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THE LIVES AND TECHNOLOGIES OF EARLY CAREER RESEARCHERS

EXECUTIVE SUMMARY



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Executive Summary

The early career researcher (ECR) is a PhD student or postdoc, who has only been in their field of research for a few years. ECRs may be a force for change in research processes and technologies, flexible and willing to experiment with new systems, but this affect may be moderated by the more conservative researchers who work with, and in some cases supervise, them.

Every early career researcher is uniquely situated in career stage, research area, discipline, networks, and objectives. Nonetheless, their experiences share some common features. ECRs are attempting to build their professional research profile, whilst often trying to fit in to a new environment, be that a new discipline, institution, group or role. Short degree courses and short term contracts mean that many early career researchers have lives punctuated by change. Throughout, they are aware of complex issues of trust, an example of which is the delicate balance between mutual support from peers, and competition for funding, jobs, and publications.

Day-to-day, early career researchers' lives have much in common, even across quite different disciplines. Their work involves them in a wide variety of tasks throughout the research lifecycle - seeking new information, gathering data, analysis, reflection and discussion, and publishing - plus teaching and administrative roles. ICT plays a role in almost all these activities, and ECRs choose the tools they use with care, balancing the costs and benefits of each.

People and relationships play a key role in the ICT experience of the early career researcher.

Early career researchers are members of multiple networks, frequently overlapping, with subtly graduated relationship types and trust levels. For whatever reason, physically proximate relationships are currently dominant in the lives of many ECRs; particularly strong relationships are characterised by the use of multiple redundant communication channels or technologies. It can be argued that the development of early career researchers would be enhanced by a more distributed network, which is not always possible today due to the often limited travel funding for conference attendance and visits; online scholarly networking could support this instead. Work-life balance is important to early career researchers, who wish to retain their own boundaries between professional and social activities, even if those boundaries are blurred.

The culture and practices of a discipline, or research group, often dominate choices about the ways in which technology is used. Traditional methods - even pen and paper - still play an important role for many early career researchers. Email is also still widely used, although this is often forgotten in discussion of communication technologies today. Early career researchers are happy to repurpose non-academic technology tools for scholarly use, although this practice is not widespread. Awareness of novel ways of using tools spreads generally via networks. Serendipitous discovery of new tools and methods through word of mouth is also very common and appears to be one of the best ways to find out about new systems or practices.

Despite many ECRs being interested in trying out new technologies, 72% of early career researchers reported that they did not even use Web 2.0 or social media to share their research. This may reflect the many and varied constraints which limit ICT take-up amongst early career researchers, perhaps including norms of secrecy in research practice; this study found social, confidence, skills, institutional and participatory constraints on technology use by ECRs.

Any tool used for collaboration or communication requires that all those engaged in the work must have the tool available to them, and be capable of using it, and choose to do so. This can limit the adoption of new technologies, as many groups will include a mixture of more and less technically-savvy researchers (whether early career, or established), and any tool which is to be used across the group must be acceptable to all. Other researchers who may view new technology

(particularly 'social web' tools) with scepticism, or as frivolous, can discourage early career researchers from using, or promoting, these systems.

The landscape, then, is one in which each early career researcher uses a set of technologies they have chosen (within the constraints they experience), provided by a range of organisations (including their institution, commercial providers, and other sources), to undertake the many tasks related to research, as well as teaching, administration and social activities. Early career researchers appreciate the benefits of new technologies, but need to see that the advantages outweigh the effort and costs of adopting them, and the various constraints noted above may block researchers from moving to more efficient and effective working practices supported by new ICT systems.

Tools to support research

The virtual research environment should be thought of as the portfolio of tools and systems which each ECR chooses to use during online research activities, whether or not they are integrated together.

Cloud-based systems, with clear governance and ownership, distinct from research programmes or institutions, will offer particular advantages to the early career researcher, in that they are more likely to move between projects and universities fairly frequently. We also identify a strong desire for data portability, alongside interoperability. We anticipate that data portability will become critical for the mobile ECR, as well as offering good long term support for data preservation and access so that projects can migrate their information between systems when required.

The academy should not neglect the scope for configurable tools for specific research groups and programmes. Generic, unconfigurable systems (whether large repositories and complex web front-ends and workflows, or simple tools crafted for a single purpose) may be insufficient to capture the specialist data types, research practices and culture of individual disciplines and programmes. Well designed systems, offering useful common functions but heavily configurable to meet the needs of a specific community, will be more able to meet the expectations of established (and growing) research groups and will be more likely to be widely adopted and used. They will also offer better sustainability and value for money, as the bulk of the software can be supported centrally and reused for many users and groups.

Scholarly networks

There is a clear need for a specialist professional networking system, with suitable arrangements for security, privacy and authority, to support early career researchers in the key activity of building their networks of people and resources. Any such system must respect the mobility of the ECR. Cloud-based systems may be particularly well-suited for this requirement. Personal data portability - controlled by the individual ECR - is a must, so that their investment in setting up a network of contacts and their online profile can be retained through career moves.

Design of new scholarly networks should recognise the distinction between the task of finding new people and new resources, and that of maintaining relationships, or communicating with people within a network.

Scholarly networks should also take into account the desire of the early career researcher to define their own work-life boundaries. Online networking systems should support the important social aspects of research life, including the online equivalent of tea-room interactions where possible. Strong networking technologies should not prohibit social functions, and institutions operating scholarly networks should accept and support their use for social purposes. Early career researchers will repurpose technology to their own ends, and this should be anticipated.

Designing for researchers

Early career researchers need tools which fit into their busy and varied lives, and which do not come with a heavy training overhead. This means that projects to create new technologies and tools should budget for time and resource to engage with the research community they are targeting. This might mean user research activity, followed by skilled user-centric design practices; or it may mean using developers who are embedded in the research environment, engaging with the culture and practices of the research group first hand. Well designed user interactions are key to reducing the barriers to take-up of new tools, and this should be considered at all stages of development projects. This must include genuine examination of the real workflows, and how they fit with existing and other research activities.

When we look at new technologies which aim to support open research practices, we must remember that technical barriers are only one reason why open research is not widely practiced today. There is a lot of focus currently on open notebook and open access practices, which are promoted in the expectation that they offer the early career researcher significant advantages, but the existing research policy environment means that policy and procedural changes are needed if these practices are to be encouraged.

Early career researchers appreciate having data online, and moving more research data onto the internet would be valued. The ways in which data is stored should be considered from day one, so that it is truly reusable in the future - this applies both to data from networked research equipment, and data from offline sources. Tools to support core research itself online must respect the context in which this happens - trivially appealing tools that do not create or sustain a compelling overall workflow will not be adopted.

Social change

Around the edges of any successful technology development must be a social environment in which the new system can be used. Institutions must ensure that policies and procedures - both central and local to research groups and departments - do not block new technologies from being deployed and used (inadvertently or otherwise).

Usability comments notwithstanding, some tools may be too complex to be used without training. Training and awareness-raising around new and existing tools must be available at the right place and the right time, and aimed at the correct level. This may mean training sessions offered through the year; separate training for ECRs at different stages of their careers (even within this group, there are very different support needs at different points); and particularly it may mean support for incoming ECRs who need to be able to hit the ground running in a new role. A useful research toolkit, perhaps tailored for each department or group - available to all new ECRs, showcasing both the available tools and the ones deemed useful by other researchers locally - would be a valuable aid in discovering what is available and how to access it, quickly.

Preferably, the skill acquisition around use of a tool should be designed into tools where possible, rather than being a time-consuming activity outside the normal research day. Imaginatively designed and constructed web systems can support users in learning whilst they undertake a real task with a new tool, ideally using their own data from the start. This speeds up evaluation of new systems within the real research context. We anticipate simple workflow support tools, capable of dealing with complex situations, and with peer support systems built in, being developed over the next five years, to meet the needs of busy researchers and to support rapid sharing of best practice.

If there is good support for serendipitous discovery and peer support around the technology (and the research processes supported by the technology), then the tool can expect to be evaluated - if not adopted - by more early career researchers, as they recommend systems to each other.