

Support Process Patterns in Higher Education

Alexandre Coimbra †, António Rito Silva *

† GIPSI/Catholic University of Portugal
Palma de Cima, 1649-023 Lisboa, Portugal
ambc@ci.ucp.pt

* INESC-ID/Technical University of Lisbon
Rua Alves Redol n°9, 1000-029 Lisboa, Portugal
Rito.Silva@inesc-id.pt

Abstract

Higher Education Institutions are complex organizations where certain level of autonomy permits diverse units to execute their work independently.

In most occasions there is no general idea of how a unit's work reflects in the others unit's work, neither the reasons that took certain units to organize their work in a certain way.

The goal of this work is to provide to the units directors, and the institutions directors, a tool, which will provide a more integrated vision of how their Higher Education Institution works, and also to provide an explanation why units execute their work in certain ways under certain conditions.

Keywords: Process, Patterns

1. Introduction

The authors have worked for various years in construction and maintenance of University Information Systems which support the administrative activity of the Higher Education Institutions.

When building one system for various Higher Education Institutions the authors were faced with Institutions doing the same thing in multiple and distinct ways.

The description of this multiplicity, and the reasons of its existence, permits the sharing of the best work practices.

Exist a broad work of patterns application in diverse domains, which capture problem resolutions, and share knowledge. Known examples of its use is in diverse areas like architecture, software development and business processes.

The authors do not have knowledge that these techniques have been applied to the administrative processes in Higher Education Institutions. We believe that the application of process patterns in this area will provide more value to the work organization, answering the following questions:

How process patterns can help to provide a more integrated vision of how the Institution Work?

A process usually affects more than one organizational unit of the Institution [7]. This permits to have a transversal vision of the organization, in opposition to functional or departmental representation of the organization.

A transversal vision integrates in a model the contributions of the various organizational units.

How process patterns can help in the design and development of University Information Systems?

The traditional way of systems development is initiated with analysis of the requirements of the system. Many times they are expressed by a document elaborated by a stakeholder that has only a partial vision of the business [3]. Constructing the system based on a global model of the functioning helps to avoid constructing systems based on the functional lines [6], resulting in a more integrated system. These models can act also as a way to identify outsourcing opportunities, after the Institution decide what are they core processes [3]

The structure of this document begins with a definition of the applied methodology, where underlying concepts are described and work validation is defined. Followed by a pattern, and the relations between the various patterns that are thought to exist.

2. Methodology

The methodology used in this work is the usage of process patterns to perceive the various ways of work organization. To do this we are going to define what is meant by process, patterns and process patterns. Followed by a proposed classification, and a structure used to define a process pattern. Lastly the validation of process patterns is presented.

2.1. What is a process pattern?

Various authors define process and patterns in distinct ways. Here are some of the definitions:

- A process is a sequence of actions, by which one or more inputs are used to produce one or more outputs. [1]
- A process is defined as having a goal, a specific input, specific output, the usage of resources, a number of activities/sub-processes which execute or not in a determined way under certain conditions. It affects more than one organisational unit and builds some kind of value to some kind of client. [3]
- A pattern is a description of a general solution to a common question or problem, from which a solution to a specific problem can be determined. [1]
- A pattern is a triple: problem, context, recurrent solution of the problem in that context. [3]

In this document we consider a process pattern as a sequence of actions that are common in more than one institution, to resolve the same problem in the same context.

2.2. Organizing process patterns

Process Classification

Laudon [5] describes that the value chain model[7] highlights specific activities in the business where competitive strategies can be best applied, and where information systems are most likely to have strategic impact. This model sees the institutions like a chain of basic activities that add margin value to products or services. These activities can be described as either primary activities or support activities. Primary activities are mostly related with production and distribution of products and services that create value to the client. Primary activities include inbound logistic, outbound logistic, sales, marketing and services. Support activities make possible the delivery of primary activities, and consist in organization infrastructure, human resources, technology and acquisitions.

Using the Porter value chain model[7], a possible classification[2] of processes in Higher Education Institutions can include the following:

- Core Academics
 - Generate knowledge
 - Transmit knowledge
- Academic Support
 - Acquire grants
 - Manage grants and contracts
 - Promote and tenure faculty
- Student Support
 - Create and manage student learning and living environment
 - Enrol students (matriculate, admit, register)
- Indirect Support
 - Acquire goods
 - Managing facilities
 - Record and report financial transactions
 - Provide technical resources and infrastructure
- Auxiliary Support
 - Provide food services
 - Provide bookstore merchandise

Another classification [8], provides a guide to categorize and describe the College and Universities operations and administrative activities. It presents a taxonomy of five hierarchal levels. The first level is:

- Instruction
- Research
- Public service
- Academic support
- Student services
- Institutional Administration
- Physical plant operation
- Student Financial Support

A process definition is usually transversal to the organizational units, and not by functional areas. Nevertheless

either in the classification presented by [2] or [8], learning and research are common elements.

Patterns classification

Patterns are classified by purpose and level of abstraction. Presented are some of the definitions by distinct authors:

- Design patterns vary in their granularity and level of abstraction. Classification of patterns are made by purpose (creational, structural, behavioral) and level of abstraction (class, object). [4]
- It is possible to apply process patterns at all levels of development, in a three type scale. By growing scope they are: task, state, phase. [1]

Process patterns classification

In this document we are adopting the classification of primary processes and support processes in relation to its purpose.

Core Academics[2] and processes related to inbound logistics, outbound logistics, products and services definitions are classified as primary processes. All the others are classified as support processes:

- Primary Processes
 - Instruction
 - Research
 - Admissions of new students to the Institution
 - Student Placement in the job market
 - Courses definitions
- Support Processes
 - All activities that make the existence of the primary activities possible

In relation to its level of abstraction we are going to classify the process patterns as process patterns and task patterns.

The authors think that it will be useful to include the process patterns in the production cycle of Higher Education Institutions, as a way to highlight the dynamics of the Institution. With this goal the calendar pattern was created.

2.3. Process patterns template

To make a pattern understandable, it is divided into different items that try to show the purpose of the pattern, and the conditions in which it should be used.

The following table compares the items selected in this document to describe a process pattern with the items used to describe a design pattern[4] and a business pattern. [3]

Design pattern specification[4]:	Business pattern specification[3]:	Selected items:
Name	Name	Name
Intent	Intent	Intent
Also Known As	-----	Also Known As
Motivation	Motivation	Forces
Applicability	Applicability	
Structure	Structure	Structure

Participants	Participants	Participants
Collaborations	-----	-----
Consequences	Consequences	Consequences
Implementation	-----	-----
Sample Code	Example	Example
Known uses	-----	-----
Related Patterns	Related Patterns	Related Patterns
-----	Source/Credits	-----
-----	-----	Evaluation Metrics

Table 1: Describing a process pattern.

This section describe what is the purpose of each item used to describe a process pattern.

Name

The pattern’s name conveys the essence of the pattern succinctly.

Intent

Short description that indicates the general pattern purpose answering the following questions: What does the design pattern do? What is its rationale and intent?

Also Known As

Indicates other well-known names for which the pattern can be known. This item is only presented when other names are known.

Forces

What are the situations in which the process pattern can be applied? What are the examples of bad practices that can be resolved with the pattern application? How do we recognize these situations?

Structure

A graphical representation of process pattern using a simple notation. Indicates the processes and its sequence.

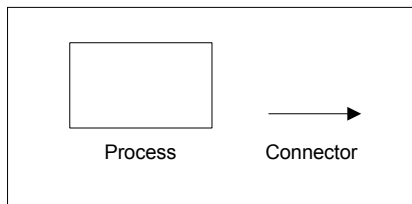


Figure 1: Notation.

Participants

Describes the elements of the model that participate in the pattern, as visualised in the structure. The responsibility of each participant is described in this section.

Consequences

How does the pattern support its objectives and eliminate the problems felt in the situation? What are the trade-offs of using the pattern?

Example

Provide a concrete example, where the pattern is used to resolve a problem.

Related Patterns

What patterns are related to this one?

Evaluation Metrics

Metric suggestions of evaluations that can qualify and quantify the success/insuccess of the applied pattern.

2.4. Validating process patterns

Validation of the patterns is made through a presentation to a panel of directors and workers of various Higher Education Institutions. In function of the critics and ideas exposed by the members of the panel, the patterns are modified until it is consensual to everyone.

The panel is created in a way that it tries to represent all Higher Education Institutions. Criteria taken into account to elaborate the panel are the legal constitution (Private, Public) and level of instruction (Graduated, Postgraduate) available in the Institutions.

3. Patterns

CALENDAR

The pattern’s name conveys the essence of the pattern succinctly.

Intent

Short description that indicates the general pattern purpose answering the following questions: What does the design pattern do? What is its rationale and intent?

The Calendar is a way of temporal organization of the Higher Education Institutions.

Also Known As

Indicates other well-known names for which the pattern can be known. This item is only presented when other names are known.

SCHOOL YEAR, ACADEMIC CALENDAR

Forces

What are the situations in which the process pattern can be applied? What are the examples of bad practices that can be resolved with the pattern application? How do we recognize these situations?

The main forces of this pattern are the resource management and the fulfilment of legal obligations.

Higher Education Institutions are frequented by distinct people, which have different roles. These roles are usually faculty, students and administrative. In order to optimise the resource usage it is necessary to have temporal rhythms that will permit each role to plan his action.

The existence of legal set dates for the admission of new students who come from undergraduate studies usually defines the beginning of the graduated studies calendar.

Structure

A graphical representation of process pattern using a simple notation. Indicates the processes and its sequence.

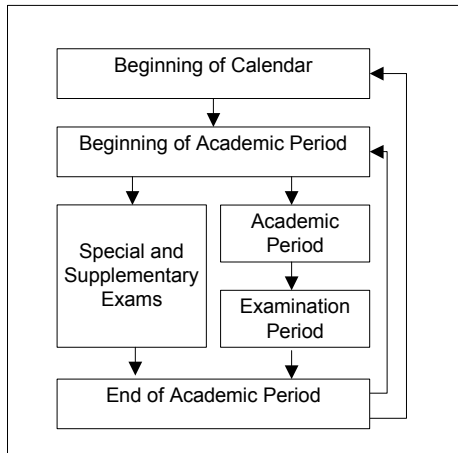


Figure 2: Calendar Pattern Structure.

Participants

Describes the elements of the model that participate in the pattern, as visualised in the structure. The responsibility of each participant is described in this section.

Beginning of Calendar represents a set of activities that initiate the calendar. These activities consist of organizing and scheduling the processes that will occur throughout the calendar.

Beginning of Academic Period represents a set of activities that initiate the academic period. Normally a calendar is made of various academic periods. These activities consist of organizing and scheduling the processes that will occur throughout the academic period.

Academic Period represents a set of activities that occur during the academic period. It's here that instructions occur.

Examination Period consists in a set of activities where evaluation of students is made, after the instruction occurs.

Special and Supplementary Exams represents the activities that occur in a dedicated time to evaluate students under special rules.

End of Academic Period is a set of activities that close the Academic period or the calendar.

Consequences

How does the pattern support its objectives and eliminate the problems felt in the situation? What are the trade-offs of using the pattern?

Having activities with set dates permits the allocation of resources for limited time.

Example

Provide a concrete example, where the pattern is used to resolve a problem.

The Faculty of Engineering and Science of Victoria University of Australia offers some courses with duration of three years, and the calendar is organized with two academic periods.

The Faculty of Engineering of Catholic University of Portugal offers some courses with duration of three years, and the calendar is organized with three academic periods.

Related Patterns

What patterns are related to this one?

All remaining patterns refer to activities that occur during one or more phases of the calendar.

Evaluation Metrics

Metric suggestions of evaluations that can qualify and quantify the success/insuccess of the applied pattern.

Having into account that an Higher Education Institution primary's activities is instruction, a possible metric to evaluate the calendar is the ratio between the sum of the academic's periods duration in relation to remaining phases.

4. Process patterns relationships

Process patterns don't exist in isolation, in most cases they are related to one another. The only pattern presented in this document is the calendar pattern. Nevertheless the existence of other patterns will be specified in future work. The diagram that follows presents how the diverse patterns relate to one another. In that extent the diagram presents non-support process patterns, like instructional pattern, that permits to see the relationship between support and non-support process patterns.

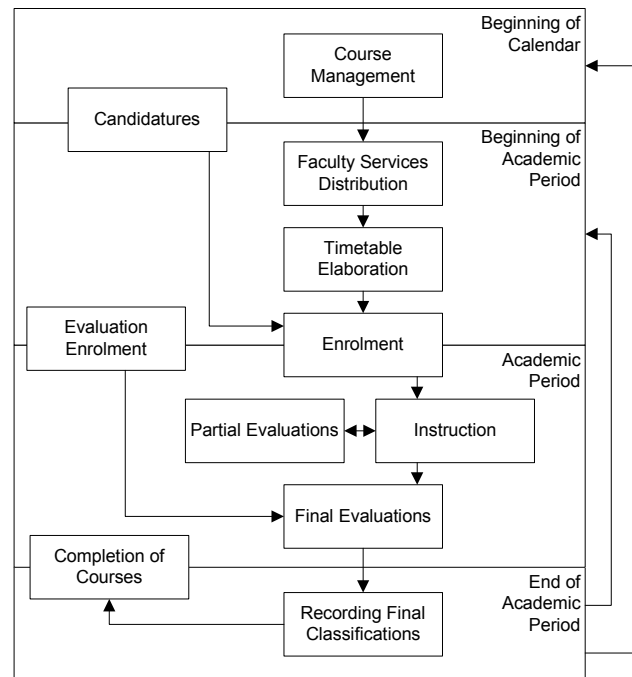


Figure 3: Patterns relationships.

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