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# Project Management in Signal Processing Project based on CDIO Model

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## **ABSTRACT**

CDIO Model is an innovative framework for producing engineers with the global workshop. The content and features of CDIO are introduced in Engineering Project Management in signal processing project. Engineering Project management is an integrative undertaking that requires each project process to be appropriately aligned and connected with the other processes to facilitate coordination. Addressing each process and its inputs and outputs and determining which are applicable to the engineering project on CDIO model are discussed. The practice is confirmed that the strategy can improve student project ability.

## **Key Words**

CDIO; Engineering Project Management; Signal Processing Project

## **INTRODUCTION**

The acceptance of project management as a profession indicates that the application of knowledge, processes, skills, tools, and techniques can have a significant impact on project success<sup>[1]</sup>. The project management structure is introduced in signal processing project on CDIO model. A signal processing project is a temporary endeavor undertaken to create a unique hardware, software or algorithm. The temporary nature of signal processing projects indicates that a project has a definite beginning and end. Temporary does not necessarily mean the duration of the project is short. It refers to project's engagement and its longevity. Temporary does not typically apply to the hardware, software or algorithm created by the project; most projects are undertaken to create a lasting outcome.

Every signal processing project creates a unique product, service, or result. The outcome of the project may be tangible or intangible<sup>[2]</sup>. Although repetitive elements may be present in some project deliverables and activities, this repetition does not change the fundamental, unique characteristics of the project work. For example, filter design can be constructed with the same or similar components and by the same or different teams<sup>[3]</sup>. However, each filter design project remains unique with a different application, different design, different algorithm, different stakeholders, and so on.

An ongoing work effort is generally a repetitive process that follows an

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organization's existing procedures. In contrast, because of the unique nature of projects, there may be uncertainties or differences project creates. Project activities can be new to members of a project team. In addition, projects are undertaken at all organizational levels<sup>[4]</sup>. A project can involve a single individual or multiple individuals, a single team, or multiple teams.

## **PROJECT MANAGEMENT IN SIGNAL PROCESSING PROJECT**

Project management in signal processing project is accomplished through the appropriate application and integration of the logically grouped project management processes, which are categorized into five Process Groups. These five Process Groups are: Initiating, Planning, Executing, Monitoring and Controlling, and Closing.

Managing a signal processing project includes:

- Identifying requirements;
- Addressing the various needs, concerns, and expectations of the members in planning and executing the project;
- Setting up, maintaining, and carrying out communications among members;
- Managing members towards meeting project requirements and creating project deliverables;
- Balancing the competing project constraints

Project members may have differing ideas as to which factors are the most important, creating an even greater challenge. Changing the project requirements or objectives may create additional risks. The project team needs to be able to assess the situation, balance the demands, and maintain proactive communication with members in order to deliver a successful project. Due to the potential for change, the development of the project management plan is an iterative activity and is progressively elaborated throughout the project's life cycle. Progressive elaboration involves continuously improving and detailing a plan as more detailed and specific information and more accurate estimates become available. Progressive elaboration allows a project management team to define work and manage it to a greater level of detail as the project evolves.

Teacher plays the role of the project manager in signal processing project on the CDIO model. In general, project managers have the responsibility to satisfy the needs: task needs, team needs, and individual needs. As project management is a critical Ostrategic discipline, the project manager becomes the link between the project and the team. Projects are essential to the growth and survival of the CDIO education model. Projects help the members create value in the business model, learn the knowledge in the development of new products and services, and make members easier for companies to respond to changes in the environment, competition, and the marketplace. The teacher's role therefore becomes increasingly strategic. However, understanding and applying the knowledge, tools, and techniques that are recognized as good practice are not sufficient for effective project management. In addition to any area-specific skills and general management proficiencies required for the project,

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effective project management requires that the project manager possess the following competencies:

- Knowledge—Refers to what the teacher knows about project management.
- Performance—Refers to what the teacher is able to do or accomplish while applying project management knowledge.
- Personal—Refers to how the project manager behaves when performing the project or related activity. Personal effectiveness encompasses attitudes, core personality characteristics, and leadership, which provides the ability to guide the project team while achieving project objectives and balancing the project constraints.

## **PROJECT MANAGEMENT PROCESSES IN SIGNAL PROCESSING PROJECT**

A process in signal processing project is a set of interrelated actions and activities performed to create a pre-specified hardware, software or algorithm. Each process is characterized by its inputs, the tools and techniques that can be applied, and the resulting outputs. Teacher or team leader who plays the role of project management are an integrative undertaking that requires project process to be appropriately aligned and connected with the other processes to facilitate coordination. Actions taken during one process affect that process and other related processes. Project management processes in signal processing project are grouped into five categories:

- Initiating Process Group. Those processes performed to define a new project or a new phase of an existing project. The members survey project business, finances and technology.
- Planning Process Group. Those processes required to establish the scope of the project, refine the objectives, and define the course of action required to attain the objectives that the project was undertaken to achieve. The team leader assigns jobs and defines the modules.
- Executing Process Group. Those processes performed to complete the work defined in the plan to satisfy the project specifications.
- Monitoring and Controlling Process Group. Those processes required to track, review, and regulate the progress and performance of the project; identify any areas in which changes to the plan are required; and initiate the corresponding changes.
- Closing Process Group. Those processes performed to finalize all activities across all Process Groups to formally close the project or phase.

The integrative nature of project management in CDIO model requires teachers who monitor and control process to interact with the other Process Groups, as shown in Figure 1. Monitoring and Controlling processes occur at the same time as processes contained within other Process Groups.

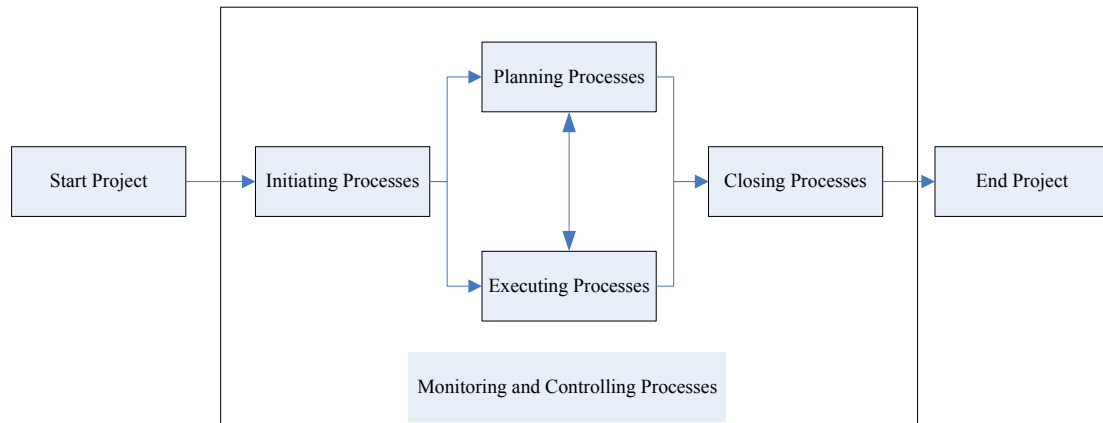


Figure 1 Project Management Processes in Signal Processing Project

Throughout the project, a amount of data and information is collected, analyzed, transformed, and distributed to project team members. Project data are collected as a result of various Executing processes and are shared within the project team. The collected data are analyzed in context, and aggregated and transformed to become project information during various Controlling processes. The information may then be communicated or stored and distributed as reports. The information flow is shown below.

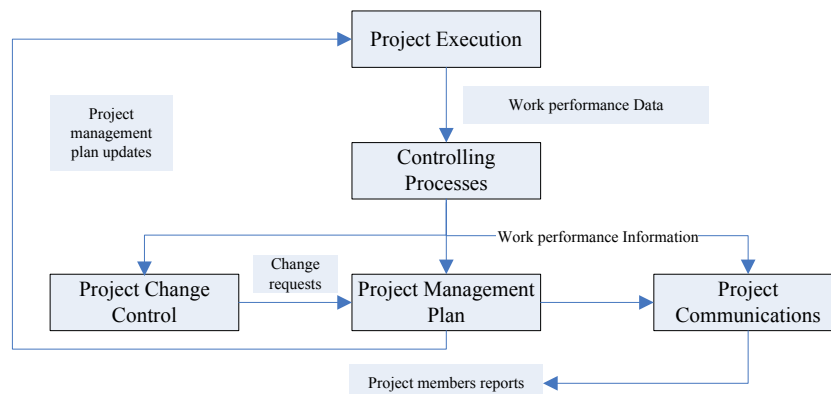


Figure 2 Project Information Flow

### EXAMPLE

The following figure is the project management plan in radio project in Chengdu University of information technology based on CDIO model.

Table 1 Project Management Plan in Radio Project

Project Plan	Specific requirements	term	Outputs
Project proposal--The development of radio	Technical Development Report; Business outlook report; Product cost reports.	2	Summary report; Guide the record; PPT.
Circuit analysis and dynamic simulation based on MultiSim	Circuit diagram in MultiSim; Basic concept; Simulation report; Protel software.	3	Simulation summary report; Guide the record; PPT; Project feasibility analysis report I.
Superheterodyne radio transistor	Design a radio using discrete components; Device selection; Interim report; Process test.	4	Technique design plan; Guide the record; PPT; Schematic design; PCB diagram; Components list.
Multi-function transformation	Add features on the radio Device selection; detailed design steps; Technical exchange; Product.	5	Project feasibility analysis report II ; Technique design plan; Guide the record; PPT; Schematic design; PCB diagram; Components list.
Debugging document and After sale service documents	The theory and hardware implementation; Theory of signal and system, digital signal processing; DSP or FPGA implementation; debugging document; After sale service documents.	6	Project user manual; Project promotion plan; Guide the record; PPT.

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The products of different student teams are shown below:

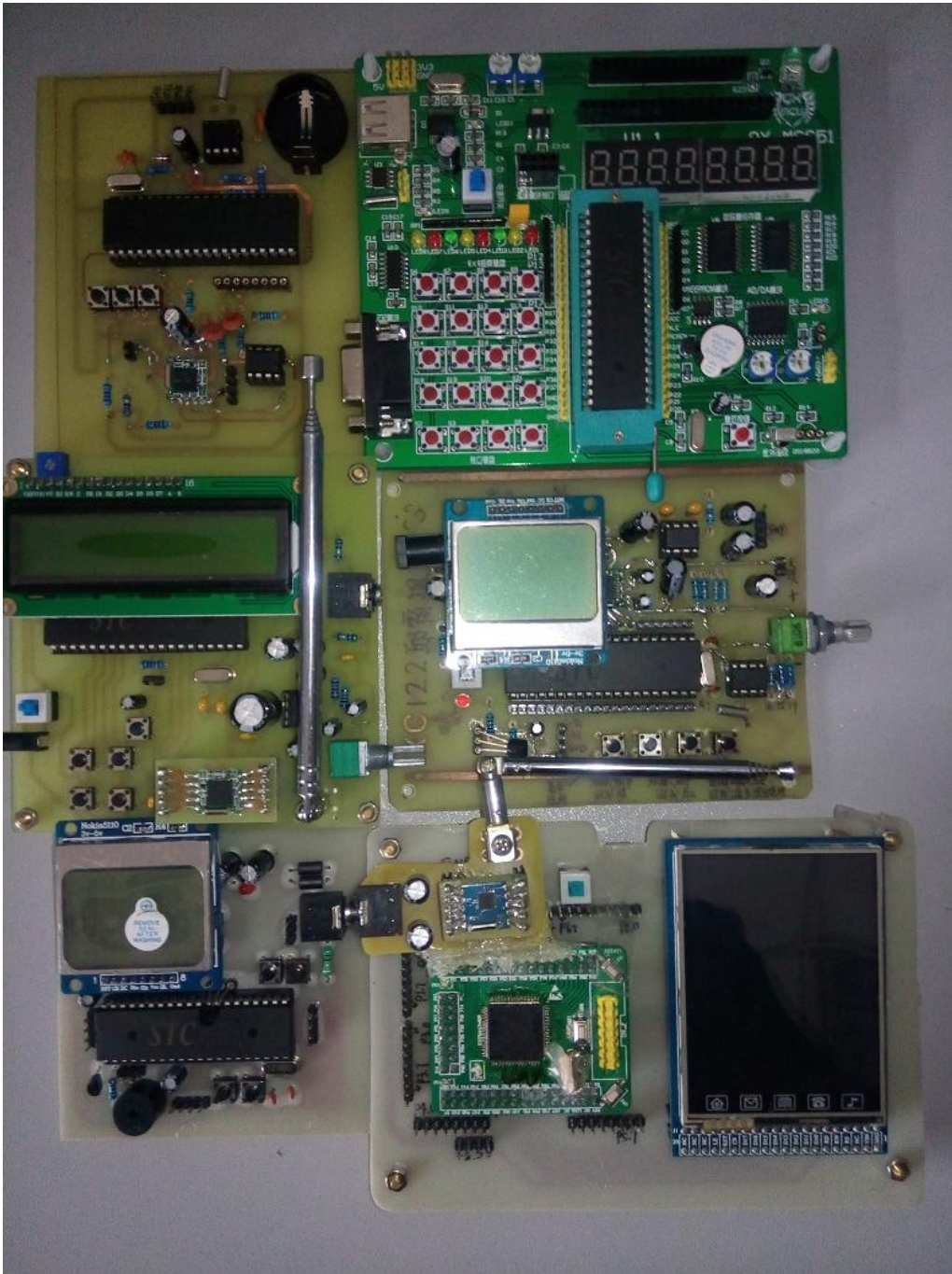


Figure 3 Products of Radio Project

## CONCLUSION

The project management structure was introduced in signal processing project on CDIO model in 2010 in Chengdu University of Information Technology. The students who finish the project in the project management structure can develop a good habit of project management and be more adaptable to the operation mode of

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enterprise project.

## REFERENCES

- [1] Du Yaling, Yin Yilin. Empirical study of the governance approach to improving the management performance of public projects : take enterprise construction-agent projects as an example [J]. China civil engineering journal,2011,44(12):132-137.
- [2] Klakegg O J. Governance Frameworks for Public Project Development and Estimation [J]. Project Management Journal,2008(5):27-41.
- [3] HUANG Ai-zhou, MEI Shao-zu · Research on Management Thoughts Beyond BPR - Process Management [J] · Science and Technology Management,2002,12(3):105-107 ·
- [4] XU Jia-kai. Analysis on Process Management [J]. Enterprise Management, 2010(12):33-35 ·

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