Workforce Capability Development for eResearch: what skills do we really need?

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INTRODUCTION

In early 2011, GA, in collaboration with CSIRO Minerals Down Under (MDU) Flagship Program, and the National Computational Infrastructure (NCI) at ANU, GA began a series of eResearch projects that have focussed on applying advanced ICT tools and technologies to enhance scientific outcomes for the agency. Three GA projects volunteered to be part of a pilot project and scientists worked in collaboration with a CSIRO MDU technology team to develop tools, workflows and an eResearch portal to assist with the discovery, access and processing of scientific data. By the end of 2011 it was clear that a more formal eResearch Agenda would enable GA to use new ICT technologies to exploit an information-rich world to undertake applied research and to deliver new business outcomes in ways that current technologies do not allow.

From the start of the GA eResearch pilot project, it was apparent that the projects that volunteered to be part of the pilot had the necessary skills to rapidly adapt to eResearch techniques. In scaling out to the rest of the organisation, the key question was whether the other projects had the necessary scientific and technical skills. To address this question, the Strategic People Development Section (HR) of GA Corporate Services agreed to:

• Conduction a capability analysis of the GA scientific staff that participated in the pilot including a review of university training and post graduate training; and
• Conduct capability analysis of the CSIRO technical groups involved in the deployment of the GA eResearch portal and the three eResearch pilot projects.

HOW WE APPROACHED THE PROJECT

Questions were designed and a template was used to generate and document the data gathered. The questions for each participant related to their Qualifications and how they have applied them at work (knowledge application), Job Experiences (that are directly relevant to eResearch functions / achieving results), Skills/knowledge (that they apply in eResearch functions) and behavioural attributes identified as key for eResearch. Each participant was also asked to define what they felt were the core elements of eResearch. Twelve scientists participated from GA and 5 technical staff participated from CSIRO. This is accepted as not necessarily being a statistically viable sample, but yet the results from both teams were internally consistent.

FINDINGS (FOLLOWING DISTILLATION OF DATA PROVIDED/CONVERSATIONS):

1. Both teams defined the core elements of eResearch as:
   • Being directly connected to electronic data and enabling scientists to work directly on the observational data, rather than on syntheses of sub-sampled data;
   • Enabling probabilistic analysis with multiple scenarios being investigated and uncertainties being quantified;
   • Being characterized by technical innovation and undertaken by those willing to work on cutting edge of problem solving; and
   • Requiring computers to enable it and humans to drive it!

2. The academic/qualification composition of GA Scientific team ranged from BSc’s to PhD and comprised of qualifications relating to mathematics, applied mathematics, and geophysics with some computational science, modelling and numerical analysis.

3. The academic/qualification composition of CSIRO technical team also ranged from BSc’s to PhD with the vast majority holding qualifications relating to computer science, programming, mathematics, physics and geophysics. Most had some scientific qualifications, but there was a much stronger focus on computer science/software engineering than in the GA scientific teams.

4. The identified key enablers by the teams for institutionalising eResearch within the workforce were:
   • Organizational agility;
   • A specific eResearch enabling team to support the scientists;
   • An approach to fostering early adopters; and
   • Skilled Software developers.
CONCLUSIONS
The following conclusions were made from the questionnaires:

- Overall, eResearch requires a culture of multi-disciplinary teams - system designers, scientists, computer scientists and information management specialists working collaboratively with specialized scientists;
- All CSIRO technical participants listed the ability to communicate and actively listen was the most important attribute for an eResearch expert;
- The scientific workforce needs of the future within an eResearch platform require a scientific workforce that is heavily characterized by greater capacity in mathematical, numerical modeling, statistics, computational skills, software engineers and spatial skills including the capability for integration of data across multiple domains;
- The qualifications of CSIRO technical team ranged from BSc level to PhD: they also had many years experience in developing eResearch tools, portals and technologies.
- The profiling of both teams involved in the GA/CSIRO eResearch project provided valuable evidence-based information and understanding regarding the skills, qualifications and characteristics of those that participated in the eResearch pilot.
- These understandings could also be used to inform recruitment, re-assignment and Learning and Development strategic decisions.

ABOUT THE AUTHOR(S)

Lesley Wyborn is a granite specialist by training and joined the then BMR in 1972. She has held a variety of positions as the organization changed to AGSO and to Geoscience Australia. She has been involved in eResearch projects since 2000 and with CSIRO was one of the founders of the Solid Earth and Environmental Grid (SEE Grid – http://www.seegrid.csiro.au). With Robert Woodcock and other CSIRO staff, she was part of NCRIS/SuperScience projects such as AuScope Grid, SISS and the NeCTAR Virtual Geophysics Laboratory.

Christiana Eze is the Director – Strategic People Development Geoscience Australia. She has an MBA Degree in Public Administration and has managed a wide range of strategic human resources management projects. She specialises in workforce planning, leadership and management development, change management and coaching within the Public Sector Environment.

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Tony Marks is the General Manager, Corporate at Geoscience Australia. Prior to this role, he was the Deputy Chief Executive (Corporate) and CFO of the Australian Institute of Criminology. Tony has 25 years of experience in the public and private sectors, ranging from taxation and treasury to strategic financial management, integrated corporate services and business transformation. He has held senior financial positions with ActewAGL and the Defence Housing Authority and has been a member of several Boards.