# Chapter 50
# Cloud-Based Intelligent DSS Design for Emergency Professionals

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## ABSTRACT

*Computational Intelligence (CI) has become a well-established research field of computer science in which multi-disciplinary problems are studied to design an effective computing solution. As a known computer-based CI approach, decision support systems (DSS) has gained popularity as a computing solution to structured and unstructured problems in organizations' managerial improvement. DSS design needs to meet the domain-specific demands of emergency professionals on both an on-site and a real-time basis using the support of the most up-to-date technological provisioning platform. The advantages of cloud computing may offer promising support (e.g. Internet or web-based provisioning) for DSS services to meet the emergency professionals' decision needs. This chapter introduces requirements of a cloud-based CI approach for domain-specific decision support through the functionalities on an anywhere and anytime basis. The chapter highlights the context of intelligent DSS design in terms of support in determining the priorities of taking action, both for medical emergency professionals and natural disasters workers, as potential application areas identified in this study.*

## INTRODUCTION

Computational Intelligence (CI) became one of the rapidly growing fields in the computer science discipline, in which different problems are studied in order to develop intelligent solutions for effective management. Decision support systems (DSS), as one kind of intelligent solution, has gained a great deal of attention by many current research studies, employing different artificial intelligence (AI) techniques based on targeted objectives. Previous studies in CI revealed two main objectives of research (Duch, 2007) the first

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is an attempt to understand the problem domain in terms of analyzing and extracting intelligent behavior to possible optimization; and the second objective is towards modeling and designing intelligent systems. However, the intelligent systems design should focus not only on the problem analysis and relevant technology design, but also on how to meet the client's domain-specific on-site information demands within the new technological provisioning platform that would provide better user access and flexibility.

The advantage of cloud computing is that it is capable to offer a cloud-based (e.g. Internet or web-based provisioning) DSS service to meet the emergency professionals/workers' decision needs. Other known benefit is that it can bring access and service flexibility both for service users and service providers. With the benefit, it is important to understand and develop conceptual approach for designing the services. The study is relevant to such a service design, namely an intelligent DSS application design for the provision of cloud computing. The intelligent service approach would be able to provide domain-specific decision support to the decision makers through cloud-based functionalities on an 'anywhere-anytime' basis. This initiative could offer a new, shared provision where decision makers can actively perform their effective decision making, and help in liaising with relevant authorities by prioritizing action during real emergency problems while in the emergency location or on the move.

Cloud computing[1] is used as a modern architecture of shared computing service. The services offered are mainly supported through computing utility rental by service providers. After the introduction of web-based utility services by *Amazon.com*, many web service providers became increasingly interested in the cloud-computing platform for launching new services to meet clients' demands. A cloud-based provision involves minimal labor and implementation expense (Santos, Gummadi & Rodrigues, 2009). Recent studies provide examples of the proliferation of cloud computing through two main services. Firstly, Nurmi, Wolski and Grzegorczyk (2010) described an open-source software framework for cloud computing in which computing resources are considered as an "Infrastructure as a Service". Cloud providers such as *Amazon, Flexiscale,* and *GoGrid* offer "Infrastructure as a Service" for clients to access a virtual machine. These providers allow businesses to host resource services. Secondly, cloud providers such as *Google* offer a "Software as a Service" that provides use of applications over the Internet (Santos et al. 2009). In addition, Santos et al. (2009) addressed requirements of confidentiality and integrity in data access and process, and deliberately proposed a trusted cloud computing platform for facilitating a "closed box execution and storage" in a virtual environment (p.2). This implies that the cloud-based provision must provide secure functionalities with a concurrent trusted storage facility. In the same way, it is important to formalize the growing requirements of new problem-specific intelligent application design with better service benefits. This is the main focus of the chapter.

In particular for natural disaster management, Bessis, Asimakopoulou & Xhafa (2011) described a roadmap that guides employment of collective computational intelligence for disaster management. From a disaster manager's decision-making point of view, this study identified various crucial issues such as information collection, combined interactions at different decision making levels, and designing a pervasive approach for action taking or controlling (Bessis et al., 2011). Our study is motivated by factors beyond the challenges here for emergency professionals in managing natural disasters. As such, two practical instances (in particular for medical and natural disaster emergency situations) are highlighted here in this study and give rise to the research question: *how can we outline user specific requirements to design intelligent DSS exploring new technological provisions?*