

## Introduction

In the project management world, the customer decides whether the project is successful or failed (Project Management Institute, 2013; Stolovitsky, 2014). If project is executed on time and within budget, the project will succeed (Falco & Macchiaroli, 1998; Stolovitsky, 2014). When project is established, the project performing process can be included with five stages which are the initiating, planning, executing, controlling, and closing, shown as Figure 1 (Project Management Institute, 2013; Taiwan Project Management Association, 2012). Developing a project planning is a strict task. It can take significant effort to put together a well-crafted document which includes all necessary activities, milestones, assignments, and details. Once the well-crafted document presented as the “Project Plan” is ready to be put into action, the next step is to effectively share the relevant pieces of the plan in the best possible manner to the different team members and stakeholders responsible for successful execution (Dvir, Raz, & Shenhar, 2003; Stolovitsky, 2014). Globalization has increased competition among enterprises; projects should be collaboratively planned and implemented by using cloud computing technology to increase business competitiveness (Aarseth, Aholab, Aaltonenc, Økland, & Andersena, 2017; Papke-Shields & Boyer-Wright, 2017; Wang, 1999).

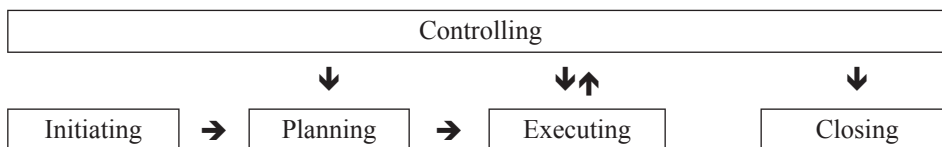


Figure 1. Project performing process

In business, every task can be defined as a specific project (Davis, 2017; Taiwan Project Management Association, 2012). When implementing a project, the project scope must be evaluated to determine whether the cooperative mode is a personal or teamwork mechanism. A project manager receives project authority after the initiating stage and begins project planning, producing a project proposal at the end of this stage. Because the proposal affects the executing and controlling of the project, its quality is the critical aspect of project success (Andersen, 1996; Taiwan Project Management Association, 2012; Zwikael, Pathak, & Ahmed, 2014).

The project planner, project workers, and project stakeholders are three typical types who need to interact with the plan (Fangel, 1984). Project planning skills are essential for project manager (Heravi, Coffey, & Trigunarsyah, 2015; Stolovitsky, 2014). The training of project skills of project manager and members is important, even if the project process owns a best of solid plans. The project manager must recognize a warning sign and take action. During the training course of managing a project, the project manager and members must monitor activities (Carlos, 2013).

Standish Group investigated with 8,000 software projects in 1995. The investigative result showed that the only 16% of projects could be finished on time and within budget, and the 40% of causes were caused by requirements development and management issues (Johnson, 1995). The other researches also showed that there were about 30% to 40% of software projects escalations (Keil, Mann, & Rai, 2000; William, 1989), and the most common reasons of project failures were the poorly managed, lack of a solid project plan, poorly defined roles and responsibilities, and team weaknesses (Aarseth et al., 2017; Carlos, 2013; Zwikael et al., 2014). The PDCA (Plan-Do-Check-Act) quality management cycle, called the Deming cycle, is proposed by Dr. William Edwards Deming and adopted to improve the product quality and producing process promotion. The Deming cycle focuses on the quality process by planning, doing, checking, and action. This process can ensure that the objectives can be achieved, and the quality can be improved continually. The planning stage is the primary procedure in the Deming cycle, and it is normally used to build a clear and definite objective, and establish the relative plans for the objective achievement (Wiki, 2016).

A perfect project management can promote the project success ratio. The project planning stage is the most important of project management process, and the quality of project planning will directly affect whether the project can be finished (Andersen, 1996; Davis, 2017; Tulip, 1983; Zwikael et al., 2014). In addition, the professional ability of project manager is also one of the critical causes which affect the project result. Hence, this study aims to improve the cooperative project planning abilities of project manager by using a proposed e-training instruction with a cooperative project planning e-training system based on a collaborative computer-aided learning (CCAL) mechanism. To achieve this, a collaborative project planning model and suitable e-training course were developed for collaborative project planning, and a web-based computer-supported collaborative platform called the Project Planning Ability Training System (PPATS),