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Managing Email Overload in Organizations: Research Opportunities and Recent Results

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Information Replication



- Redundant information/ Multiple reminders/multiple interruptions...




ALICE: I JUST SENT YOU AN E-MAIL.

HERE'S A COPY OF MY MESSAGE BUT I'LL JUST TELL YOU WHAT IT SAYS.

IT SAYS I SENT YOU A VOICE MAIL TELLING YOU TO LOOK FOR A FAX THAT SAYS I WANT TO TALK TO YOU.

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Email Related Issues

- Problems associated with the inefficient use of emails at work such as email overload and interruptions.
 - Knowledge workers use strategies that are as random and diverse as their daily work requirements

New-email management practices are needed to solve such problems (Denning 2002)

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The Phenomenon of Email Overload

A Recent NPR News Coverage

- Americans get and send 3 billion email per day
 - In 1995 - 8 emails per day
 - In 2005 - 90 emails per day

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Email Related Issues ...


- Recent Statistics
 - "The annual rate of email growth is approximately 66 percent" (E-Policy Institute 2004)... leads to "email overload"
 - 67 percent "check continually" and 17 percent check "a few times each hour" (Osterman Research, 2004)
 - "Interruptions" consumes about 28 percent of the knowledge worker's day = 28 billion lost hours per year in the United States = an annual cost of \$588 billion to U.S. companies (Spira and Feintuch 2005)
- Recent calls issued by researchers
 - ICIS 2005 panel session on "Techno-managerial perspective on email management"
 - Weber says, "..... lack of research on email more IS research in order to better understand the problems associated with email (Weber 2004).
 - Saunders says, "time is a concept that needs to be more fully developed and integrated into IT research" (Saunders 2002)

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Email Overload

- 2004 AMA Research on workplace E-Mail & Productivity
 - On a typical workday, time spent on e-mail is ?????
 - 0-59 minutes 77.9%
 - 90 minutes-2 hours 18%
 - 2-3 hours 2%
 - 3-4 hours 2.5%
- US Department of Labor Bureau of Labor Statistics (2005), Spira and Feintuch (2005)
 - Cost of Interruptions
 - = 28 billion lost hours per year in United States
 - = Annual cost of \$588 billion to US companies (assuming an average cost of \$21 per hour)

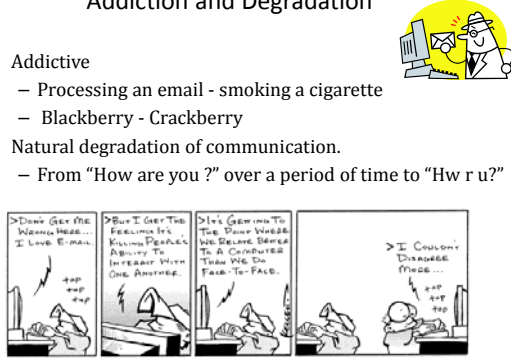



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Addiction and Degradation

- Addictive
 - Processing an email - smoking a cigarette
 - Blackberry - Crackberry
- Natural degradation of communication.
 - From "How are you ?" over a period of time to "Hw r u?"

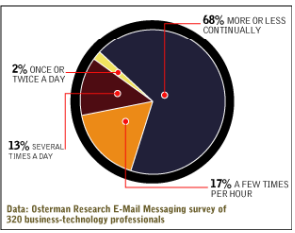



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Email Addiction

- Osterman Research- How often do you check your E-mail for new messages when at work?



Data: Osterman Research E-Mail Messaging survey of 320 business-technology professionals




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Recent Studies at OSU

- Email routing within contact centers
- Knowledge worker attention
- Email overload and interruptions
 - To improve individual knowledge worker performance by
 - Identifying effective and efficient ways of managing email communication at workplace that will
 - Improve email response time & primary task completion time.
 - Reduce email overload and number of interruptions per day.




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Questions Being Addressed

- How often to check email?
- Is it better to check continuously?
- When should we switch from email to other tasks and back?
- How much time should we spend checking emails when we do check email?




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Research in Email Management Strategies

How often should we process email? Balancing interruptions and quick response times



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The Definition and Process of Interruption

Interruption- According to **distraction theory**, it is "an **externally generated, randomly occurring, discrete event** that breaks continuity of cognitive focus on a primary task." (Corragio, 1990)

The Process of Interruption. (Trafton, 2003)

The diagram illustrates the process of interruption. A horizontal timeline is shown with a blue line above and a red line below. The process is divided into three main stages: Pre-processing, IL + Interrupt processing, and Post-processing. An 'Interrupt arrives' event (represented by a lightning bolt) occurs during the Pre-processing stage. The 'Interrupt departs' event (represented by a person leaving a computer) occurs during the IL + Interrupt processing stage. A thought bubble labeled 'Recall time-ble' is shown above the IL + Interrupt processing stage. A cartoon character is shown at a computer workstation during the IL + Interrupt processing stage.

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Modeling Email Flow and Interruption Process

The concept of (time-based) proficiency

The graph plots Proficiency (%) on the y-axis (0 to 40) against Time Period on the x-axis (0 to 6). The curve starts at (0,0), rises to about 30% at time period 2, then drops to 0% at time period 3. It then rises again to about 30% at time period 4, and finally reaches about 40% at time period 6. The stages are labeled: 'Activity Begins' (0-2), 'Forgetting' (2-3), 'Relearning' (3-4), and 'Activity Continues' (4-6).

Figure from Ash and Smith-Daniels (1999)

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Considerations

- Not all emails are interruptive
- Some people check their emails at natural breaks
- Some emails can not wait

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Email Policies

Email-hours for knowledge workers with different levels of dependencies on email communication					Policy	# of Email hour-slots
Policy type	Very Low (1 hr)	Low (2 hrs)	High (3 hrs)	Very High (4 hrs)		
Triage	8am-9am	8am-10am	8am-11am	8am-12 noon	C1	1
Schedule	8am-8:30am 4:30pm- 5pm	8am-9am 4pm-5pm	8am-9:30am 3:30 am to 5:00 pm	8am-10am 3pm- 5pm	C2	2
Schedule	8am-8:15am, 11am-11:15am 1pm-1:15pm 4:45pm- 5pm	8am-8:30am, 11am-11:30am 1pm-1:30pm 4:30pm- 5pm	8am-8:45 am, 11am-11:45am, 1 pm - 1:45 pm, 4:15 pm - 5:00 pm	8am-9am 11am - 12 1pm- 2pm 4pm- 5pm	C4	4
Schedule	8am-8:08am 9- 9:08am and so on	8-8:15am 9-9:15am 10-10:15am and so on	8-8:23am 9-9:23am 10-10:23am and so on	8- 8:30am 9- 9:30pm 10- 10:30pm and so on	C8	8
Flow	Processed as soon as emails arrive	Processed as soon as emails arrive	Processed as soon as emails arrive	Processed as soon as emails arrive	C	Infinite

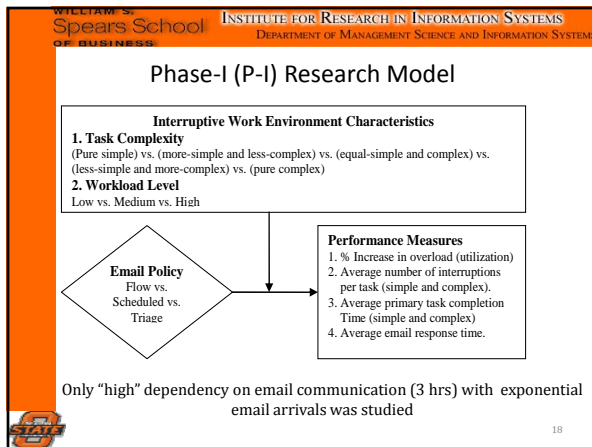
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Approach/Methodology

- Challenge
 - Difficult to conduct this study as an experimental or field study with enough control.
- A Multi-phase Simulation Study
 - Serves as a tool for theory enquiry and development (Peschl, 2001; Di Paolo, 2000).
 - A way of doing thought experiments and a technique that often gives surprising 'emerging' results (Axelrod 2003).
 - Hypotheses development using simulation


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Methodology

Discrete event simulation using Arena 8.01
 Model Run length= 500 days
 Model Warm-up time= 50 days
 No. of replications of each model= 20
 15 scenarios evaluated for 6 different policies.
 Thus, Total number of simulations models= 15 x 6= 90
 Total number of data points generated = 90 x 20 = 1800

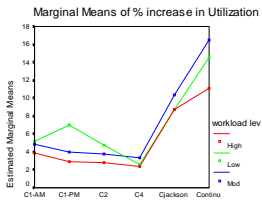


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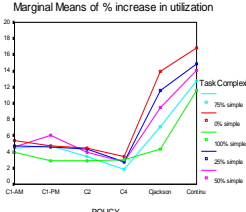
Selected Results

Marginal Means of % increase in Utilization




Effect of Policy x Workload Level on % increase in Utilization

Marginal Means of % increase in utilization



Effect of Policy x Task Complexity on % increase in Utilization

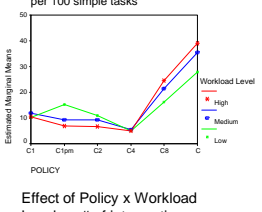


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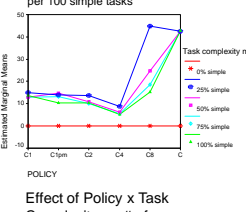
Selected Results

Average No. of interruptions per 100 simple tasks




Effect of Policy x Workload Level on # of interruptions per simple task.

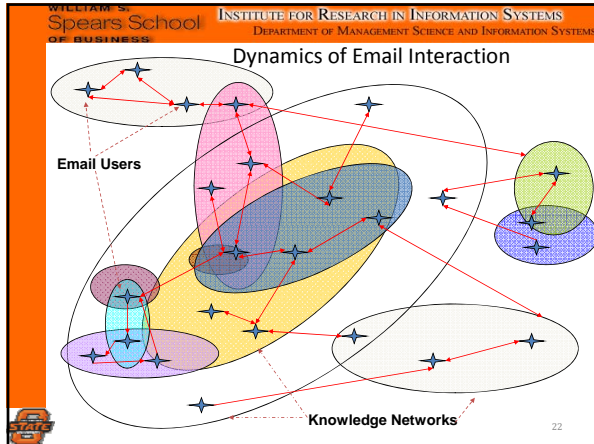
Average No. of interruptions per 100 simple tasks

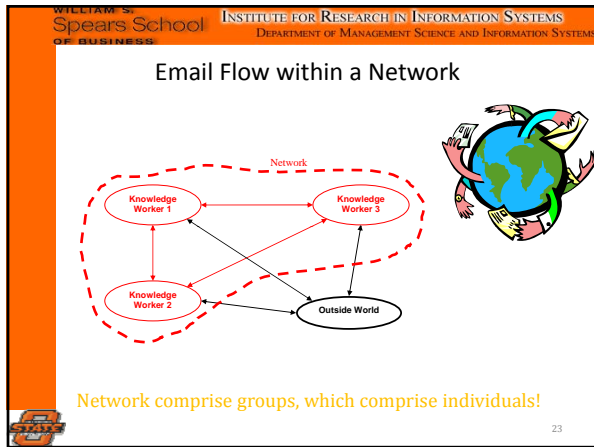


Effect of Policy x Task Complexity on # of interruptions per simple task.



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What if we could change the organizational culture to check emails on a scheduled basis?

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SIMONE

Simulator for Interruptions and Message Overload in Network Environments




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Simone's Anatomy


- Simulation model
 - Modeling Emails
 - Modeling Email Life
 - Modeling Email Processing Strategies
 - Modeling Email Flow and Interruption Process
- Model Implementation
 - Implementation of Primary Task Processing
 - Implementation of Email Processing Strategies
 - Implementation of Email Flow in the Network
- Limitations and Implications for Future Work



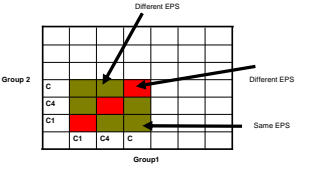
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Email Processing Strategies

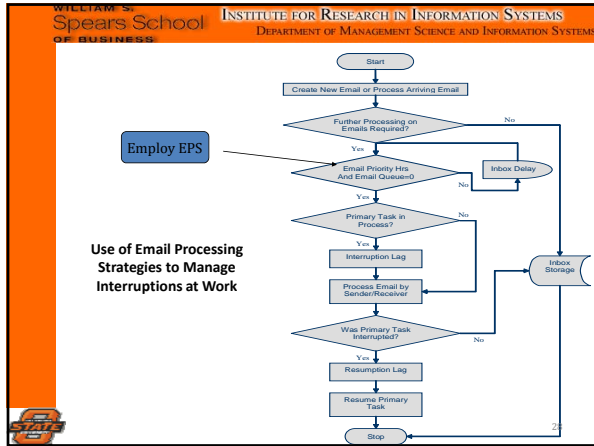


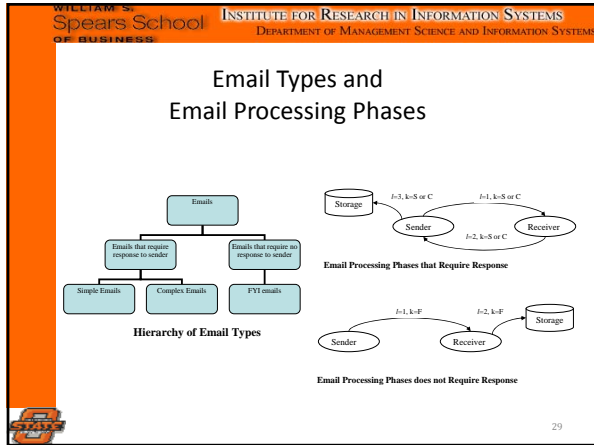
EPS Description	Notation
Once a day	C1
Four times a day	C4
Continuously	C

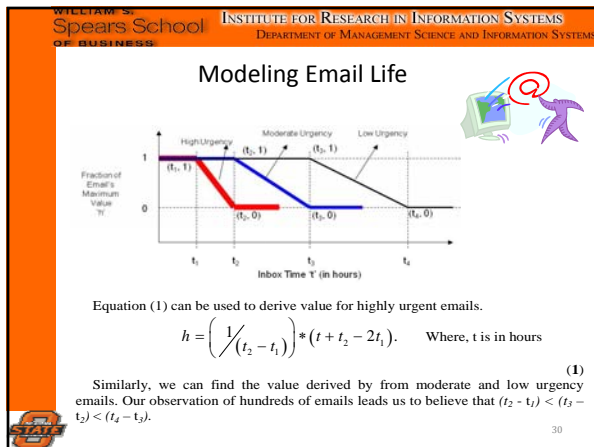


EPS between Two Groups of Knowledge Workers

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Different Types of Email Policies

- Email Processing Strategies (EPS)
 - Rhythmic Policy: A network is said to use a rhythmic policy if there is some synchronization w.r.t the use of individual EPS both within and across its groups.
 - Rhythmic-Same: if individual EPS used are same within and across its different groups. For e.g. [(C1, C1), C1], [(C4, C4), C4]
 - Rhythmic-Different: if individual EPS used are same within but different across its different groups. For e.g. [(C1, C1), C4], [(C4, C4), C1]
 - Arrhythmic Policy: A network is said to use an arrhythmic policy if individual EPS are different within and across its different groups or completely random. For e.g. [(C1, C4), C], [(C, C), C]




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Types of Networks

- Network Structure
 - Homogeneous (HEN): A network is called "homogeneous" if all the constituting knowledge workers spend almost similar amount of time on emails.
 - Examples include networks with no hierarchies such as networks found in academia, friends, etc.
 - Heterogeneous (XHEN): A network is "heterogeneous" if there is a dissimilarity in the amount of time that knowledge workers spend on emails.
 - Examples are networks with hierarchies.




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What do we measure?

- Time-Effectiveness: the average ratio of total "value added" time spent by the network to the total time spent ("value added" + "non-value added")
- Value-Effectiveness: the benefit attained from the timely exchange of information contained within an email
- Avg. Task Completion Time: the average amount of time for which a task remains with the knowledge worker before it is completed
- Avg. E-mail Response Time: the average amount of time an email remains with the knowledge worker before a desired action on it such as pre-processing, responding, reading, and filing, is completed



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Research Design

Full Factorial Design
(Total number of scenarios/factors=38)

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Implementation of Simulation Model

- Main Modules:
 - Primary task processing
 - Email processing strategies
 - Email flow within and outside of network
 - Performance variable calculation

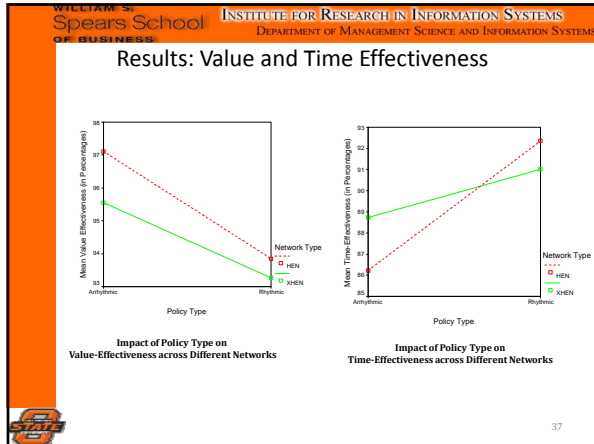
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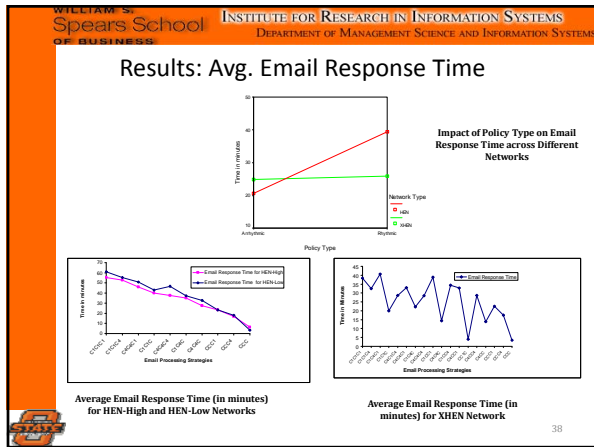
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Implementation of Computational Model

- 38 Simulation models created using Arena 8.01
- Models implemented:
 - Primary task processing
 - Email processing strategies
 - Email flow within and outside of network
 - Performance variable calculation
- Model validation
- Run length=210 days
- Warm-up time=30 days [Welch's method]
- No. of replications= 20 [Replication truncation method using the relative precision approach (Chung 2003)]

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Optimal Policy

- Under varying email arrival characteristics-
 - Optimal policy for primary task completion time - C2 closely followed by C4.
 - Optimal policy for email response time - C
 - Optimal policy for reducing interruptions- C4 closely followed by C2

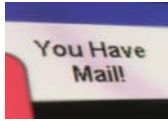

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Cost Implications: Individual Level

For a 10 hour workday

- C policy: Avg. 28 min per day per knowledge worker
- C4 policy: Avg. 12 minutes per day
- C1 policy: Avg. 4-5 minutes per day


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Time Implications: Network Level

Assuming the wage rate of \$50 per hour

- Small Organization (100 KW)
 - C:2333 work hours= \$600,000 /year
 - C4:1000 work hours= \$260,000 /year
 - C1:305 work hours= \$80,000 /year
- Large Organization (1000 KW)
 - C:233,333 work hours = \$60 M /year
 - C4:100,000 work hours = \$26 M/year
 - C1: 30,000 work hours= \$8 M/year





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Implications

- Productivity improvements
 - On an average, an organization could potentially save 3 to 6 percent of overall time spent per day by using email strategies that are more time effective.
 - However, savings comes at a cost of 2.5 to 3.5 percent reduction in the communication-value!





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Other Studies at OSU

- When to switch tasks
- How many emails to process at a time?
- Etc.




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Conclusions

- Problem is growing
- We need further research and technologies to manage it
- Organizational experiments



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