The Challenges of Multitasking: Working Faster, Better, Cheaper?

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Research Interests

- Collaboration: distributed
- Multi-tasking in the workplace
- Collaboration resilience
- Network centricity in organizations

Multi-tasking study is in collaboration with…

Victor Gonzalez
Justin Harris
Daniela Hausstein
Ulrik Klocke
Hy Loc
Aimee Strang
Norman Su
Hideto Yuzawa

……who have fit this in with all their other tasks

Multitasking and IT

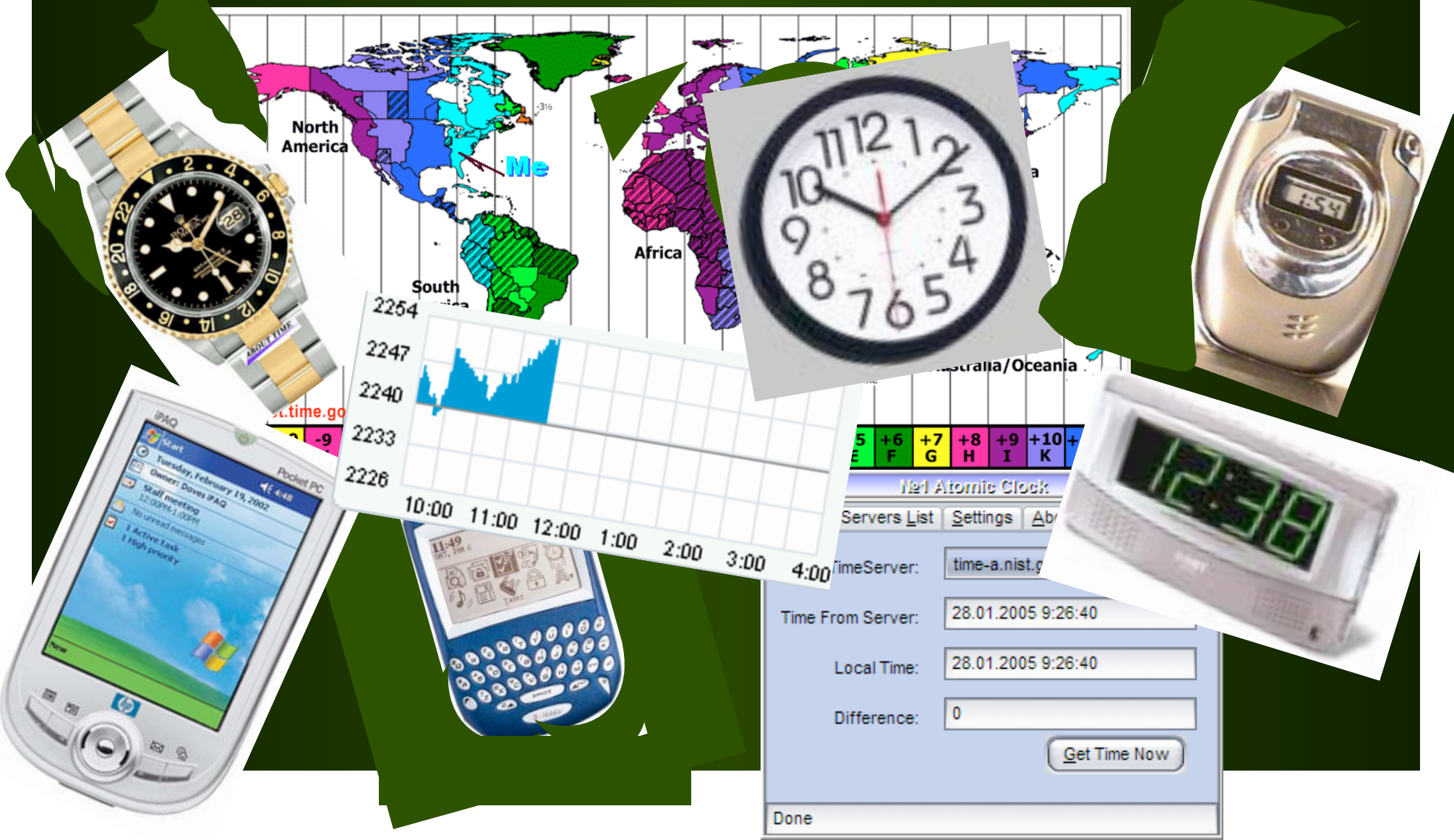
Multi-tasking is prevalent for information workers

We've got it all wrong with IT design

Information is not organized to support the reality of multi-tasking

We switch projects; information needs to be organized to enable seamless switching among projects, people

For information workers today, time is their most scarce resource



Invisible Work

Multi-tasking part of a larger phenomenon of *invisible work*

The extra effort that people must invest to meet demands of their jobs

Where does multi-tasking stem from?

As scope of work increases

Flattening of hierarchies, expansion of work roles

Link between downsizing, large-scale expansion, increased work activities, higher levels of stress

Adoption and use of technologies in the workplace

Studies conducted

Field study of multi-tasking in three organizations

Field study of switching communication and media

Laboratory study of interruptions, speed, and stress

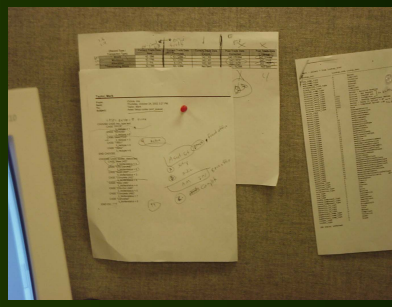
Diary study of multi-tasking

TIMA prototype

Methodology

Observation of daily activities

- initial observation
- ~3 days of observation/person
- Each activity timed (to the second) and annotated
- Details of event: what was done, who was present, topics of conversation



Clarifications made at the end of day

Pre and post (long) interviews after observations

36 people observed

Coding events

Event = the amount of time that people spent in continuous uninterrupted use of a device or engagement in an interaction with other individuals

Examples:

- telephone call
- typing a Word document
- talking “through the cubicle wall”

Pre- and Post-email Eras

	Horne & Lupton 1965[a]	Minzt-berg 1970[a]	Sproull 1984[a]	Ives & Olson 1981[a]	Stephens et al. 1992	Hudson et al., 2002[b]	Mark & Gonzalez 2006
Desk Work	26%	22%	19%	19%	28%	42%	42.9%
Phone	9	6	13	9	9	--	7.6
Scheduled Meetings	10	59	34	48	48	27	14.3
Un-scheduled Meetings	55	10	34	20	14	19	22.3
Other	--	3	--	2	2	--	12.9
Total Time	100%	100%	100%	100%	100%	88%	100%

What changed with IT?

People spend more of their day at deskwork

Proportion of desk work nearly doubled in IT-rich environments (42.5%), compared to pre IT-rich environments (23%)

People spend less of their day in F2F formal meetings

pre-IT rich (with exception of Horne & Lupton): 47%

IT-rich environments: 21%

How Fragmented is Work?

How fragmented is work really?

Events	% of day	Avg. Time/event (minutes:seconds)
Using PC's	27.8%	02: 30
Personal	11.2%	33:32
Formal meetings	14.3%	42:56
Using email	8.3%	02:04
Going to other cubicles	12.4%	08:21
Interaction in cubicle	8.3%	04:29
Using paper documents/books	6.6%	01:50
Talking "through the walls"	1.7%	01:06
Using other tools	0.8%	01:15
Using phone	7.6%	03: 02
Unknown	1.0	05:09

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Unknown	1.0	05:09
All actions *except* Formal meetings, Personal, and Unknown	**73.5%**	**03:05**

People spend about 3 minutes on any task before switching or being interrupted

How often do people switch devices? N=24

Device	% of day	Avg. Time/device (minutes:seconds)
PC's (incl. email)	36.1%	02: 52
Desk phone	5.2%	02:17
Paper documents	5.0%	01:33
Books, manuals	1.8%	01:57
Financial terminals	1.6%	01:20
Cell phone	0.7%	04:13
Daily planner (paper)	0.2%	00:50
Address books (paper)	0.07%	01:00
Hand-held calculator	0.05%	00:48

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Hand-held calculator	0.05%	00:48
All devices	**51.6%**	**02:11**

People spend slightly more than 2 minutes using any digital or physical device before switching or being interrupted

Projects

Maybe switching isn’t so bad if you’re working on the same project/context?

Working spheres

What becomes difficult is switching between projects

A *Working Sphere* is a set of interrelated events which:

- -share a common goal
- -involves communication with a particular set of people
- -uses unique resources
- -has its own time framework

Examples:

"The TGX project", "Clear Quest app" project, task force

People work in an average of 12.2 different working spheres per day

People worked an average of about 10 1/2 minutes in a working sphere before switching or being interrupted

Even when removing “non-significant” interruptions (2 minutes or less), average working sphere segment was 12 minutes, 18 seconds

Types of Interruptions

Maybe not all interruptions are the same?

Internal/External Interruptions

	Type of Interruption	% of All Types
Internal 43.6%	Leaving cubicle	14.7%
	Checking/Using computer	12.3%
	Email use	5.8%
	Phone call	5.8%
	Talking “through the wall”	3.5%
	Using paper documents	1.5%
External 56.4%	Person comes into cubicle	25.8%
	Email notification	14.5%
	Phone ringing	10.3%
	Others call “through the wall”	4.1%
	Status on financial terminals	0.7%
	Reminder notification	0.7%
	Voice message light	0.4%

Resumption of Work

Resumption of Interrupted work

We consider only work interrupted and resumed on same day, for uniform comparison

We do not consider the last hour of work

Resumption of Interrupted work

Good news:

81.9% of interrupted work was resumed on the same day

Bad news:

Interrupted work resumed on the average in 23 min. 15 sec.

But… our informants worked in an avg. of 1.92 (sd=1.79) WS before resuming work

Informants reported: a high cost in reorienting to work

Gender

Gender Effects!

6 females, 29 males

Females worked in significantly more central and peripheral working spheres than males

Females experienced fewer interruptions

Females were less likely to interrupt themselves

Females more likely to resume interrupted work (87.3%) than males (80.8%)

*all results significant to $p<.05$

The paradox in IT support

IT currently supports individual tasks, and is not designed to support the integration of information into larger themes, associated with projects

The burden falls on the users to integrate their work that is fragmented over time and space!

Information should be organized according to working spheres

Interruptions need to match users' current working spheres

Chains of Interaction

People often communicate in *chains* of interactions (median 3 links)

People switch media and organizational contexts within chains

H: Chains of interaction are a way of aligning work with others

Characteristics of Chains

All significant results at $p<.05$:

Email-initiated chains have the longest links

External interruptions lead to significantly more links

Organizational context switching is correlated with media switching

Organizational context switching is also correlated with job strain

What about interruptions and stress?

Email Experiment

Email done with and without interruptions

Total time to perform task:
[total time to perform task – time spent on interruptions]

Errors: factual errors, typos

Politeness metric-assigned points for standard greeting/closing phrases and polite words

Stress: NASA Task Load Index: stress, workload, time pressure, effort, and frustration

Surprise

People took longer to perform the task when not interrupted, but they wrote more

People measured significantly higher in stress, mental workload, frustration, time pressure, effort

Interrupted work is done faster, but at a price

When interrupted, people develop a mode of working faster (and writing less) to compensate for the time they know they will lose by being interrupted.


DELL