

Overview of the Computing Curricula CC2020 Report

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Spring Meeting on Zoom

City University of New York

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Presenter

Five decades of teaching experience

Published eighteen books

ACM editor-in-chief for nineteen years

Evaluator of eighty+ computing/engineering programs

Accreditation experience – more than thirty years

Chair of ACM Accreditation Committee – twelve years

Helped develop Estonia Accrediting Agency

IEEE Foundation board of director member

IEEE Fellow and Life Member

ACM Distinguished Educator

CSAB Fellow



John Impagliazzo

Opinions expressed in this presentation are the result of the presenter's personal experiences and they do not reflect the endorsements of any other organization.

CC2020 Scope

Demographics

Number of Task Force members: 50
Number of continents represented: 6
Number of countries represented: 20
Number of women: 21; men: 29
Task force co-chairs: 1 woman; 1 man
Steering committee: 5 women, 10 men
Number of international representatives: 11
Number of industry-government members: 7
Number of academic members: 43
Professional endorsements: 21

Curricula

Computer Engineering
Computer Science
Cybersecurity
Information Systems
Information Technology
Software Engineering
(Data Science)

[acm.org](https://www.acm.org)

→ Education

→ Curricula Recommendations

CC2020 Overall Project Goal

To produce a modern replacement for the
CC2005 computing curricula document
by the end of 2020

What is CC2005?

CC2005 = Computing Curricula 2005

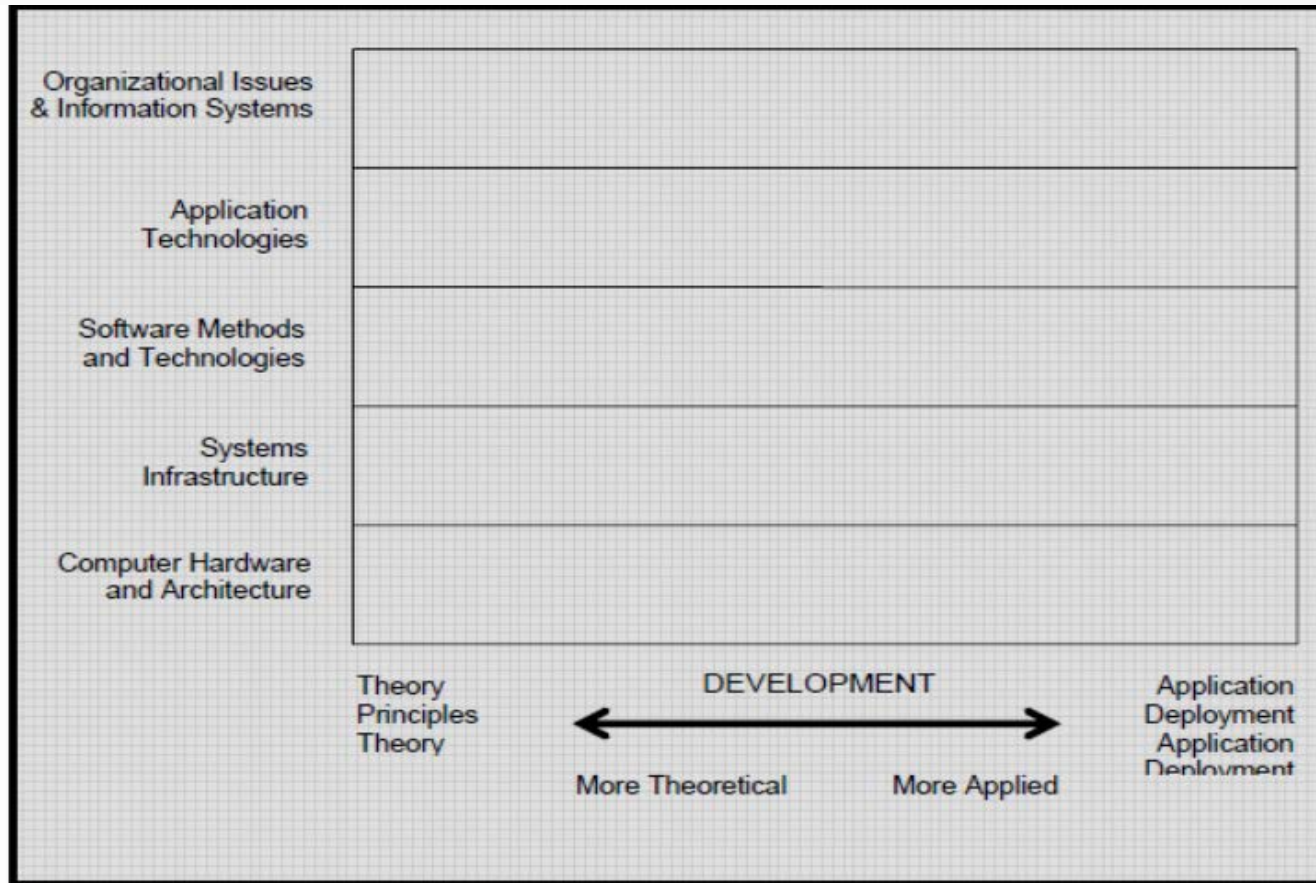
A multi-organizational (ACM, IEEE, AIS, BCS, etc.) effort to consolidate curricular reports and hence called the “Overview Report”

Illustrates the knowledge scope of five computing disciplines

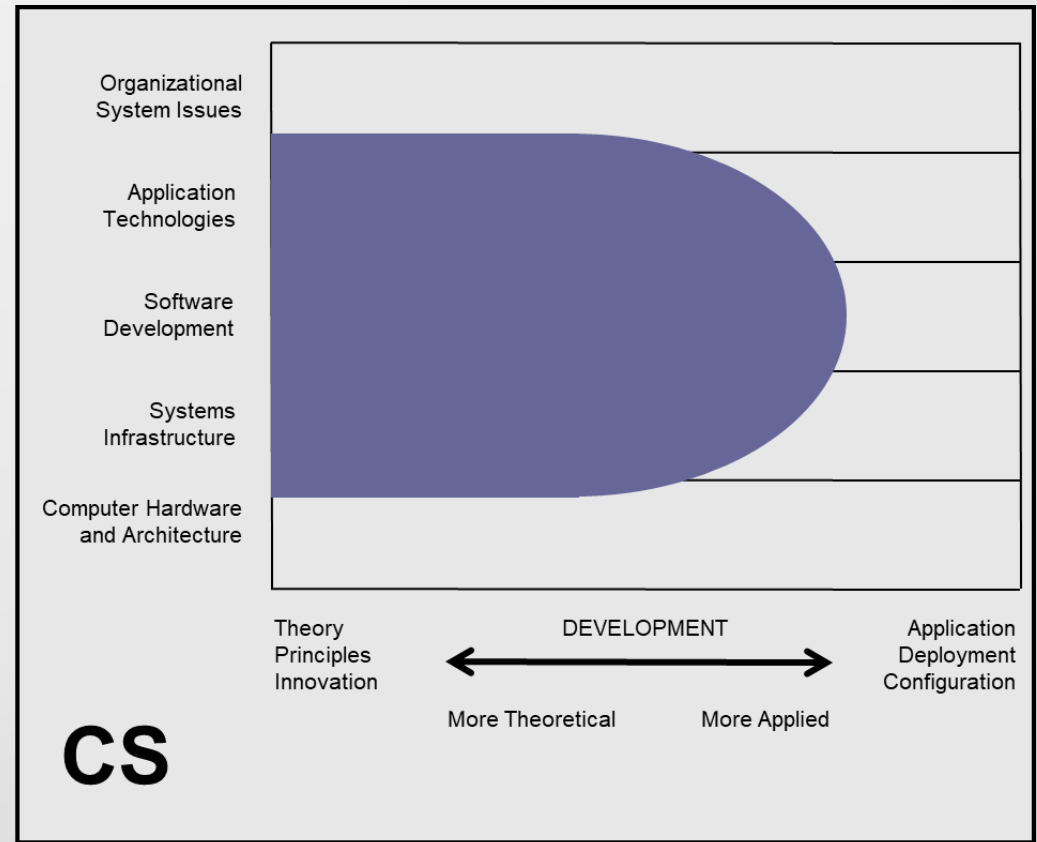
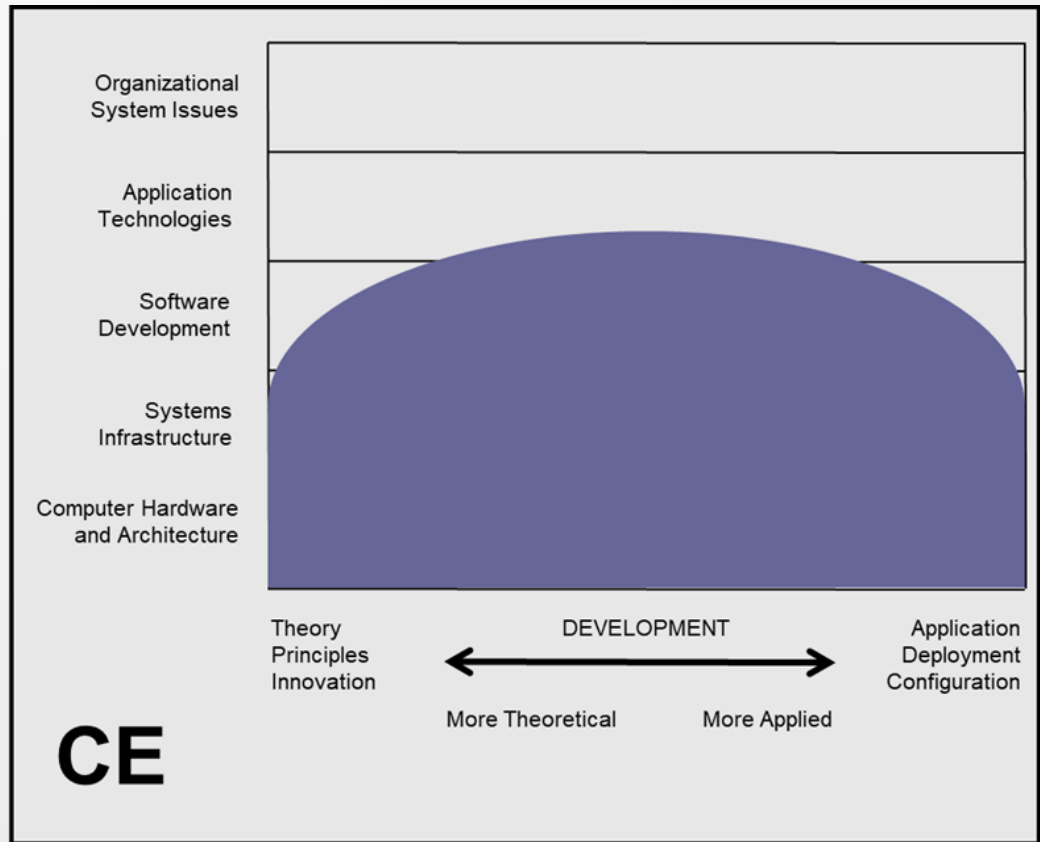
- Computer Engineering
- Computer Science
- Information Systems
- Information Technology
- Software Engineering

Provides comparison tables and visualizations contrasting the five disciplines

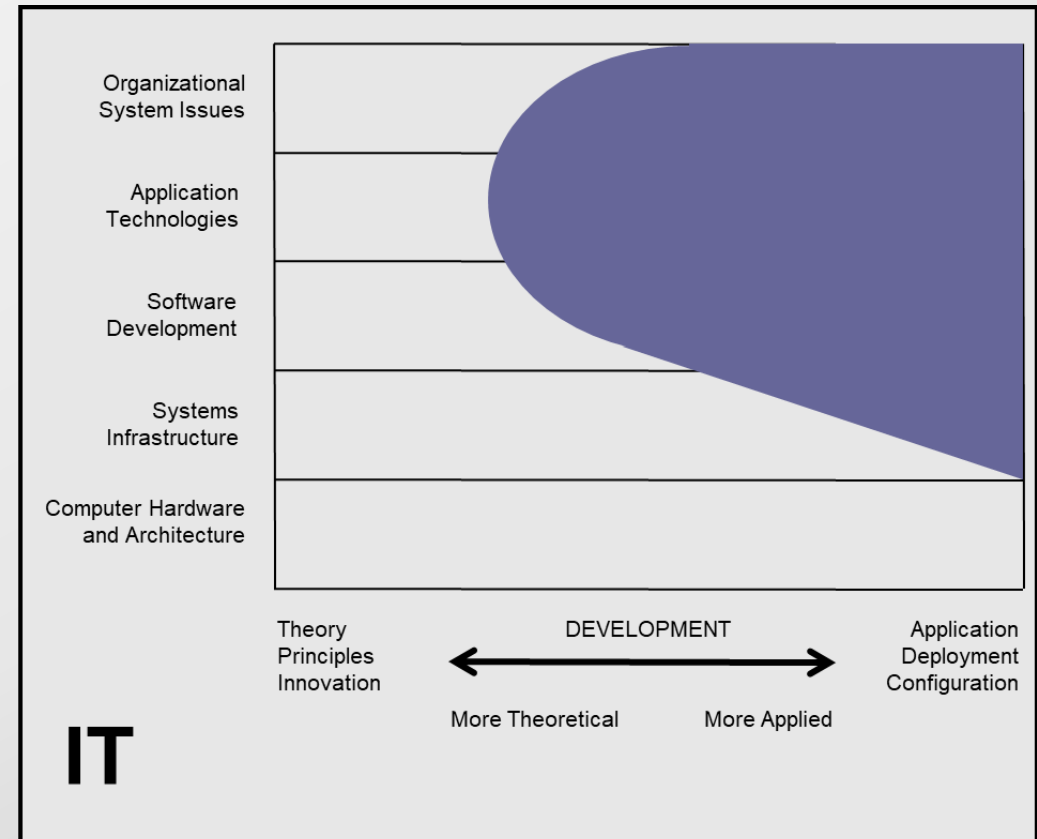
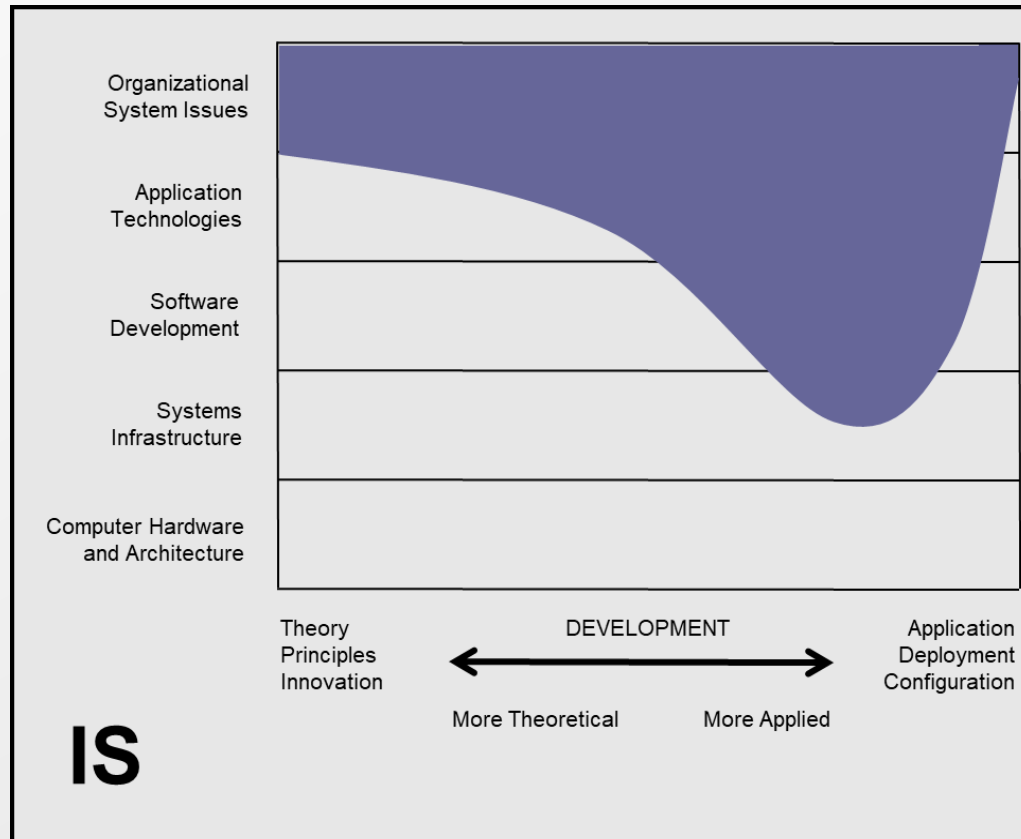
Visualization from CC2005 [1 of 4]



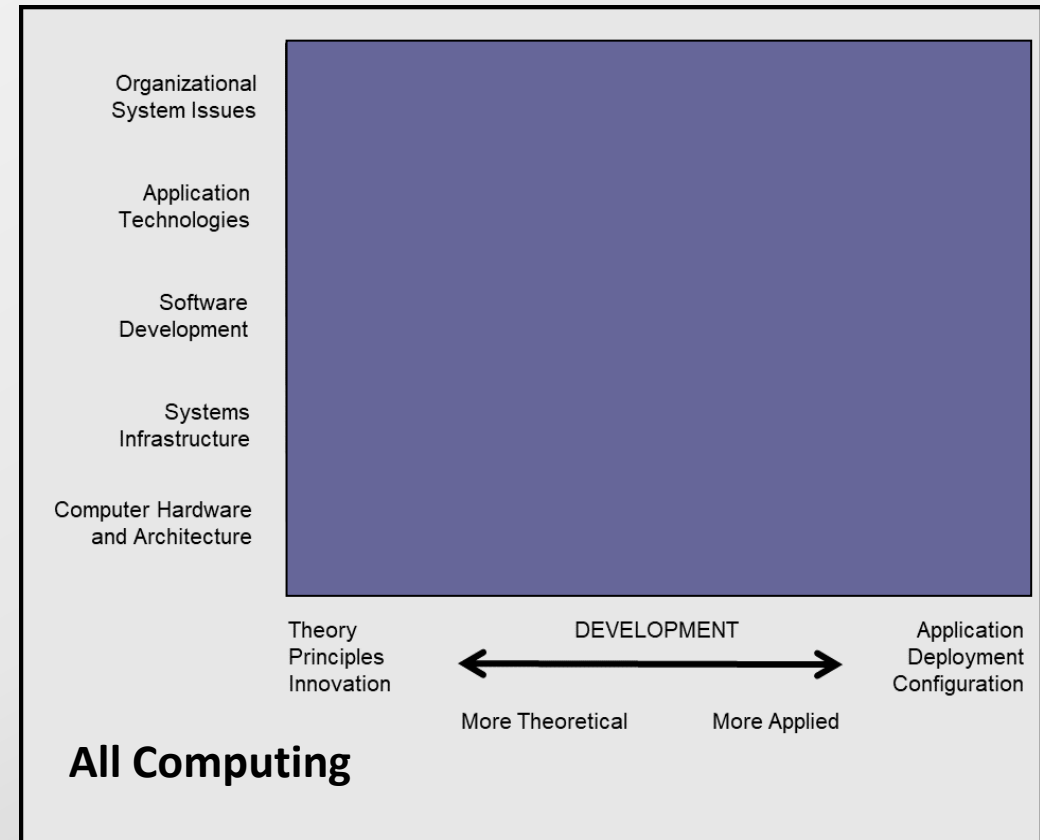
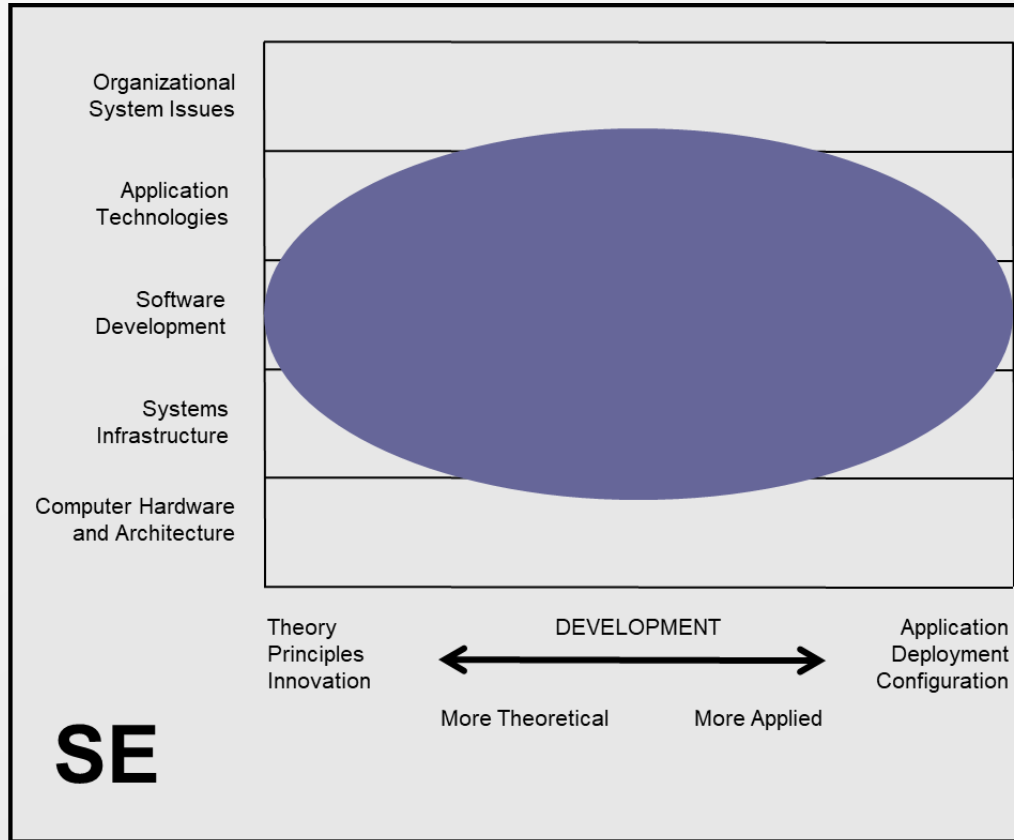
Visualization from CC2005 [2 of 4]

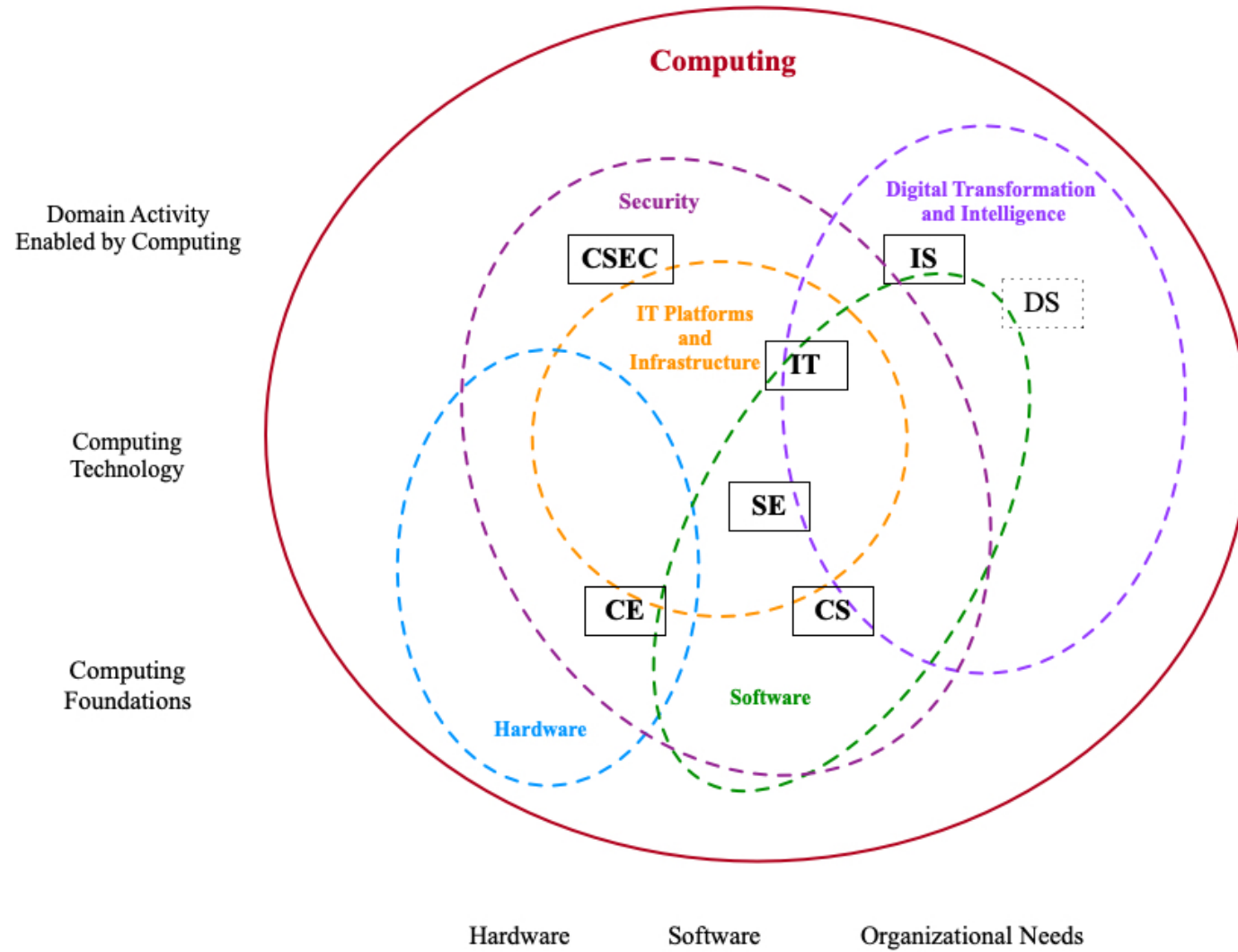


Visualization from CC2005 [3 of 4]



Visualization from CC2005 [4 of 4]





Visualization from CC2020

Knowledge-based Learning

Body of Knowledge

The complete set of concepts, terms and activities that make up a professional domain, as defined by the relevant professional association

It is more than simply a collection of terms ... or a collection of information.

It is the accepted ontology for a specific domain.

[Institute for Competitive Intelligence]

Learning Outcomes

Learning outcomes are written statements of what a learner is expected to know and be able to demonstrate at the end of a learning unit (or cohesive set of units, course module, entire course, or full program)

[IT2017 Report]

Competency-based Learning [1 of 2]

Information Systems

Competencies represent a dynamic combination of cognitive and meta-cognitive skills, demonstration of knowledge and understanding, interpersonal, intellectual and practical skills, and ethical values.

[MSIS2016 Report]

Software Engineering

[Competency is the] demonstrated ability to perform work activities at a stated competency level, which is one of five increasing levels of ability to perform an activity ...

[SWE Competency Model – 2014]

Competency-based Learning ^[2 of 2]

Information Technology ^[a]

Competence refers to the *performance* standards associated with a profession or membership to a licensing organization.

[IT2017 Report]

Information Technology ^[b]

Assessing some *level of performance* in the workplace is frequently used as a competence measure, which means measuring aspects of the job at which a person is competent.

[IT2017 Report]

Competency Meaning [Industry]

Competency = Skills

+ Dispositions

+ Knowledge

in Context

Competency = Technical Skills + Ability + Knowledge

Competency = Technical Skills + Behavior + Knowledge

Competency = Technical Skills + Human Attributes + Knowledge

Competency Meaning [Academic]

Competency = Knowledge

+ Skills

+ Dispositions

in Context

Competency = Knowledge + Technical Skills + Ability

Competency = Knowledge + Technical Skills + Behavior

Competency = Knowledge + Technical Skills + Human Attributes

Disposition Meaning

Disposition relates to the human attributes and characteristics expected from computing professionals in computing environments

Examples of dispositional attributes include:

Communication

Writing

Problem solving

Organization

Planning

Multitasking

Leadership

Creativity

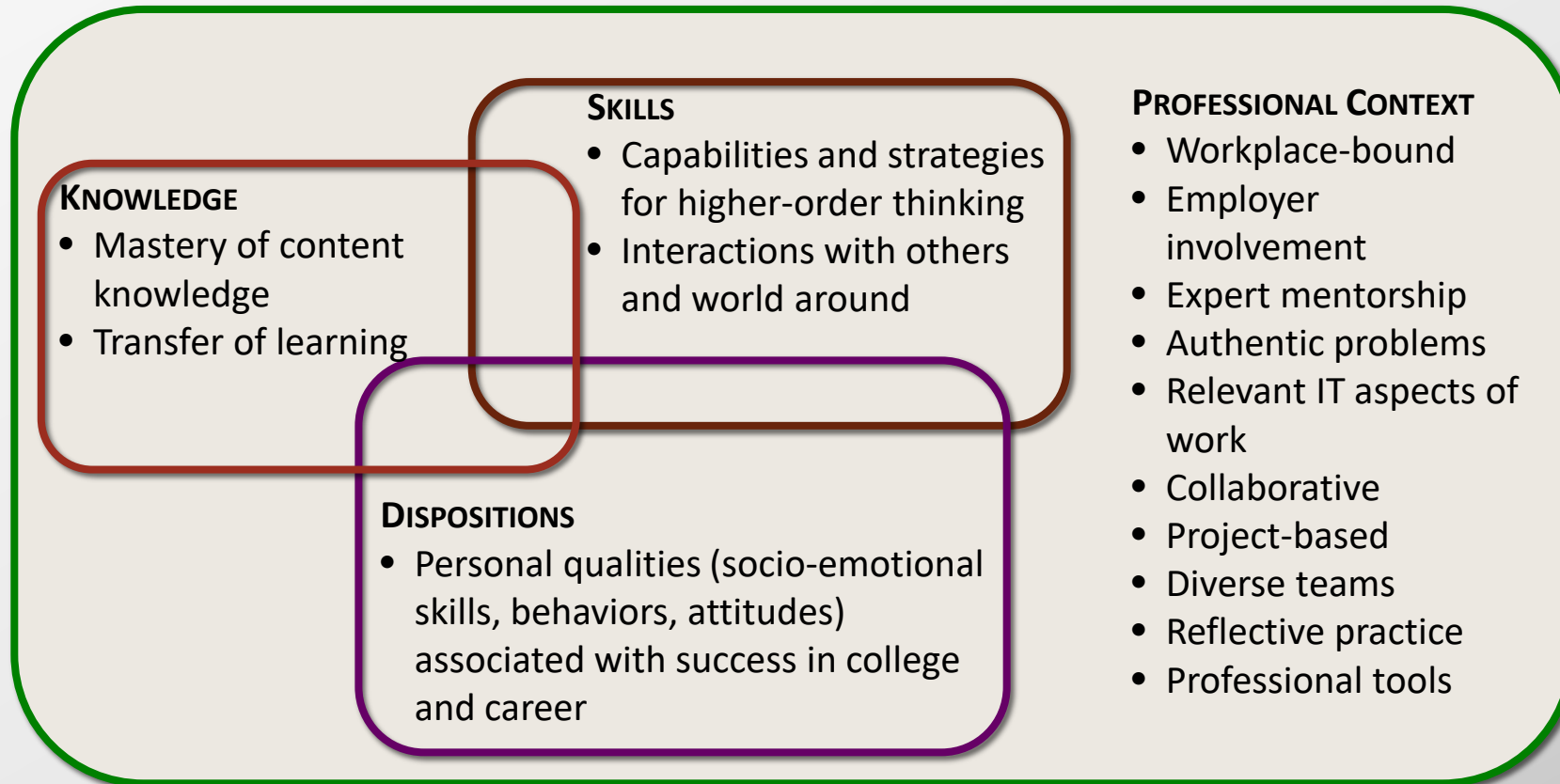
Time management

Mentoring

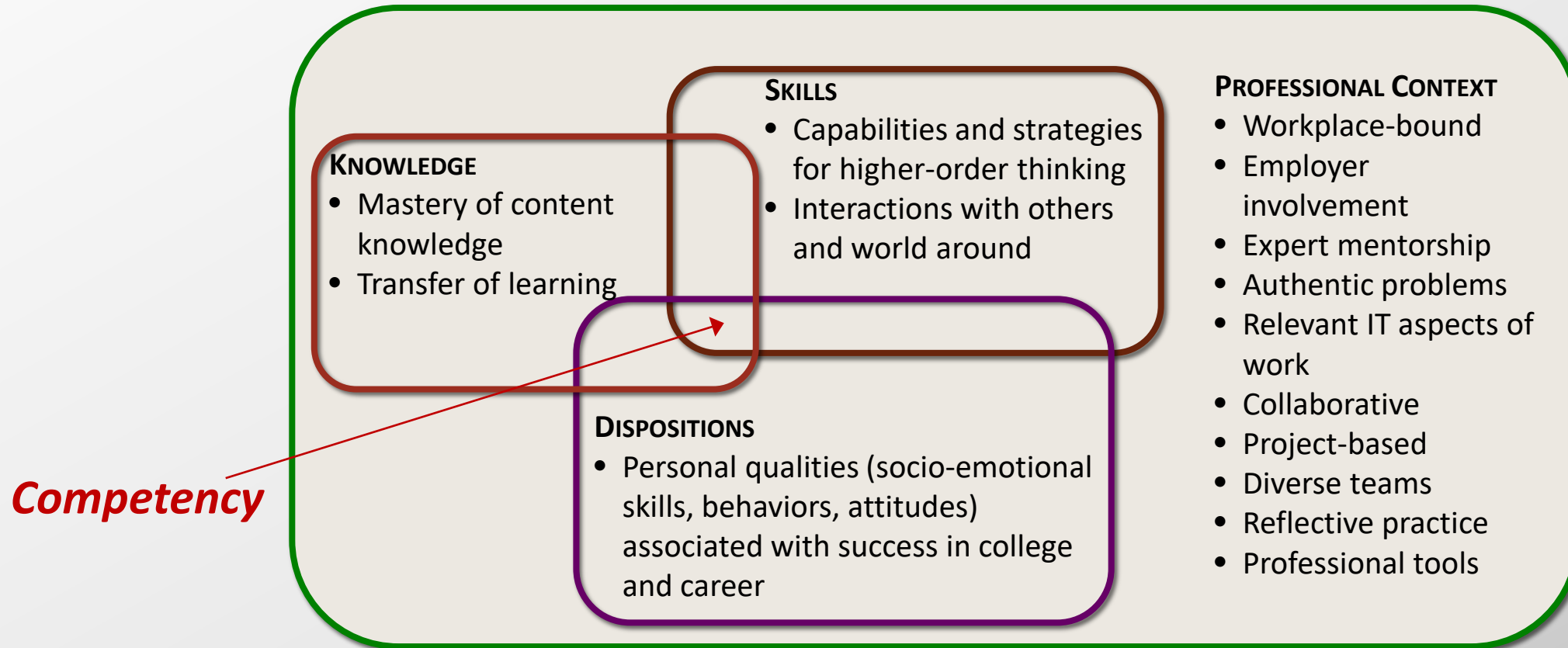
Presentation

Team participant

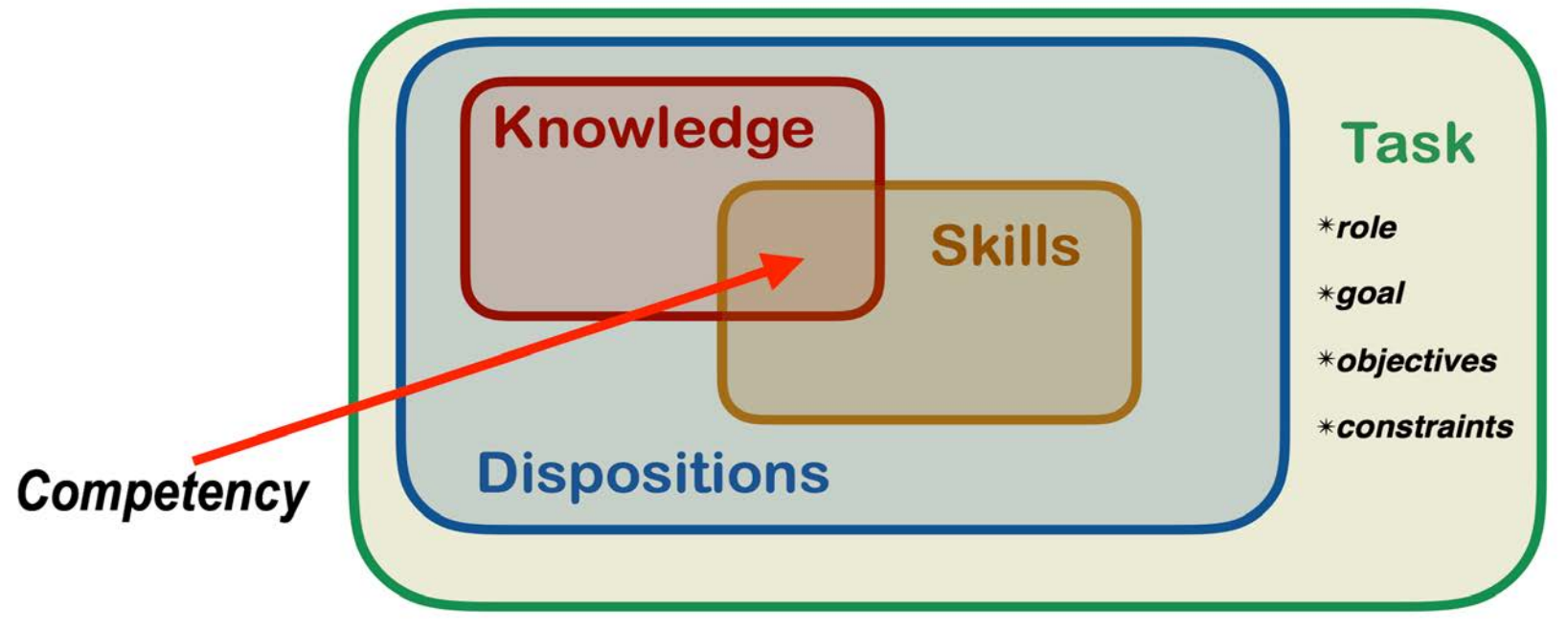
Competency in IT2017 Context



Competency in IT2017 Context



Competency in CC2020 Context



CC2020 Accomplishments

Curricular Advancements

The CC2020 project concluded
2020 December 31

Published via the ACM Digital Library

Competency-based approach:
IT2017, IS2020, DS2021

Competency-based considerations:
CS202x and others

Computing the Future

Adopted the word “Computing” as a unifying term

Adopted “Competency” to represent the future of all
computing programs

Competency = Knowledge + Skills + Dispositions

Set the foundation for future computing curricular
reports

Develop modern visualizations to represent
computing competency

CC2020 Contents

Main Body

1. Introduction
2. Evolution of Computing Education
3. Knowledge-based Learning
4. Competency-based Learning
5. Visualization of Curricula
6. Global and Professional
7. Challenges and Opportunities
8. Beyond CC2020

Appendices

- A. Poster from CC2005
- B. Skill Frameworks
- C. Draft Competencies - Samples
- D. Competency-based Curricula
- E. From Competencies to Curricula
- F. Repository Development
- G. Additional Visualizations
- H. Glossary and Nomenclature
- I. Sustainable Competence in China
- J. Contributors and Reviewers

Next Steps for Computing Educators

1. Review the CC2020 document
 - a. Suggest doing a document scan
 - b. Read Chapter 4 on competency
 - c. Read other areas of interest
2. Appreciate the global scope of CC2020
 - a. Significant gap exists between industry and academia
 - b. Countries considering transformations
 - c. China already transforming (See Appendix I of CC2020 Report)
3. Address competency-based learning
 - a. Become familiar with competency
 - b. Assess skills and dispositions in addition to knowledge
 - c. Apply competency-based learning in courses

Thank You!

Questions?