

Humanware – The Critical Importance of People in Cyberinfrastructure

The Evolving Role of the Cloud and the Importance of *Humanware* to Research

Humans in the Loop: Enabling and Facilitating Research on Cloud Computing Workshop
A workshop for PEARC19 – Chicago, IL July 29, 2019

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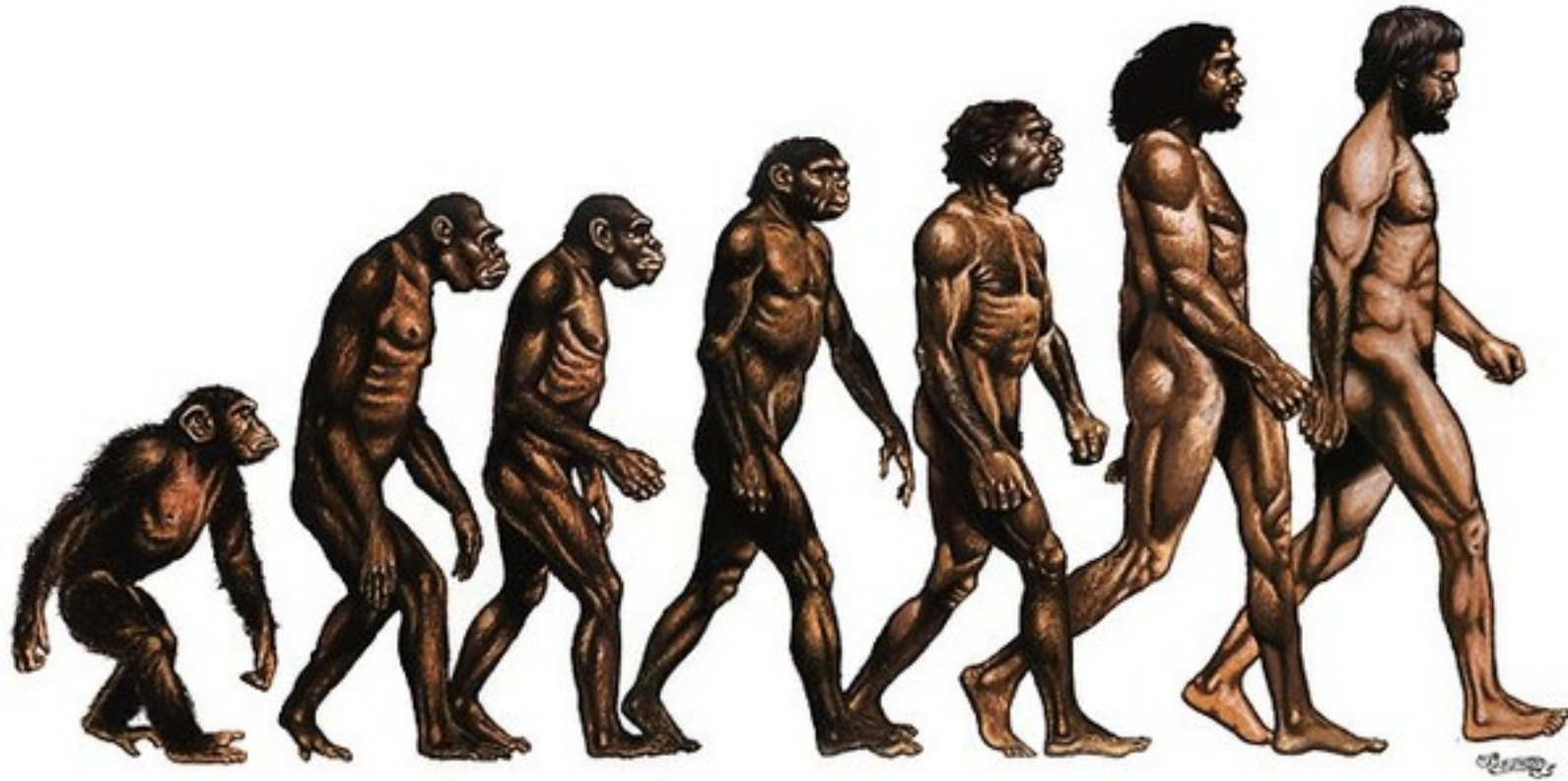
Who I am, what I've done, how I see things ... and why

- I am **not** a researcher – ***I'm a suit*** (perhaps a 'fallen' suit)
 - Central IT roles in leadership, CIO/Campus Executive
 - Board/Advisory positions in several key cyber areas
- Active & Recognized voice in the CIO community
- I am kinda like 'Forrest Gump'
- I am more of an op-ed writer than a scientific investigator

Fundamental Premise of Users of Technology



HEY MAN ... I JUST RIDE 'EM. I DON'T KNOW WHAT MAKES 'EM GO.



Humans in the Loop

- In the beginning, computing and support was centralized
- Evolution of the technology of computing/IT drove change
 - Distributed ‘mini-computers’ in the late 70s and early 1980s
 - Personal computers in the late 80s and 90s
 - Advent/Advance of parallel/cluster computers in the 90s
- Role of central IT also played a part in the distribution of computing/IT
 - *(Not usually by design or in the best ways ...)*

The Rise of Local/Distributed Support

- Distributed systems still required support
- Best support is that which comes when you yell for it
- A model emerged – or was it a paradigm?
 - The role of the user (be generally knowledgeable)
 - The role of local support (technical, but part of the local culture)
 - The role of central IT
 - Give users training and tools (online knowledgebase, HelpDesk, etc.)
 - Support Local Support Providers (training, tier-2 tech, build community)
 - Provide deep support in some areas (e.g., cyberinfrastructure)

Humans in the (Research/Cyberinfrastructure) Loop

- Research use of computing/CI has had its own history
 - Centralized ‘supercomputers’
 - National Centers
 - ‘Closet Clusters’
- People in roles supporting CI use in research vary
 - Central IT system and application-area experts
 - Grad students, Post Docs, local staff
 - Technically interested and astute faculty/researchers

The Premise of the importance of Humans

- The most effective use of technology comes when those who use it are capable of fully understanding its use and application to their challenges

OR ...

- Those who use it are supported by people who are capable of fully understanding its use and the application to the challenges faced in given disciplines

This latter situation is where humanware is relevant

Humanware?

- **Cyberinfrastructure** – defined as comprising “computing systems, data storage systems, advanced instruments and data repositories, visualization environments, *and people*, all linked together by software and high performance networks to improve research productivity and enable breakthroughs not otherwise possible.”
- In 2011, the National Science Foundation Advisory Committee for Cyberinfrastructure (ACCI) Task Force on Campus Bridging published its final report, wherein the need for address and funding of *humanware* was articulated.

https://www.nsf.gov/cise/oac/taskforces/TaskForceReport_CampusBridging.pdf

What that report said about Humanware

“Time and again, at all levels of the acquisition and deployment of information technology through the past several decades, we have seen that without this humanware component – the people who make all the other components work – investments made in those other components – however significant in amounts! – do not realize their full potential without attention to and investment in the support of their use by scholars. Scholarly productivity and knowledge breakthroughs and discovery, however enhanced they may be by advanced cyberinfrastructure do not reach their full potential without the human element.

Aye, there'\$ the rub ...

- While the report highlights the importance of the need for humanware, it did leave open the question of where responsibility for support for its provision would rest – with funding agencies, or with the institutions that received funding?
- This key question remains, and further explanation and justification of the role people play is required to lead to better address of this question.

A [former] CIO's view

- We spend a \$-load of money on buying all the other 'wares' in cyberinfrastructure, but are challenged to devote funds to humanware
 - Institutions are reluctant for a wide variety of reasons/challenges
 - Funding agencies (NSF, NIH, etc.) are similarly reluctant
- Why is that?
 - “Stuff” can be purchased with one-time money (though that conveniently ignores the need to eventually replace it)
 - “People” require ongoing commitment (in most cases) and that kind of money is harder to come by in budgets

What's happening at Research Universities *

- Pressure in trying to establish and/or sustain investments in CI
- Many priorities for central IT making it very hard to focus on research enablement
- Lack of good research-savvy IT leaders (CIO pipeline issues)
- Lack of understanding/appreciation for IT/CI among institutional executive leadership (presidents, provosts, CBOs, Boards)
 - Not helped by a lack of good ROI data for IT/CI investments

** My opinion as an observer of higher education*

Directions from funding agencies (e.g., NSF) *

- Overall funding reductions due to politics in the US government
- A sense that investing in campus infrastructure is something institutions should be funding rather than asking for federal grants
- A sense that the 25-year effort to establish, expand, and maintain ‘National Centers’ (NCSA, SDSC, PSC, TACC, Teragrid/XSEDE) is not sustainable
- Various funding programs establishing a ‘toe in the water’ for cloud credits as a replacement for capital infrastructure
 - Some awareness of the need for humanware

** My opinion as an observer of higher education*

Cloud Providers reaching out to researchers

- Amazon, Google, Microsoft (Azure), IBM, etc.
- However, all is not glittering gold ...
 - Tools, documentation, and support are not good
 - Lack of product-trained technical support (humanware)
 - Key challenges with overcoming the ‘ka-ching!’ element of cost per use

Humanware is more critical with the cloud

... And just as absent from strategies

- Cloud requires even more support for adoption and ongoing use
- Especially true if researchers eventually hope to see the various providers as 'commodity' ... being able to move from one to another based upon pricing and performance
- People are still a 'base-budget' resource ... hard to fund in shrinking budgets
- Skill levels with cloud environments are lacking and the vendors don't have good programs for education and certification
 - *Real challenges in getting these same vendors engage in pedagogy on campus*
 - *Revisit the story of Microsoft Certification Programs in the 1990s*

ROI remains hard to grasp *

... no Buck\$, no Buck Rogers

- Metrics for the benefits of CI-enablement of research are hard to quantify and qualify
- Costs are more difficult to control in the cloud
 - Campus allocation and consumption versus \$/cycle or \$/TB costing
- Scientific data and analysis is illuminating the ‘woods dark and deep’ but we have miles to go before we sleep.
- In many cases, there is an intuitive feeling that CI investments advance research, but it is largely an act of faith on the part of administrators

** My opinion as an observer of higher education*

What we're doing at Indiana University



INDIANA UNIVERSITY



Humanware Advancing Research in the Cloud — HARC

TEAM



Humanware – Advancing Research in the Cloud (H-ARC)

<https://humanware.iu.edu/>

Objectives:

1. To study and improve the understanding within the higher education community of how people in support roles – *Humanware* – advance the use of cloud-based cyberinfrastructure (CI) in the advancement of research at universities.
2. To provide detail in the form of ‘return on investment’ (ROI) of the use of cloud-based CI by offering case studies on its use as compared to campus-based or existing national CI resources

Humanware – Advancing Research in the Cloud (H-ARC)

- Funded by Microsoft through June 2020, part of a global initiative
- Platform (vendor) agnostic – looking at how human resources impact adoption of cloud CI
- **Progress to date – This workshop and the papers to be published**
- Plans for next phases (Partners in Advancing Research in the Cloud)



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