Follow-the-Sun Software Development
A Controlled Experiment to Evaluate the Benefits of Adaptive and Prescriptive Approaches

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How can we develop software taking the advantage of a 24 hours cycle?
Follow-the-Sun Development

• Is a global software development strategy

• The main goal is to decrease the time-to-market thus, speeding up the final product's development

• This environment works with teams located in different countries and several time zones away from each other

• Each team has to work for a specified period of time

• The handoff can be applied to any kind of task

• This handoff should occur on a daily basis and following a standard process
FTS Challenges

Communication difficulties
- Increasing of the number of teams
- Lack of synchronous communication between distributed teams
- Knowledge sharing practices and knowledge reuse
- Time zone overlap

Coordination barriers
- Increasing of the number of development centers
- Team management
- Team building
- Cultural and geographical differences
- Coordination costs
- Calendar efficiency
- Daily handoff cycles

Cultural differences
- Socio-cultural diversity
- Social, ethnic and cultural aspects
- Law and legislation
FTS – Evolution and Trends

1999
• The first documented experience – IBM 1997

2004
• Studies address the use of FTS by organizations

2006
• Two additional case studies at IBM
  • US and Australia || US and India

2007
• Study report the use of FTS by Infosys in 2005

Today
• Empirical studies

Controlled Experiments

- Solingen and Valkema (2010)
- Carmel, Espinosa and Dubinsky (2009)
- Espinosa, Nan and Carmel (2007)
• **Espinosa, Nan and Carmel (2007)**
  - The impact of time zone overlap on speed and accuracy.

• **Carmel, Espinosa and Dubinsky (2009)**
  - Quasi-experiment designed to measure speed in software work conducted by distributed teams working with Agile (adaptive) software development.

• **Solingen and Valkema (2010)**
  - The impact of the number of sites in a daily cycle in terms of overall working speed, individual working speed and working accuracy.

**Our study**

Adaptive x Prescriptive approaches
Our Goal and Research Questions

Goal

• To investigate the use of the adaptive and prescriptive approaches in the context of FTS

**RQ1:** Are teams using adaptive approaches faster than teams using prescriptive approaches?

**RQ2:** Do teams using adaptive approaches deliver more accurate work than teams using prescriptive approaches?

**RQ3:** Do teams using adaptive approaches deliver more quality than teams using prescriptive approaches?
The Experiment Dimensions

- **Process:** The experiment was executed by the development of experiment activities as part of a post graduation class in two isolated labs.

- **Participants:** Postgraduate students.

- **Type of experiment and experimental units:** The experiment was performed using one factor and two treatments.
  - \( v_{Adp} \): Maps developed using the adaptive approach.
  - \( v_{Pre} \): Maps developed using the prescriptive approach.

<table>
<thead>
<tr>
<th>Adaptive</th>
<th>Prescriptive</th>
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<tbody>
<tr>
<td>LAB1 D</td>
<td>LAB1 D</td>
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<tr>
<td>LAB2 M</td>
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- **Scenario:** The studied problem was an academic task, and it was represented by the execution of tasks in a fictional task map.
The Study Design

- Five shifts of 15 minutes each (representing one workday);

<table>
<thead>
<tr>
<th></th>
<th>Shift 1</th>
<th>Shift 2</th>
<th>Shift 3</th>
<th>Shift 4</th>
<th>Shift 5</th>
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<tbody>
<tr>
<td>Adaptive</td>
<td>Team 1</td>
<td>Team 2</td>
<td>Team 1</td>
<td>Team 2</td>
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- Participants were organized in two sites where each site had two teams (Map Designer (D) or/and Map Maker (M));

- We used FTS with no time-zone overlap between the distributed teams.
After five shifts… out of thirteen maps.

- Adaptive teams
  - 6/13 = 46%
  - Result: 6 maps

- Prescriptive teams
  - 4/13 = 30%
  - Result: 4 maps

16% difference
When we observed the total points of correct elements for each map, prescriptive teams have more accuracy.

Adaptive = 70%  Prescriptive = 85%
Results - Quality Analysis

Adaptive teams:
- More speed
- Less quality

Prescriptive teams:
- More quality
- Less speed
Conclusions and Future work

• Adaptive approaches increase the speed, but they do not enhance accuracy and quality of the work done by distributed sites.

• This experiment has important findings that contribute to the literature on global software engineering and FTS software development.

• Future work
  
  • New studies in order to replicate this experiment with more participants and different shifts scenarios (e.g. some time-zone overlap).
  
  • Replication of this experiment with industry participants in the context of software development.
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## Instrumentation, Training & Execution

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>When</th>
<th>How</th>
<th>When</th>
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<tbody>
<tr>
<td>Experimental Unit</td>
<td>Prescriptive</td>
<td>Experiment</td>
<td>Maps Development</td>
<td>Execution</td>
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<td>Maps Development</td>
<td>Execution</td>
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<tr>
<td>Document</td>
<td>Experiment guide</td>
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<td>Handoff form</td>
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<td>Collecting data from maps development</td>
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<td>Training</td>
<td>Pre-experiment</td>
<td>To present the experiment context and motivation</td>
<td>Preparation</td>
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<tr>
<td>Metric</td>
<td>Report</td>
<td>Post-experiment</td>
<td>Data was gathered using a manual report.</td>
<td>Conclusion</td>
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