

# The Productivity Barrier is Breached!

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These are the viewgraph slides I used in my keynote talk at the Tools & Methods for Business Engineering Conference, 6 June 1996.

Think of a large lake held in place by an earthen dam, which has cracks in it and is leaking. The lake is the pent-up reservoir of service-sector productivity growth. The dam is the generation-old barrier to that growth. The cracks are the fissures caused by workflow technology. The fickle hand of fate does not have enough fingers to plug the holes. Soon the whole thing is going to let loose.

My message is that this good outcome is going to happen because we are finally seeing what service work is all about. We are therefore starting to see how to design information technologies that will enable those engaged in work to produce continuing new value for their customers.

We are witnessing a paradigm shift. We are moving away from old, mechanistic views of work toward new, biological views. We are seeing work happening, not in the movements of objects or information, but in the negotiations and commitments among people. We are developing notations for the maps of these webs of commitments which can be used as blueprints for workflow implementations. With these maps we can see the key practices of the successful companies and adopt them in others without having to bring over the whole company culture.

# Service-Sector Productivity: A Nagging Problem

- 80% of US economy
- Over \$1T invested in IT since 1985
- Service productivity: growth  $\leq 0$  for most of that time, +1.5% last three years.
- Manufacturing: +4% annually over same period.

- Why the poor Return on Investment for IT in service work?
- What is different about the office and the factory floor?

# Key Realization

The notions central to our common understanding of work -- objects, routing, and processing -- are incapable of describing important human actions such as negotiating, fulfilling commitments, and satisfying customers.

This insight gave birth to the workflow industry around 1990.

# Measuring Productivity

Typical information-automation view:

*Windows 95 users completed basic computing tasks 19% faster than Mac users and 50% faster than OS/2 users. Tasks included printing files, managing documents, creating shortcuts, customizing desktop.*

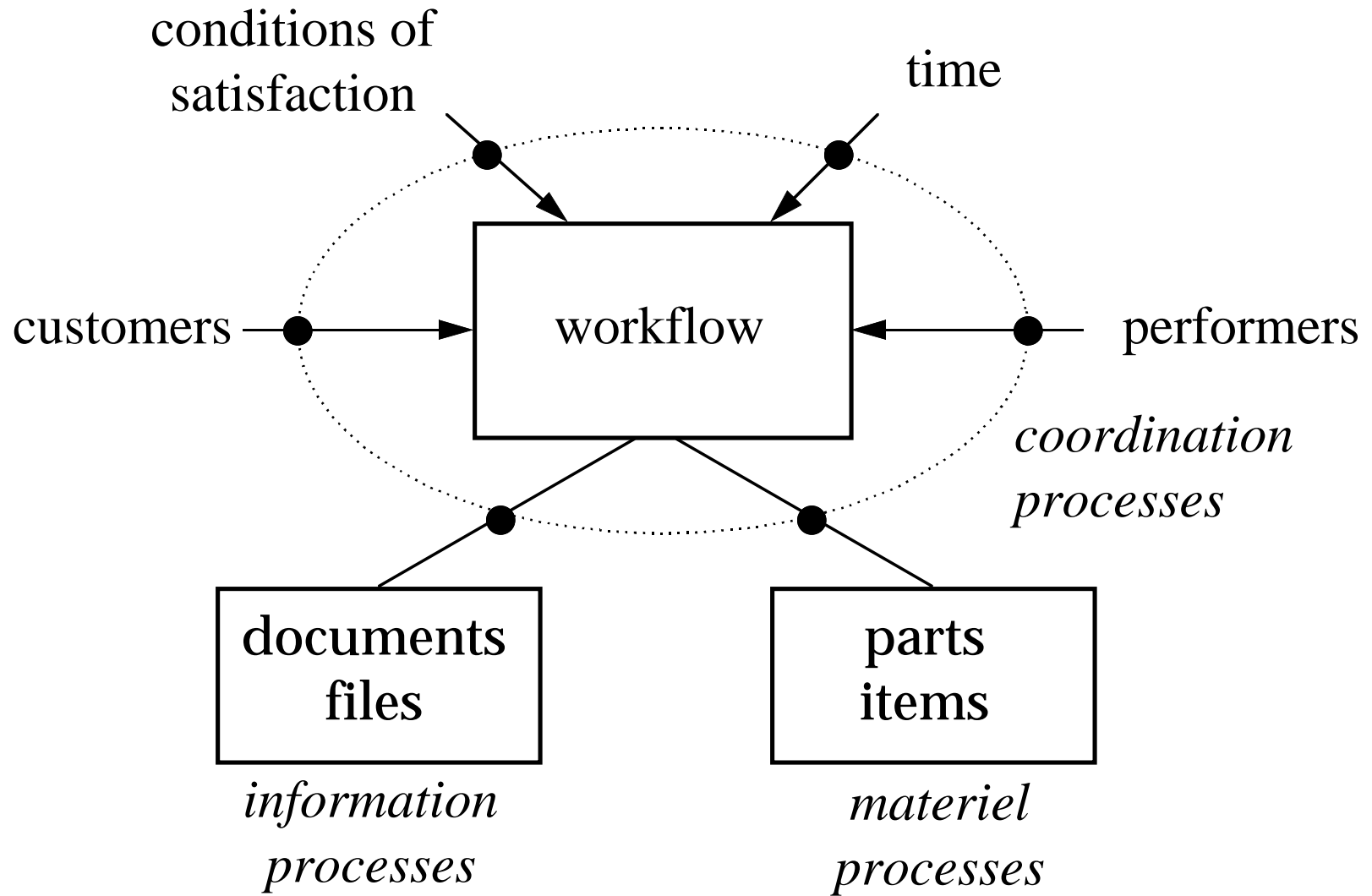
*(IBD, 11/95)*

- Human looks like a machine that carries out a sequence of information processing steps that manipulate and transform information objects.
- Waste = lost time or materials
- Customers, performers, conditions of satisfaction, and time are not present.

# Work-Supporting Technologies

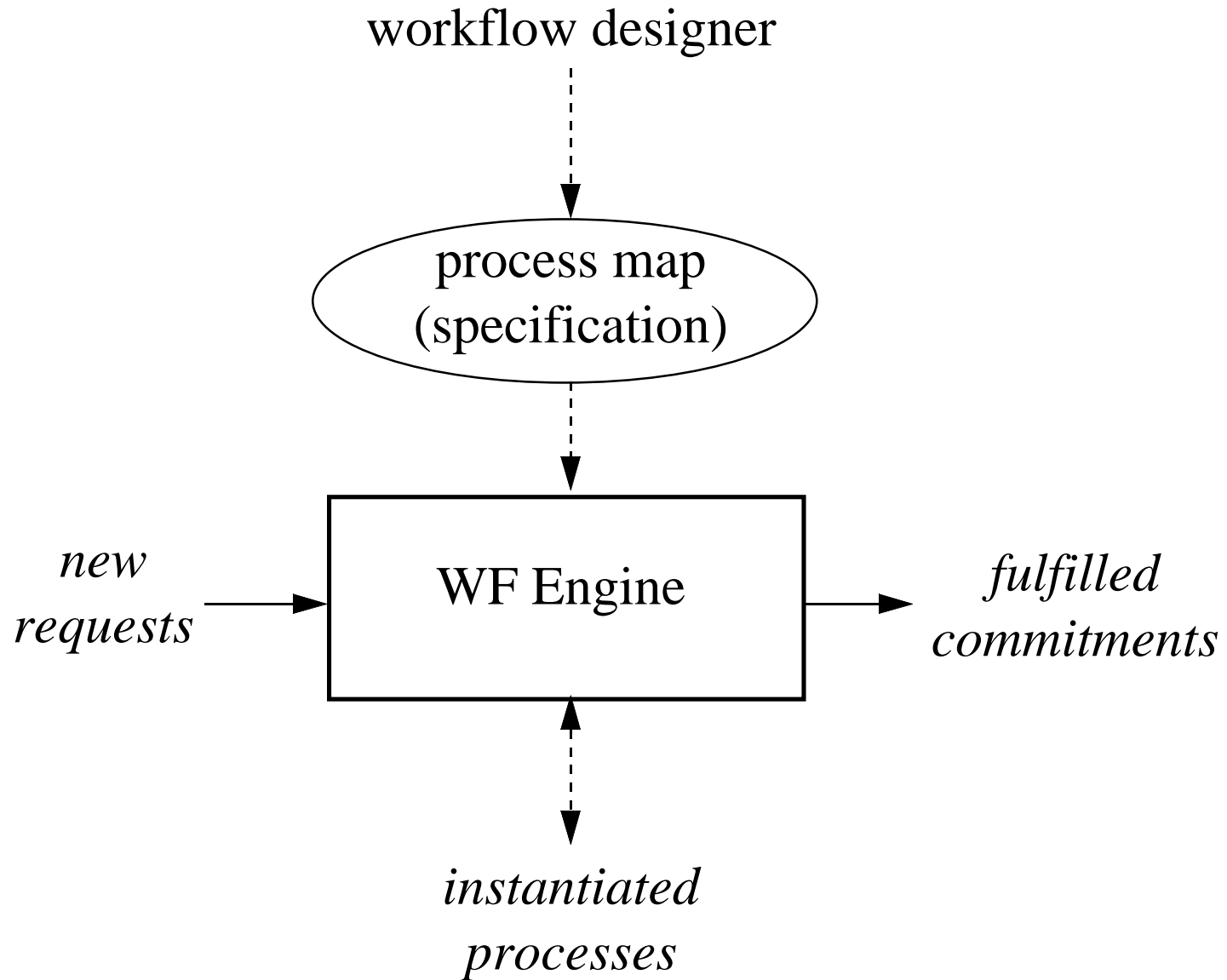
- Manufacturing technologies
  - *materiel processes (parts, items)*
- Information technologies
  - *business processes (documents, files)*
- Workflow technologies
  - *coordination processes (agreements, requests)*

The next picture shows the relations among these three kinds of work-supporting technologies. The workflow technology coordinates actions among people and their interactions with the information and materiel processes. The basic ingredients of workflow are customers, performers, conditions of satisfaction, and time.



The next picture further refines the “workflow” box of the previous picture into the specification of the coordination process and the workflow engine that drives, tracks, and measures the coordination process.

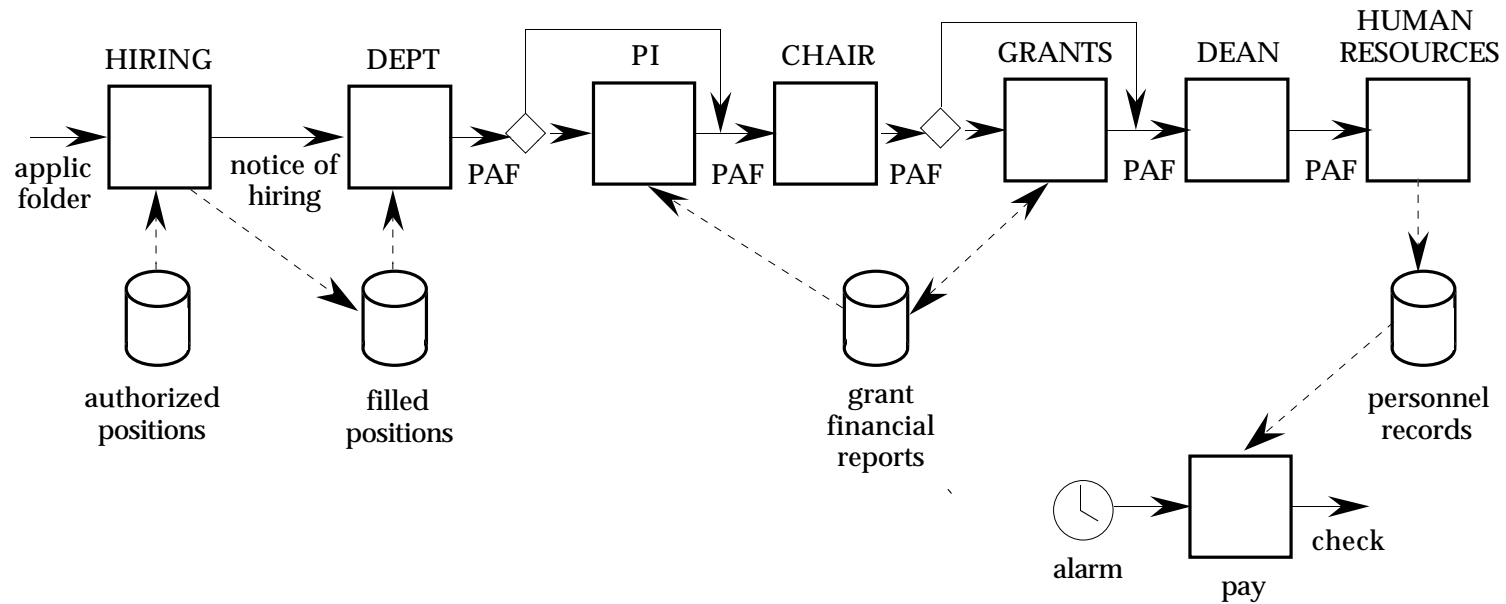
I want to focus on the workflow map and why it is fundamental to understanding the productivity paradigm shift.



The next picture shows a typical “linear dataflow map” of a personnel process at a university, showing all the steps from application for the job through receiving paychecks after being hired. The boxes represent functions, the arrows represent flow of data (typically on forms), and the cylinders represent databases. The clock represents a trigger for the regular paycheck.

This kind of map does not show customers, performers, or conditions of satisfaction. It cannot be used to measure how well the customers are being satisfied.

# Linear Dataflow Map



# Why linear model fails in office

- Value of work depends on customers -- waste for one is value for another.
- Practical complaints focus on dissatisfaction, morale, lateness, etc. -- waste not observable in linear model.
- Most actions in workplace are negotiations and fulfillments -- not directly observable in linear model.

In the linear model, we are concerned about throughput, response time, and queueing. This statement therefore sounds like something is wrong: “It takes 8 hours to complete 15 minutes of work.”

Whether this is a complement or a criticism depends on the business and its customers. A copy shop that took this long for a 15-minute job would soon lose its customers. A dry cleaner who could remove the spot by the end of the day would be valued by its customers.

In 1988, Konosuke Matsushita, chairman of the Matsushita Electric Company, was asked by a journalist whether he really thought that Japanese industry could stay ahead of American industry. Here's what he said.

“We will win and you will lose. You cannot do anything about it because your failure is an internal disease. Your companies are based on Taylor’s principles. Worse, your heads are Taylorized too. You firmly believe that sound management means executives on the one side and workers on the other, on the one side men who think and on the other side men who can only work. For you management is the art of smoothly transferring the executive’s idea to the worker’s hands.”

Konosuke Matsushita, 1988

Matsushita is saying that our problem with productivity lies in our paradigm. Copying the Japanese methods won't do us any good unless we understand what is behind them.

His compatriot, Ohno, the designer of the famous Toyota production system, says we don't see that waste is miscoordination, and that miscoordination in turn produces lost time and materials. We don't see how the waste of a single worker can propagate through the whole process and leave an external customer dissatisfied. We have the wrong conception of work.

# What is Work?

Taylor's answer (1900) was that work is the motions of the worker and the movement of materials; the worker performs procedures that process materials and move them to other workers.

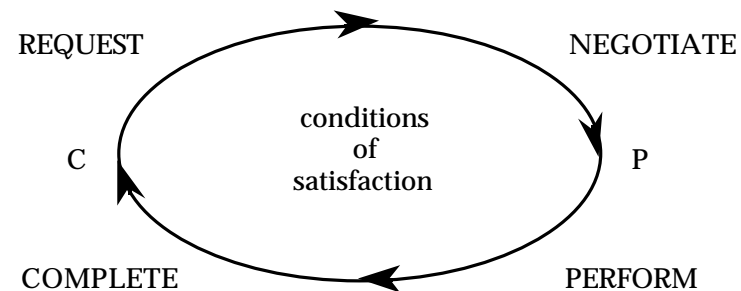
In the 1950s, Herb Simon and then Jay Forrester extended this to include information. Workers performed functions that processed information and provided results to other workers.

In 1980, Fernando Flores said that work is the fulfillment of commitments. This is a powerful insight that distinguishes workflow from earlier paradigms.

Flores said that all work is performed in the context of a transaction between two people, one who requests it (the customer) and one who does it (the performer). What is to be done is stated in the mutually agreed conditions of satisfaction, which include a time by when it will be completed.

The two-person transaction has four stages: preparing the request, negotiating on the conditions of satisfaction, performing the work, and declaring satisfaction with the results. This can be represented with a loop notation shown on the next page.

# The Basic Loop: All One-on-One Transactions



# The Key is Speech Acts

- “State transitions” in loops are marked by speech acts of the participants.
- Four speech acts define the basic loop.
- Two more speech acts establish the loop.
- Some acts can start secondary loops.
- Web of loops makes a business process.

In the basic transaction loop, the speech acts marking the ends of the four segments are:

C: “I request.”

P: “I agree.”

P: “I am finished.”

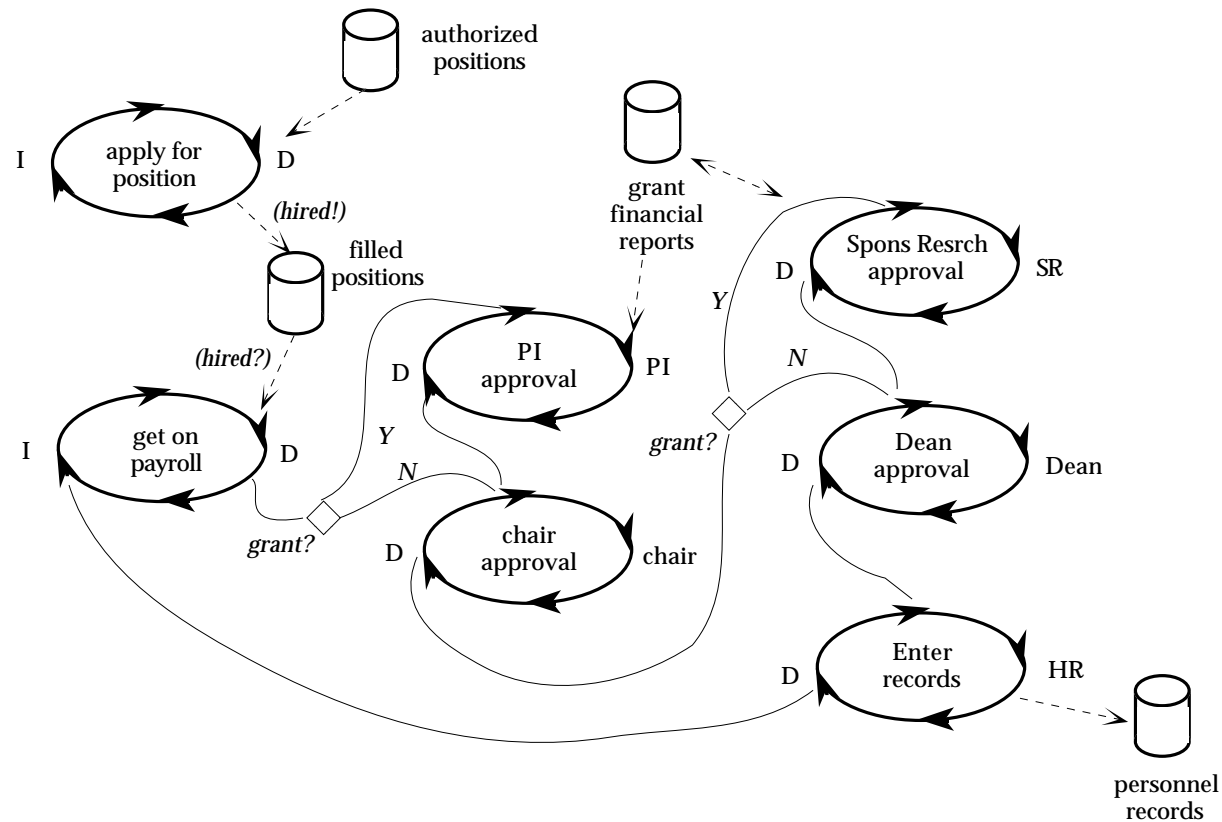
C: “I am satisfied.”

The importance of speech acts is that they make the loop observable. If it is observable we can depict it, we can track events and state in it, and we can measure it.

During any of the four segments of a loop, the customer or performer doing the segment can make a request of a third person. This starts a secondary loop, whose completion counts as progress in the main loop. In this way an entire web of interconnected loops can arise to depict the entire process that serves an outside customer.

The university personnel process is shown again on the next page, as a workflow map. If you look carefully, you can see that the function boxes of the previous (dataflow) picture are embedded in the performance phases of the workflow map.

# Workflow Map of Process



Notice the fluid, biological form of this picture, and compare with the rigid, mechanical form of the linear-model's picture.

This is no accident. The linear-model is founded in the mechanistic views of work appropriate for assembly lines. The workflow view is founded in human coordination appropriate for biological beings.

- The loops and interconnections are in a limited number of forms, or patterns.
- Just a few dozen patterns are sufficient to describe and generate workflows of all business processes. Complexity comes from the wide variety of possible interconnections.
- The basic patterns are a “periodic table” of work elements.

Three questions now arise.

What is the relationship between this theory of work and communication and the operations of today's successful companies?

Is this theory consistent with the practices of those companies?

Will the practice of the theory in a company make them more successful?

To answer these questions, it is helpful to examine the “common sense” of the way organizations function.

# Common Sense

- Automatic way of thinking
- Shared, unspoken assumptions
- “The way things are done”

# Old Common Sense

- Vertical hierarchy of reporting and communicating
- Functional departments
- Efficiency of function
- Quality, cost reduction, profit increase are the mission

# New Common Sense

- Horizontal, process-driven
- Customer satisfaction is the mission
- Constant improvement needed to maintain customer loyalty and reputation

# Who Practices Which Sense?

- (old) Prey
- (new) Predators

# Predators and Prey

- Predators:

*Mayo Clinic, Deluxe Check, Federal Express, LensCrafters, State Street Bank, AAA, IKEA, Marriott, Harley-Davidson, Wal-Mart, Toyota, Starbucks*

- Prey:

*IBM, DEC, Wang, Unisys, Kmart, Sears, GM, Macy's, most banks/SLs, Folgers, Eastern Airlines*

# What have the predators learned?

- Exquisite coordination of all action toward customer satisfaction
- listen to individual customer
  - *no unneeded steps*
  - *no missed steps*
  - *all steps completed*
  - *followup*
- listen to the market (anticipation)

# What is the “secret”?

- Master coordination
- Others can do the same without having to learn the “company culture”:
  - *workflow map to see, measure*
  - *workflow engine to coordinate, track*

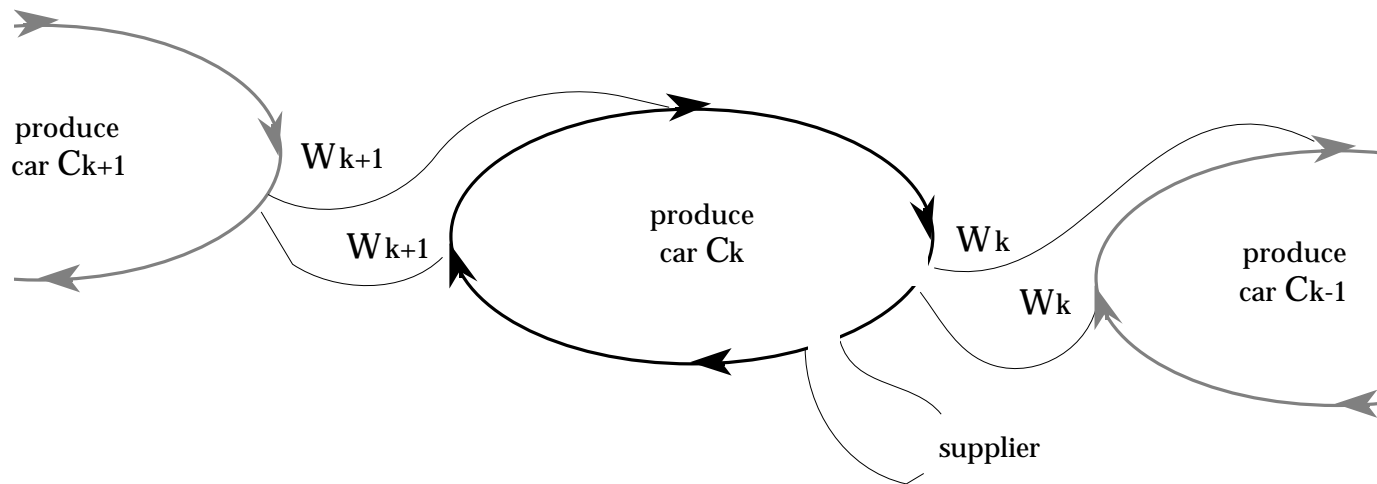
# An Example: Toyota Production System

*In the old common sense, it looks like the TPS has given us several management techniques:*

- Just-in-time inventory management
- Customized cars
- Stop-the-line button

But in the new common sense, we can see much more, the orchestrated coordination of many workers, all oriented on customer satisfaction.

# “Secret” of Toyota Production System



$W_k$  is a worker at station  $k$  on the line.

# “Secret” ...

- JIT = Satisfaction of a scheduled request
- Customizing = propagating customer's original request down the line
- Quality control = each worker is a customer, on down the line
- Each worker sees own waste as propagating through entire process

This suggests that a company can adopt the secret -- workflow mapping, tracking, and measurement -- without having to adopt the “company culture” of the predators.

What has happened when firms adopted the workflow interpretation and built an information system to support it? The following case studies show that they have all experienced dramatic gains in productivity within a few months.

# Actual Cases

- GMU HR process

*Effort to solve complaints dropped 50% of total to 25% -- within a few months*

- SF office of Y&R

*Reduced OT 50%, re-do's 64%; increased jobs on time 63% and within budget 19% -- in three months.*

# Cases ...

- IBM PC Company Engineering Changes  
*Reduced cycle times from 25 days to 7 days -- within a few months.*
- Bankers Trust Large Investors Service  
*Reduced cycle time from 5 days to 1, staff by 1/3 -- within a few months.*

# Cases ...

- Tandy Electronics, Dallas

*Improved process productivity by 10% -- within a few months.*

- Business License Dept, Clark County, Nevada

*Cured 400 bottlenecks, reduced issuance time from 120 to 45 days -- within a few months.*

# Cases ...

- Continental Rehab Center, San Diego

*Reduced patient processing time for complex test series from 3 months to 3 weeks -- within a few months.*

- Babson College, Wellesley, Mass

*Significantly improved IT function and permanently reduced admin staff costs by 40%, transferring staff to student advisor functions.*

# Cases ...

- **Common motivation: customer satisfaction problem**
- **Common action: mapped their business process, configured IT system to support it**
- **Common result: dramatic improvements in productivity (10% to 60%) within a few months**

Footnote: group exercise of mapping the process can be a “bottom up” approach to process reengineering

# From Maps to Methods

Success stories demonstrate the power of the method and make construction of appropriate tools an attractive investment.

# Five Kinds of Tools

- Mapping
- Tracking
- Measuring
- Modeling
- Application

# Client-Server Systems

- The buzzword
- Selecting and integrating tools can be daunting -- immense apparent complexity
- Workflow mapping a useful starting point for the implementer.
- A new paradigm for distributed systems?

# Many tools already exist ...

- Lotus Notes
- Microsoft Exchange
- Novell GroupWise
- ActionWorkflow and Metro systems
- Many more are coming

*Workflow is migrating in OS*

# Conclusions

- Workflow systems are beginning to affect service sector productivity significantly.
- Workflow supports TQM and BPR efforts, significantly improving success rates.
- New era of productivity about to dawn.  
(Government may may accommodate by allowing economic growth.)

# Workflow on the Web

- **Center for the New Engineer Workflow Tutorial Module (Hieb & Denning)**

<http://www-cne.gmu.edu/modules/workflow>

- **Workflow tutorial (Sheth)**

<http://www.cs.uga.edu/LSDIS/workflow>

- **Prof Dr A-W Scheer's IDS page**

<http://www.ids-scheer.de>

- **Workflow and Reengineering Int'l Ass'n**

<http://vvv.com/waria>