Offshoring and Evolution of 24-Hour Knowledge Factory

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Offshoring: Key Driving Forces

- Technological
- Economic
- Organizational
- Strategic
- Political
- ….

Other Significant Drivers

- Y2K and EEC
- Policies of governments in emerging economies, especially ones with educated personnel
- Policies of governments in developed economies

- Impact of Disruptive Technologies

Medical Transcription Services

- Extended Learning Curve- Eight to Twelve Month Training Program
- Cost: US $2500 to $3000/mo versus Indian MT < $300/mo
- Education: All have at least undergraduate degrees
  - 221 science/medical-based degrees
  - 37 doctors
  - 17 pharmacists
- Cultural: Bagels and Beagles and other cultural differences

When will Offshoring Stop?

- Offshoring involves the utilization of services provided in foreign countries by surmounting immigration barriers through the use of information technologies.
- Offshoring will continue as long as desired talent is available in foreign countries and significant differences exist in skill levels and wages.

Indiana Example

- Summer of 2003: Tata America Int. Corp, Accenture, and Deloitte Consulting make bids ranging between $ 15.2 million and $ 38.5 million. No Indiana-based company submitted bid. Up to 65 contract workers were envisaged to work alongside 18 state workers.
- September 2003: Governor Frank O'Bannon accepts lowest bid.
- November 2003: Governor Joe Kernan cancels contract.
- Decision NOT related to shortcoming of any type.
- Projected Difference: $ 8.1 million versus approximately 50 employees.
- Voting in House: ARE SUCH DECISIONS INCONSISTENT WITH US CONSTITUTION AND WITH OBLIGATIONS TO WTO?
- Different Approach in California and Springfield, MA
- Decision of Voters in Indiana 2004!!

U.S. States and Offshoring

- Many State Governments have adopted, or have seriously considered, legislation to discourage or prohibit offshoring.
- U.S. Supreme Court decision invalidated Massachusetts law that penalized businesses that operated in Myanmar.

U.S. Constitution and Offshoring

- Federal government holds exclusive rights on matters involving interstate commerce and foreign affairs.
- States' anti-offshoring legislation violate the spirit of U.S. federalism and the U.S. Constitution and are likely to be invalidated.

International Law and Offshoring

- If the federal government approved these laws, they could potentially violate U.S. commitments to the World Trade Organization.
- U.S. is proponent of free trade

Case of State Protectionism

- 1789 New York gave exclusive rights to one company to ferry passengers between New York and New Jersey.
- 1812 New Jersey passes retaliatory legislation
- U.S. Supreme Court intervenes and allows competition from New Jersey
- Led to major innovations in steamboat industry

Today

- 200 years ago, the issue was intra-state interests vs. national interests
- Today, the issue is national vs. global
- Arizona prohibits offshoring of IT work on government awards
- Work now done in other states
- Gradually, organizations will opt to get work done in multiple places

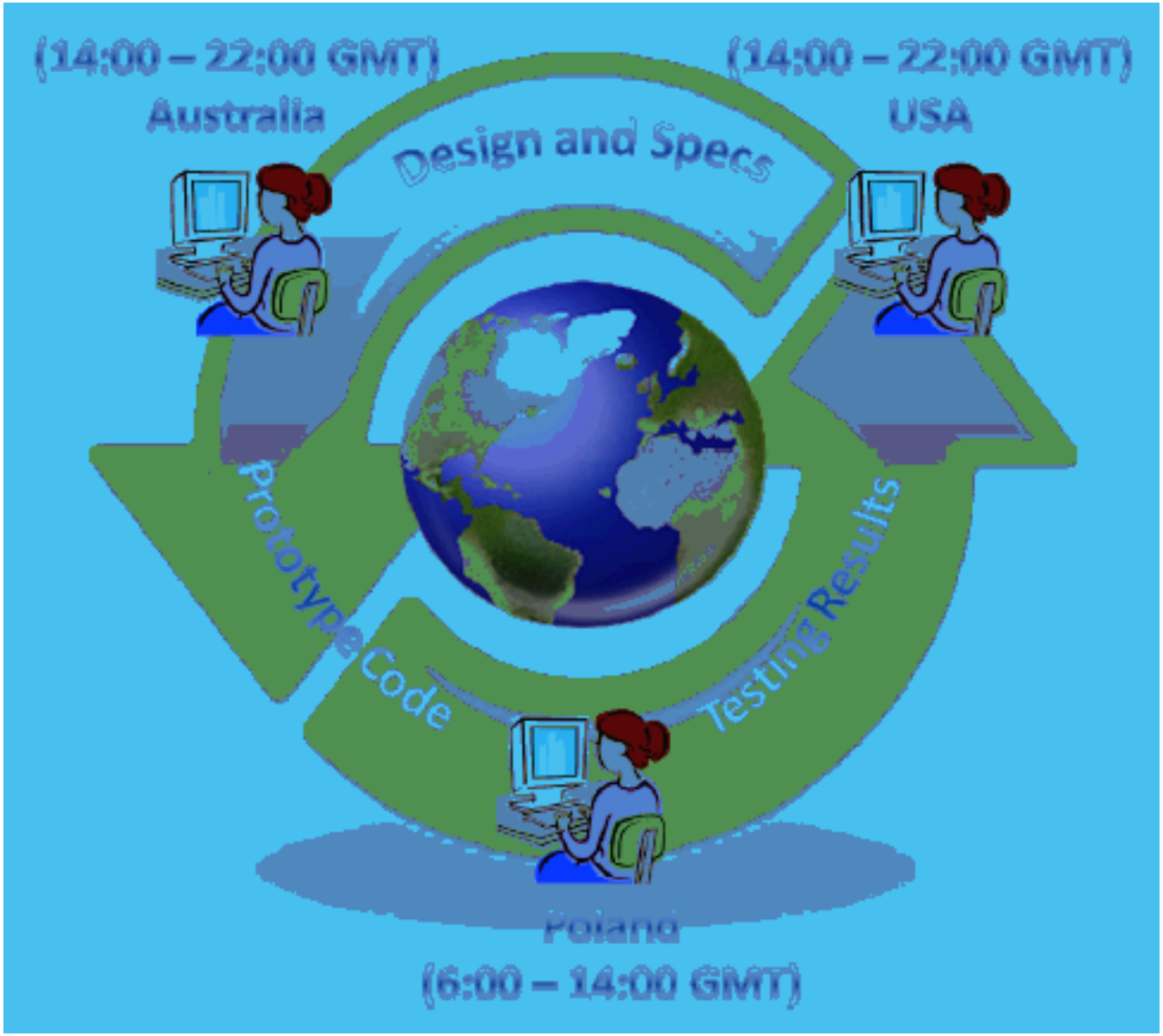
Industrial Revolution

- Work standardization
- Shift work
- By breaking down production tasks, productivity attained new heights as artisans became employees and specialization abounded.

Information Age

- The advent of electronic computers, coupled with diminishing telecommunications costs, allows for the establishment of multiple “factories” in different time zones, transcending physical barriers.

24-hour Knowledge Factory



24-hour Call Centers

- 3-4 call centers in time zones 6-8 hours apart allow employees of call centers to respond to calls during normal daytime work hours by creating
- Concept gradually adopted to support global communications networks
- Semiconductor chip designers can avoid the “graveyard shift”
- Other industries can be transformed by using multiple work centers
- Medical reasons too!

Case Study: IBM

- One-year detailed study
- Two-site global work environment
- Insights gained from this case study are helpful for understanding the dynamics of environments involving three or more sites.

Hypotheses

H1: The distributed team will rely more heavily on written communication for group discussion.
H2: The distributed team will rely less (than the co-located team) on broadcast style email messages.
H3: The distributed team will conduct longer discussions primarily in written (email) form.
H4: The distributed team will send fewer logistical messages to members of the group.
H5: The distributed team will make major use of the source code modification process to resolve issues, in place of informal collaboration, before the Ôfeature freezeÕ date.
H6: The socio-technical system of the distributed team will be less interconnected (as compared to the co-located team).
H7: The distributed team will rely more on meetings for short term issues.
H8: The distributed team will formally assign tasks in meeting format.
H9: The output of the distributed team will be similar, in terms of quality, as that of the co-located team.
H10: The distributed team will rely more on formal systems for knowledge capture, as compared to the co-located team.
H11: The productivity of the distributed team will be lower than that of the co-located team (because of the overhead involved in transferring tasks back and forth on an incremental basis).

Results from IBM Case Study

Hypothesis	Process Variable	Distributed Team		Co-located Team		T-test ($p<0.05$)
		Mean	Standard Deviation	Mean	Standard Deviation	
H1: The distributed team will rely more heavily on written communication for group discussion.	Contributors per email thread	1.73	1.55	1.50	0.74	Inconclusive
H2: The distributed team will rely less (than the co-located team) on broadcast style email messages.	Average weekly email threads	10.42	5.05	19.85	10.75	Confirmed
H3: The distributed team will conduct longer discussions primarily in written (email) form.	Average emails per thread	2.32	2.25	1.75	0.95	Inconclusive
H4: The distributed team will send fewer logistical messages to members of the group.	Average weekly emails	17.06	10.13	29.91	19.55	Confirmed

Results from IBM Case Study

Hypothesis	Process Variable	Distributed Team		Co-located Team		T-test ($p<0.05$)
H5: The distributed team will make major use of the source code modification process to resolve issues, in place of informal collaboration, before the Ôfeature freezeÕ date.	Source code check-ins prior to deadline	53.82	74.56	11.56	11.0	Confirmed
H6: The socio-technical system of the distributed team will be less interconnected (as compared to the co-located team).	Average number of developers per code element	1.10	0.2	1.63	1.04	Confirmed
H7: The distributed team will rely more on meetings for short term issues.	Fraction of tactical (vs. strategic) meeting items	0.81	0.17	0.39	0.22	Confirmed

Results from IBM Case Study

H8: The distributed team will formally assign tasks in meeting format.	Percent of task assignment (versus status) meeting agenda items	0.35	0.13	0.24	0.17	Confirmed
H9: The output of the distributed team will be similar, in terms of quality, as that of the co-located team.	Average SPR actions per week	134.21	168.3	104.37	152.39	Inconclusive
H10: The distributed team will rely more on formal systems for knowledge capture, as compared to the co-located team.	Average # of individuals modifying SPR state	3.25	0.97	1.74	0.34	Confirmed
H11: The productivity of the distributed team will be lower than the co-located team (because of the overhead involved in transferring tasks back and forth on an incremental basis.	Average SPR time to resolution	113.80	83.17	120.72	130.45	Inconclusive

Results (cont.)

- Productivity of co-located team was NOT higher than that of distributed team
- Similar quality and speed for both teams
- More individuals worked on SPRs in distributed team than in co-located team
  - SPR database used as mechanism for collaborative knowledge sharing

Results (cont.)

- Distributed structure encouraged members to document decisions, thereby leading to superior knowledge repository
- Distributed teams can use emerging technologies in innovative ways
- Distributed teams can outperform co-located teams

OfficeTiger

- Financial services for financial analyses, accounting, asset pricing research, and corporate banking firms.
- Clients often completed part of the work and handed over the remainder to Office Tiger’s analysts.

OfficeTiger (cont.)

- In a recent year, one-third of deadlines were shorter than three hours and about one half of the deadlines were within a day.
- T-Track system used to track work in progress and serve as platform for collaboration among several geographically dispersed teams

Degree Structure of Work

Structured Work **Semi Structured Work** **Unstructured Work**

24-hour knowledge factory
Concept Relevant Here

IPand Other Trans-National Issues

- Healthcare and Legal sectors are heavily governed at state level
- Current environment regulated by non-federal bodies
- Mechanism for resolving offshoring problems need to be streamlined
- Create new transnational layer along the lines of the European Economic Union

Offshoring in Additional Areas

- Legal: P & G
- Accounting
- R&D
- Teaching: My job can be outsourced!
- British Rail
- Italian Passports

Results of Major Studies

- $ 1 spent abroad leads to $ 1.45-1.47 of “value”
- Of this, foreign firm receives only 33 cents;
- US company receives between much more;

- Aggregate benefit to US economy of $ 16.8 billion from one sector alone.

Comparison of Teams

Factor	Global Teams / Business Process Outsourcing	24-Hour Knowledge Factory Paradigm
Division of Work	Non-overlapping subsystems are integrated, post-production into a main system; or non-overlapping chunks of work that different entities (such as in-house operations department and external BPO firm) execute (such as in a BPO firm and in-house operations department Are subsequently integrated together.	Same body of work that is incremented and augmented by different functional units.
Mode of Processing	Parallel Processing	Sequential Processing
Work Completion Cycle and Frequency of Transfer between Units	Can range from under a w eek to over a year (in large application development projects).	Three times during a 24-hour period.

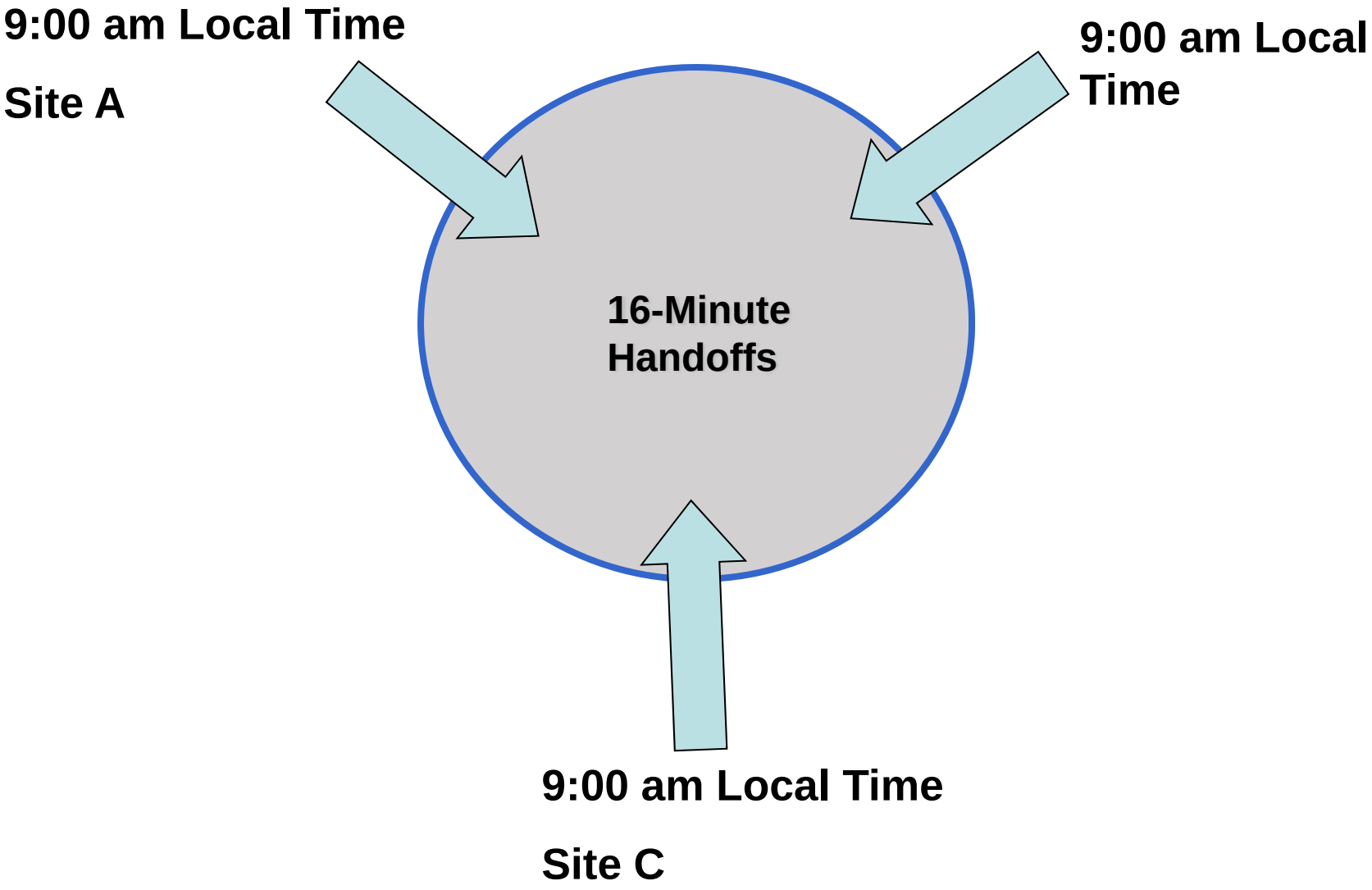
Comparison of Teams

Factor	Global Teams / Business Process Outsourcing	24-Hour Knowledge Factory Paradigm
Work Completion Cycle and Frequency of Transfer between Units	Can range from under a week to over a year (in large application development projects).	Three times during a 24-hour period.
Relationship between Functional Entities	Contractual with buyer–client responsibilities delineated in advance, and augmented by Service Level Agreements.	Peer-to-Peer, with the different collaborating entities becoming extended organizational forms of each other.
Responsibility for Output Quality and Locus of Control	One party; usually, the sponsor organization, in US/Europe, is responsible for auditing the quality of output of other entities.	Each entity is equally responsible for the quality and audits the work of all other entities.
Governance	Contracts with metrics-based on service-level agreements with penalties (incentives) for under-performing (exceeding) these metrics.	Incentives based on achieving shared market-facing objectives and multi-point evaluation of performance; metrics based on service level agreements rarely used.

Comparison of Teams

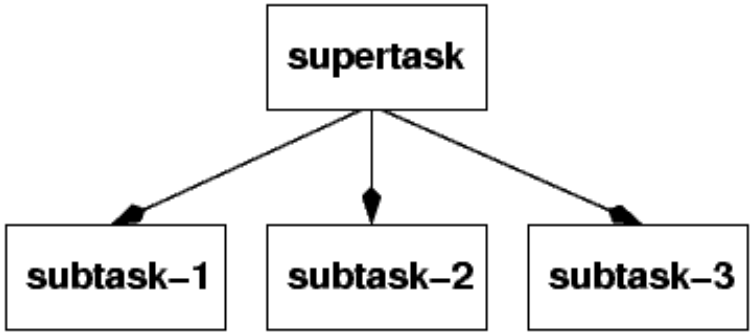
Factor	Global Teams / Business Process Outsourcing	24-Hour Knowledge Factory Paradigm
Knowledge Transfer Mechanisms	Formal codification of work; electronic repositories of data that can be queried.	Composite Personae: human experts delivering knowledge and context through human intervention; interactive, real-time systems; and real-time interorganizational teams.
	Real-time interactions are infrequent and are exceptions to the normal operating mode.	Frequent, real-time human-intervention based interactions are the norm.
Capabilities of Functional Units	Mostly complementary.	Identical or near identical; each functional entity can provide services to other entities.

Process Timing



	Step 1	Step 2	Step 3	Result
Decision History Module	**Design Rationale**	**Design Parameters**	**Attribute Values**	**Utility Measures**
Decision Rationale Module	**Attribute Definition**	**Utility Interview**	**Utility Function**	

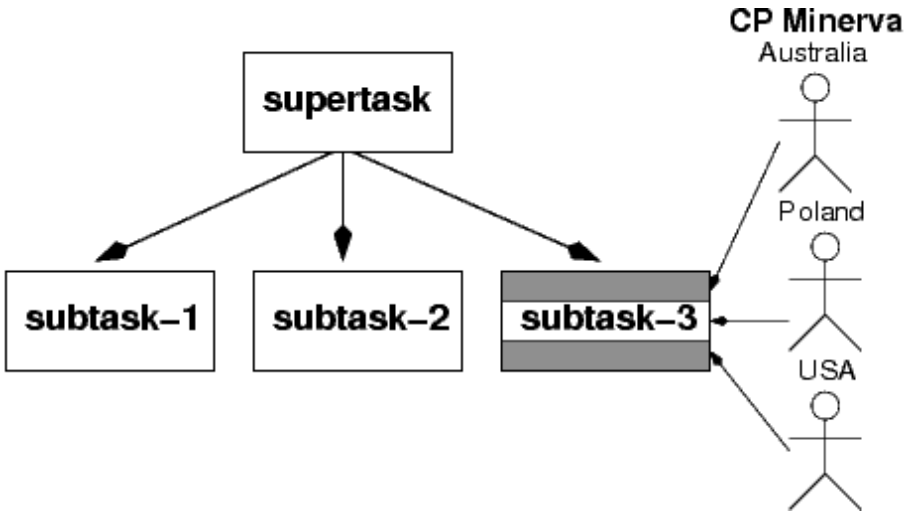
Composite Personae:
24 Hour Knowledge Factory



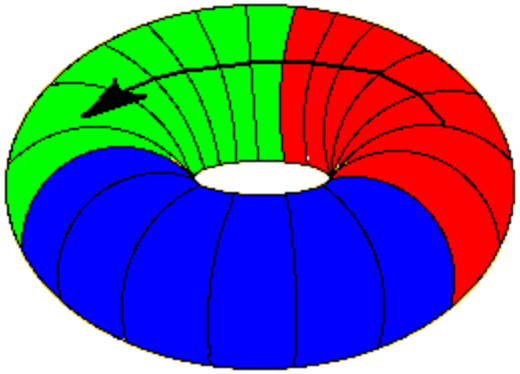
Cohesion creates practical limits on degree of horizontal decomposition

Composite Personae are micro-teams that virtualize developers.

Tasks are decomposed horizontally and vertically.



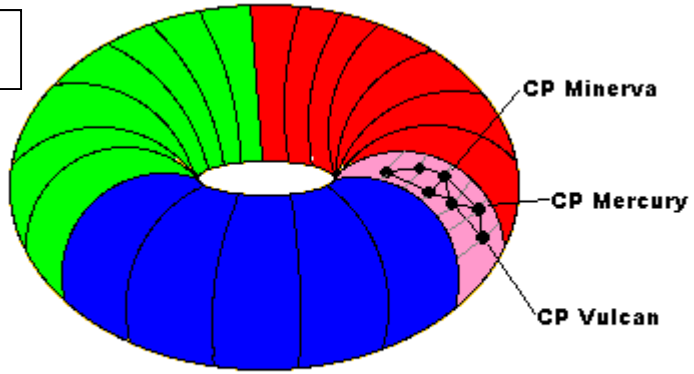
Composite Personae: Communication Patterns



hand-off information flow

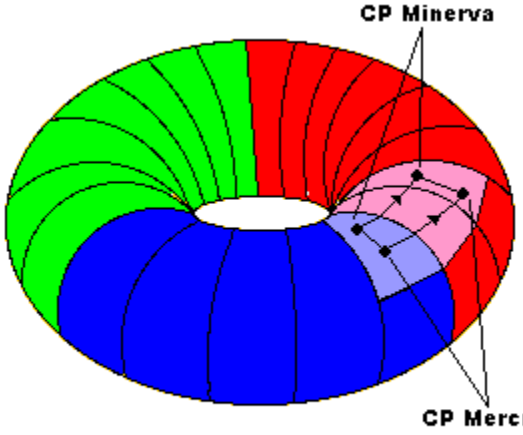
Hand-off

Lateral



lateral communication between CP drivers

Lateral + Hand-off

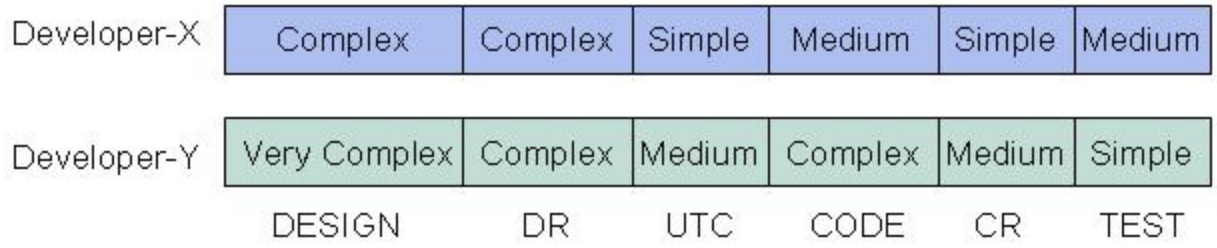


lateral + hand-off communciation between CPs and their drivers

Emphasis on tacit knowledge sharing favors Agile methods: *XP*, *Scrum,* etc.

CPro

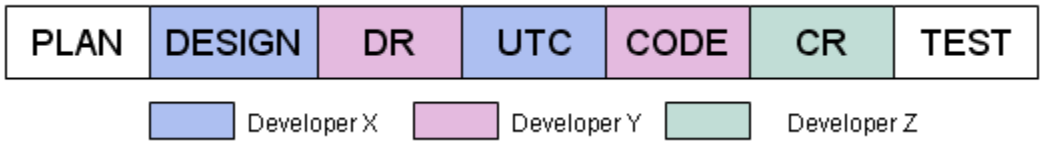
- Agile, Lightweight process for 24HRKF
- Inspired from Personal Software Process
- Each task divided into phases
- Each developer estimates for himself



CPro…

- Monte Carlo Schedule Caster simulates many possible work schedules

- TDD and Reviews as both Defect Reduction and communication mechanism

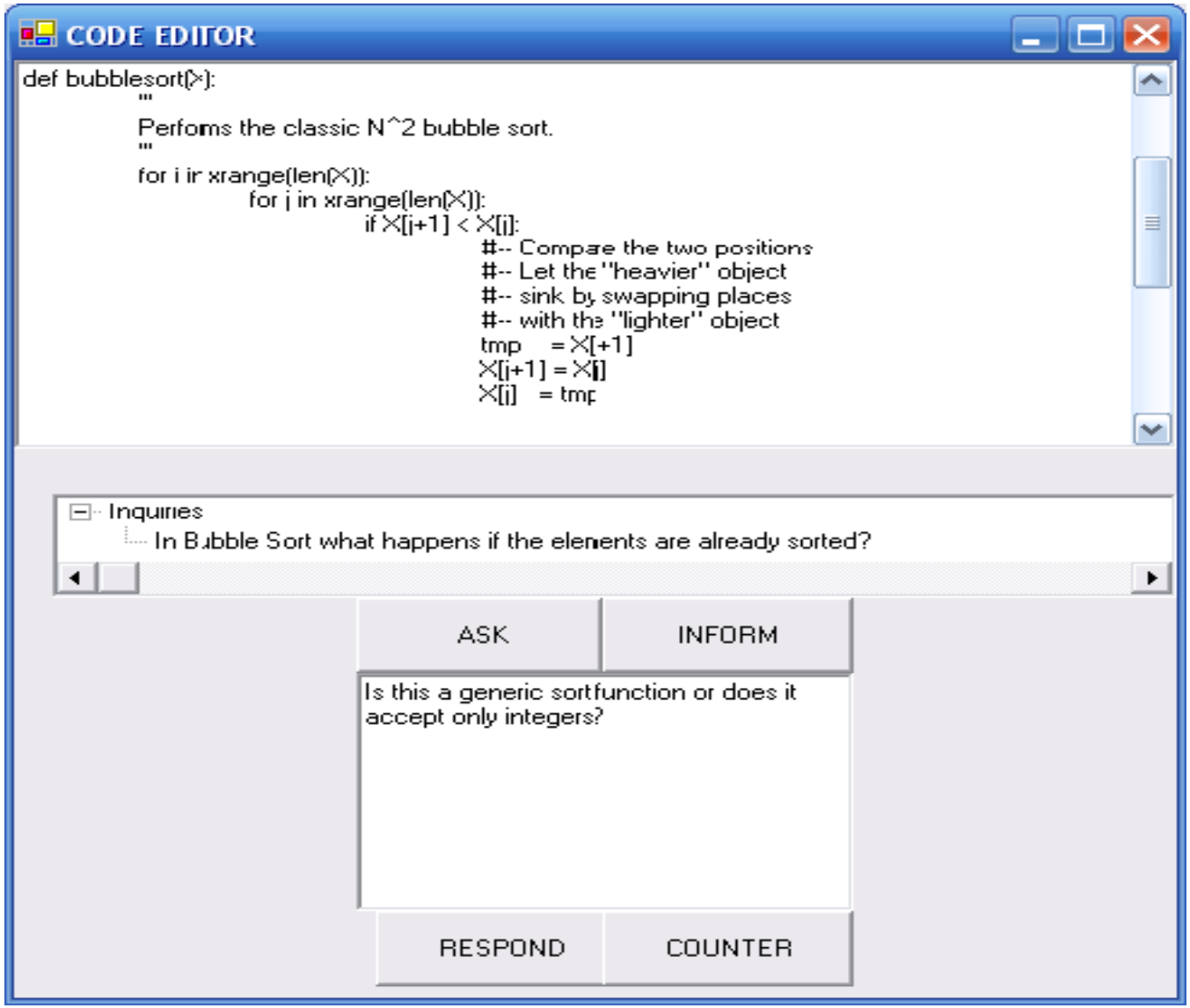


Scrum

- Collaborative shifts necessitates intimate knowledge transfer (hand-off) between the collaborating parties.
- The following are synthesized by the groupware tool during a hand-off:

  - *What has been accomplished since the last shift (Project Artifacts).*
  - *What problems were encountered in the previous shift (Speech Acts).*
  - *What needs to be accomplished in the next shift (CPro).*

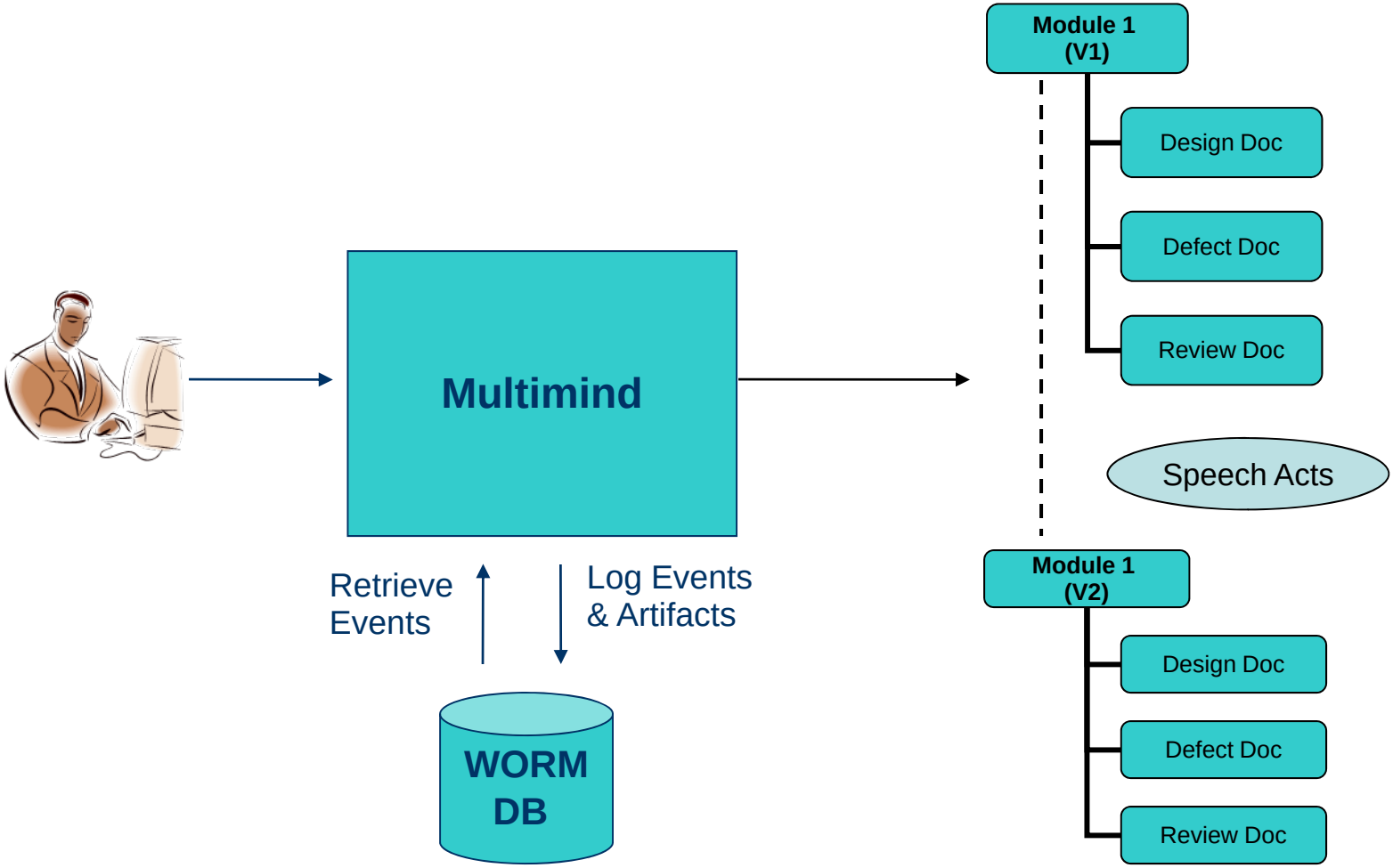
An Illustration of Speech Acts



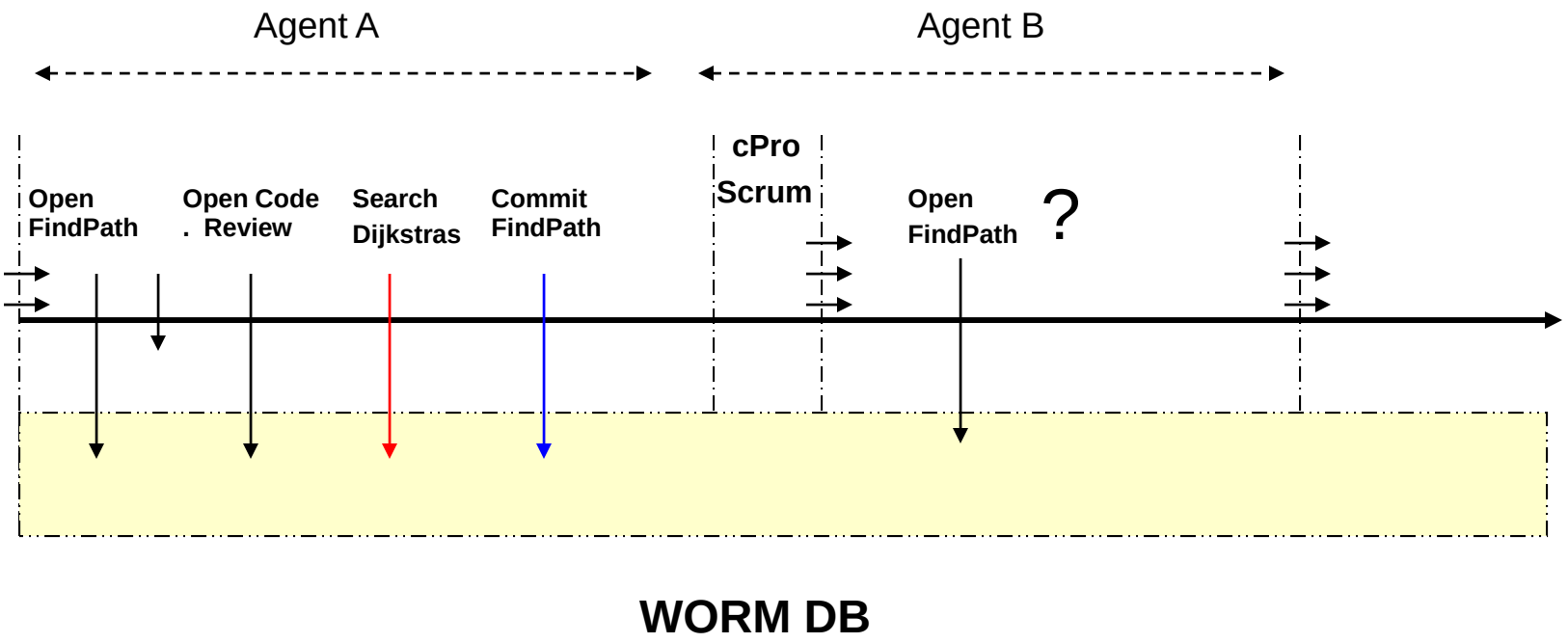
Proposed solution framework

- Cybernetic memory: a chronologically ordered WORM object database.
- Project Artifacts that are the objects of interest and necessary for the final product
- Monitors sequences of events, particularly information/knowledge flow to/from an agent

System Design



Decision Justification - Timeline



Software Development Processes and the Twenty Four Hour Knowledge Factory

- Implications
  - Global Software Development
    - Consistent Language, Tools, Processes
    - Cross-site Team Building
- Solutions
  - Integrated Development Env.
    - IBM Jazz
  - Discussion Board Communication
    - Integrated in the IDE
    - Specialized for Software Development Processes
  - Asynchronous Communication
    - Transfer of Knowledge
    - Efficient
    - Convenient
  - Process Suggestions
    - Handoff Process
    - Well-defined version control system
    - Shared workspace repositories across multiple sites

For Further Reading

- Book: http://next.eller.arizona.edu/books/book4.aspx

- Papers:
- http://next.eller.arizona.edu/publications/ssrn/index.aspx