Discrete Event Simulation As A Tool To Support REENGINEERING

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Research/Articles/Books/Presentations

Reengineering Work: Don't Automate, Obliterate
Michael Hammer, Harvard Business Review, July-August, 1990

The New Industrial Engineering:
Information Technology and Business Process Redesign
Thomas Davenport and James Short, Sloan Management Review, Summer, 1990

The New Realism in Office Systems
Business Week, June 15, 1992

Cigna Reengineers Itself
Computer World, July 8, 1991

EDI, E-MAIL, and Workflow Automation
EDI World, April 1993

Reengineering The Corporation: A Manifesto For Business
Michael Hammer and James Champy, Harper Business

Process Flight Simulation
Howard Rubin

Dynamic Modeling
Ed Yourdon, Howard Rubin

My Talk

- **Review the suggested benefits of reengineering.**

- **Review suggested reengineering steps.**

- **Discuss the role of time in reengineering.**

- **Suggest limitations of analysis tools for reengineering.**

- **Discuss ways simulation could have been used to support reengineering at Mutual Benefit & Life.**

- **Discuss other potential reengineering uses of simulation.**

Suggested Benefits of Reengineering

- **Reduction in response time.**

- **Reduction in personnel requirements.**

- **Improved quality of service.**

- **Reduction in costs.**

- **Job enlargement.**

- **Flatter organizations.**

- **More flexible/responsive organizations.**

Suggested Reengineering Steps[2]

- **Develop business vision and process objectives.**

- **Analysis:**

  - **Understand and measure existing processes.**

  - **Identify processes to be redesigned.**

- **Redesign the process:**

  - **Organize around outcomes, not tasks.**

  - **Have those who use process outputs perform the process.**

  - **Subsume information processing work into the real work.**

  - **Treat dispersed resources as if they were centralized.**

  - **Link parallel activities instead of integrating their results.**

  - **Put the decision point where the work is performed.**

  - **Capture information once at the source.**

  - **Identify IT levers.**

  - **Design and build a prototype of the process.**

- **Implementation.**

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[2] **Reorganized from the Hammer and Davenport articles.**

Analysis

There are two primary reasons for understanding and measuring processes before redesigning systems. First, problems must be understood so that they are not repeated. Second, accurate measurements can serve as a baseline for future improvements. If the objective is to cut time and cost, the time and cost consumed by the untouched process must be measured accurately.

The New Industrial Engineering

Design

... A key point is that the actual design is not the end of the process. Rather, it should be viewed as a prototype, with successive iterations expected and managed.

The New Industrial Engineering

Implementation

The extent of these changes suggest one factor that is necessary for reengineering to succeed: executive leadership with real vision.

Reengineering Work: Don't Automate, Obliterate

The Role Of Time In Reengineering

Despite a decade or more of restructuring and downsizing, many U.S. companies are still unprepared to operate in the 1990s. In a time of rapidly changing technologies and ever-shorter product life cycles, product development often proceeds at a glacial pace. In an age of the customer, order fulfillment has high error rates and customer inquiries go unanswered for weeks.

Reengineering Work: Don't Automate, Obliterate

Perceived Limitations of Existing Analysis Tools

- **Existing Systems Analysis/CASE tools are not well equipped:**

  - **To identify bottlenecks.**

  - **To measure response times.**

  - **To measure staff requirements.**

  - **To measure work in progress.**

  - **To measure costs and benefits.**

  - **To dynamically display events.**

  - **To provide intuition about time issues to management.**

- **These are the capabilities needed to support reengineering.**

- **This suggests the use of graphical simulation packages.**

- **A particularly good example where they can be applied is to the reengineering performed at Mutual Benefit & Life.**

Mutual Benefit & Life[3]

. . .   The long, multistep process involved credit checking, quoting, rating, underwriting, and so on. An application would have to go through as many as 30 discrete steps, spanning 5 departments and involving 19 people. At the very best, MBL could process an application in 24 hours, but more typical turnarounds ranged from 5 to 25 days - most of the time spent passing information from one department to the next.

The president of MBL, intent on improving customer service, decided that the nonsense had to stop and demanded a 60% improvement in productivity.   . . .

Reengineering Work: Don't Automate, Obliterate

- **This description suggests that MBL is a good candidate for reengineering with the help of simulation.**

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[3]   **This case is discussed extensively in Hammer's article.**

Analyzing MBL With The Help Of Simulation

- **We modeled MBL's application processing as having:**

  - **Applications arriving daily in batches.**

  - **Uniformly distributed batch sizes.**

  - **5 clerks processing part of each application in sequence.**

  - **Exponentially distributed clerk processing times.[4]**

  - **Random interruptions of the clerks.[5]**

- **Using simulation, we were able to:**

  - **Measure existing response times.[6]**

  - **Determine where bottlenecks occurred.**

  - **Determine how response time was affected by:**

    - **Workload level.**

    - **Variability in workload levels.**

    - **Variability in service time distributions.**

    - **Random interruptions of the clerks.**

    - **How applications were moved to the next clerk.**

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[4]   **With a mean of .2 hour.**
[5]   **The time between interruptions and the interruption times were both exponentially distributed with means of 20 days and 1 day respectively.**
[6]   **The average of 1 hour of processing took an average of 40 hours elapsed time when batch size averaged 34 jobs per day.**

Redesigning MBL With The Help Of Simulation

- **We modeled MBL's final design as having:**

  - **Applications arriving daily in batches.**

  - **Uniformly distributed batch sizes.**

  - **5 clerks processing whole applications in parallel.**

  - **Clerk processing times being Erlang distributed.[7]**

  - **Random interruptions of the clerks.**

- **Using simulation, we were able to:**

  - **Measure improvement in response times.[8]**

  - **Minimize bottlenecks.**

  - **Determine how response time was affected by:**

    - **Workload level.**

    - **Variability in workload levels.**

    - **Variability in service time distributions.**

    - **Random interruptions of the clerks.**

    - **How applications were moved to the next clerk.**

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[7]   **The sum of 5 exponentially distributed service times with mean of .2 hour.**

[8]   **The 40 hours of elapsed time with the original design shrunk to 16 hours elapsed time after the system was redesigned.**

Implementing At MBL With The Help Of Simulation

- **Keeping in mind the need for *executive leadership with real vision*, in our research we observed that:**

  - **The factors causing delays are not intuitively obvious.**

  - **Simulations can graphically display workflows and backlogs.**

  - **Simulations can help develop better intuition.**

- **This suggests that the understanding obtainable by observing simulations may provide more incentive for management to push for reengineering changes.**

Suggested Reengineering Steps[9]

- **Develop business vision and process objectives.**

- **Analysis:**

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- **Redesign the process:**

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[9] **Reorganized from the Hammer and Davenport articles.**

Other Potential Reengineering Uses Of Simulation

- **Analyzing effects of work prioritization.**

- **Analyzing training implications.**

- **Analyzing hiring vs. contracting decisions.**

- **Analyzing effects of flattening organizations.**

- **Analyzing effects of work changes.**

- **Analyzing the benefits/design of concurrent engineering.**

- **Analyzing reengineering applied to software development.**[10]

- **Identifying inter-organizational opportunities.**[11]

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[10] **This is already being done by Howard Rubin and Ed Yourdon.**
[11] **Clive Wrigley at McGill University has already started to use simulation to identify ways of improving EDI protocols. One of the things that comes out of his work is that simulation can help identify bottlenecks, which can then become business opportunities.**

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