



# Information Technology Fundamentals

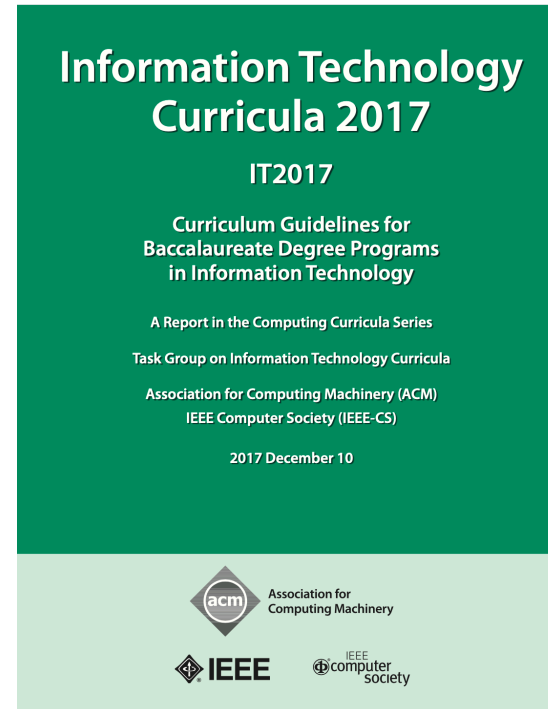
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# IT Discipline

## Module 1: Part 3



# Module 1. Main Objectives

1. Review Computing Curricula
2. Introduce Baccalaureate Degree Program for IT Engineering: Definition and Expectations
3. Describe and Classify IT Professionals:  
Industry and Research Perspective

# Contents

- IT Discipline: Driving Forces and Novel Definition
- Preparing Contemporary IT Professionals
- Competencies and Information Technology
- Industry Perspectives on Information Technology
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# Driving Forces through IT Innovations

- By the time the first IT Curriculum Guidelines report was released in 2008:
  1. **Apple** had developed the iPhone
  2. **Facebook** had been born
  3. **Amazon** had launched its Kindle e-reader
  4. **YouTube** had become the world's most popular video sharing website
  5. Google had released the **Android operating system**
  6. Mobile broadcast internet access had adopted **4G standards**.

These innovations have opened doors to  
**the second machine age**

## Second Machine Age

- The industrial revolution or **first machine age** was about complementing human work with the automation of manual labor and horsepower
- **The second machine age:** substitutes for humans the automation of knowledge and software-driven machines

# Most Notable IT Innovations

1. **Mobile applications** have been the leading digital platform since 2016, with total activity on mobile devices accounting for two-thirds of digital media time spent, after mobile overtook fixed internet access in 2014.
2. **Social platforms** that combine social media, social collaborations, and social feedback (reviews, comments, and 'likes') have contributed to integrating social technologies with business applications, ranging from social customer relationship management to internal communications and collaboration, and to the business public social site.
3. **User experiences** are replacing the traditional user interfaces containing windows, icons, menus, and mouse clicks with contemporary integrations of touch, gesture, voice, gaze tracking, real-time web implementation, and video in the design, implementation, and evaluation of user interfaces.

# Most Notable IT Innovations

4. **Internet of things (IoT) and big data** were among the top ten strategic technology trends announced annually by Gartner, Inc. in 2011, e.g., General Electric's move to open GE Digital, **Predix in 2016.**
5. **Cybersecurity** advances must preserve the internet's societal and economic benefits. Cybersecurity risk management comprises the full range of activities undertaken to protect IT and data from unauthorized access and other cyber threats, to maintain awareness of cyber threats, to detect anomalies and incidents adversely affecting IT and data, and to mitigate the impact of, respond to, and recover from incidents.



# Most Notable IT Innovations

- 6. *Automation*** is becoming a global force that will transform economies and the workforce. Robots and computers cannot only perform a range of routine physical work activities better and more cheaply than humans, but are also increasingly capable of automating cognitive capabilities.

# **Multiple Challenges in IT Education Guideline**

- Rapid technological advances in computing
- Emergence of new computing areas of study
- Persisting skill gap between employers' expectations and graduates' preparation
- Continuing participation of women and other underrepresented groups in IT programs and careers
- Limiting the size of a realistic and implementable curriculum
- Increased variety of careers in IT
- Evolving professional practices
- Differentiating the information technology discipline from other computing disciplines.

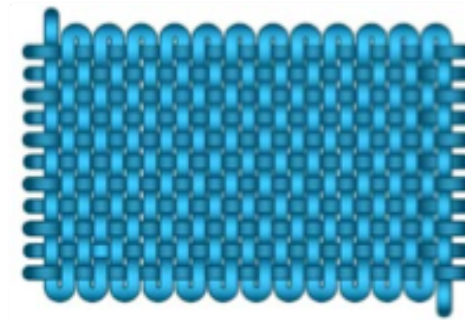
# **IT Academic Discipline Definition**

## **[ACM 2017]**

*Information Technology is the study of systemic approaches to select, develop, apply, integrate, and administer secure computing technologies to enable users to accomplish their personal, organizational, and societal goals.*

# Depiction of IT: Like Tapestry

It emphasizes **structural and functional connections** among many and varied aspects of IT and expresses creativity and innovations that IT programs can bring forward with support from this report's guidelines.



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# Rationale

- Industry finds that students who have **experience with the realities of professional work** understand the value of interpersonal skills in **collaborating with team members and clients:**
  1. maintain their focus on producing high-quality work
  2. adhere to strong ethical convictions
  3. contribute their time and talents to worthy outside causes
  4. engage in lifelong learning
  5. participate in improvements in their organizations

# Professional Practice

- IT programs should adopt a curriculum that integrates learning of professional practice through courses, seminars, and credit-bearing work experiences:
  - *Senior Capstone Courses*
  - *Professionalism, Ethics, and Law Courses*
  - *Practicum/Internship/Co-op Programs*
  - *Team-based DevOps Courses*
  - *Seminars on Trends and Change in IT*
  - *Entrepreneurial Innovation Courses*

# **Preparing Contemporary IT Professionals**

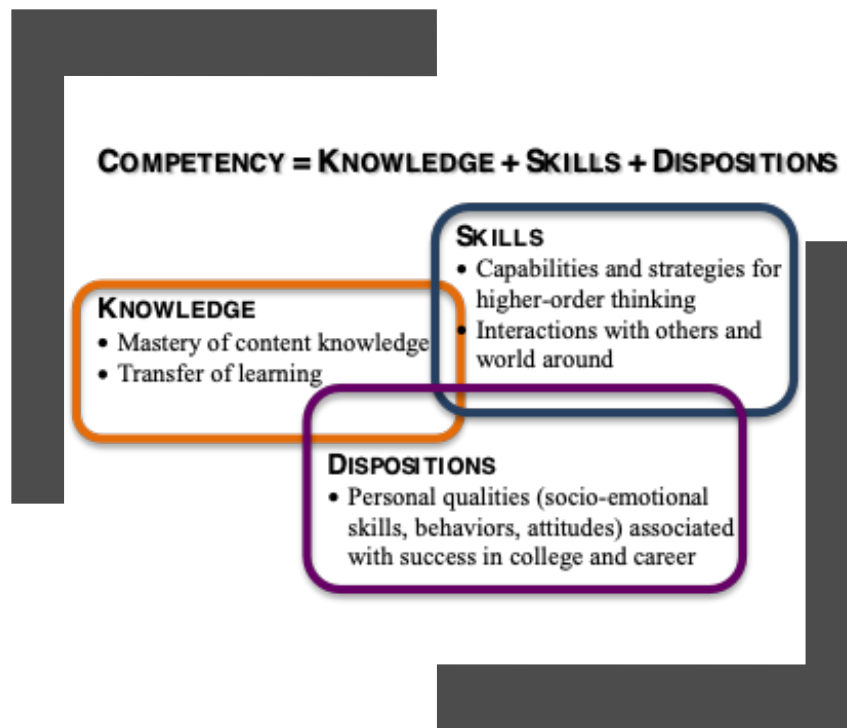
- Preparing for the Global Workplace
- Modeling Local and Global Work Environments
- Administration, Faculty, and Student Roles
- Incorporating Professionalism and Ethics into the Curriculum
- Assessing Professional and Ethical Work
- Certifications



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# Meaning of Competency



- **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
- **Competencies** are what **a person brings to a job conceptualized as qualities** by which people demonstrate superior job performance

# Meaning of Competency

- **Knowledge** designates a proficiency in core concepts and content of IT and application of learning to new situations.
- **Skills** refer to capabilities and strategies that develop over time, with deliberate practice and through interactions with others and the world around us
- **Dispositions** encompass socio-emotional skills, behaviors, and attitudes that characterize the inclination to carry out tasks and the sensitivity to know when and how to engage in those tasks

# Learning Transfer

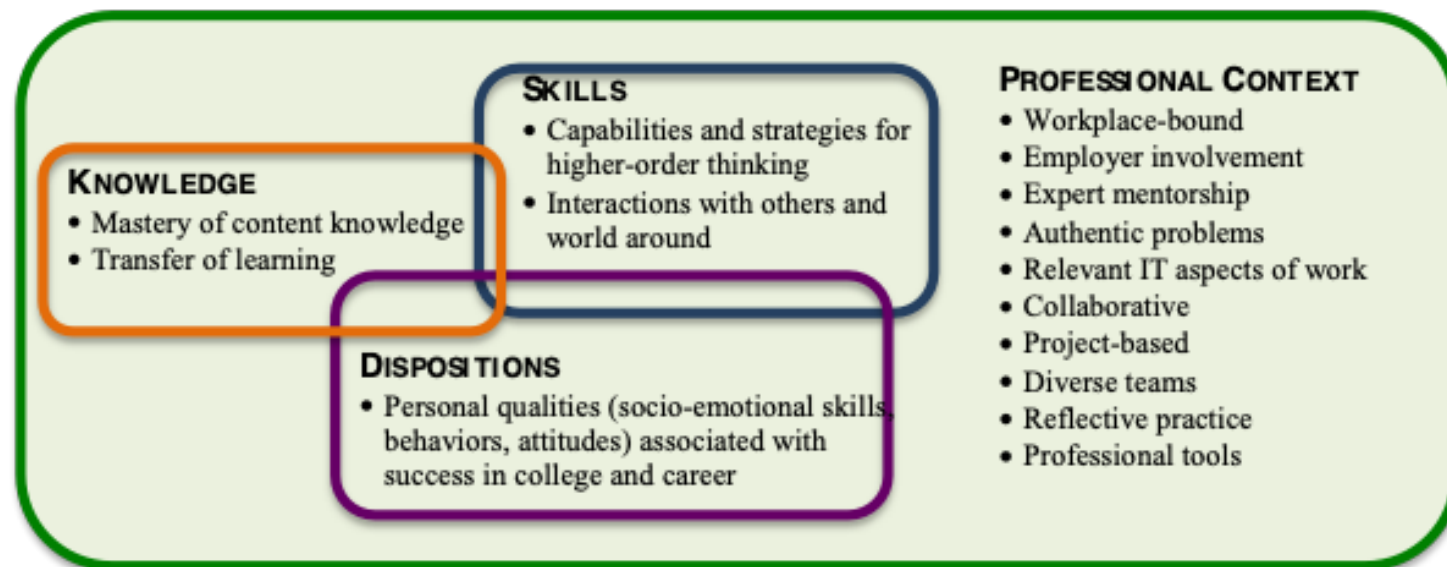
## Adapted from Understanding by Design (UbD) Framework

Explain	Learners make connections, draw inferences, express them in their own words with support or justification, use apt analogies; teach others.
Interpret	Learners make sense of, provide a revealing historical or personal dimension to ideas, data, and events; interpretation is personal and accessible through images, anecdotes, analogies, and stories; turn data into information; provide a compelling and coherent theory.
Apply	Learners use what they have learned in varied and unique situations; go beyond the context in which they learned to new units, courses, and situations, beyond the classroom.
Demonstrate Perspective	Learners see the big picture, are aware of, and consider various points of view; take a critical and disinterested stance; recognize and avoid bias in how positions are stated.
Show Empathy	Learners perceive sensitively; can “walk in another’s shoes;” find potential value in what others might find odd, alien, or implausible.
Have Self-Knowledge	Learners show metacognitive awareness on motivation, confidence, responsibility, and integrity; reflect on the meaning of new learning and experiences; recognize the prejudices, projections, and habits of mind that both shape and impede their own understanding; are aware of what they do not understand in a specific context.

Transfer of learning from a classroom environment to the workplace and everyday environments is the ultimate purpose of school-based learning

# IT Competencies and Professional Practice

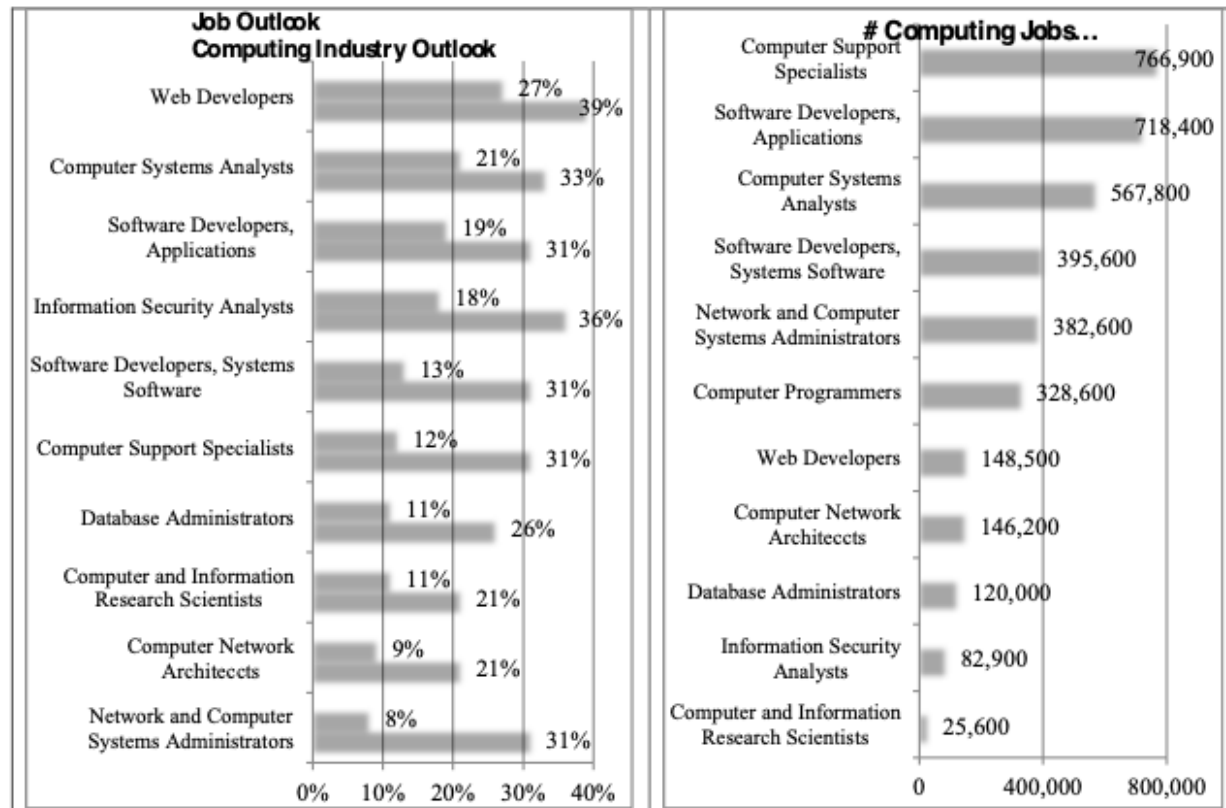
**IT COMPETENCIES = (KNOWLEDGE + SKILLS + DISPOSITIONS) IN CONTEXT**



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# Overview of Industry and IT



A recent study by the Bureau of Labor Statistics (BLS) estimates that **by 2024 employment in IT** in the United States will increase by 12%.

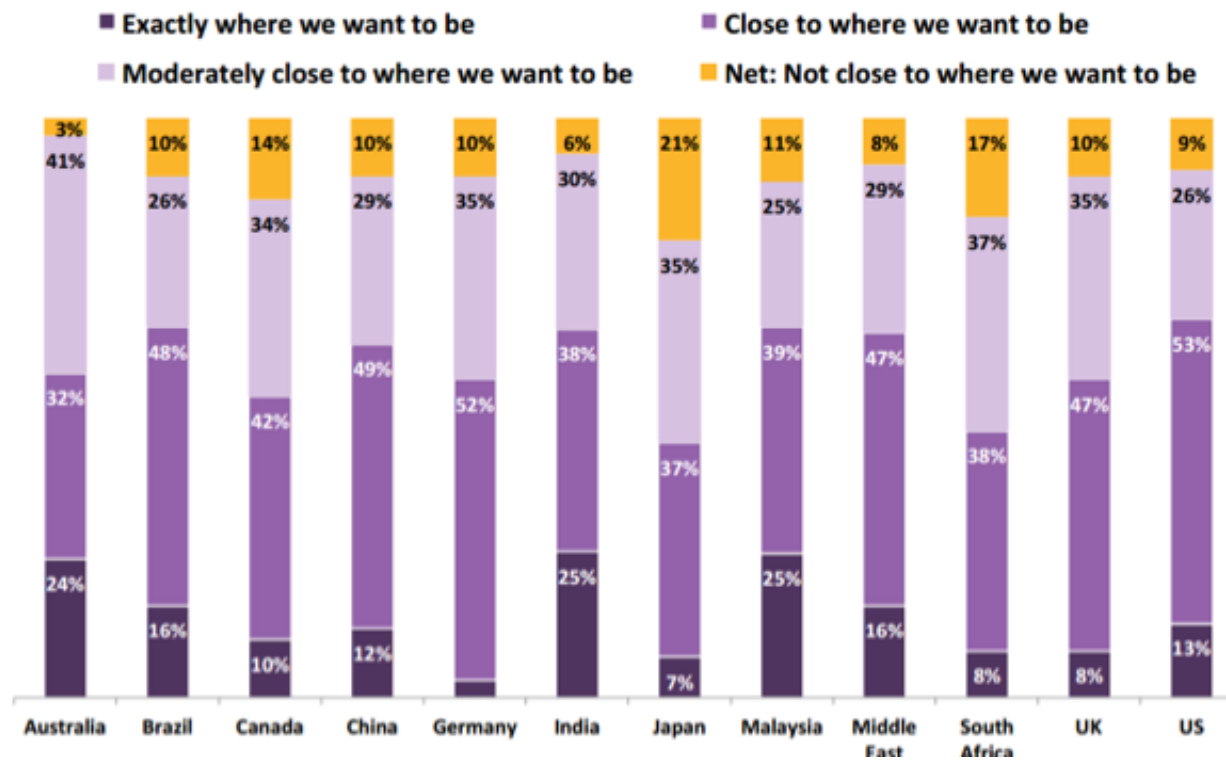
# State of IT Skills Gap

## Four important areas of the IT field:

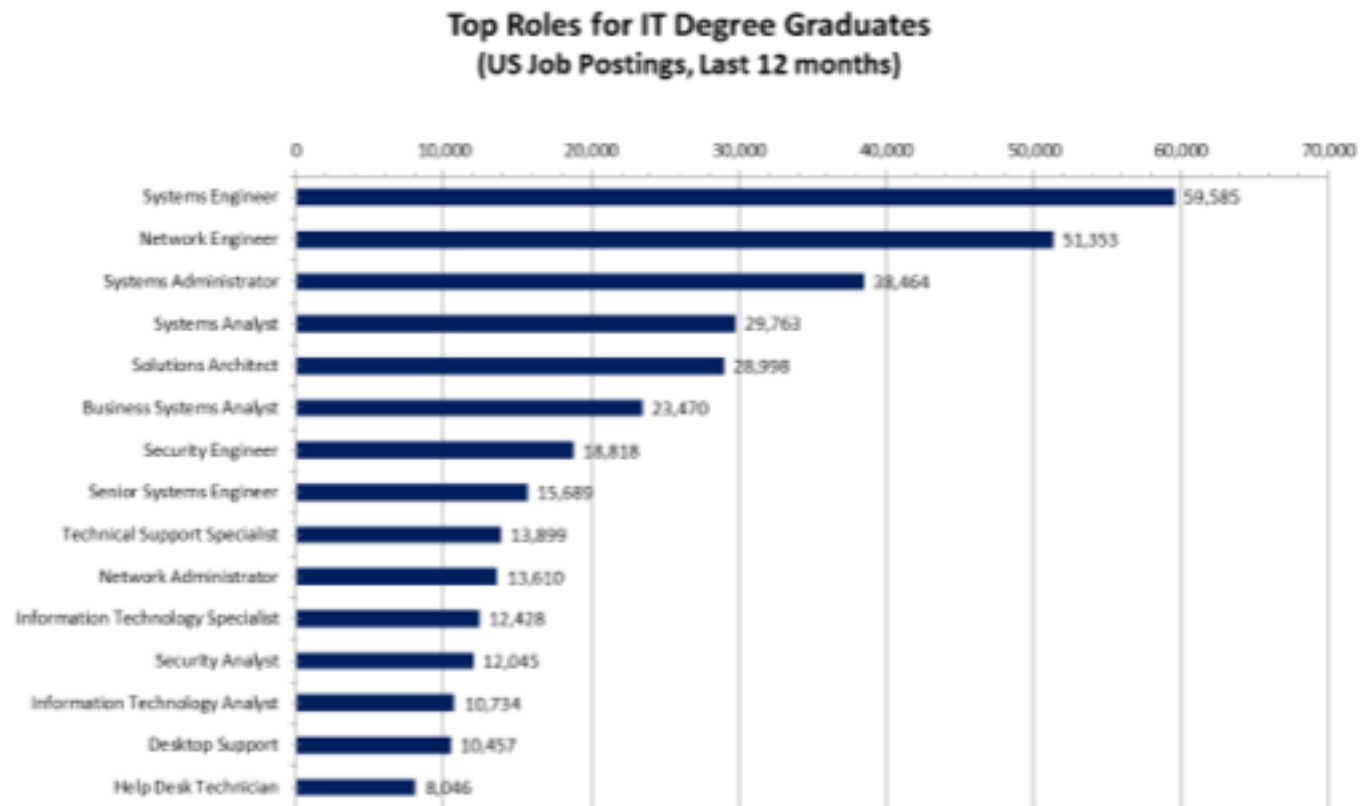
1. **Infrastructure:** Jobs that include network management, project management, help desk and service desk, as well as managing cloud implementations.
2. **Development:** Programming and software development for the Internet of Things (IoT), mobility, and cloud devices.
3. **Security:** Jobs that focus on ensuring that systems are less susceptible to attacks.
4. **Data:** Job roles that focus on database management, as well as analytics of stored data.



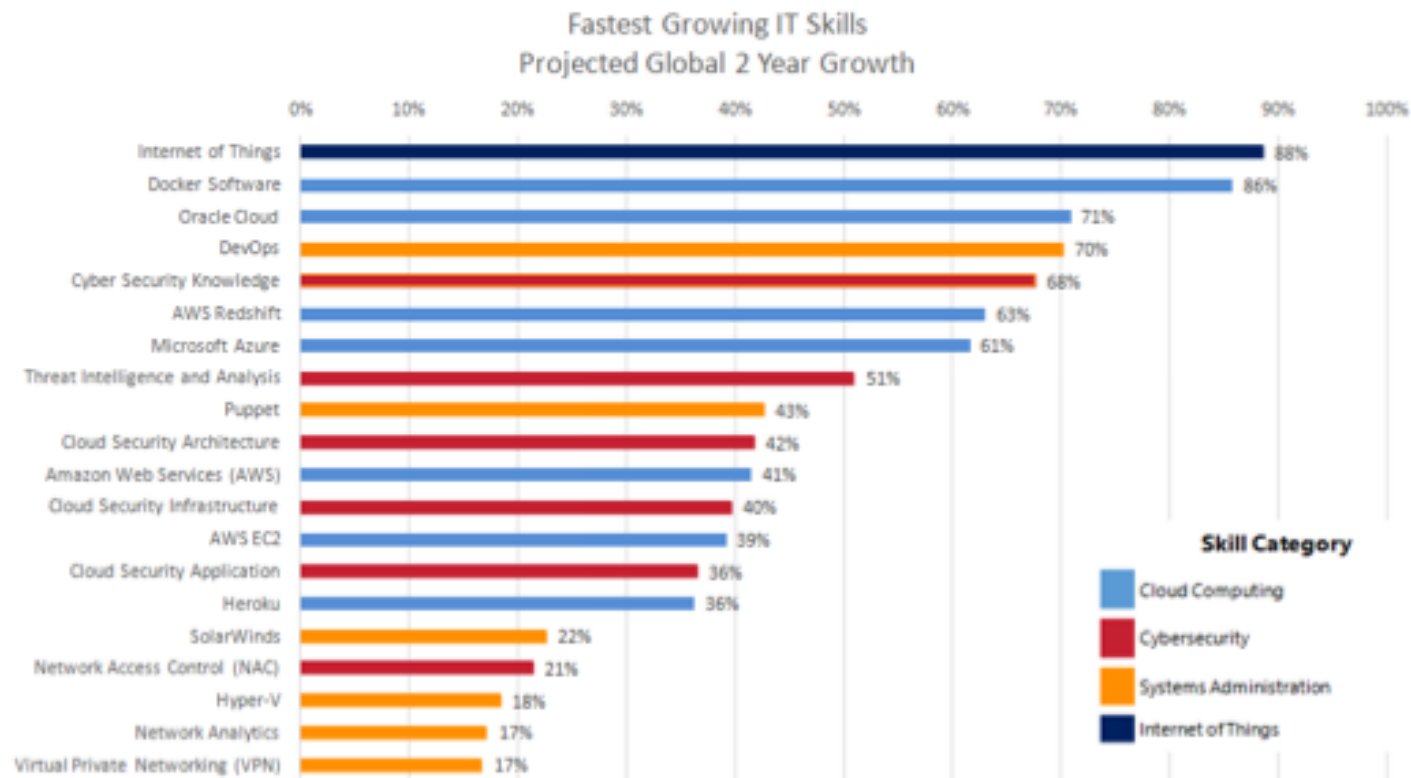
## Staff IT Skills v. Organization Need by Country (Feb. 2015)



# Market for Top IT Degrees



# IT Graduates in an Evolving Market

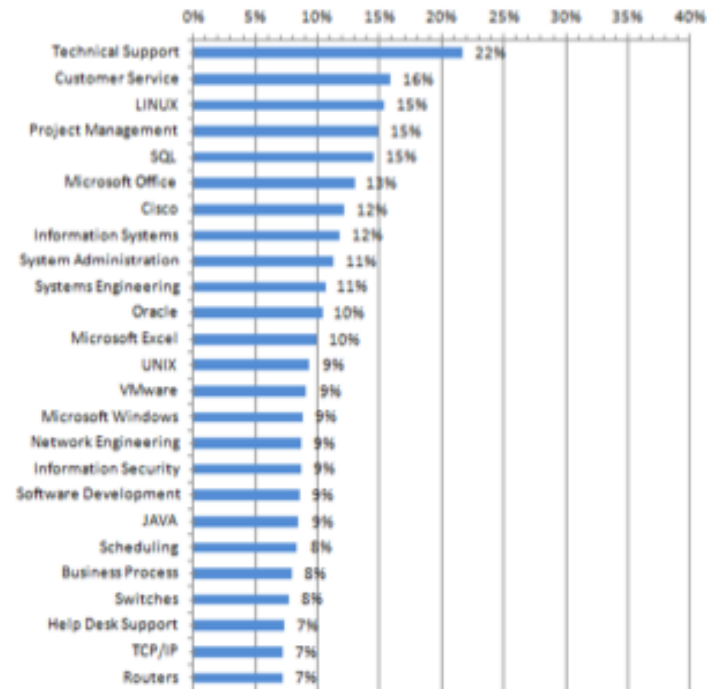


# Soft Skills

- Desirable qualities for certain forms of employment that do not depend on acquired knowledge: they include common sense, the ability to deal with people, and a positive flexible attitude

# Technical and Non-Technical Skills as of 2015

Technical Skills in Greatest Demand



Baseline Skills in Greatest Demand



# Importance of Soft-Skills/Non-Technical Skills by Country or Region

Soft-Skills/Non-Technical Skills	Australia	Brazil	Canada	China	Germany	India	Japan	Malaysia	Middle East*	South Africa	UK	US
Project Management	44%	54%	29%	50%	33%	52%	35%	62%	48%	58%	34%	41%
Customer service	49%	59%	47%	45%	33%	48%	29%	57%	48%	72%	49%	41%
Verbal and written communication skills	35%	31%	29%	34%	25%	32%	19%	58%	26%	54%	29%	34%
Teamwork	46%	50%	57%	45%	52%	54%	24%	72%	34%	66%	49%	49%
Strong work ethic	38%	35%	37%	35%	37%	39%	23%	62%	23%	69%	41%	40%
Motivation and initiative	24%	43%	35%	43%	31%	40%	39%	55%	26%	58%	40%	37%
Flexibility and adaptability	30%	38%	40%	58%	33%	40%	28%	44%	10%	52%	33%	43%
Analytical skills	28%	26%	30%	40%	31%	35%	25%	50%	8%	46%	26%	32%
Innovation/creative problem solving	24%	33%	25%	28%	24%	25%	20%	43%	7%	53%	21%	28%

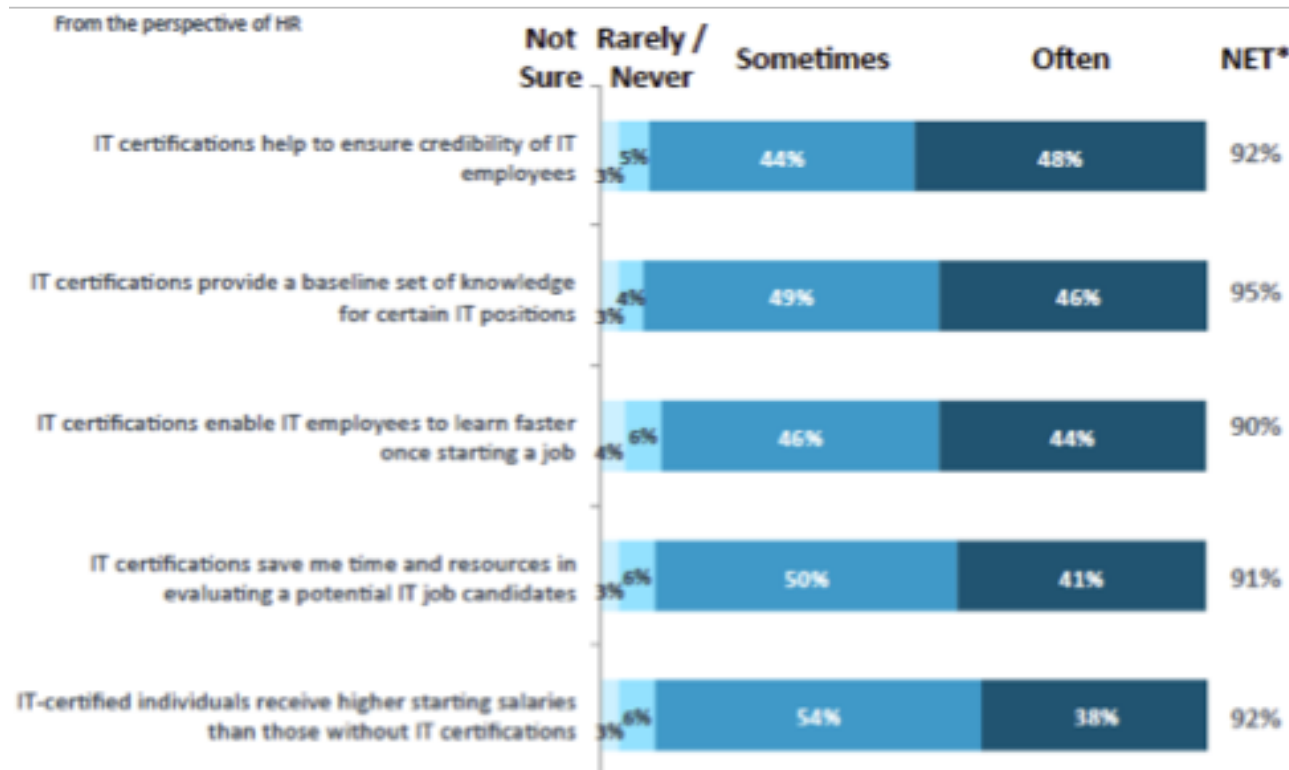
\*Middle East is an aggregation of data from Oman, Saudi Arabia and the UAE.

# Important IT Skills

- Communication Skills
- Teamwork Skills
- Technical Skills: Certificate as an indicator of experience

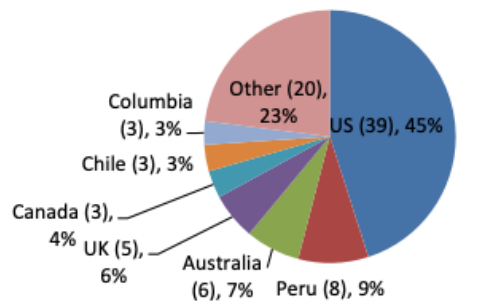
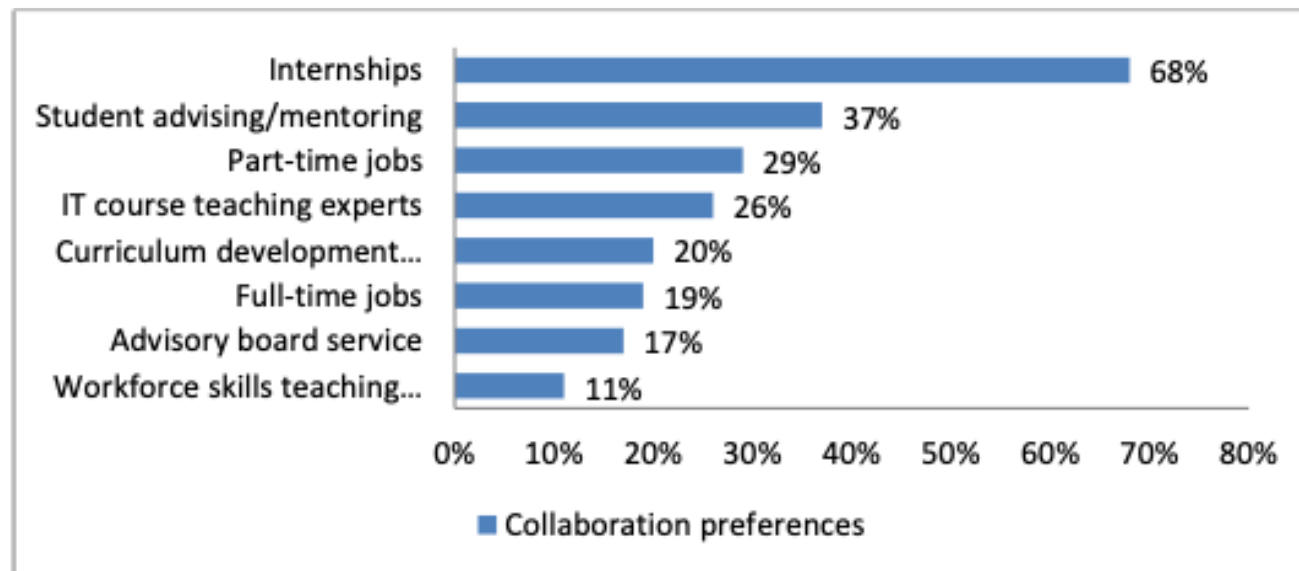
<ul style="list-style-type: none"><li>• Entry-level networking and security (CompTIA, Cisco)</li><li>• Professional networking and routing and switching (Cisco, Citrix)</li><li>• Virtualization and networking (Citrix VMWare)</li><li>• Windows servers and infrastructure (Microsoft)</li><li>• IT service management (Axelos)</li></ul>	<ul style="list-style-type: none"><li>• Project management (Project Management Institute, Axelos)</li><li>• Security (ISC2)</li><li>• Security management (ISC2)</li><li>• Cloud computing (Amazon)</li><li>• Risk management (ISACA)</li><li>• IT auditing (ISACA)</li></ul>
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## Reported Benefits of having IT Certified Job Candidates





# Academic/Workplace Collaboration



# Range of IT Skills Needed in 2017

Technical Skills	Needed at Company
Security	40%
Database/Information management	38%
PC support	36%
Storage/Backup	33%
Networks	31%
Cloud architecture	29%
Telecommunications	27%
Web development	27%
Server/Datacenter management	27%
Mobile device support	24%
Application development	23%
Big Data tools/analytics	23%
Virtualization	21%

Business Skills/Soft Skills	Needed at Company
Flexibility	41%
Analytical skills	39%
Teamwork	37%
Customer service	34%
Innovation/Problem solving	33%
Project management	30%
Strong work ethic	29%
Motivation	28%
Business understanding	27%
Broad technology knowledge	27%
Verbal/written communication	22%

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IT Curricular Framework

**FINAL WORDS!**

# IT Curricular Framework and Relative Colors

IT Domains	Essential Domains	Supplemental Domains
<b>Essential Only (5)</b>		
Information Management (ITE-IMA)		
Integrated Systems Technology (ITE-IST)		
Platform Technologies (ITE-PFT)		
System Paradigms (ITE-SPA)		
User Experience Design (ITE-UXD)		
<b>Essential + Supplemental (5 + 5)</b>		
Cybersecurity Principles (ITE-CSP) / Cybersecurity Emerging Challenges (ITS-CEC)		
Global Professional Practice (ITE-GPP) / Social Responsibility (ITS-SRE)		
Networking (ITE-NET) / Applied Networks (ITS-ANE)		
Software Fundamentals (ITE-SWF) / Software Development and Management (ITS-SDM)		
Web and Mobile Systems (ITE-WMS) / Mobile Applications (ITS-MAP)		
<b>Supplemental Only (4)</b>		
Cloud Computing (ITS-CCO)		
Data Scalability and Analytics (ITS-DSA)		
Internet of Things (ITS-IOT)		
Virtual Systems and Services (ITS-VSS)		

# Modern Illustration Depicting the Field of IT

