen power, now in our grasp, can even conquer space.
We want to find a new harmony,
Both in work and play,
We'll share the fresh things we discover now,
Building a new day.

Chorus:
Ahhhhh Fujitsuuuuuu, GIVES A JOY WITH EVERY NEW DAY!

- "Ever Onward," written in 1931 by IBM'er Frederick Tappe:

"There's a thrill in store for all
For we're about to toast
The corporation that we represent.
We're here to cheer each pioneer
And also proudly boast,
Of that man of men
Our friend and guiding hand
The name of T.J. Watson means
A courage none can stem
And we feel honored to be
Here to toast the IBM."

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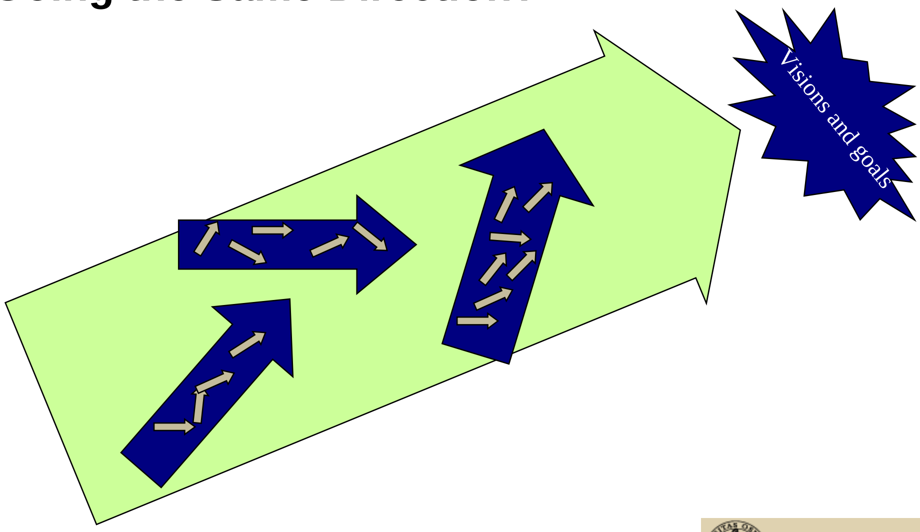
Going the Same Direction?



Why Talk about Group (Dynamics) in INF5181?

- Most of the work in sw & system development organizations happens in groups
- Although process improvement initiatives sometimes meet resistance when doing
  - process assessments,
  - planning and executing measurement programs,
  - documenting processes,
  - arranging training courses etc.,

  … the strongest resistance emerges (deliberately or not) when attempting to actually change the way individuals and groups work.
- Understanding the group dynamics in a development organization is probably the most important key to improve processes (i.e., to implement changes)

What is a Group?

- Definitions:
  - "two or more interdependent individuals who influence one another through social interaction" (Cartwright & Zander, 1968)
  - "a group exists when two or more people define themselves as members of it and when its existence is recognized by at least one other" (Brown, 1988)

- Group characteristics:
  - Interaction
  - Structure
  - Size
  - Common objectives
  - Cohesion (“proximity between group members")
  - Dynamics (internal and towards other groups)
  - Change

Evolution of a Group

TUCKMAN B (1965) "Developmental Sequence in Small Groups" *Psychological Bulletin* 63 pp. 384-399

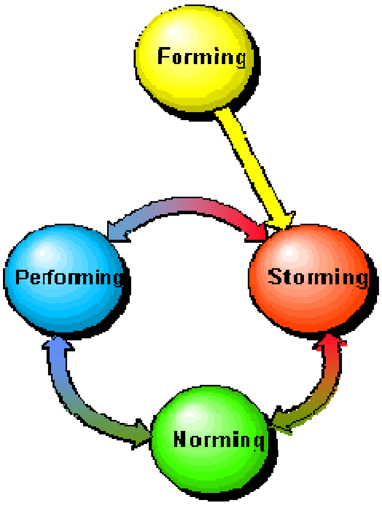
Five basic stages:

- **Forming** – members of the group get to know one another and try to set up some ground rules about behaviour
- **Storming** – conflicts arise as various members of the group try to exert leadership and the group's methods of working are established
- **Norming** – conflicts are largely settled and a feeling of group identity emerges
- **Performing** – the group has settled its relationships and expectations and works efficiently and effectively; the emphasis is now on the tasks at hand
- **Adjourning** – the group dissolves and shares their experience with others

Remarks on Group Evolution

- ALL stages are important and should be performed
- The storming stage is particularly critical
  - The "level of conflict" is an indicator for future success
    - Low conflict level in the group is often a signal for little involvement
    - Conflicts are often useful to create solidarity (if conflicts are managed reasonably and not intensified)
      - "The threshold theory of conflict" (pp. 80-82 in Group Dynamic, Forsyth)
  - Management plays a crucial role during storming

The Evolution of a Group – Long-term View



- Group evolution will continue when tasks change.

Group Evolution and Process Improvement

- Introduction or change of processes often follows the five stages of group evolution (forming → storming → norming → performing → adjourning).
- The conflict level (when introducing/changing processes) can be a good indicator for future success.
  - Experienced consultants in process improvement become suspicious when there is lack of conflict!
  - However: if the conflict level is too high, the group may never reach the Norming phase

Role Evolution (the individual’s view) – Steps

- Registration
  - Arrival of non-member
- Evaluation
  - Group evaluates new member / new member evaluates group → quasi-member
- Socialization
  - Assimilation, the group and the new member get acquainted with each other
  - Acceptance and full integration of new member → full member
- Maintenance
  - Role re-evaluation (repeatedly)
  - If role no longer suitable/needed → marginal member
- “Re-socialization” or exclusion of marginal member

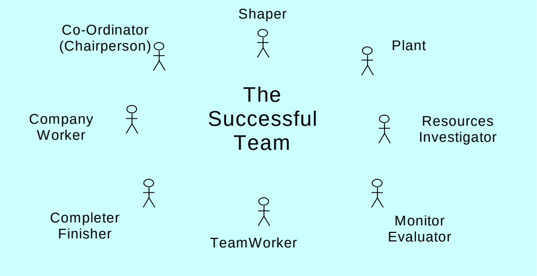
The Ideal Group

- An ideal group (a team) consists of “A small number of people with complementary skills who are committed to a common purpose, performance goals, and a common approach for which they hold themselves mutually accountable.”

  [Katzenbach, J.R., and Smith, D.K., The Wisdom of Teams: Creating the High-Performance Organization, Cambridge, Mass.: Harvard Business School Press, 1993.]

Balanced Teams

www.belbin.com



Shaper

Co-Ordinator (Chairperson)

Plant

Company Worker

The Successful Team

Resources Investigator

Completer Finisher

TeamWorker

Monitor Evaluator

- Meredith Belbin studied the performance of top executives carrying out group work at the Hendon Management Centre
  - Tried putting the ‘best’ people together in ‘Apollo’ teams – almost invariably did badly
  - Identified the need for a balance of skills and management roles in a successful team

Management team roles (Belbin)

- The **co-ordinator** – good at chairing meetings and resolving conflicts
- The ‘**plant**’ – an idea generator
- The **monitor-evaluator** – good at evaluating ideas
- The **shaper** – helps direct team’s efforts
- The **team worker** – skilled at creating a good working environment
- The **resource investigator** – adept at finding resources, including information
- The **completer-finisher** – concerned with getting tasks completed
- The **implementer** – a good team player who is willing to undertake less attractive tasks if they are needed for team success
- The **specialist** (added in 1996) – the ‘techie’ who likes to acquire knowledge for its own sake

Group Performance vs. Task Types

Some tasks are better carried out collectively while other tasks are better delegated to individuals

- *Additive tasks*
  - The effort of each participant is summed
- *Compensatory tasks*
  - The judgements of individual group members are summed
  - Errors of some compensated for by judgements of others
- *Disjunctive tasks*
  - There is only one correct answer and someone must:
    - Come up with right answer
    - Persuade the other that they are right
- *Conjunctive*
  - The task is only finished when all components have been completed

Group Work and Task Complexity

- Some results from studies (→ survey of 241 studies including 24 000 persons by [Bond & Titus, 1983]):
  - Solving <u>simple</u> tasks in groups (even with passive listeners) increases performance (efficiency).
    - This is called “social facilitation”. However, groups do not increase quality (effectiveness).
  - Solving <u>complex</u> tasks in groups decreases performance (and quality).
    - This is due to the fact that groups “bind cognitive resources”, thus impairing the primary task.

Group Work and Creativity

- Studies show that it is not optimal to have “brainstorming” in (large) groups
- Creative work should be prepared “offline” and then discussed jointly

How to avoid low performance in groups?

- Means to avoid performance reductions in groups are (among other things):
  – Give group members interesting, engaging and challenging tasks
  – Create confidence so that others try to give their best performance
  – Clarify personal responsibility (and authority) – ideally related to the impact on the end product
  – Evaluate individuals based on their (identifiable) contribution

How to avoid resistance in SPI programmes?

- Important learning from (Coch & French, 1948) experiment:
  - Increased degree of participation in change program reduces degree of resistance and stimulates increased output.
  - **Question:** Not everyone can always actively participate in a change program. How to still avoid high degree of opposition?

Decisions Made by Groups

- Groups using some of their time on defining (and agreeing on) the decision-making process come up with better decisions (Hirokawa 1980)
  - Often, however, groups use very little or no time for clarifying/discussing the decision-making process.
- Sometimes groups develop “group thinking”
  - i.e., lack of real discussion of alternatives and a strong motivation to agreeing (with dominant person) and being loyal (esprit de corps).

Obstacles to good team decisions

- Inter-personal conflicts – see earlier slide on team formation
  - Conflicts tend to be dampened by emergence of *group norms* – shared group opinions and attitudes

- *Risky shift* – people in groups are more likely to make risky decisions than they would as individuals
  - One explanation for this dynamic is that there has been a diffusion of responsibility that otherwise may fall on one individual

Delphi approach

- To avoid dominant personalities the following approach is adopted
  1. Enlist co-operation of experts
  2. Moderator presents experts with problem
  3. Experts send in their recommendations to the moderator
  4. Recommendations are collated and circulated to all experts
  5. Experts comment on ideas of others and modify their own recommendation if so moved
  6. If moderator detects a consensus, stop; else back to 4

Positive Group Dynamics: Team ‘mindfulness’

- Impression of a ‘collective mind’
  - Group members are aware of the activities of other members that contribute to overall group success
- Some attempts to promote this:
  - Egoless programming
  - Chief programmer teams
  - XP
  - Scrum

Egoless programming

- Gerry Weinberg noted a tendency for programmers to be protective of their code and to resist perceived criticisms by others of the code
  - Encouraged programmers to read each others code
  - Argued that software should become communal, not personal – hence ‘egoless programming’

Chief programmer teams

- Fred Brooks was concerned about the need to maintain ‘design consistency’ in large software systems
- Appointment of key programmers (→ Chief Programmers) with responsibilities for defining requirements, designing, writing and testing software code
- Assisted by a support team:
  - co-pilot – shared coding
  - editor who typed in new or changed code
  - program clerk who wrote and maintained documentation and
  - tester
- Problem: finding people capable of the chief programmer role

Extreme programming

- XP can be seen as an attempt to improve team mindfulness and reduce the length of communication paths (the time between something being recorded and it being used)
  - Software code enhanced to be self-documenting
  - Software regularly refactored to clarify its structure
  - Test cases/expected results created before coding – acts as a supplementary specification
  - Pair programming – a development of the co-pilot concept

Scrum

- Named in analogy to a rugby scrum – all pushing together
- Originally designed for new product development where 'time-to-market' is important
- 'Sprints' increments of typically one to four weeks
- Unlike XP, requirements are frozen during a sprint
- Daily 'scrums' – daily stand-up meetings of about 15 minutes
- At the beginning of the sprint there is a sprint planning meeting where requirements are prioritized
- At end of sprint, a review meeting where work is reviewed and requirements may be changed or added to

Trust

- Confidence in colleagues and managers appeared to be most important factor in support of job satisfaction (Driscoll, 1973).
- Groups with high degree of trust are more effective than those with less confidence.
  - E.g., the reaction to well-justified criticism will usually be different in trustful relations than where you suspect someone could have used or plans to use the criticism against you.
  - It is difficult to imagine successful improvement work in total absence of criticism.

Groups and Communication: Time/place constraints on communication

	Same place (co-located)	Different place (geo. distributed)
Same time (synchronous)	Meetings Interviews	Telephone Instant messaging Video conference
Different times (asynchronous)	Notice boards Pigeon-holes	Email Voicemail Documents

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Other factors influencing communication means/channels

- Size and complexity of information
  - Where high, favours documents
- Familiarity of context e.g. terminology
  - Where low, favours two-way communication
- Personal / Sensitive / Confidential
  - Preferable face-to-face communication
  - If written, requires confidentiality protection

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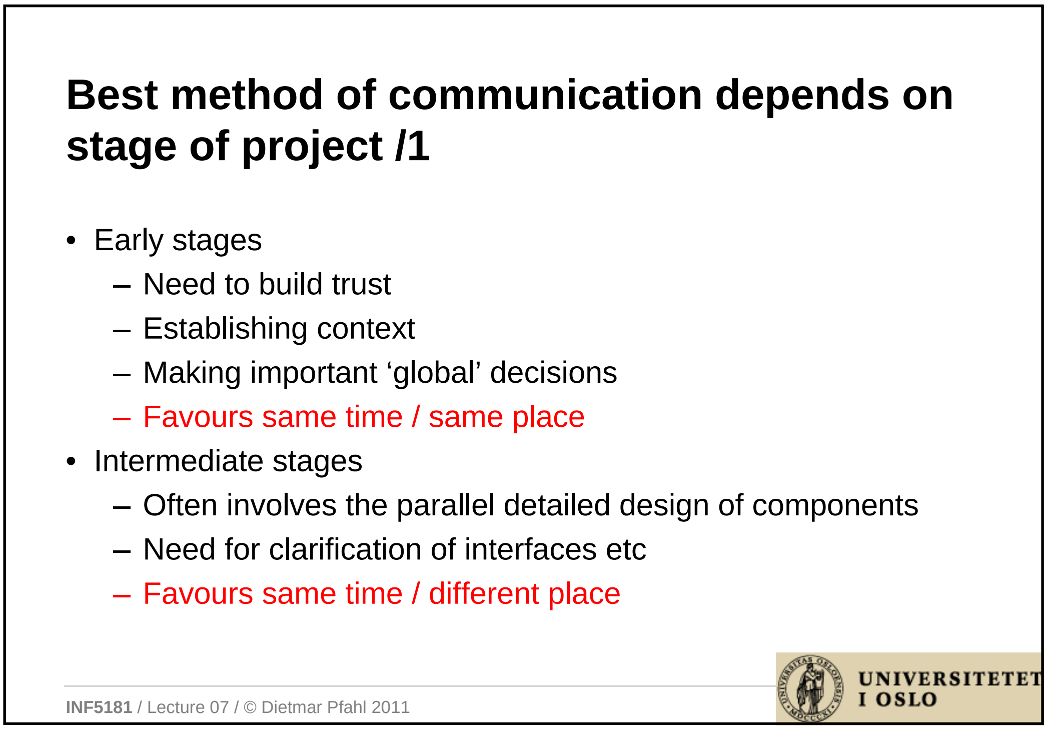
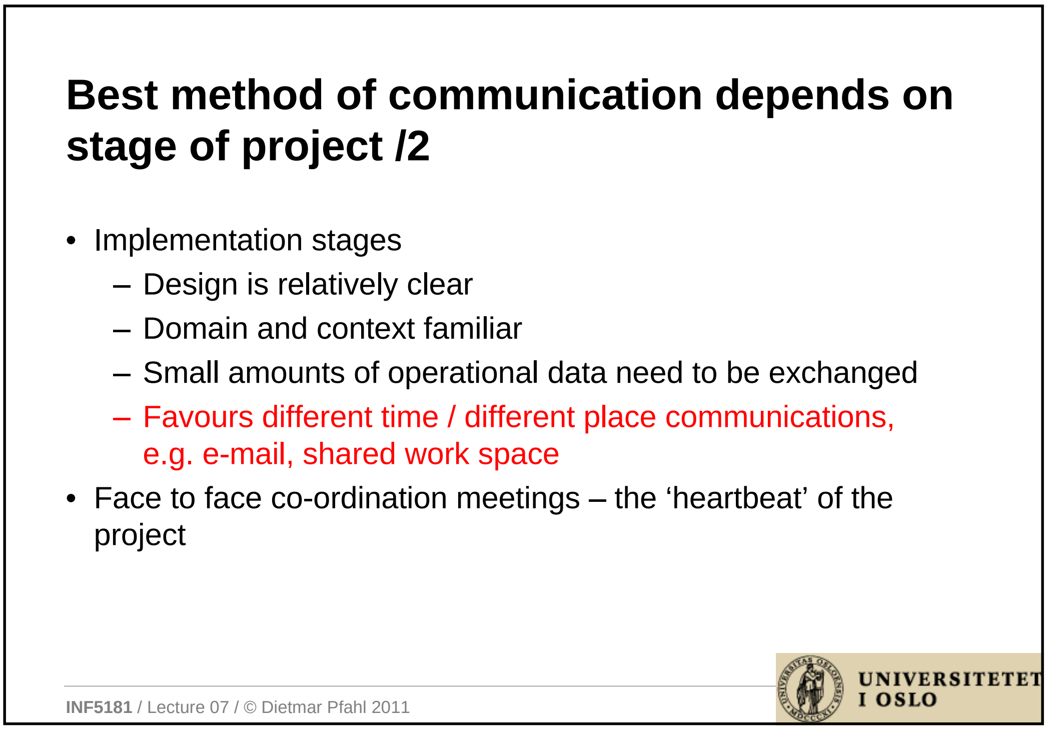


Best method of communication depends on stage of project /1

- Early stages
  - Need to build trust
  - Establishing context
  - Making important ‘global’ decisions
  - Favours same time / same place
- Intermediate stages
  - Often involves the parallel detailed design of components
  - Need for clarification of interfaces etc
  - Favours same time / different place



Best method of communication depends on stage of project /2

- Implementation stages
  - Design is relatively clear
  - Domain and context familiar
  - Small amounts of operational data need to be exchanged
  - Favours different time / different place communications, e.g. e-mail, shared work space
- Face to face co-ordination meetings – the ‘heartbeat’ of the project

Structure of Lecture 07

- Hour 1:
  - Problem Solving – Basics
  - The “People Framework”
- Hour 2:
  - Working in Groups
  - Motivation ←
- Hour 3:
  - Exercises
  - Question/answer session about project

Motivation

- Motivation can often make up for shortcomings in resources and skills
- Taylor’s approach → financial incentives
  - Higher wages for the best workers
- Abraham Maslow (1908-1970)
  - Motivations vary from individual to individual
  - Hierarchy of needs – as lower ones fulfilled, higher ones emerge
    - Lowest level – food, shelter
    - Highest level – self-actualization

Herzberg

- Herzberg suggested two sets of factors affected job satisfaction
  - Hygiene or maintenance factors
    - Make you dissatisfied if they are not right, e.g., pay, working conditions, …
  - Motivators
    - Make you feel the job is worthwhile, e.g., by giving a sense of achievement

Vroom

- Vroom and colleagues identified three influences on motivation
  - Expectancy
    - The belief that working harder leads to better performance
  - Instrumentality
    - The belief that better performance will be rewarded
  - Perceived value of the reward

Oldham-Hackman job characteristics

- Identified the following characteristics of a job which make it more ‘meaningful’
  - Skill variety
  - Task identity
  - Task significance
- Two other factors contribute to satisfaction:
  - Autonomy
  - Feedback

Absence of (Undue) Stress

- Stress can be reduced by good processes
- Good processes should yield:
  - Reasonable estimates of effort
  - Good project control leading fewer unexpected crises
  - Clarity about what is expected of each team member – reduces role ambiguity
  - Reduced role conflict where a person is torn between conflicting responsibilities

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Exercise 1

- Imagine an organization that implements web-solutions.
- The organization was started by two students at IfI and has in three years grown from two to forty employees.
- The founders have (with little help) realized that others ought to manage the organization and hire Petter who was a middle level manager in the IT-department of a bigger Norwegian bank.
- Petter sees immediately the need to introduce more structures and proposes introduction of routines which are the same as those used in his last job.

- Analyze the situation and identify risks!

Exercise 2

- Web-development projects are often cross-disciplinary, e.g., a project may be composed of pedagogues, graphical designers and programmers. Thus, the project will be done by persons with very different preferences regarding work, collaboration and communication styles. Assume that project members of different professions don't know each other. If you make additional assumptions, make them explicit.
- Compared to a project with a homogeneous team, how will the diversity in the group influence/change the project structures with regards to:
  - process
  - product specification
  - communication
  - status reporting within the project

Exercise 3

- Management proposes a structure for status reports from project members to project managers. The structure looks like this:
  - Name of developer & date
  - Completed work
  - Ongoing work
  - Future work
  - Comments/risk points/problems
  - Status related to plan (plan vs. actual)

Questions:

- What are the advantages and disadvantages of having such formal communication?
- A status report should not be longer than one page. Which effect has this on communication?
- Should the project manager also make such status report for project members?

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Next Lecture

- Industry Presentation: SPI at Skatteetaten (Cost Estimation)
- Instructor:
  - Bente Anda