Using the Cloud to Facilitate Global Software Development Challenges

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Table of Contents

- Context
- Global Software Development (GSD) Challenges
- Research Question
- Objective of the Research
- Research Methodology
- Cloud Computing
- Motive for Using the Cloud for Supporting GSD
- GSD processes as a Service
- GSD Challenges and the Cloud
- Discussion
Global software development:
- Entails development of software across geographically distributed teams
- The motive is to reap business advantages by ensuring round the clock software development

Reduce cost in software development projects

Communication tools and strategies enhance the options to use a remotely located work force

Outsourcing software development is becoming increasingly popular
- But Outsourcing software development to various destinations is not an easy task
Global Software Development Challenges

• GSD brings challenges to distributed software development activities

• Outsourcing software development leads to different challenges:
  – Geographic distance as teams are dispersed across countries
  – People work in different time zones
  – Understanding of different cultural practices
  – Team members speak different languages
## Global Software Development Challenges

<table>
<thead>
<tr>
<th>Collaboration Challenges</th>
<th>Issues</th>
<th>Negative Impact on Software Project</th>
<th>Facilitating GSD Using Services (SOA/Cloud )</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Geographic</strong></td>
<td>Distance Time Knowledge transfer Tools</td>
<td>Communication gaps Project Delays Ambiguity on technical aspects Unequal quality levels across the sites</td>
<td>Dynamic binding, runtime adaptation, and timely availability of required services could help dealing with geographic issues. Also, availability of SaaS could diminish installation overheads</td>
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<tr>
<td><strong>Cultural</strong></td>
<td>Unequal distribution of work Lack of Trust Fear</td>
<td>Increase in cost Poor skill management Reporting problems</td>
<td>Service could maintain a fair distribution of work between the teams. Only a specific person will be responsible for the task assigned to</td>
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<td><strong>Linguistics</strong></td>
<td>Frequency of communication Knowledge transfer</td>
<td>Loss in project quality Invisibility on project development Ineffective project management</td>
<td>Run time evolution of services can meet with the linguistic issues. Also, isolation of each task and related information as a service can ensure right level of knowledge transfer</td>
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<td><strong>Temporal</strong></td>
<td>Lack of Motivation Less visibility Risk</td>
<td>Loss in Project Quality Poor management of configuration Chances of project artifact loss</td>
<td>Services maintain a registry where all of them are stored. Also, a cloud maintains inventory of services. This attribute could be used to store and retrieve configurations</td>
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Research Question

• Is it possible to support collaboration in GSD using Service Oriented Architecture (SOA) and cloud computing?
  • As a Process (Implications for the GSD business model)
  • As a Product (It is developed run and distributed globally)
• For this purpose, we suggest making use of cloud computing paradigm
• The goal is to enhance the usefulness of GSD using the cloud services
• The data in the cloud is accessed through services, we study its usefulness in the light of SOA
• We argue that GSD challenges can be addressed using different types of cloud computing realizations
Objective of the Research

• The research proposes the development of GSD process activities using the cloud services
• We discuss how the GSD process can be aligned with SOA
• How GSD products can be implemented using services
• Although some web tools support GSD communication processes but the question remains
  – How GSD processes can work better by making use of service oriented environment?
Research Methodology

• Our literature review studied the characteristics of services (both SOA and the cloud)
• GSD challenges were identified
• A workshop was held by Lero, VUA, PoliMi, the attendees had research expertise in GSD and SOA
  – We developed the proposed concept through interactive discussion and brainstorming
  – We investigated the potential of SOA based cloud services to address GSD challenges
Cloud Computing

• Cloud computing is a computing paradigm in which both hardware and software resources are provided on demand.
• It has the following representations:
  – IaaS (Infrastructure as a Service)
  – PaaS (Platform as a Service)
  – SaaS (Software as a Service)
• The cloud paradigm is famous for its flexibility, scalability, independence, and reduced cost
<table>
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<th>Supporting Characteristics of the Cloud Computing</th>
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<tr>
<td><strong>Virtualization</strong></td>
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<td><strong>Reduced Cost</strong></td>
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<td><strong>Scalability</strong></td>
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<tr>
<td><strong>Infrastructure</strong></td>
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<td><strong>Performance</strong></td>
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<td><strong>Multi tenancy support</strong></td>
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Motive for Using the Cloud Services for Supporting GSD

• Standard procedures cannot scale up to support dynamism
• Similar ideology posed by both SOA and GSD; e.g. coordination, context, and execution monitoring
• Our thesis is that GSD challenges can be overcome through SOA support
  – To increase interoperability, diversification, and business and technology alignment
  – to improve the collective effectiveness of the enterprises participating in globally distributed projects
GSD Processes as a Service

- Figure illustrates the concept of using the cloud paradigm to support GSD
- The idea is to reduce the challenges caused by global distance
GSD Challenges and the Cloud

**Coordination**
- Coordination requires interaction among sequence of operations but Geographic distance negatively affects the ability to coordinate.
- Cloud services may ensure interactions among different activities.
- In Services, interaction between the service provider and the consumer is independent of the geographic distance.
- It can allow resources sharing not only for infrastructure but also software resources.
  - IaaS can provide GSD teams with resources such as computing power and storage provisioning to store project related data.
  - Software resources may consist of application systems and database servers.
  - Application resources can assist in providing SaaS with necessary interfaces that can facilitate collaboration and sharing of information.
GSD Challenges and the Cloud

**Collaboration**

- Geographic distance affects the ability to collaborate. Communication and collaboration declines as the distance increases.
- Cloud service based collaboration is likely to diminish the deficiency caused by distance:
  - Business process can facilitate the optimization of over all software development.
  - The services involved in a business can change with the change in the associated business in terms of requirements.
GSD Challenges and the Cloud

**Geographic Distance**

- Distance removes the opportunity for face to face communication
- The philosophy of the cloud paradigm is to facilitate a pool of shared hardware & software resources
  - PaaS can provide a development platform to assist development and hosting on the cloud
  - It does not require any kind of software downloads and installations
  - Services become part of GSD processes being provided by the outsourcing organizations
Discussion Points

• The concept of different cloud representations continues to be subject to evolution
• Determining different functional needs of the GSD users
• Availability and subscription of the cloud services because of different types of their dependency relationship
• The right level of abstraction for project knowledge transfer across global software development sites
• Security issues
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