

Introduction to Software Engineering

Week 1

Software Engineering

- *Software engineering is "(1) the application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software, that is, the application of engineering to software," and "(2) the study of approaches as in (1)."*
- IEEE Standard 610.12

Software Engineering

- *Software engineering is an engineered discipline in which the aim is the production of high quality software products, delivered on time and within a set budget, that satisfies the client's needs.*

Myths and Realities about Software

- “A general statement of objectives is sufficient to begin writing programs.”
- “The only deliverable for a successful project is the working program.”
- “Until I get the program running, I have no way of assessing its quality.”
- “Once we write the program and get it to work, our job is done.”

Software Engineering

- Software Engineering Body of Knowledge (SWEBOK)
 - <http://www.swebok.org/>
- 11 key areas

Guide to the Software Engineering Body of Knowledge
2004 Version

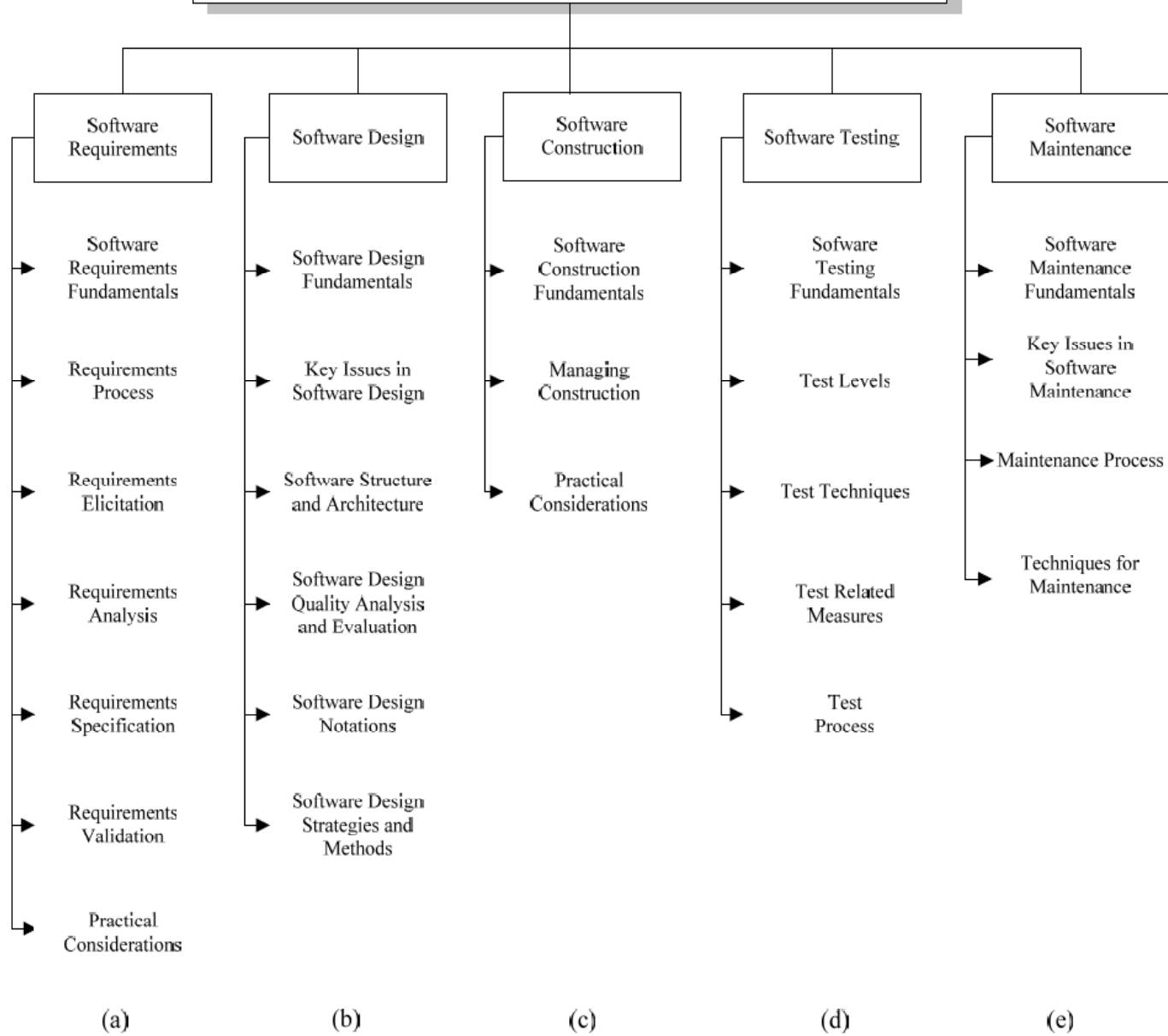


Figure 2 First five KAs

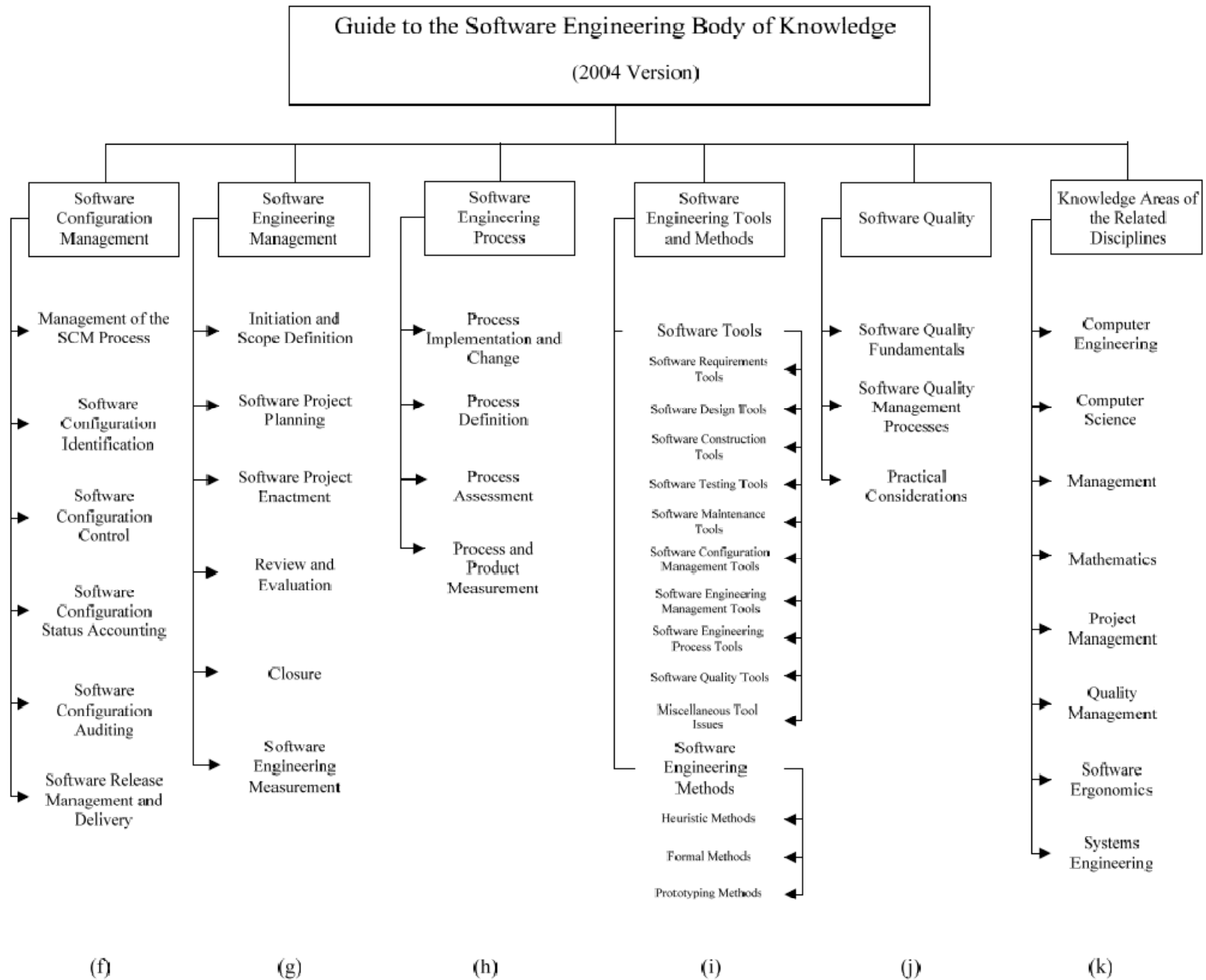


Figure 3 Last six KAs

CSUN Software Engineering Curriculum

COMP 380/L	INTRODUCTION TO SOFTWARE ENGINEERING (2/1)
COMP 480/L	SOFTWARE SYSTEM DEVELOPMENT (2/1)
COMP 585	GRAPHICAL USER INTERFACES (3)
COMP 586	OBJECT-ORIENTED SOFTWARE DEVELOPMENT (3)
COMP 587	SOFTWARE VERIFICATION AND VALIDATION(3)
COMP 589	SOFTWARE METRICS
COMP 595OSE	OPEN SOURCE SOFTWARE ENGINEERING (3)
COMP 595WEB	WEB ENGINEERING (3)
COMP 680	SOFTWARE ENGINEERING (3)
COMP 682	SOFTWARE REQUIREMENTS ANALYSIS AND SPECIFICATION (3)
COMP 684	SOFTWARE ARCHITECTURE AND DESIGN (3)
COMP 686	SOFTWARE ENGINEERING MANAGEMENT (3)

Why software engineering is critical: software disasters

- The Virtual Case File Project
- The Ariane Project
- Radiation Project

Software Project Success Rate

Data on 280,000 projects completed in 2000 - *Standish Group Data*

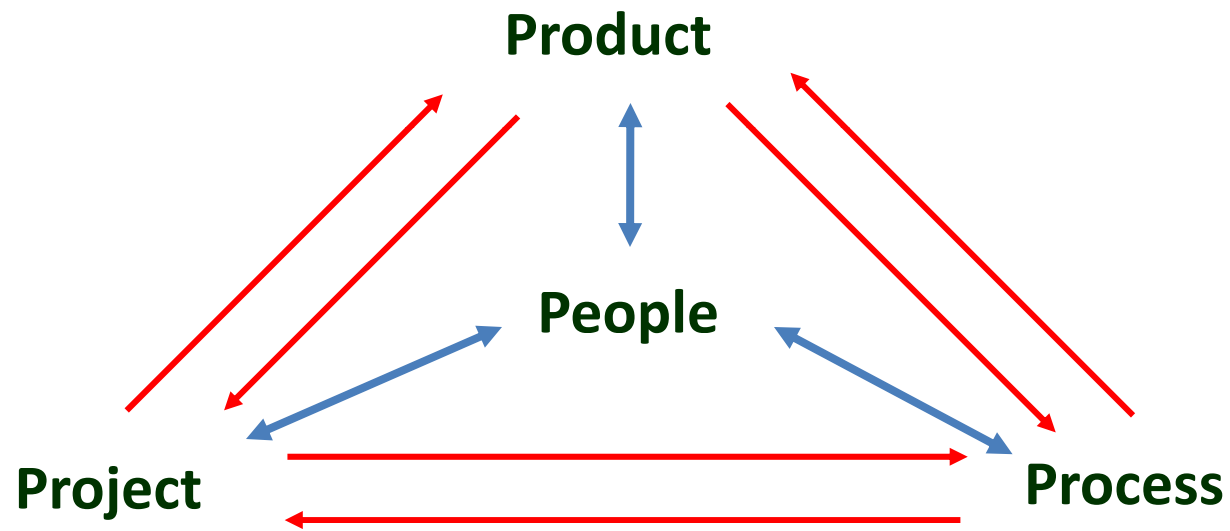


<http://www.softwagemag.com/archive/2001feb/CollaborativeMgt.html>

Why Software Projects Fails

- Over budget
- Exceed schedule and/or misses market window
- Miss stated customer requirement
- Lower quality than expected
- Performance does not meet expectations
- Too difficult to use
-

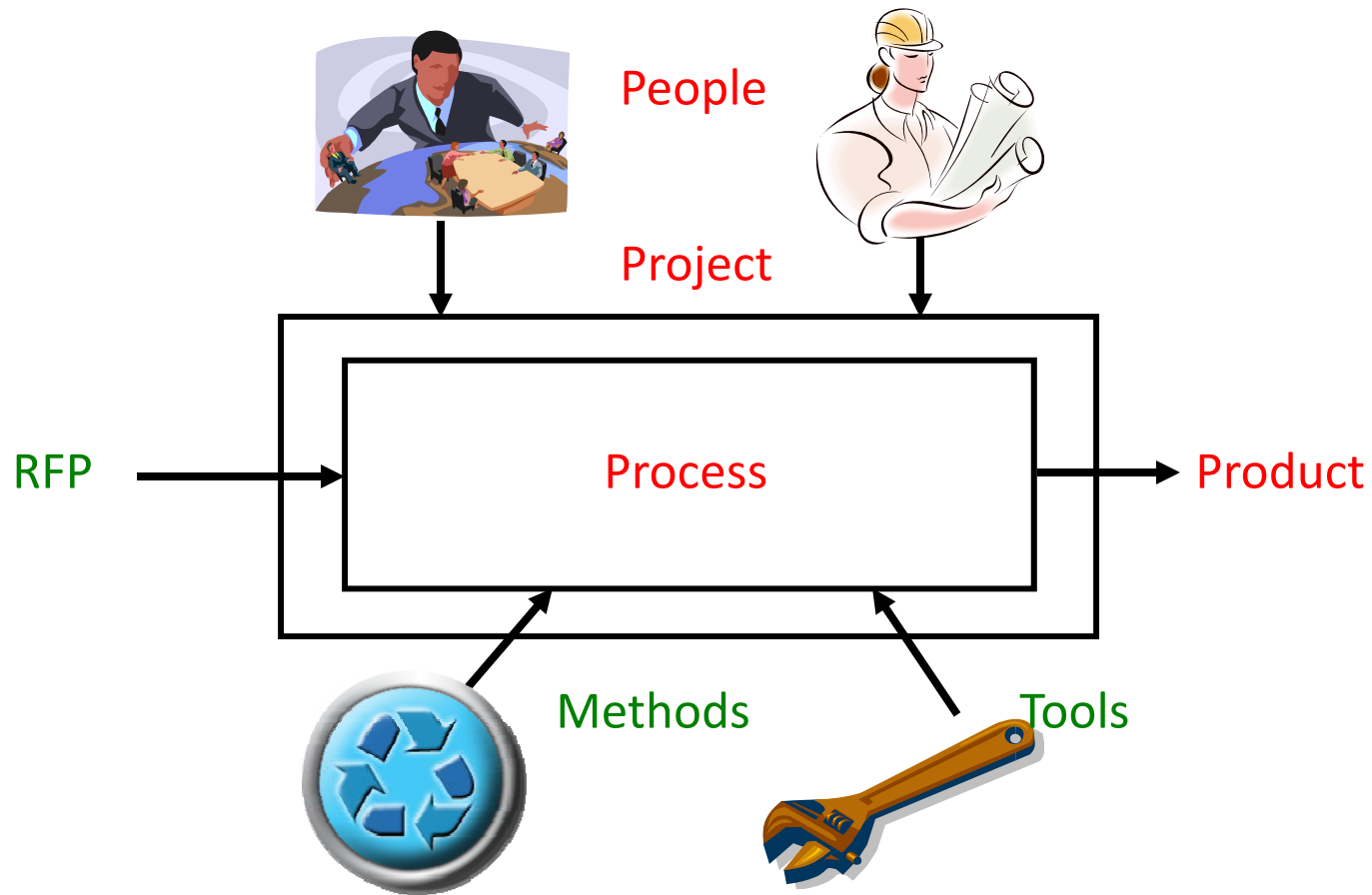
Process/Project/Product/People



Project

- A software project defines the activities and associated results needed to produce a software product
 - PMBOK
 - IEEE Guide -- Adoption of PMI Standard A Guide to the Project Management Body of Knowledge -- IEEE Std 1490-1998
 - IEEE Standard for Software Project Management Plans -- IEEE Std 1058-1998

Process/Project/Product/People



Process

- A software process is a framework for carrying out the activities of a project in an organized and disciplined manner.
- Software process models describe specific software process.
- Software life cycle process (SLCP).
 - IEEE 1074

Software Process Models

1. Waterfall and Waterfall with feedbacks
2. Rapid Prototype
3. Incremental
4. Spiral
5. Rational Unified Process (RUP)
6. Agile Process
7. Extreme Programming (XP)
8. Rapid Application Development (RAD)
9. Personal Software Process (PSP)
10. Team Software Process (TSP)
11. Capability Maturity Model Integrated (CMMI)

Product

- The products of a software development effort consist of much more than the source and object code. They also include project documentation, test plans and results, customer documentation, and productivity measurement.

People

- People are the most important resource on a software project. It is through their efforts that software is successfully constructed and delivered.

Software Engineering Principles

- Make quality number one
- Give products to customers early
- Use an appropriate software process
- Minimize intellectual distance
- Inspect code
- People are the key to success
 - Among 201 principles

Ethics in Software Engineering

- **PREAMBLE** The short version of the code summarizes aspirations at a high level of the abstraction; the clauses that are included in the full version give examples and details of how these aspirations change the way we act as software engineering professionals. Without the aspirations, the details can become legalistic and tedious; without the details, the aspirations can become high sounding but empty; together, the aspirations and the details form a cohesive code.
- Software engineers shall commit themselves to making the analysis, specification, design, development, testing and maintenance of software a beneficial and respected profession. In accordance with their commitment to the health, safety and welfare of the public, software engineers shall adhere to the following Eight Principles:
 - 1. PUBLIC - Software engineers shall act consistently with the public interest.
 - 2. CLIENT AND EMPLOYER - Software engineers shall act in a manner that is in the best interests of their client and employer consistent with the public interest.
 - 3. PRODUCT - Software engineers shall ensure that their products and related modifications meet the highest professional standards possible.
 - 4. JUDGMENT - Software engineers shall maintain integrity and independence in their professional judgment.
 - 5. MANAGEMENT - Software engineering managers and leaders shall subscribe to and promote an ethical approach to the management of software development and maintenance.
 - 6. PROFESSION - Software engineers shall advance the integrity and reputation of the profession consistent with the public interest.
 - 7. COLLEAGUES - Software engineers shall be fair to and supportive of their colleagues.
 - 8. SELF - Software engineers shall participate in lifelong learning regarding the practice of their profession and shall promote an ethical approach to the practice of the profession.
- <http://www.acm.org/about/se-code>

Do You Know?

- List of the 10 fastest-growing jobs through 2014 in terms of salary
 - <http://www.cnn.com/2006/US/Careers/01/26/cb.top.jobs.pay/index.html>

Unified Modeling Language (UML)

- What UML Is
 - UML is a visual modeling language that uses a combination of graphical and textual notation to express and document requirement, analysis, and design.
 - UML is an open industry standard.
- What UML Is Not
 - UML is not a computer programming language
- <http://www.omg.org>

The Taxonomy of UML Diagrams

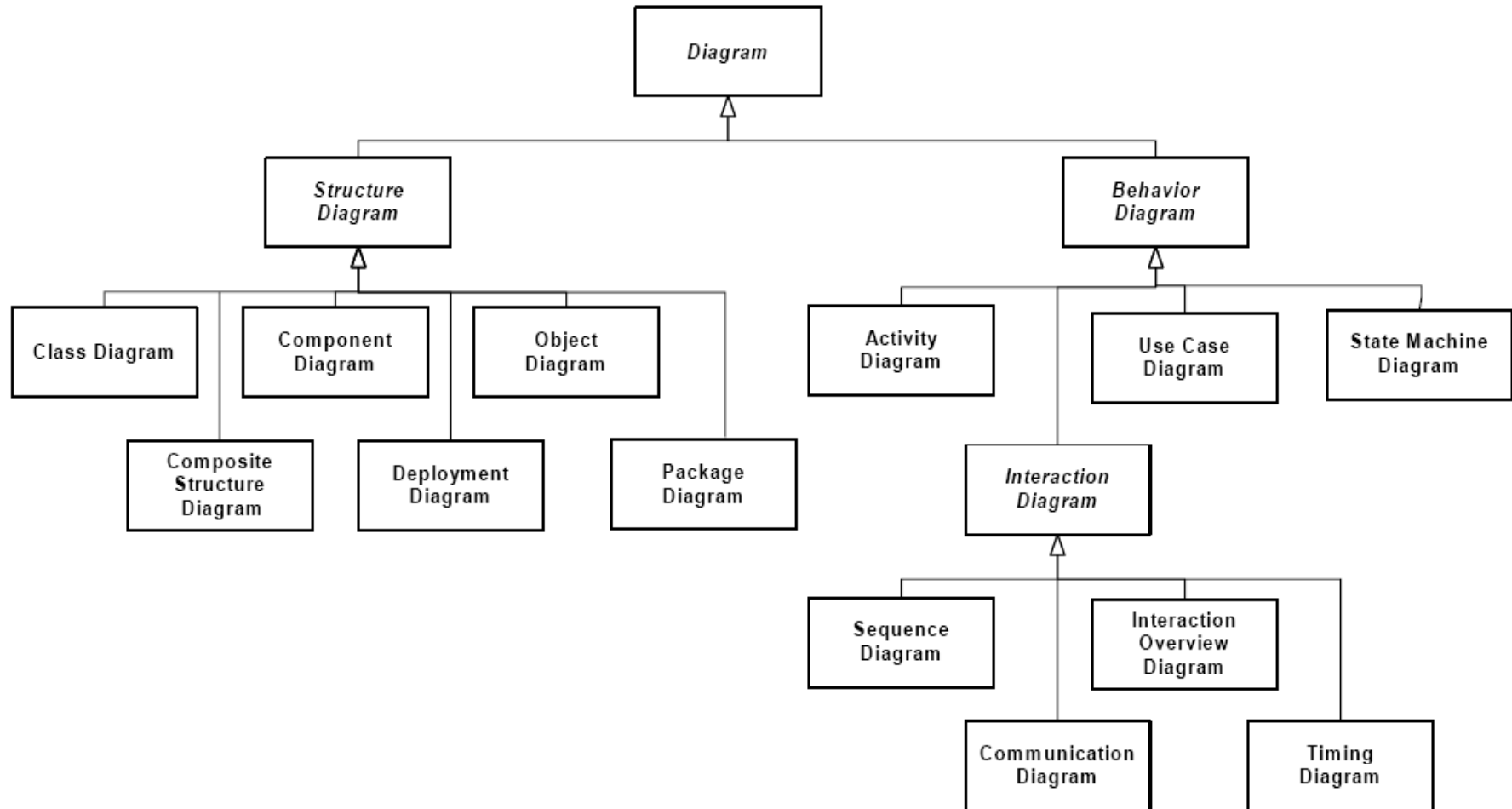


Figure A.5 - The taxonomy of structure and behavior diagram

UML Drawing Tools

- Microsoft Office Visio
- Pacestar UML Diagrammer
- Open source software tools

Lab Activities

- Organize a team.
- Note that each team consists of five students.
- Submit team information including student names, student IDs, and email addresses.

(Team) Homework Assignment 1

- Study Waterfall, Increment, Prototype software process models and prepare for presentation slides.
- Presentation slides should include, description, visual representation (figure), advantages and disadvantages of each process model
- Due date is 1:00 pm on January 31st