

Obsolescence in Software Engineering Careers

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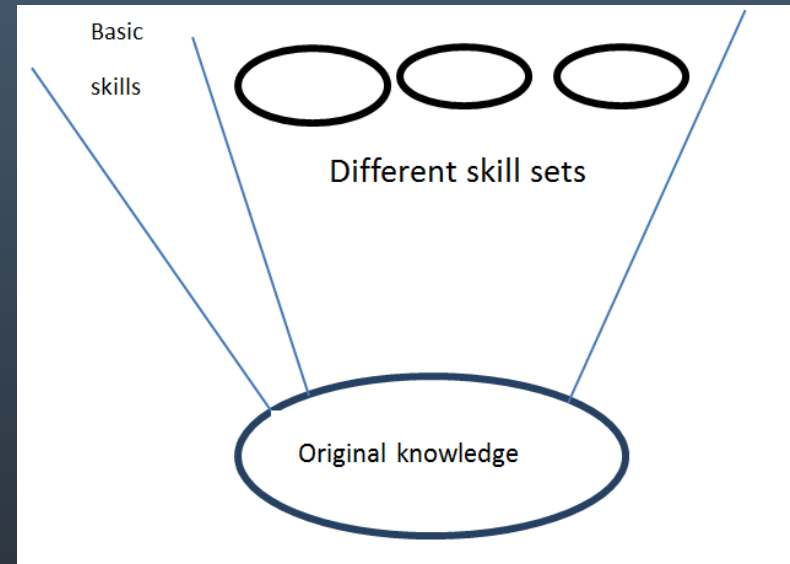
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- **What is IQP?**
 - Interactive Qualifying Project (IQP) at WPI
 - Deals with the relationship between technology and society.
 - Central feature of the WPI Plan
 - The goals of the Plan:
 - promote learning by doing through project work,
 - maximize student choice in designing their own educational programs,
 - ensure that students had competent as professionals, literate in the humanities and understood the societal implications of their professional work.
- **Importance of IQP**
 - Vital to WPI's claim to have a project-oriented program. Many colleges, including liberal arts colleges, require senior year theses in a student's major discipline.
 - The IQP is the means which WPI has chosen to make science and engineering students aware of the role of their professions in society.
 - The IQP is by design interdisciplinary.
 - The IQP is the major element of another important pillar of the WPI educational philosophy, that is the freedom of students to make their own educational choices.
 - The IQP is essential for our off-campus programs.

Introduction – Project Topic

- Software engineering is fast-moving
- Part of the skill sets obsolete every 3-5 years
- How do professionals in other fast developing technical industries deal with this issue?
- What are the best practices within SE to deal with issue?
- What can software engineers learn from them to stay up-to-date?



Industry Overviews

Interviews

Previous Research Papers

Industry Investigation

Company Investigation

- Industry Overviews:
13 Industries
- Interviewees: 13 total
 - Software Engineers: 7
 - Medical Professionals: 2
 - Chemical Engineer: 1
 - Game Developer: 2
 - Professional Development: 1
- Industry Investigation: 4
 - Game Development
 - Medical Industry
 - Chemical Engineering
 - Mechanical Engineering
- Company Investigation: 4
 - Mass General Hospital
 - EMC
 - Google
 - General Motors

- Recommendations for software engineering companies
- Suggestions for individual software engineers
- Example for future WPI Interactive Qualifying Project groups
- For us:
 - Graduation requirement
 - How to work as a group
 - How to conduct research
 - How to perform technical writing


First of All – Self-Motivation

- Interest-driven
- Companies provide resources
- Initiate opportunities

- Microsoft
 - MyLearning
 - Channel9.msdn.com
- Mass General Hospital
 - MGH Leadership Academy
- Children’s Hospital Boston
 - Net Learning
 - My Yearly Report
 - Equipment Training
- General Motors
 - Technical Education Program



Microsoft Channel9 Website







Delivery Modes

Blended Learning Model – Maximize your Learning Efficiency and Experience

Leverage a variety of options

Not everybody learns the same way, or at the same pace. Some like a classroom environment, others do well with self paced methods that are easier on your time and budget. Choose from traditional classroom training (with hands on labs) or online learning where the pace of instruction is up to you. Watch for these icons when selecting your course.

 <p>Instructor-Led Training (ILT) Traditional classroom training, usually with hands-on labs, given at one of our many training centers worldwide, by a highly qualified EMC instructor. View Facilities and Labs ></p>	 <p>e-Learning Downloadable, self-paced training, generally 1 to 3 hours in length which can be accessed directly over the Internet, or downloaded to your PC for use any time.</p>
 <p>Video Instructor-Led Training (VILT) Video content of actual Instructor-Led Training (ILT) packaged in a convenient DVD format, with an intuitive navigation menu. Lecture content, simulated demos, and student materials are identical to the ILT. Video-ILT Testimonial (EMC Customer) ></p>	 <p>Online Instructor-Led Training (Online ILT) A real-time interactive training experience where students access a live audio instructor session with slides. Lecture, discussion, questions and answers, and lab exercises make this a rich and flexible training experience. Online ILT Course Participant Instructions ></p>

- EMC
 - Education Services
- Johnson & Johnson
 - eUniversity
 - School of Personal and Professional Development
 - Management Education and Development
- Ubisoft
 - Ubisoft Campus

- Software Engineering
 - Splash
 - ICSE
- Chemical Engineering
 - AIChE Spring Meeting
- Game Development
 - Game Developers Conferences (GDC)
 - Boston Post Mortem
- Nursing Industry
 - American Nurse Association Meetings

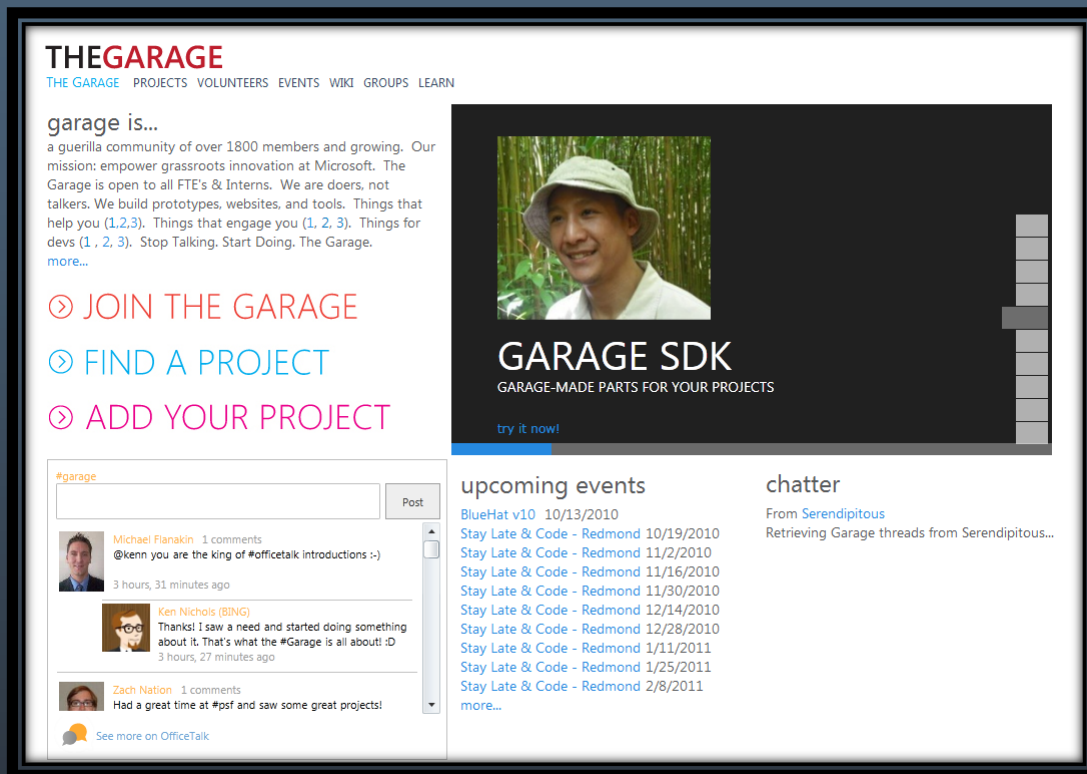


- Mostly part-time
 - Flexible hours
 - Related to current or future jobs
 - Either degree or individual classes
 - Self-initiated
- Examples:
 - Microsoft
 - EMC
 - Johnson & Johnson
 - General Motors
 - Nintendo
 - MGH

Common Approaches - Certifications

- Doctors
 - Full physician's license
 - Specific license
- Nurses
 - National Council Licensure Examination (NCLEX)
 - Registered Nurse
 - Practical Nurse
- Engineers (but not software engineers)
 - Professional Engineers License
- EMTs
- Actuaries & Accountants
- Auto Mechanics

- Microsoft
 - “The Garage”
- Google
 - “20% Time”
- 3M
 - “15% Time”



THE GARAGE
 THE GARAGE PROJECTS VOLUNTEERS EVENTS WIKI GROUPS LEARN

garage is...
 a guerilla community of over 1800 members and growing. Our mission: empower grassroots innovation at Microsoft. The Garage is open to all FTE's & Interns. We are doers, not talkers. We build prototypes, websites, and tools. Things that help you (1,2,3). Things that engage you (1, 2, 3). Things for devs (1, 2, 3). Stop Talking. Start Doing. The Garage. more...

[JOIN THE GARAGE](#)
[FIND A PROJECT](#)
[ADD YOUR PROJECT](#)

GARAGE SDK
 GARAGE-MADE PARTS FOR YOUR PROJECTS
 try it now!

#garage

Michael Flanakin 1 comments
 @kenn you are the king of #officetalk introductions :-)
 3 hours, 31 minutes ago

Ken Nichols (BING)
 Thanks! I saw a need and started doing something about it. That's what the #Garage is all about! :D
 3 hours, 27 minutes ago

Zach Nation 1 comments
 Had a great time at #psf and saw some great projects!

See more on OfficeTalk

upcoming events

- BlueHat v10 10/13/2010
- Stay Late & Code - Redmond 10/19/2010
- Stay Late & Code - Redmond 11/2/2010
- Stay Late & Code - Redmond 11/16/2010
- Stay Late & Code - Redmond 11/30/2010
- Stay Late & Code - Redmond 12/14/2010
- Stay Late & Code - Redmond 12/28/2010
- Stay Late & Code - Redmond 1/11/2011
- Stay Late & Code - Redmond 1/25/2011
- Stay Late & Code - Redmond 2/8/2011
- more...

chatter
 From Serendipitous
 Retrieving Garage threads from Serendipitous...

Microsoft “The Garage” Program Website

Stretch Goals



Work Challenge

- EMC
 - Professional knowledge reading
 - Teach a class
- IBM
 - May achieve when stretched
 - Increase difficulty



- Tata Motors
 - All engineers rotate jobs every 3 months for 2 years
- EMC
 - Different program duration based on divisions
 - Three different functional teams
 - Training on technology and personal skills
- Google
 - Employees encouraged to switch jobs every 3 years



- Game Industry
 - Magazines in the hallway
 - Game developer websites
 - Email news update
 - Participation in developer forums



- Children's Hospital Boston
 - Experienced & new nurses collaborate for 1 year
- Microsoft Corp.
 - Central website for matching up mentors & mentees
- Fidelity Investments
 - Mentor-driven program
 - Mentor assigned for each new hire

- Conclusion from previous research papers on similar topics
- Interviews & Personal Communication
- Company and Industry Investigation
 - Company website
 - Professional Organization website

Evaluation – Highly Recommended



- Offer Internal Training
 - Convenient, Immediate
 - Wide variety of courses
 - More helpful if job-related
- Encourage Conference Attendance
 - As shown in [Table 2](#)
 - Background research showed it was very important
 - Newest ideas and technologies can be found at them
- Facilitate Informal Presentations
 - In-building/on-site convenience
 - Great introduction to a new topic

- Create Challenging Work
 - As shown in [Table 1](#)
 - More challenge = Less obsolescence
- Reimburse Tuition
 - Encourages employees to pursue a higher degree
 - Benefits both company and employee
- Listen to Individual Initiative
 - As shown in [Table 3](#)
 - Builds self-motivation

- Organize Mentoring Program
 - Experienced employees have a lot of knowledge to share
 - Good for in-depth knowledge without a class
- Provide Rotation Program
 - Prevents engineers from getting set in a routine
 - Lets them to learn things they might not have
- Organize Side Projects
 - Engineers can work on interesting self-directed projects
 - Companies can adopt these projects

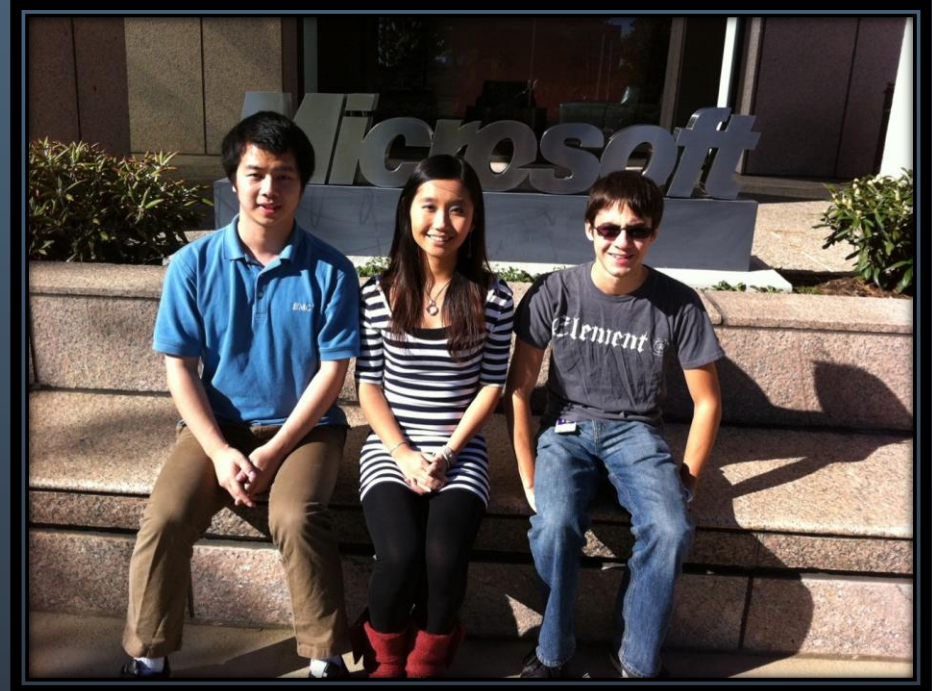
- Encourage Networking
 - Opens new opportunities for learning and jobs
 - Does not directly lead to learning
- Give Freedom to Explore
 - Engineers reluctant to learn things that they aren't interested in
- Subscribe to Industry News
 - Good for introductions to new topics
 - Must go elsewhere for more in-depth learning

- Conduct Annual Reviews for Professional Development
 - Provides motivation for employee
 - After a while might stretch too much
- Post Internal Jobs
 - Employees can work in positions they like more
 - No direct correlation to professional development

Evaluation – Not Recommended

- Require Licenses
 - Can use \neq Can create
 - Time spent on passing the exams rather than learning the materials
 - Exams might not cover fast developing fields
 - Engineers generally not like/have licenses
- Reward Professional Development
 - As shown in [Table 3](#)
 - Interviewed software engineers do not agree

- We would like to thank:
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Evaluation – Highly Recommended

Work Challenge

Career Attribute	Obsolescence Score		
	Current Knowledge	Emerging Fields	
Technical Responsibility	Limited	116.1	65.2
	Moderate	117.5	67.8
	Extensive	122.2 ¹	72.0 ²
Engineering Function	Operations/Const./Prod.	113.8	65.0
	Sales/Mgmt./Teaching	116.9	68.7
	Design	120.5	67.3
	Research/Development	122.0 ³	70.3 ⁴
Administrative Duties	Primarily Technical	120.5	68.6
	Both	118.0	68.2
	Primarily Administrative	113.4 ⁵	66.5 ⁶

Table 1: Variance between Career Attributes and Knowledge Obsolescence (Robert A. Rothman, Robert Perrucci. Vulnerability to Knowledge Obsolescence among Professionals. *The Sociological Quarterly*. Spring, 1971, 12.)

Note: 1F = 18.65, p < .001
 3F = 20.43, p < .001
 5F = 24.65, p < .001

2F = 59.90, p < .001
 4F = 24.60, p < .001
 6F = 6.33, p < .001

Attending Conferences,
Join Professional Organizations

Professional Characteristics		Obsolescence Score	
		Current Knowledge	Emerging Fields
Professional Activities	Limited	111.3	61.2
	Moderate	115.9	66.4
	Extensive	123.3 ¹	72.3 ²
Achievement Orientation	Low	115.3	64.4
	Medium	116.8	67.8
	High	120.5 ³	70.2 ⁴

Table 2: Analysis of Variance between Professional Characteristics and Knowledge Obsolescence
(Robert A. Rothman, Robert Perrucci. Vulnerability to Knowledge Obsolescence among Professionals. *The Sociological Quarterly*. Spring, 1971, 12.)

Note: ¹F = 56.88, p < .001
 ³F = 23.08, p < .001

²F = 153.50, p < .001
⁴F = 49.82, p < .001

Evaluation – Highly Recommended

Rewarding Policies

Organizational Climate		Obsolescence Score	
		Current Knowledge	Emerging Fields
Frequency of Rewarding Professional Activity	Seldom or Never	118.7	67.7
	Occasional	118.7	68.5
	Often	116.6 ¹	67.7 ²
Work Force in R&D	None	116.9	66.8
	1 to 29%	117.1	66.7
	30 to 49%	118.6	69.9
	50% and more	120.9 ³	69.7 ⁴
Professional Climate	Weak	117.7	67.5
	Strong	118.7 ⁵	68.6 ⁶

Encourage Individual Initiatives

Table 3: Analysis of Variance between Organizational Climate and Knowledge Obsolescence

(Robert A. Rothman, Robert Perrucci. Vulnerability to Knowledge Obsolescence among Professionals. *The Sociological Quarterly*. Spring, 1971, 12.)

Note:

¹F = n.s.

³F = n.s.

⁵F = 4.96, p < .001

²F = n.s.

⁴F = 6.05, p < .001

⁶F = 15.69, p < .001



- Pictures:
 - <http://theperfectpayplan.typepad.com/.a/6a00e552b195b9883401156f1899ef970c-800wi>
 - http://www.trinoteam.com/images/press/gamasutra_t_rino.jpg
 - <http://www.derekyu.com/images/art/gdmag-pacman.jpg>
- Video:
 - Main Page, ShiftHappens
<http://shifthappens.wikispaces.com/>, Access Date:10/08/2010