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"Modeling Coordination Costs Due to Time Separation in Global Software Teams"

Problem

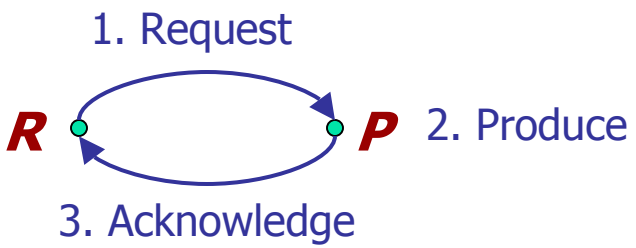
- Coordination in global SW tasks
- The effect of geographic distance?
- Global SW teams often span time zones
- Tease out the effect of time separation?
- Distance is ***symmetric***, time separation is ***not***
- Is time separation good or bad?
- Is 60% overlap better than 20% overlap?
- Is it more difficult to coordinate?
- How about *"follow-the-sun"?*

Research Question

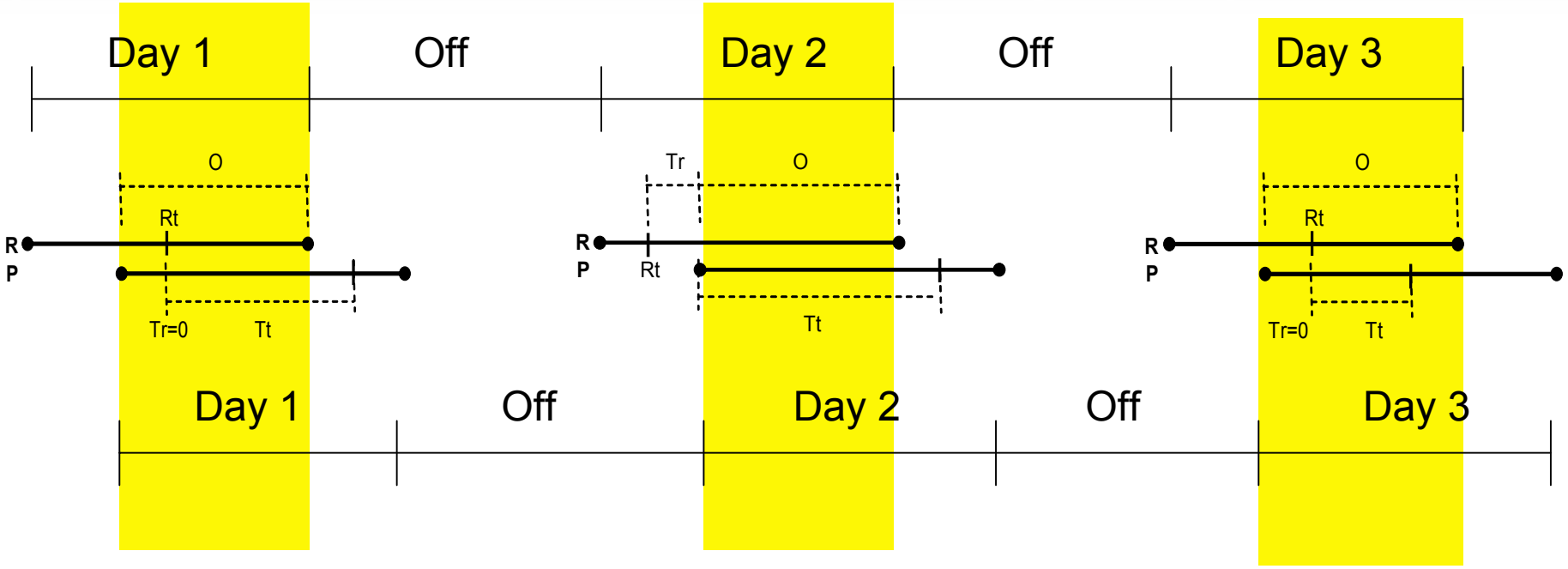
What is the effect of time separation on coordination costs?

Approach

- Coordination = management of dependencies (Malone et. al. 91, 94)
- Malone ’87: coordination structures
- Model: SW **dyad** dependencies
- 2 actors: ***R*** task requestor; ***P*** task producer
- Time measured from ***R’s*** perspective
- Costs:
  - Production $=\lambda CpTt$
  - Coordination$=Cl+2\lambda Cm+\lambda TdCd$
  - Vulnerability$=\lambda Pn(PrRwCpTt+2Cm+(Tr+PrRwTt+Ta)Cd)$



Example: 50% work day overlap



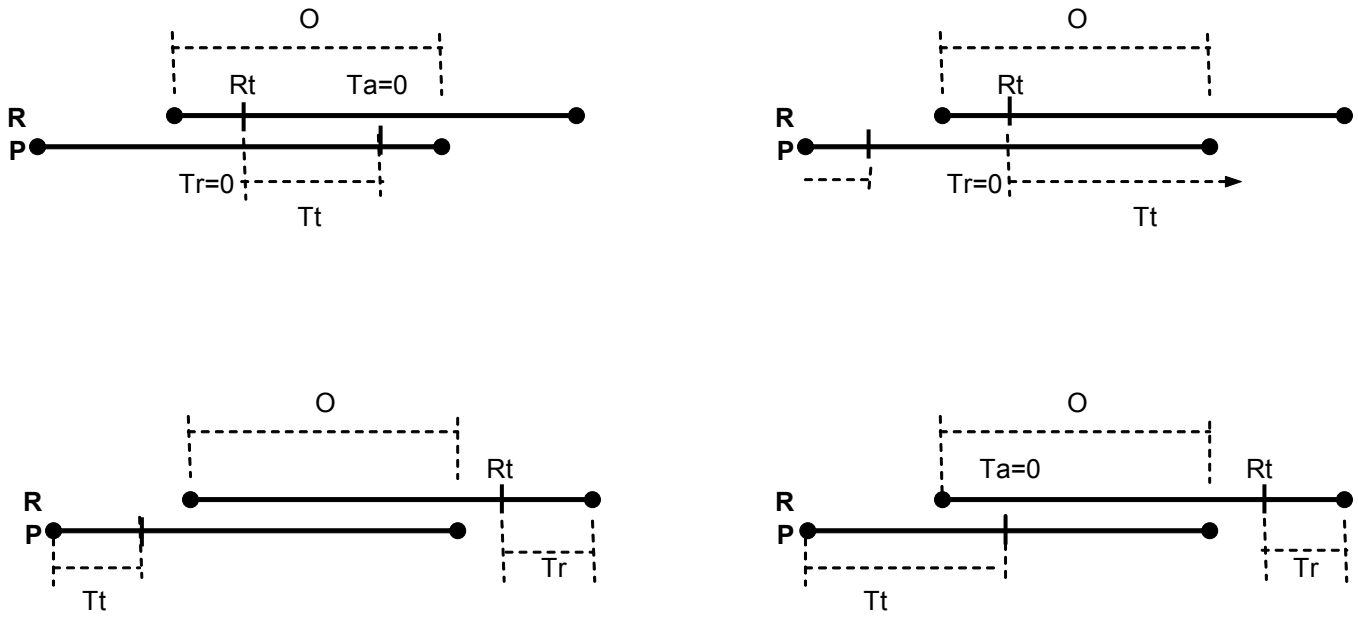
Simulation

- Generated 11,000 observations:
  - Different distance and time-separated conditions
- Regression on coordination and vulnerability costs
- Results shows a robust model; results support intuition:
  - Time, distance and overlap time matter
  - ***Rt*** reduces coordination costs (i.e. request time matters)
  - Negative effects decrease with ***Rt*** (i.e., close to overlap hours)
- Future steps: test model empirically (lab/field studies)
- Explore: larger teams; more complex work arrangements
- Will gradually relax some assumptions

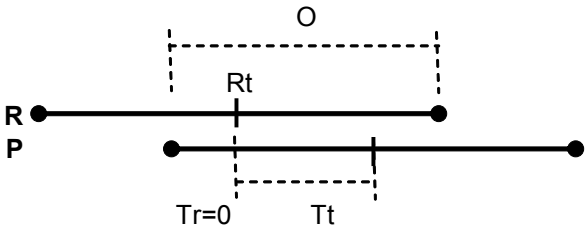
Questions?

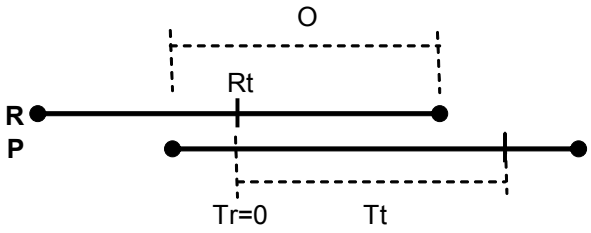
Backup Slides

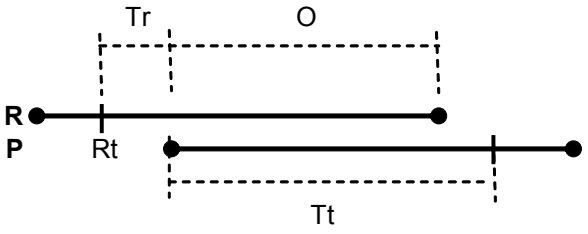
Time Separation Diagram:
Overlap At the Beginning of R's Workday

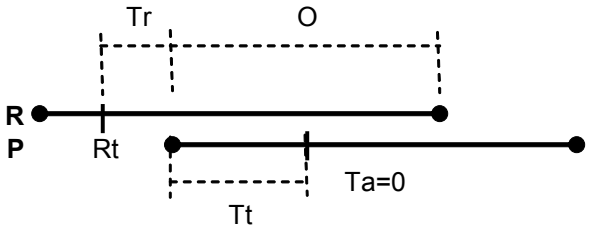


Time Separation Diagram:
Overlap At the End of R's Workday









Regression Analysis

	Coordination Costs				Vulnerability Costs			
	Main Effects		+ Interaction		Main Effects		+ Interaction	
Variable	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
Constant	**-390.64**	**<0.001**	**-409.64**	**<0.001**	**-55.18**	**<0.001**	**-69.65**	**<0.001**
Request Time	**-353.81**	**<0.001**	**-49.51**	**<0.001**	**-133.62**	**<0.001**	**-27.13**	**<0.001**
Task Duration	**721.50**	**<0.001**	**942.53**	**<0.001**	**71.88**	**<0.001**	9.80	0.143
Overlap Index	**-159.64**	**<0.001**	-2.51	0.492	**-135.13**	**<0.001**	0.21	0.923
Distributed	**594.14**	**<0.001**	**600.09**	**<0.001**	**24.71**	**<0.001**	**26.82**	**<0.001**
Time Separated	**208.39**	**<0.001**	**205.34**	**<0.001**	**70.91**	**<0.001**	**75.21**	**<0.001**
Distributed & Time Separated	**749.31**	**<0.001**	**759.58**	**<0.001**	**123.90**	**<0.001**	**122.93**	**<0.001**
ReqTime x TskDur			**-321.26**	**<0.001**			**-26.33**	**0.020**
ReqTime x Overlap			**471.20**	**<0.001**			**255.99**	**<0.001**
TskDur x Overlap			**496.89**	**<0.001**			**-28.37**	**0.009**
ReqTime x Distr			5.87	0.279			4.79	0.136
ReqTime x TimeSep			**-610.74**	**<0.001**			**-170.78**	**<0.001**
ReqTime x Distr&Time			**-608.48**	**<0.001**			**-257.61**	**<0.001**
TskDur x Distr			1.52	0.922			3.87	0.676
TskDur x TimeSep			**-416.15**	**<0.001**			**87.36**	**<0.001**
TskDur x Distr&Time			**-454.54**	**<0.001**			**154.38**	**<0.001**
Overlap x Distr			*9.32*	*0.071*			4.14	0.177
Overlap x TimeSep			**-366.62**	**<0.001**			**-235.66**	**<0.001**
Overlap x Distr&Time			**-262.92**	**<0.001**			**-305.90**	**<0.001**
R-sq	0.854		0.974		0.571		0.901	
R-sq Change			0.120				0.330	
R-sq Change P-Value			<0.001				<0.001	