Herbsleb & Grinter: Conway's Law Revisited

ICSE 99

Product and Process

- Conway and Parnas relate work breakdown to product; *the process also has a structure*
  - » *Product, Organization, Process, all entangled and reflecting each other*
- But ...
  - *"there will always remain many decisions that cannot be made ahead of time, unanticipated problems, details to be filled in, mistakes to be corrected and recovered from"*
- *These demand effective informal communication*

The "water cooler"

(on the west coast, substitute an espresso machine)

- "What appear to be merely 'casual conversations around the water cooler' often serve to informally exchange the kinds of information and experience that are critical to project coordination."
  - Especially: The connection you didn't even know to ask about.

Integration Plan

- *... "a plan for integrating ... consisted of 40 steps"*
- *"no surprise that the components were not ready for integration on the schedule described in the plan"*
- *"We chopped and changed as things became ready."*
  - – Side question: How would you avoid this situation, considering the "virtual impossibility of predicting the effort and timing of a new product being developed in a new organization"

Interface specs

- *“Interfaces were specified primarily by event tracing, or ‘fence diagrams’ that showed sequences of messages among processes”*
- *“it became clear that the interface specifications lacked many essential details”*
- *“not until the initial attempts to make the pieces work together that these alternate assumptions were exposed”*
    - How do you avoid this?

Change management (revision control, ++)

- *“separation allowed two change management processes to evolve independently, one for each site.”*
    - Don’t. Ever. And also don’t let people bypass or ignore the change management system. You will suffer if you do.

Documentation

- *“Under time pressure to build the system, the developers proceeded with coding, and slowly the code diverged from the design.”*
- *“The developers were left with one accurate source of documentation – the code itself.”*
- *“As* [some detail] *was not included in the documentation, the headers were not correct, and it took weeks to figure out that this was the problem”*

Barriers to informal communication

- Lack of unplanned contact
- Knowing who to contact about what
- Cost of initiating contact
- Ability to communicate effectively, and
- Lack of trust, or willingness to communicate openly.

Unplanned Contact

- *"just the usual sort of friendly exchange, common in the workplace ... seem to be surprisingly important in keeping projects coordinated"*
- *"project members are often unaware of the assumptions they are making, or that others might be making conflicting assumptions"*

Knowing whom to contact

- *"no straightforward way to find out who was responsible for the component on the other site"*
- *"developers [who] had spent ... time at the other site ... became 'contact people' or 'liaisons.'"*

Communication & technology

- Face-to-face is most effective ... but if you can't have that ...
- *"every conference call I walked out of, if I ask somebody what do you understand from it, and they say, 'I don't know' ."*
- *"E-mail was ... preferred ... , especially [for] non-native English speakers"*
  - Today: Video calls help some; IM may or may not help. Still very short of a face-to-face chat in front of a whiteboard

Culture differences

- *"the Germans have a greater tendency to take hierarchical relationships a bit more seriously, expecting and receiving a greater degree of direction from managers and supervisors"*

  - Note: Besides national cultures, differences also exist between the cultures of different companies and professions. Bankers are from Jupiter, programmers are from Mars.

Trust and Confidence

- *“they just did not seem to be able to make progress until they had worked together face to face”*
- *“manifested itself in ‘uncharitable’ interpretations of behavior”*
    - We observed a similar need to build trust and confidence in globally distributed CIS 423/523 projects last year, without recourse to travel. Resolved, but not easy.

Conclusions

- Software design promotes independence
    - Conway’s law, Parnas’s guidance on software architecture: Limit dependence to simple, precise interfaces that correspond with communication structure
- But you’ll never get it entirely right
    - Informal communication is needed because things change and break, and there are always details to be filled in and negotiated. Geographic, linguistic, and cultural distance makes it harder.