

CSci 780  
Advanced Software Engineering

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**Peopleware**

Productive Projects and Teams

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**Outline**

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- Managing the Human Resource
- Coding War Games
- The Work Environment
- The Right People
- Jelled Teams
- Teamicide
- Conclusion
- Discussion

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**Problem**

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- The software industry has a “notorious” reputation for being out of control in terms of schedule accuracy, cost accuracy & quality control. A majority of large systems run late, exceed budgets & many are cancelled. [Capers Jones]
- Study of 500 projects [DeMarco & Lister]
  - 15% cancelled, aborted or postponed
  - 25% failure for projects requiring >25 staff years

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**What Is The Cause?**

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- Hardware?
  - Faster computers
  - Bigger displays
  - Newer pagers
- Software?
  - Better compilers
  - Newer programming languages
  - Code analysis tools

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**Peopleware**

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- “The major problems of our work are not so much *technological* as *sociological* in nature”
- Success factors
  - Communication
  - Staffing
  - Motivation
  - Low turnover
- We tend to focus on technical issues because they are easy to tackle

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**Peopleware (cont)**

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- Motivation is undoubtedly the single greatest influence on how well people perform. Most productivity studies have found that motivation has a stronger influence on productivity than any other factor. [Steve McConnell, *Rapid Development*]
- Hire the best people, keep them happy so they don't leave, and remove obstacles from their way [DeMarco & Lister]

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## The Production Bias

- Squeeze out errors
- Occasional mistakes natural and healthy
- No goofing on the job
- Self-motivation, creativity
- Interchangeable workers
- Need uniqueness
- Optimize the steady state
- Project always changing
- Standardize procedures
- Some standardization
- No experimentation
- Selective experimentation

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## Overtime

- Spanish Theory of Value: Value acquisition is a zero-sum game
  - Example: unpaid overtime
- Unpaid overtime is a myth
  - Burnout, undertime, turnover
  - Resentment
  - Working faster, not better
- Example: Eagle project at Data General
  - Great "productivity"—entire team quit afterwards

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## Quality—If Time Permits

- Quality is not just another product attribute
  - "We can't afford to do more Q&A"
- There's a market cost for poor quality
- But developer's self-esteem is based on it
  - Would you enjoy producing a crappy product?
- Quality needs to be set by the developer, not the customer
  - Ex: HP has a culture of quality, and low turnover

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## Coding War Games

- Design, code, and test medium-sized program
  - Minimal time, minimal defects
- 2 person teams compete to complete programming challenges
- Normal work environment, hours, tools, etc.
- 600 participants, 92 companies (1984-1986)

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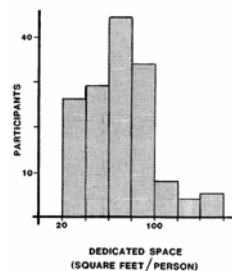
## Results

- Individuals
  - Best vs. worst: 10 to 1
  - Best half vs. worst half: 2 to 1
- Non-factors
  - High-level programming language
  - Years of experience, salary (weak correlation)
  - Quality level (zero defect group outperformed others)
- But there *was* an organizational correlation!
  - Best organization vs. worst organization: 10 to 1

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## Workplace Stats



**PROGRAMMER WORKPLACE  
(AVERAGES FROM THE SAMPLE)**

|                     |                     |
|---------------------|---------------------|
| Dedicated space:    | 63 square feet      |
| Enclosure:          | cubicle walls (78%) |
| Cubicle height:     | 5 feet              |
| Dedicated terminal: | 60%                 |

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## Workplace Stats (cont)

| QUESTION  | PERCENT OF RESPONDENTS |
|---|------------------------|
| Is your workplace acceptably quiet?   | 58% No                 |
| Is there sufficient privacy?  | 61% No                 |
| Do people often interrupt you needlessly?                                     | 62% Yes                |
| Is it difficult or impossible to work effectively in your workplace from 9-5? | 41% Yes                |
| Does your workplace make you feel appreciated?                                | 51% No                 |
| Is your workplace at work as pleasant as your workplace at home?              | 54% No                 |

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## Impact of Workplace

| ENVIRONMENTAL FACTOR                           | TOP 25%  | BOTTOM 25% | ALL      |
|--|----------|------------|----------|
| Dedicated floor space                          | 78 sqft. | 46 sqft.   | 63 sqft. |
| Acceptably quiet workspace                     | 57% yes  | 29% yes    | 42% yes  |
| Acceptably private workspace                   | 62% yes  | 19% yes    | 39% yes  |
| Can you silence your phone?                    | 52% yes  | 10% yes    | 29% yes  |
| Can you divert your calls?                     | 76% yes  | 19% yes    | 57% yes  |
| Do people often interrupt you needlessly?      | 38% yes  | 76% yes    | 62% yes  |
| Does your workspace make you feel appreciated? | 57% yes  | 29% yes    | 45% yes  |

- IBM Santa Teresa Study
  - Working alone: 30%, working with others: 70%
  - 30% time noise-sensitive, 70% time noise generators

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## The Penalty of Interruptions

- *Flow*: condition of deep mental involvement
- *E-factor*: uninterrupted time / total time
- Takes about 15 minutes to achieve flow
- With interruptions every 15 minutes...
- More war games results
  - Workers with quiet workplaces were 1/3 more likely to deliver zero-defect work

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## Solutions?

- Email instead of phone
- Unplug the phone
- Structure workplace to have meeting rooms with doors
- Retreat to these rooms for discussions
- Avoid headphones—music hinders creativity
- Offices with windows
- Retreats
- Don't be afraid of personalization

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## The Right People

- Managers: Make sure to look for the right thing
  - Can the person perform?
  - Can the person learn?
  - Not a "professional" (drone) appearance
- Job-seekers: Prove your capabilities
  - Develop a software "portfolio"
  - Do an internship
  - Work for free?

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## Keeping Good People

- Strive to be the best
- Create a binding atmosphere (expect to stay)
  - Community garden, basketball court
  - Let/help people get their Master's or PhD
- Widespread retraining and promotion

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## Jelled Teams

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- Tight-knit, productive teams of people
- Sense of elite-ness
- Sense of identity
  - Want T-shirts
- Joint ownership of product
- Obvious enjoyment

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## Teamicide

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- Defensive management
- Bureaucracy
- Physical separation
- Fragmentation of people's time
- Quality reduction of the product
- Phony deadlines
- Clique control
- Phony, insulting goals
- Merit reviews, bonuses tied to performance

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## Toward Good Team Chemistry

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- As before:
  - Cult of quality
  - Sense of eliteness
- But also:
  - Provide satisfying closure
  - Allow and encourage heterogeneity
  - Preserve and protect successful teams
  - Provide strategic, not tactical direction

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## Conclusion

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- People are the most valuable asset
- High productivity requires job satisfaction
- Management is not about "kicking ass"
- Managers should not *make* people work, but rather *make it possible* for people to work
- Phones are evil
- Some prison cells are bigger than workspaces
- Aim for internal, not external motivation
- Cultivate quality, trust, pride, worth, loyalty

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## Questions

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- Is overtime really that bad? After all, the work *does* get done!
- Team/company horror stories?
- Do you think managers will adopt these ideas?
- Why wouldn't these ideas apply to other engineering disciplines?
- Any impact of these ideas on methodologies?

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