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Modern Computing Curricula

Overview Report on Computing Curricula 2004

Covering Undergraduate Degree Programs in:

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

CC2004 Task Force

Representatives of:

- **ACM**
- **IEEE-CS**
- **AIS**
- **SITE → SIGITE**
- **BCS**
- **IFIP**
- **ABET / CAC / CSAB**

Active participants from Curricula Task Forces:

- **CE2004**
- **CS2001 (also known as CC2001)**
- **IS2002**
- **IT2005**
- **SE2004**

Context

- CC2001
  - "Computing Curricula 2001"
  - Joint task force of IEEE-CS and ACM
  - Original goal: update CC91
- CC2001 goal changed early in the process
- Explosion of computing in the 1990s:
  - Changed the world
  - Changed the computing education world
  - Made the original CC2001 goal archaic

Context

CC2001 saw the need for different volumes

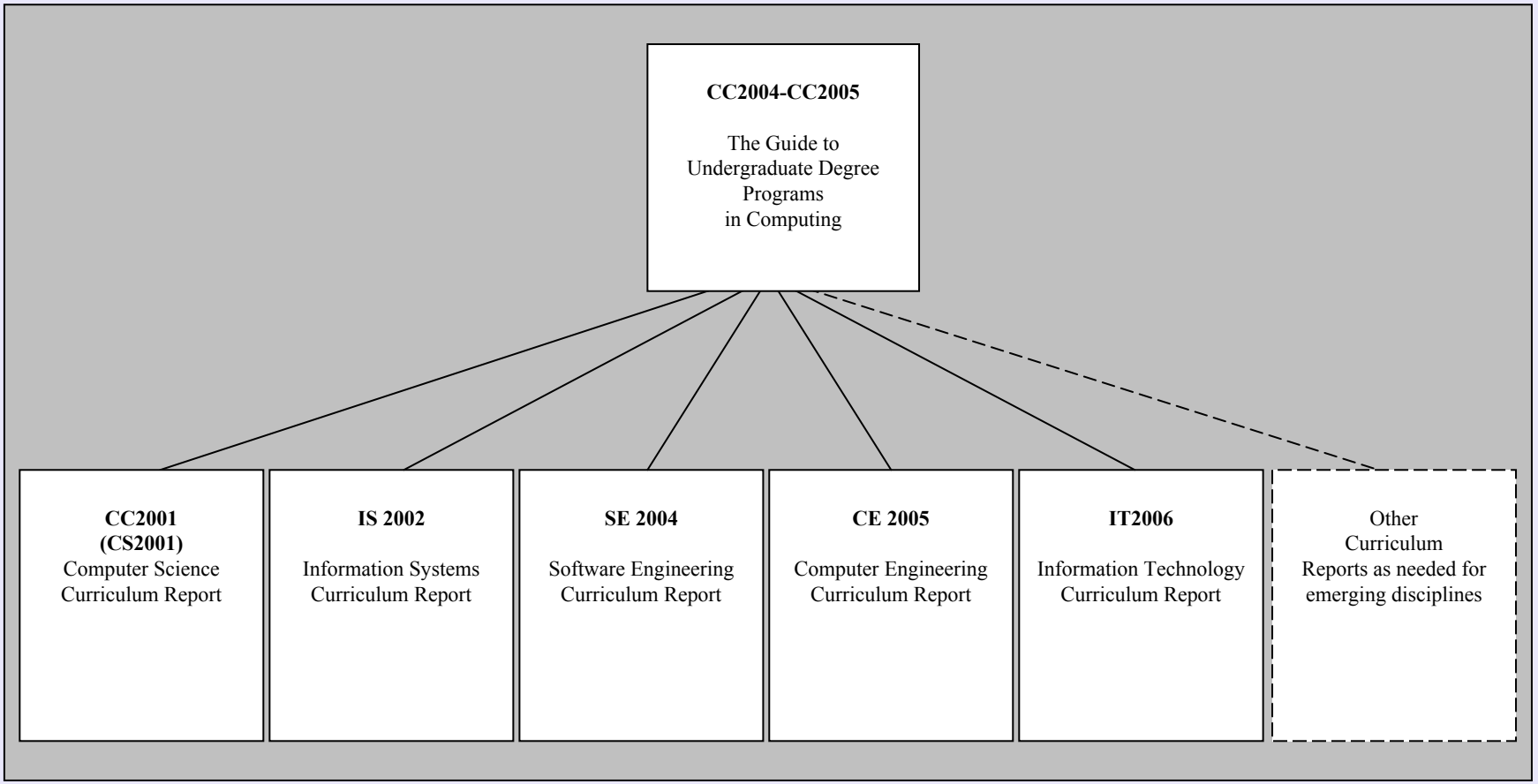
- It produced the ***CS Report***
- It called for distinct volumes for each of:
  - ***Computing Engineering***
  - ***Information Systems***
  - ***Software Engineering***
  - ***New computing disciplines*** as required
- It called for an ***Overview Volume***
  - A ***guide*** to the computing field
  - A ***report*** on commonalities and differences

Status of the curriculum reports

- ***Computer Science*** CC2001 (CS2001)
- ***Information Systems*** IS2002
- ***Software Engineering*** SE2004
- ***Computer Engineering*** CE2005
- ***Information Technology*** IT2006

- ***The Overview Volume*** CC2004-05
  - Based on the *Body of Knowledge* from each
  - Report on commonalities and differences
  - A users' guide to the computing disciplines
  - A larger project to create a map of computing

Organizational Structure



How computing education changed

Computing has become a family of disciplines

- Pre-1990s:
  - ***Computer Science*** on the technical side
  - ***Information Systems*** on the business side
- During the 1990s:
  - ***Computer Engineering*** became a strong discipline
  - ***Software Engineering*** an area within CS & began its own identity
  - ***Information Technology*** programs began emerging in the US

Computing degree programs

Pre-1990s:

EE | CS | IS

Post-1990s:

EE | CE | SE | CS | IT | IS

Computing degree programs

Pre-1990s:

EE | CS | IS

Hardware **Software** **Business**

Post-1990s:

EE | CE | SE | CS | IT | IS

Computing degree programs

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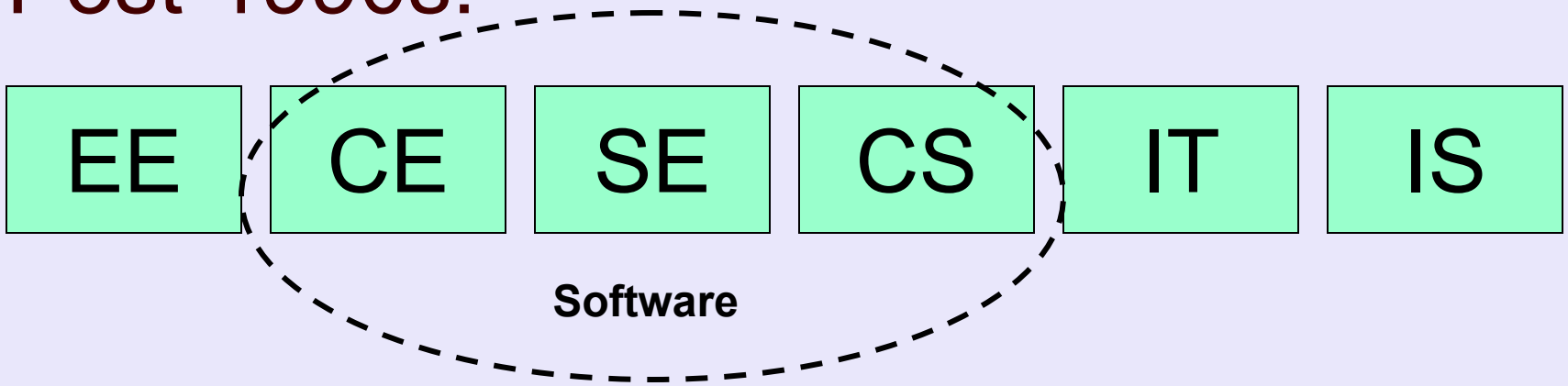
Hardware

Computing degree programs

Pre-1990s:

Post-1990s:



Computing degree programs

Pre-1990s:

EE | CS | IS

Hardware **Software** **Business**

Post-1990s:

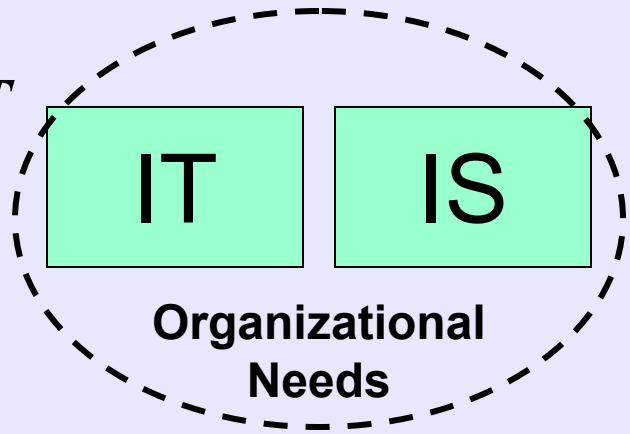
EE | CE | SE | CS | IT | IS

Organizational Needs

The difference between IT and IS

*Both focus on using **Information Technology***

- Information Systems programs:
  - Focus on the ***Information*** side of ***IT***
- Information Technology programs:
  - Focus on the ***Technology*** side of ***IT***



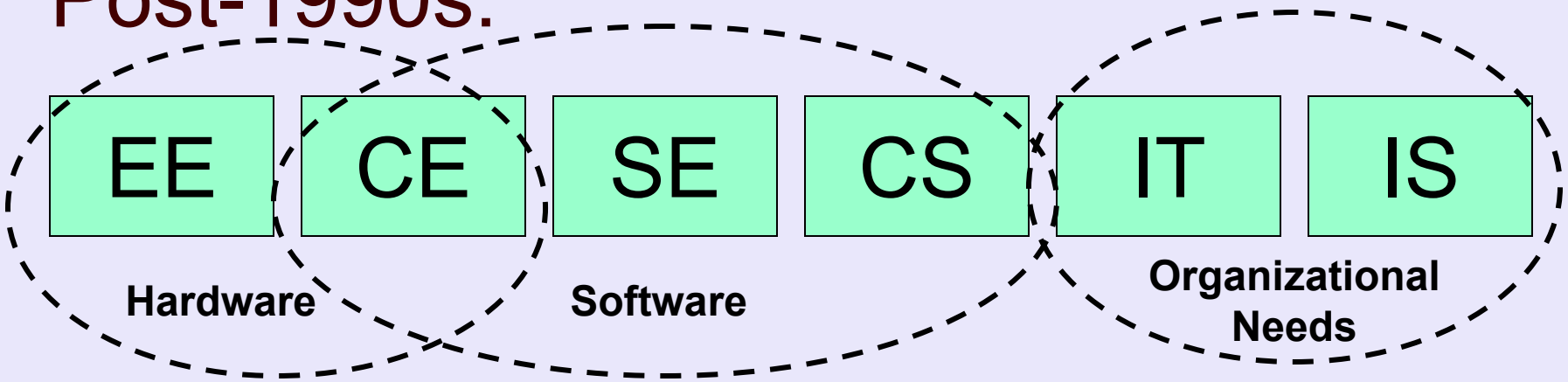
Computing degree programs

Pre-1990s:

EE CS IS

Hardware **Software** **Business**

Post-1990s:



Growing diversity in computing

The diversity is localized

- There has always been a home for hardware
  - It was only *EE*; now has become *EE* and *CE*
- There has always been a home for business
  - *Information Systems*
- The increased diversity has occurred in the space between hardware and application
  - The space traditionally filled by *CS* programs

Relative Emphases in Programs of Study

Knowledge/Skill Area	CE		CS		IS		IT		SE	
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
Programming Fundamentals	4	4	5	5	2	4	1	3	5	5
Algorithms and Complexity	2	4	5	5	1	2	0	1	4	4
Computer Architecture & Organization	5	5	2	4	1	2	1	2	2	4
Operating Systems: Principles, Design	2	4	3	5	1	1	1	1	3	4
Operating Systems: Use, Configuration	2	3	2	4	1	3	5	5	2	4
Net-centric: Principles, Design	1	3	2	4	1	3	3	4	2	4
Net-centric: Use and Configuration	1	2	2	3	2	4	5	5	2	3
Theory of Programming Languages	1	2	3	5	0	1	0	0	2	4
Human-Computer Interaction	2	5	2	4	2	5	4	5	3	5
Graphics and Visualization	1	3	1	5	1	1	0	0	1	3
Intelligent Systems (AI)	1	3	2	5	1	1	0	0	0	0
Information Management (DB): Theory	1	3	2	5	1	2	1	1	2	5
Information Management (DB):Practice	1	2	1	4	4	5	2	4	1	4
Scientific computing (Numerical methods)	0	2	0	5	0	0	0	0	0	0
Organizational Theory	0	0	0	0	1	4	1	2	0	0

Knowledge/Skill Area	Knowledge/Skill Area
Management of IS organization	e-Business
Decision Theory	Security: Theory and Principles
Organizational Behavior	Security: Implementation and Management
Organizational Change Management	Computer Systems Engineering
Legal/Professional/Ethics/Society	Embedded Systems
General Systems Theory	Circuits and Systems
Information Systems Development	Electronics
Risk Management (Project & Safety)	Digital Logic
Project Management	Distributed Systems
Analysis of Business Requirements	Digital Signal Processing
Engineering Foundations for Software	VLSI Design
Engineering Economics for Software	Hardware Testing and Fault Tolerance
Software Modeling and Analysis	Systems Administration
Software Design	Systems Integration
Software Verification and Validation	Digital Media Development
Software Evolution (Maintenance)	Technical Support
Software Process	Interpersonal Communication
Software Quality	Mathematics

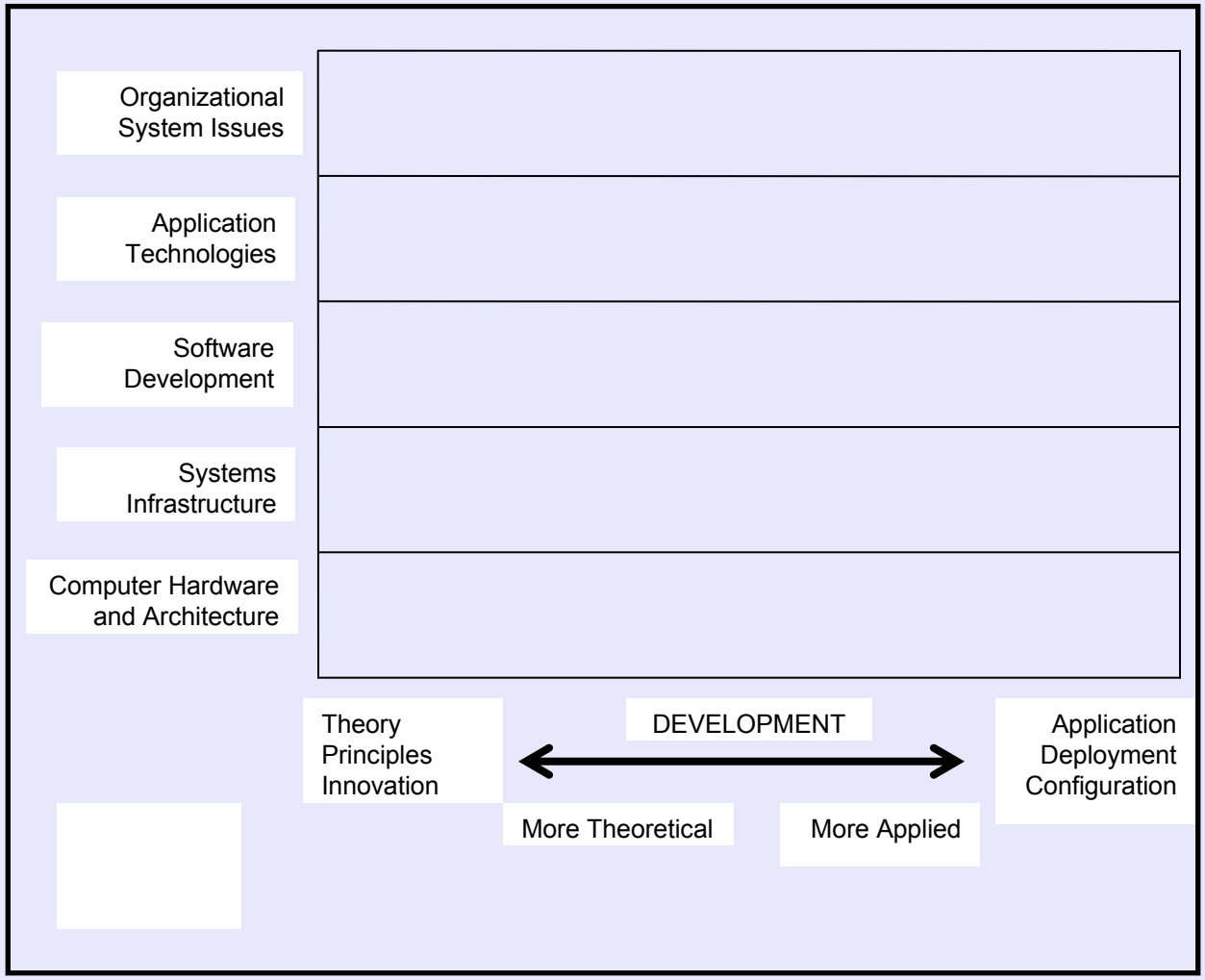
Relative Performance Capability of Graduates

Area	Performance Capability	CE	CS	IS	IT	SE
Application Programs	Design an application program	3	4	1	0	4
	Implement an application program	3	4	0	0	5
	Use application program features well	3	3	5	5	3
	Train and support application users	2	2	4	5	2
Information Management (Database)	Design a database program	2	5	1	0	4
	Use a database program well	2	2	5	5	2
	Implement information retrieval software	1	5	3	3	4
	Select database products	1	3	5	5	3
	Configure database products	1	2	5	5	2
	Manage databases	1	2	5	5	2
	Train and support database users	2	3	4	5	3
Programming	Do small-scale programming	5	5	3	3	5
	Do large-scale programming	3	4	2	2	5
	Do systems programming	3	4	2	3	4
	Develop new software systems	3	4	1	1	5

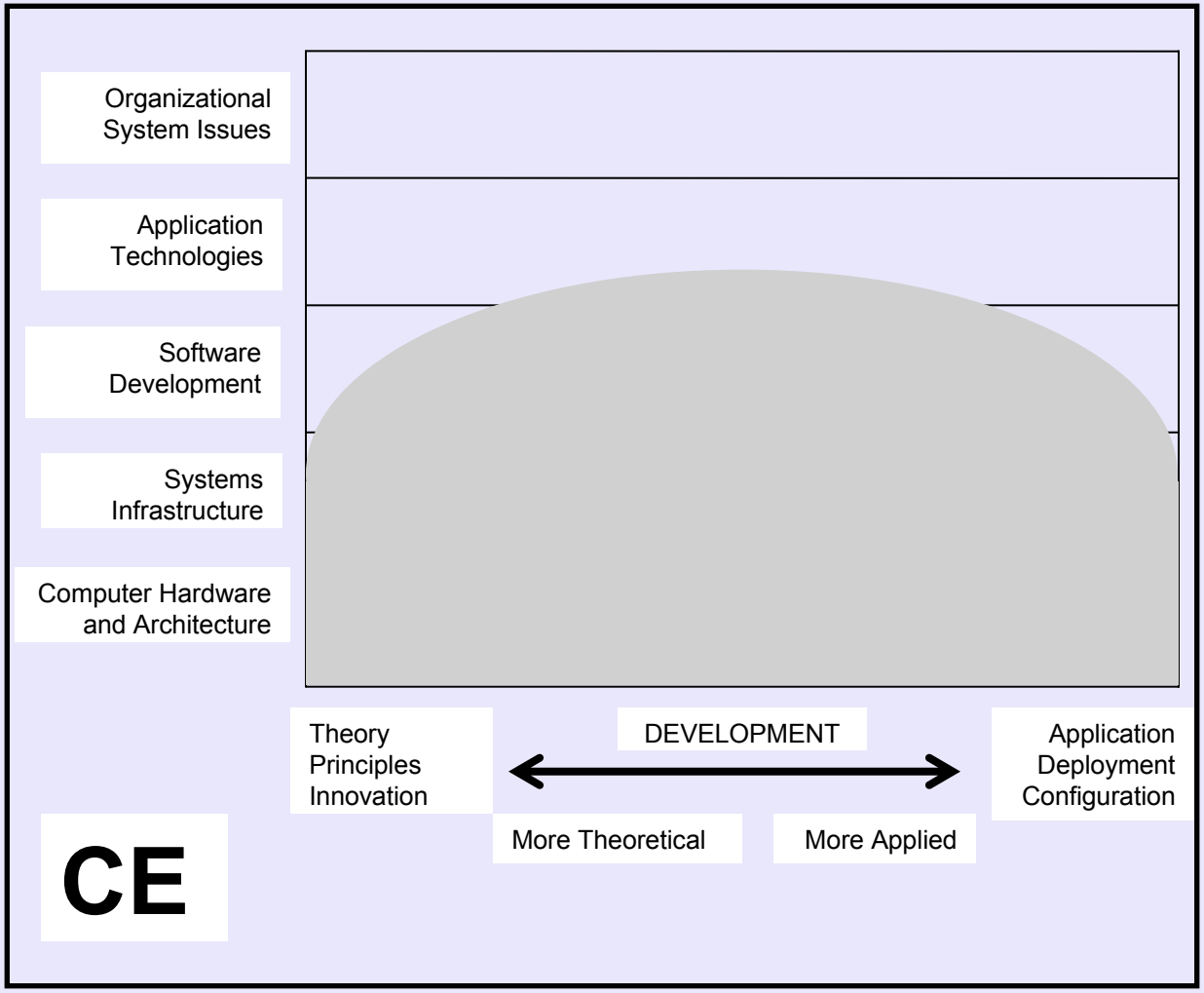
Area	Performance Capability
Info Systems	Design an application program
	Implement an application program
	Use application program features well
	Train and support application users
Application Infra-structure	Manage websites
	Create e-commerce software
	Create multimedia systems
	Develop health-related info system
	Create e-learning software
	Develop business applications
	Evaluate new forms of search engine
Computer-based Systems	Design embedded systems
	Implement embedded systems
	Design computer peripherals
	Implement computer peripherals
	Design complex sensor system
	Implement complex sensor system
	Design a chip
	Design a computer

Area	Performance Capability
Algorithms	Prove theoretical results
	Develop ways to attack problems
	Develop proof-of-concept software
	Determine if better solutions possible
Intelligent Systems (AI)	Design automated reasoning systems
	Implement automated reasoning syst's
	Implement intelligent systems
Network & Communi-cations	Design network configuration
	Select network components
	Install a computer network
	Manage computer networks
	Implement communications software
	Manage communications resources
	Implement mobile computing app's
IT Resource Planning	Develop corporate information plan
	Develop computing resources plan
	Schedule/budget resource upgrades
	Install / upgrade hardware
	Install / upgrade software

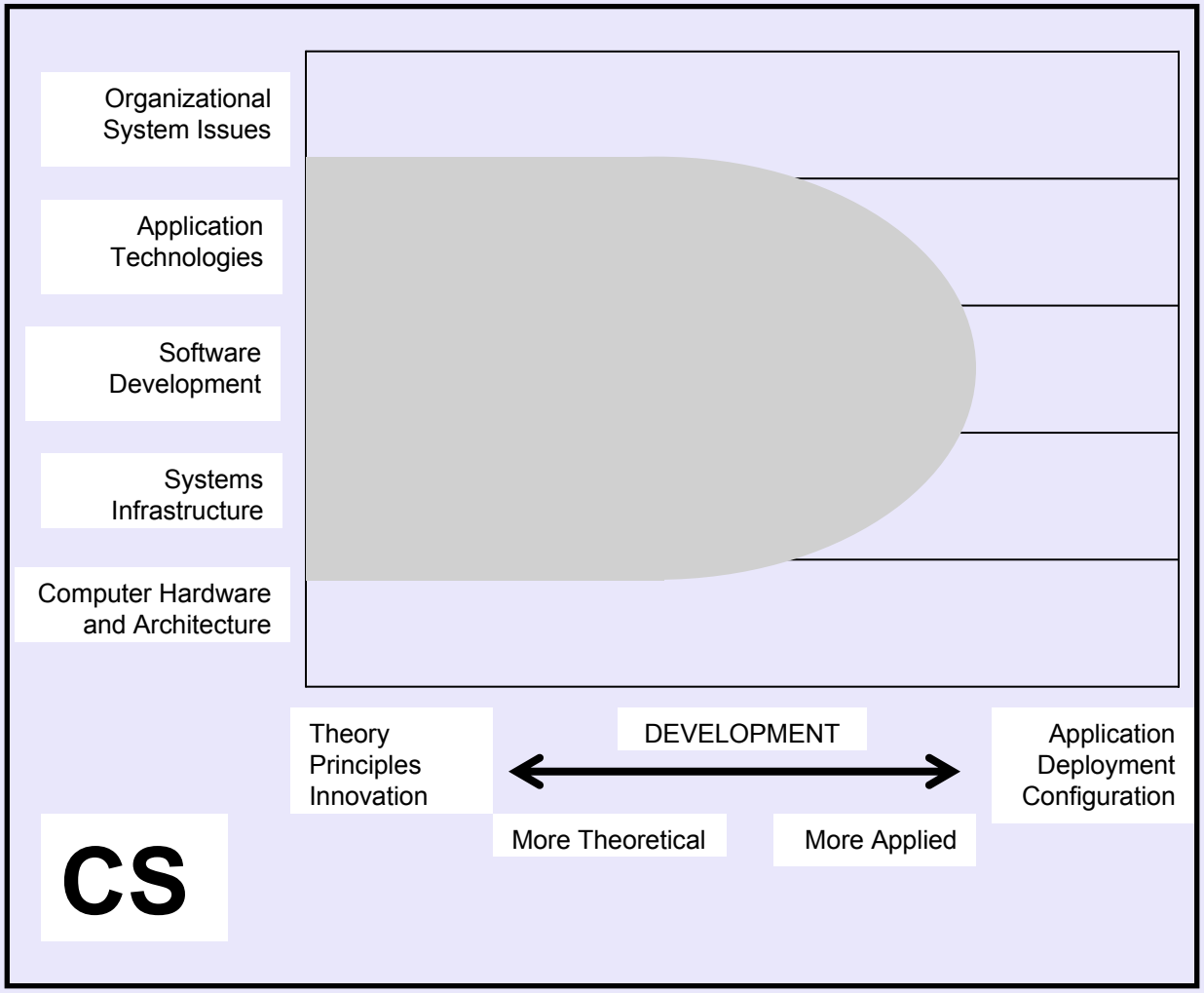
Simple Snapshots



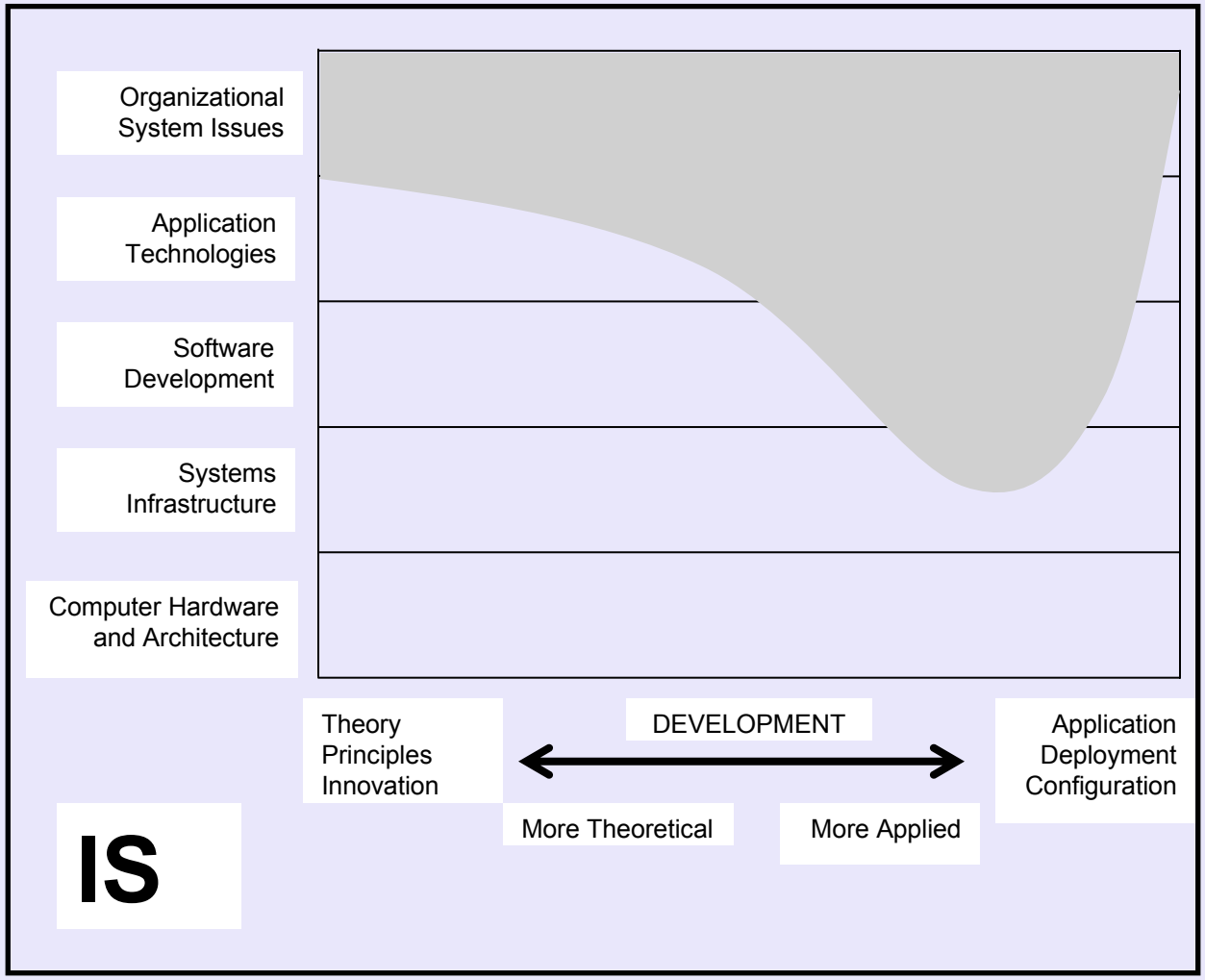
Snapshot: Computer Engineering



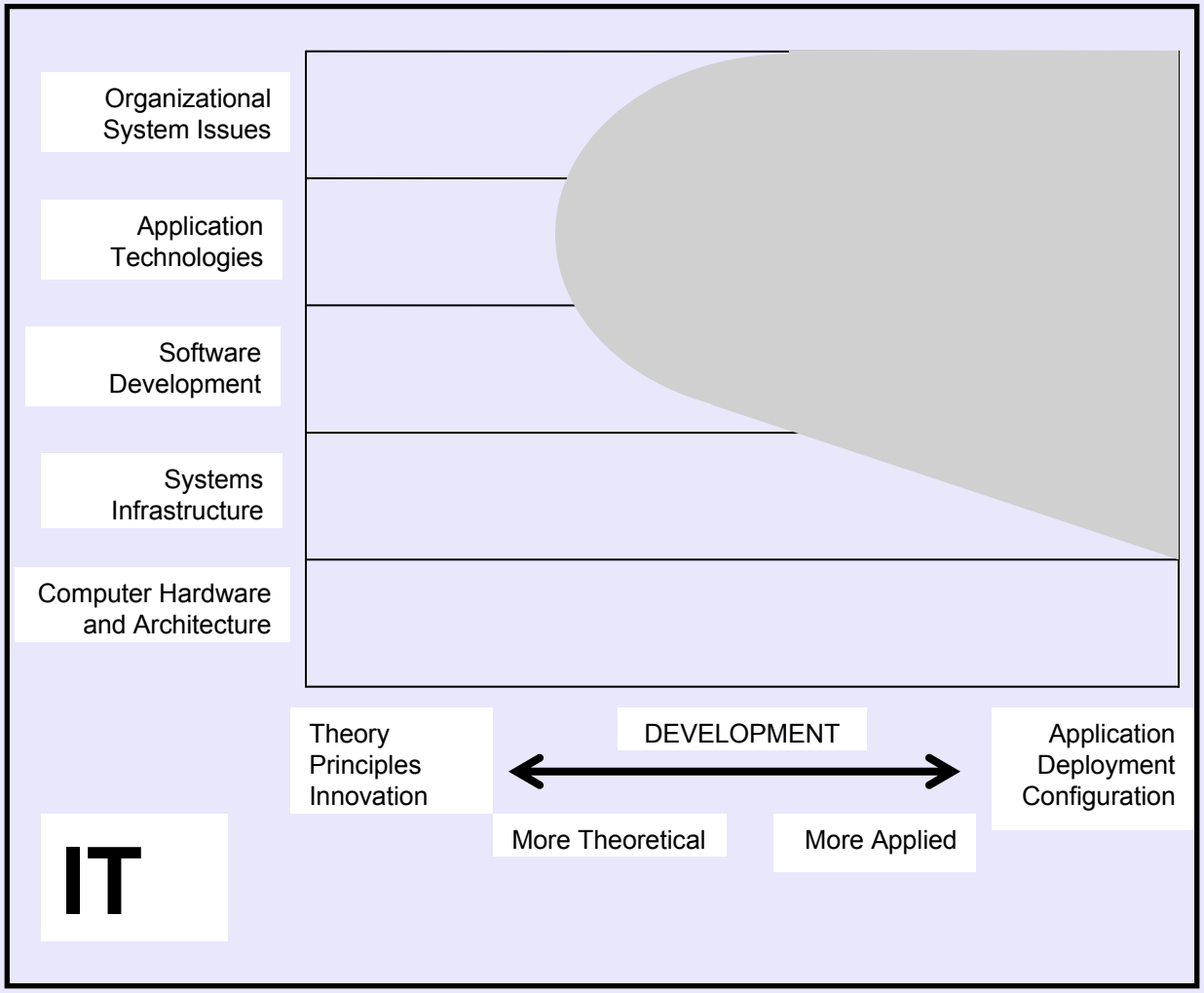
Snapshot: Computer Science



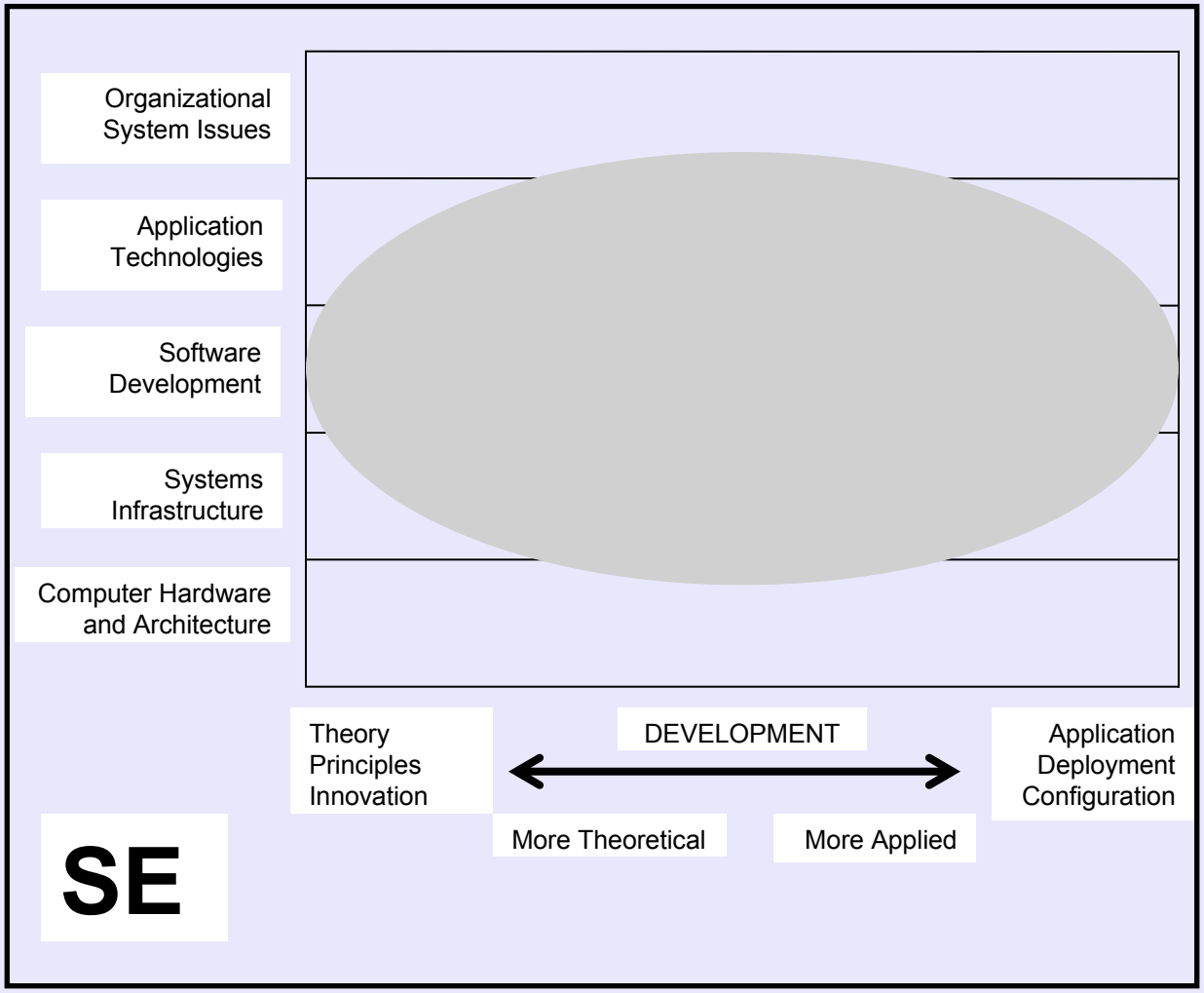
Snapshot: Information Systems



Snapshot: Information Technology



Snapshot: Software Engineering



Two Overview Projects

- *Computing Curricula 2004* is:
  - The smaller project
  - Focused on the *intersections*
  - Characterizing the *differences*
- *The Computing Ontology Project* is:
  - The larger project
  - Focused on the *union*
  - Characterizing the *problem space*

Two Overview Projects

- *Computing Curricula 2004* is a *guide* for:
  - Students, parents, guidance counselors
  - Administrators
  - Faculty

- *The Computing Ontology* is a *map* for:
  - Curriculum revision
  - Discipline definition
  - Topic classification
  - Accreditation

The Overview Report on Computing Curricula 2004

For available drafts…
for input and critique

Follow the curriculum *link at:*

www.acm.org/education/

Спасибо

Вопросы?