Closing the Gap with Contract Research: Successful Transition of Research into Application

Systems Testing Excellence Program

By
Dr. Robin Poston

6th Annual SERC Sponsor Research Review
December 4, 2014
Georgetown University
School of Continuing Studies
640 Massachusetts Ave NW,
Washington, DC

www.sercuarc.org

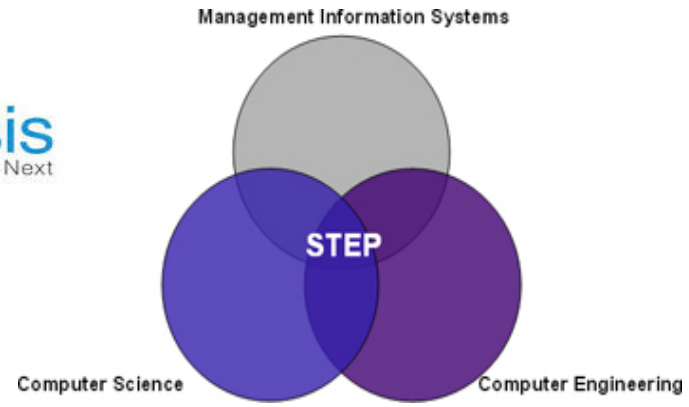
A Partnership for Advancing the Science of Testing

System Testing Excellence Program

FedEx

Mphasis
Unleash the Next

SYNTEL
Consider IT Done®



DISA
A Combat Support Agency

ELSEVIER

APPLAUSE®
WINNING APPS GET IT

LOCKHEED MARTIN

NRI 未来創発
Dream up the future.

COOK SYSTEMS INTERNATIONAL INCORPORATED

CISCO

AutoZone®

Thomas&Betts

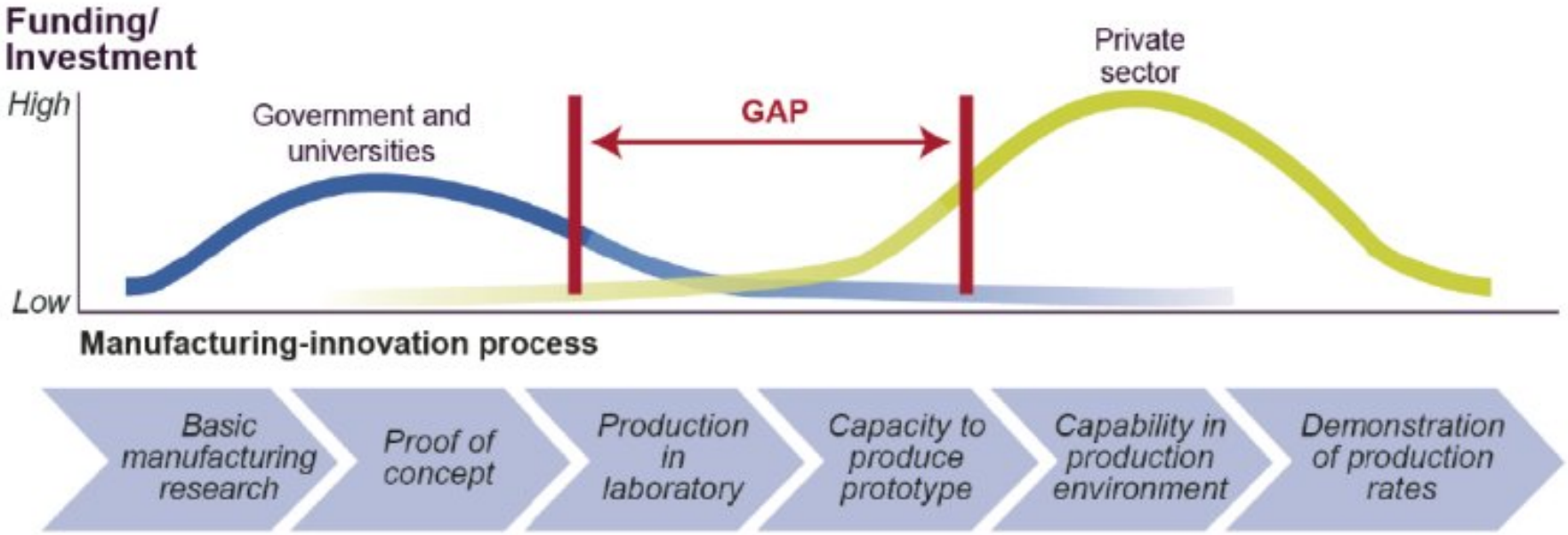
2

Software-Intensive Systems Testing

- Functional Testing
- Stress Testing
- Dark Testing
- White/Black/Grey Testing
- Regulatory Testing
- Risk-based Testing
- Exploratory Testing
- Infrastructure Testing
- Database Testing
- Requirements Testing
- Alpha/Beta Testing
- End-to-end Testing
- Configuration Testing
- Coverage Testing
- Load Testing
- Boundary Testing
- Localization Testing
- Unit Testing
- Integration Testing
- Systems Testing
- Performance Testing
- User Acceptance Testing
- Operability Testing
- *Please add …… 143??*

Contract Research in Testing

- How do we get our outsourced testing vendor to innovate so that we remain on the cutting edge?
- How do we test the quality of program designs?
- The CIO wants a ROI computation for investments in testing?
- What exactly does a tester do in agile scrums?
- How do we use test instrumentation and pattern matching for automatic failure identification?
- What is the best fitness function to find feasible sequences of method calls for evolutionary testing of object-oriented programs?
- What is the quality of automatically generated test cases based on OCL expressions?
- What statistical sampling based approach can be used to alleviate log replay testing?



Research model:	**NSF/NIH/other Grants** focused on specific industry – wide challenges (non-commercializable)	**Contract Research** using science to examine specific company challenges *	**R&D** focused on business sustainability and return on investment (commercializable)

* STEP addresses the GAP in systems testing as academics work with government agencies and private companies to develop new ideas about the specific challenges. Our research provides input for organizations for process innovation and published papers to generate more knowledge.

ITEA Journal 2012; 33: 324–326

Preparing the T&E Workforce for the Speed of Need

Tony Stout
Defense Information Systems Agency (DISA)
Robin Poston, Ph.D. and Jasbir Dhaliwal, Ph.D.
Systems Testing Excellence Program (STEP)

Given the goal of testing at the speed of need—which requires agility, flexibility, and accelerated testing by the test-and-evaluation (T&E) workforce—a critical enabling factor is the advancement of capabilities of key T&E organizations. The goal is to shift from a strong focus on managing people and projects to one on strategically measuring and maintaining a bundle of organizational technical skills and competencies that ensure future success. It is a modern strategic imperative that an organization fully understand its pre-existing skills-and-competencies profile and develop consensus around a targeted skills-and-competencies profile for future success. A deep appreciation of the gaps between these two profiles must then systematically drive all training, hiring, work allocation, contracting, and related human-resource management decisions over an extended period of time.

As the Department of Defense moves away from system-centric development and relies more heavily on software-driven services offered at the enterprise level, both the speed and accuracy at which these services are delivered become key value factors for the users. Recognizing this evolution in need is paramount to developing the workforce; such a recognition led the Defense Information Systems Agency (DISA) and the Joint Interoperability Test Command (JITC) to conduct an internal review of skills and competencies as they relate to T&E. This effort would lay the

meetings, and administer employee questionnaires to fully understand the mission, scope, and context of the work being performed by the T&E workforce.

- **Phase 2: Survey the workforce.** Develop, execute, and analyze the results of a customized skills-and-competencies (S&C) survey.
- **Phase 3: Postsurvey analysis.** Analyze survey data and provide a comparison of current skills inventory against the organizationally submitted TO-BE S&C profile, with recommend courses of action.

Phase 1 (preliminary research) included research into the roles, responsibilities, skills, and competencies of the DISA/JITC T&E workforce. This effort included the iterative development of skills-and-competencies analysis categories for use in a customized online questionnaire, through the use of data collected using a paper-based questionnaire from identified workforce members. The primary goal was to develop the categories for an online survey to provide an AS-IS competency portfolio to serve as the basis for a customized training program for skills improvement based on the development of a TO-BE skills-and-competency portfolio for future success. While the team projected a TO-BE profile at the data-analysis stage, this must ultimately be defined at both organizational and suborganizational levels and must be clearly aligned with the roles and responsibilities of the unit—whether at the division, portfolio, branch, or team level.

During Phase 2 (survey), the STEP team used data

STEP Research-Based Certifications

- Foundational Certification in Systems Testing
  - —Five Days (10 half-day modules and exam)
- Advanced Certification in Systems Testing
  - —Ten Days (20 half-day modules and group project)
- Agile Development and Testing Boot Camp
  - —Three Days

Certification Modules

- The Science of Testing
- Test Planning and Management
- Systems Testing; Requirements Testing
- Test Process Improvement Models
- Test Coverage and Test Techniques
- Testers and Users and Developers
- Risk-Based Testing
- Security Testing
- Defect Management
- Problem Solving and Quality Assurance
- Agile Testing
- Distributed Global Test Effort
- Testability and Exploratory Testing
- Automation/Integration of Test Tools
- Database Testing
- Graph and Logic Coverage
- Statistics and OR for Testing
- High Performance Test Teams
- Quality Gates and Business Rules Testing
- And more….

SYSTEMS ENGINEERING
Research Center

Systems Testing Excellence Program

mibio | MEDICAL

Memphis Institute for Biomedical Innovation & Healthcare Solutions

In partnership with

IBM THE UNIVERSITY OF MEMPHIS CBU

Vision

To become an international focal point for the development of advanced biomedical innovations and healthcare solutions by building a network of experts that offer solutions for the complex, data-driven medical device market.

INNOVATION
community driven and measured

TECHNOLOGY & RESEARCH
biosensors, embedded software, etc.

STEM EDUCATION
developing future STEM professionals

COMMUNITY
empowering and promoting Memphis

SYSTEMS ENGINEERING Research Center

IBM THE UNIVERSITY OF MEMPHIS CBU

INNOVATION initiatives

- Promotion of social innovation
- Ethnographic needs finding
- Software development tailored for medical device product development: feasibility to surveillance

STEM+M EDUCATION initiatives

- K-12 teacher & student collaborative project and innovation workshops
- IBM Rational implementation in education
- Real-world product development experiences for students and educators

TECHNOLOGY & RESEARCH areas

- Embedded software, biosensors
- Software and testing for biomedical devices
- Biologistics
- Medical device identification management

COMMUNITY involvement

Mibio strives to utilize the strength of the unique Memphis community as well as regional, national, and global partnerships to empower all involved.

Activity & Progress

Meeting & Panel Discussion

April 2014 :: Memphis

Innovate 2014 Conference

June 2014 :: Orlando

IBM Software
Innovate2014
The IBM Technical Summit
Innovate@SPEED

2014 Ongoing Efforts

Summer – Fall 2014

- STEM innovation project model (St. Mary's, St. George's, CBHS)
- Customized solutions in development by tech areas
- IBM Rational tools installed at UofM, CBU
- Workforce education grant drafted to NIH, industry

We are leveraging Memphis's strengths to develop advanced healthcare solutions.

Hosted 8th International Research Workshop on Advances and Innovations in Software Testing and Annual ITEA Technology Workshop

step.memphis.edu

November 3-4, 2014
Memphis, Tennessee

FedEx Institute of Technology
The University of Memphis