Technology Acceptance Model
Applied to the Adoption of
Grid and Cloud Technology

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ABSTRACT

Advances in grid technology in the past two decades have enabled some organizations to harness enormous computational power on demand. However, the prediction of widespread adoption of grid technology has not materialized, while cloud technology is increasingly gaining acceptance. Using the online survey engine - Survey Monkey, data were collected from individuals (242 respondents) in schools, businesses and government in USA to determine the influential factors in the adoption process of grid and cloud technology. The multiple regression technique was used to determine the relationship between the intent to adopt grids and the behavioral factors: perceived usefulness, perceived ease of use, attitude (competition from alternative technology- clouds) and trust (security). The research established a valuable model to predict acceptance or rejection of grids or clouds. Implications for professionals in business, information technology, and computer science are discussed.

Keywords: Adoption Models, Cloud Computing, Grid Computing, Multivariate Modeling, Survey Monkey

INTRODUCTION

Grid technology emerged in the nineties in the academic research institutions with the prospects of-harnessing unused computing resources for high storage and compute intensive tasks (Foster & Kesselman, 1999). This gluing of computers, networks, data archives, and instruments in an interoperable virtual environment has enabled organizations to undertake large-scale computing in weather forecasting and predictive science (e.g., SETI@home - scavenges excess PCs processing cycles). The world of enterprise has since exploited the grid infrastructure for its computing and data assets needs. As a matter of fact, it was predicted that a significant portion of the enterprise world would embrace and largely adopt the grid system in the first decade of the 21st century. This prediction of widespread adoption of the grid system has not materialized despite the obvious grid advantages (Goyal & Lawande, 2006). This situation has encouraged intense efforts to close the research gap in the adoption of the grid technologies, as undertaken in this study.

The adoption of the grid infrastructure is a topic of global interest. The growth of the enterprise grid, after its success in the research and academic communities, has been a gradual

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process. The world of enterprise has been faced with the problem of managing smaller servers such as Windows and UNIX as well as resolving the issues of application or resource silos. Goyal and Lawande (2006) estimated a low utilization of servers in organization to an average of 20%. It was expected that with the increasingly available cheaper, faster and affordable hardware such as server blades, and operating systems like the open source Linux, the IT world will embrace grid computing to save money on hardware and software (Udoh, 2008). Some organizations actually harnessed this new grid technology to solve organizational problems, but the majority did not join the bandwagon.

Some reasons have been offered for the obvious reticence of IT professionals in adopting the grid, such as security and reliability of the grid infrastructure, complexity or steep learning curve (especially the middleware), cost and the churn rate of new technology (frequency of new technology). Security issues are a major source of concern, as organizations will not distribute resources randomly on the Internet, especially their prized database infrastructure without a measure of certainty or safety assurance. These concerns and a critical analysis of the literature indicate a need for future study on the factors determining the acceptance and adoption of the grid technology by organizations (Habib, Anjum, & McClatchey, 2009; Hebron, 2008; Joseph, Ernest, & Fellenstein, 2004; Kielman, 2006; Neumann, Stoesser, & Weinhardt, 2008).

On the other hand, cloud technology (with its industry origin) is increasingly gaining popularity in the enterprise world. In cloud computing, virtualized resources are provided as a service over the Internet (Figure 1). The cloud concept offers infrastructure, platform and software as a service to users, and eliminates the need to install and run middleware and applications on a user’s own computer, thus easing the tasks of software/hardware maintenance and support. Currently, cloud deployments depend greatly on virtual machines and grids, and generally, it can be considered a natural progression or offshoot of the grid-utility model. The advent of very high-speed bandwidth has enabled cloud offerings to have same response times from distant centralized infrastructure. In this study, the influence of an emerging technology like the cloud technology is examined on the adoption of an existing technology like grid technology. In effect, the emerging cloud technology is considered a factor in the adoption of grid technology.

Generally, the grid adoption framework favors at the outset, a substantial financial outlay or focus on IT infrastructure, and then business issues as exemplified by grid implementations in several vertical industries such as finance, education, life science and telecommunications (Goyal & Lawande, 2006; Joseph & Fellenstein, 2004). This framework articulates the needed capabilities in business and IT infrastructure before an organization can successfully attain its virtualization goal. In the context of IT infrastructure required to adopt and implement an enterprise grid, Goyal and Lawande (2006), described the steps necessary to transition smoothly to the grid computing space, regardless of the technology domains. The four transitioning steps for the integration and adoption of grid technology are identification, standardization, consolidation, and automation.

On its part, Oracle Inc. has been in the forefront in identifying the global trends in grid adoption. For this purpose, the Oracle’s Grid Computing Index (GCI) was created. GCI is a biannual survey study that monitors globally organizations’ interest and activity surrounding grid computing and related technologies, such as server and storage virtualization. Quocirca Analyst on behalf of Oracle Inc conducted this survey.

The GCI index is a single number that is derived from three measurements within an organization, that is, the level of knowledge and interest in an organization, the foundation readiness and the adoption life cycle.

This GCI survey has been criticized in peer-reviewed works for the choice of a single digit to represent the adoption process, and the lack of causal relationship between the behavioral factors and the intent to adopt the
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