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The Challenges of Global Village Software Engineering

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ABSTRACT

With the advent of electronic services the globe can be packed as a single village that is called global village. In Global village (GV) all users would access to E-services regardless to geographical and political boundaries among countries. Therefore, software development corporations need to develop global systems and consider the requirements and situation of all users in the world for emerging GV- services. In addition, in global systems projects companies and software development groups (SDG) may be located in different countries in the world. These corporations need to share their knowledge and manage and schedule their activities for building global systems instead of local systems inside countries. It leads to a set of problems and challenges in software development process. In this paper we will discuss about software development challenges in global systems to be conversant of its difficulties and necessity of applying new approaches in software development process.

Keywords: *Global village, software engineering, global systems.*

1. INTRODUCTION

Global village (GV) describes the integration of using electronic services that are provided by service providers around the world. GV claims to reduce communication costs and eliminate geographical restrictions via provisioning services on Internet. In the advent of advances technology, software industries are shifting from traditional software development to universal software development (outside the borders). The GV concentrates on aggregation of information and different resources as services to be used by users around the world. The last definition of software engineering extends the IEEE definitions" software engineering is the application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software" to term" global village software engineering "as the universal definition "Global village software engineering is the application and/or study of a systematic, disciplined, quantifiable approach to the development, operation and maintenance of software, that has an impact on Global village services; that is application of engineering to software in the global village" [1].

The motivation and challenges of global systems are depicted in figure 1. Global village software engineering (GVSE) has different challenges that affect on software development processes (SDP) such as analyzing the business, requirement engineering, architectural design, implementation and test. Also project management, configuration and change management are more complex than traditional SDP. These engineering rules that should be redefined are depicted in figure 2. In this direction; we will describe the most important challenges in GVSE. The rest of this paper is organized as follow: in section 2 we explain the important challenges in project management field. Section 3 is related to business and requirement analysis; in section 4 we discuss about architectural design and finally section 5 includes the conclusion.

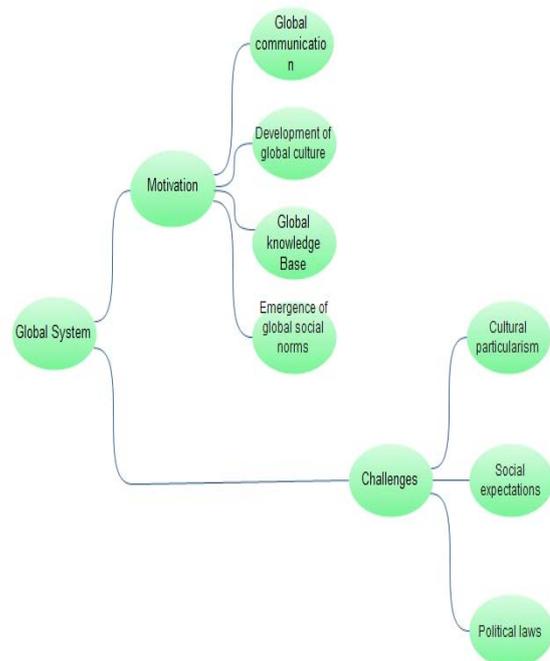


Fig 1: trends and challenges in global and integrated system

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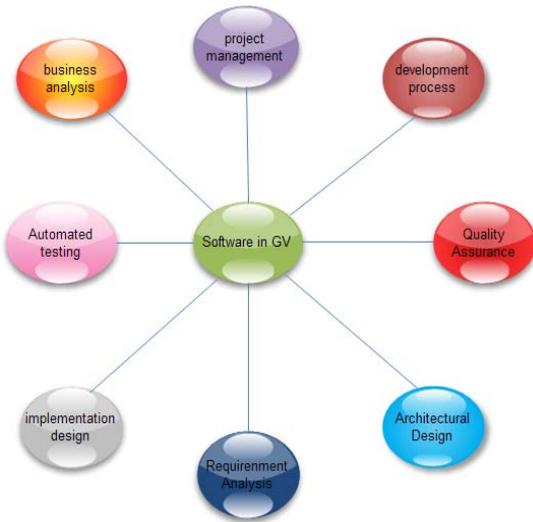


Fig 2: Engineering rules and activities in GVSDP

2. ISSUES IN PROJECT MANAGEMENT

High complexity of global project and change management are the main problems of project management in GV. In the extended definition of software for universe, project management should control problems and overcome difficulties of processes that are developing the global system. Project management is divided to Risk Management and Change Management. Figure 3 shows the important issues in both Risk and Change Management.

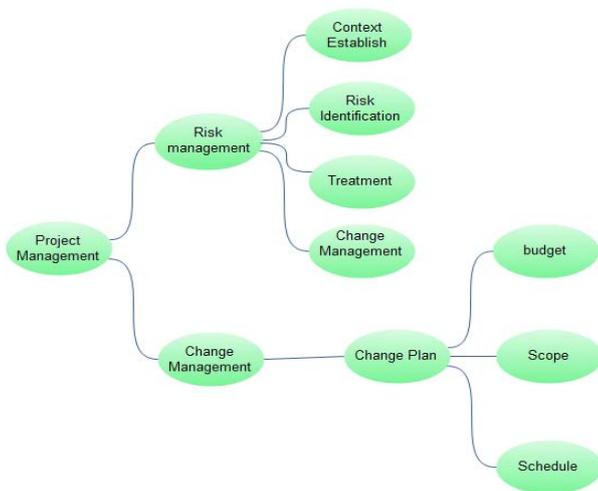


Fig 3: issues in Risk and Change Management

Risk management should be followed in two aspects. At first all risks should be analyzed and identified in architectural level and second these risks should be followed and decreased over the software development activities. For instance in GVC used the steps of PMBoK and in ISO/DIS 31000 for Risk Management in GV. These steps are 1-Context Establishment, 2-Identification, 3-Treatment, Planning and Implementation

and 4-Assessment, respectively. First step includes gathering information about business conditions. Context Establishment identifies risk contradictions and technical trade off that are affected by business motivations. In this phase business goals should be extracted, described and prioritized. In the second phase business risks that affect on business goals directly, should be recognized. These risks lead to financial problem, damaging the brand of products and increasing the costs of SDP. This step aims to discover technical risks and map them to business goals. In the Treatment, Planning and Implementation phase risk deduction strategy should be designed and implemented. Finally the last phase is the repeatable and measurable process that verifies and validates the quality of products to assessment the risk deduction.

In change management issue, the size of project, complexity and government structure are important parts that are applied to design change plan. In change management the most important problem is extending the local governments to a unified global government in globe. Therefore, managing project budget and scope and scheduling over the project are more complex than traditional projects.

3. BUSINESS ,REQUIREMENT AND DESIGN ANALYSIS

Business analysis includes balancing the requirements and business communications and technical representation of them. In this activity, businesses are grouped in local, regional and global business processes as depicted in figure 4. This figure shows that in global systems some business processes should be defined as local/ regional processes to avoid additional cost of transition all processes to global.

Therefore, precise distinction and sorting of system options in the mentioned categories can decrease SDP costs.

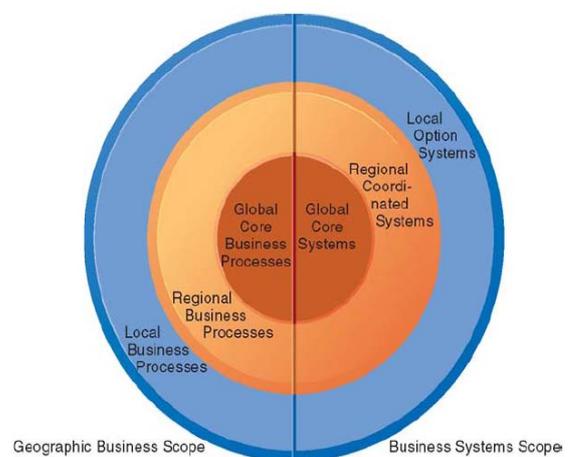


Fig 4: Grouping business process [5]

Requirement engineering in GVSE is more complex than traditional SDP. Even though in custom

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SDP, requirement understanding is the most difficult part of developing the software, in GVSD cultural diversity, difficulties in establishing proper communications, collaboration and coordination between both the individuals of engineering teams and customers make it more and more complicated. In GV service providers and organizations are geographically distributed, so coordination and communication between these centers are one of the important challenges that affect on requirement understanding. For example, different time zones are obstacle for establishing communications and coordination between teams in the world. Till now no re-definition on SDP are suggested. Only, related works discuss about the challenges in software development activities (SDA), and re-definition on them based on mentioned challenges can help us to overcome the difficulties of developing global software

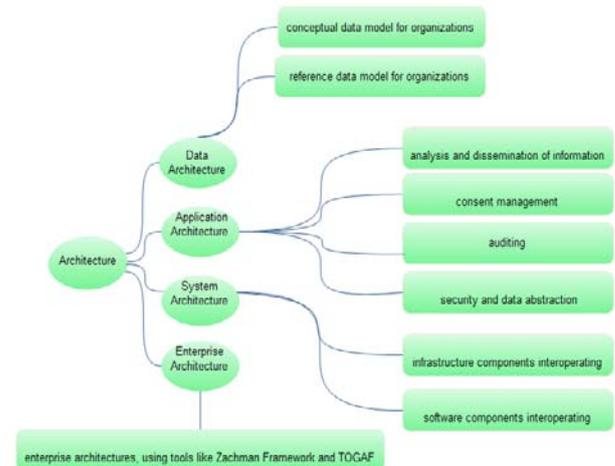


Fig 5: refinement of design activities

In this phase system and application architectural design are applied. According to GVSE, design activity should consider the organizations integration and interoperability, and additional to data design(ER, EER) and architectural design (components of software), organizations interoperability should be designed.

Integration means “The structure of different information systems to work as a unique information system “. The interoperability is the most important issue in Global E-commerce and E-Governance. Interoperability means “The ability of systems, organizations, or forces to provide services to /and accept services from other systems, organizations, or forces and /to use the services so exchanged to enable them to operate effectively together” .We define the term” interoperability” as” the ability of different systems and organizations to work together. In the other hand it means the ability of IT systems to exchange information and each organization can use this information”. The interoperability in E-Government is divided into several levels. We describe different levels of interoperability in table 1. In fact, in GV, organizations interoperability is the ability of systems to work together to satisfy citizen's requirements.

Table 1: levels of E-Government interoperability [9]

Different layers of interoperability	Meaning
Judicial interoperability	Congruence between different laws/regulations
Organisational interoperability	Congruence in goals and work processes
- Axeological interoperability	Congruence in values and goals
- Cognitive interoperability	Congruence in thought and perceptions
- Intra-processual interoperability	Congruence between internal work processes
- Interactional interoperability	Congruence in interactions
Semantic interoperability	Congruence in used language (concepts/terminology)
Technical interoperability	Congruence in technical equipment

Refinement of design activities are depicted in figure 5. In data architecture, the conceptual model of data and information in each organization, and conceptual model for organizations interoperability should be designed. Also, in this step the data model for collaboration between organizations should be planned.

Application Architecture in GV includes re-engineering of the applications for supporting the data that related to different organizations, also analyzing and publishing the information among organizations. System Architecture includes the designing and implementation of infrastructures to support organizations interoperability. Also, Enterprise Architecture should be extended for supporting collaboration and interoperating among organizations. Outline of global village software development process is depicted in Figure 6.

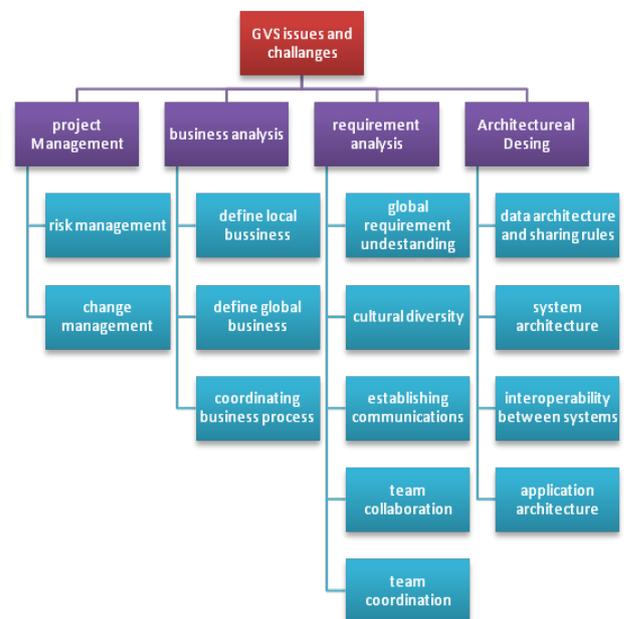


Fig 6: outlines of GVS challenges

4. CONCLUSION

With the advent of global village and transformation from the traditional SE to GVSE numerous challenges in software development are apparent. These challenges appear in all steps such as: Project Management, Risk and Change Management, Requirement Engineering, Design, Implementation and

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Test. Right now formal re-definitions of these activities are not suggested. Familiarity with these challenges helps to the apprehension of GSE's complexity. In Global village the geographical distribution causes a lot of problems. For instance cultural differences and inadequate communications are the origins of the problems and challenges in GVSE. Solving these challenges and proposing new approaches can overcome these problems and make the transformation of systems to GVS easier. So, it is necessary to propose a reference model to eliminate or diminish the challenges in GVSE.

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