SGSSS-SDS Collaborative PhD Programme:

Topic Descriptions 2020

SDS presents the following themes as important areas of research in relation to skills development in Scotland. The topic outlines below provide the broad context for each theme and pose a number of key questions of interest to policy-makers and practitioners. Applicants are encouraged to design innovative PhD proposals based on these themes.

The PhD proposals will identify an appropriate starting title, frame the research objectives to align with both academic and policy interests and identify clear research questions that fit within the broad topic outline. There is also scope for fresh thinking in designing innovative and robust methodological approaches to answering the research questions.

For all of the PhD topics it is anticipated that a strong Scottish focus will be incorporated in the PhD (for example through case studies or fieldwork) whilst maintaining a broader, international context in relation to literature and theory.

The research findings from these topics will contribute to a new, collaborative body of knowledge which adds to the strategic and cross-cutting evidence base on skills. PhD students will join an emerging cohort of doctoral candidates engaged in collaborative, policy-relevant research around important skills-related issues, as well as becoming part of a thriving research community within the host university.

For further information on topics please contact Malcolm Greig (Malcolm.Greig@sds.co.uk – 0141 468 7500).

1. Future models of enriched careers advice using machine learning

Background

SDS has a well-established capability in developing and promoting digital careers services to complement their face-to-face Career Information Advice and Guidance (CIAG) offer. My World of Work is SDS’s award winning web service that provides support to people making careers decisions. It complements the work of careers advisers in schools and centres across Scotland. A refreshed site was launched in 2016, featuring a clearer and more intuitive service, and a focus on developing Career Management Skills (CMS), which is the foundation for SDS CIAG policy. CMS is based on the principle of individuals taking control of their own career journey, with appropriate guidance, and is therefore ideally placed to benefit from automated services. The My World of Work web service has been universally adopted in Scottish schools and now has over half a million registered users.¹

As the National Career Service for Scotland SDS has more than 600 expert careers staff offering free, impartial CIAG in schools, 63 SDS careers centres, our Customer Contact Centre and a presence in community venues across Scotland (see link). SDS is the only national careers service among the UK nations and is uniquely placed to benefit from the synergy around careers delivery, design and research. The proposed research will complement and build on the invaluable expertise and embedded wisdom of our advisors to enhance SDS services.

SDS also has extensive data on the progression of young people in their education and career, which is shared through the 16+ Data Hub, a secure web portal that our partners can access. The research will

¹ https://www.skillsdevelopmentscotland.co.uk/what-we-do/scotlands-careers-services/my-world-of-work/
explore how SDS’ knowledge on young peoples’ progressions can be used to help design a sophisticated AI system that will enable us to build a highly effective, accurate and ‘natural’ complementary virtual advice service.

This sponsored PhD is a unique opportunity to benefit from working with experts in a national agency and to build on the considerable investment already made in developing a digital careers service.

The Potential of AI and Machine Learning in Careers Advice

The possibilities offered by machine learning are increasingly being exploited in finance, healthcare and marketing to quickly and efficiently predict results and target services. Machine learning is based on algorithms that learn from data without relying on rules-based programming to draw conclusions or direct an action (McKinsey, 2017)\(^2\). It can provide autonomous automated decision making based on large and complex data that can be more consistent, accurate and faster than human decision making. AI advice systems are being successfully developed across a number of professions, examples including the following:

- **Legal**: [Professor Richard Susskind](#), advisor to the Lord Chief Justice on the UK’s online court future, argues that the next generation of lawyers will have a different job to do: “Lawyers will less and less simply advise clients, [instead] they will build systems that will.”

- **Finance**: [Daimler Financial Services](#) is developing a ‘near human’ digital service using an avatar named Sarah which will display emotional intelligence and be programmed to recognise non-verbal behaviour in real-time using face recognition to engage in more natural conversations with customers.

- **Health**: [Babylon Health](#) operates an AI system that conducts an initial triage of patients to identify urgent and non-urgent cases. This initial assessment helps the service to cope with demand and frees up GPs to spend more time with people who need primary care.

- **Property management**: Commercial and residential estate agency [JLL](#) recently launched a digital online messaging service with a virtual assistant for tenants. The service takes on more routine tasks like maintenance requests. This frees up property managers to concentrate on overall service and provides a better experience for tenants.

There is considerable potential to develop machine learning to the field CIAG to help make informed and fast decisions on career choice and predict the probability of entering a career with given qualifications. This has been attempted before, for example with [Bob Emploi](#) in France which feeds user profiles into an algorithm to provide personalised career advice, and in prototype models of Automated Career Guidance Expert Systems (Ezenkwu et al, 2017)\(^3\). Researchers at Middlesex University have examined the role and functionality of avatar-based systems to guide students through employability services, concluding that it was welcomed by a significant sample of undergraduate students and by members of the university’s employability service.

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A similar service in Scotland could augment, rather than replace, existing face-to-face CIAG engagement, freeing up specialist advisors to offer targeted personal support where this is required. SDS is currently working in partnership with IBM to explore the potential of using AI and machine learning to develop careers advice. This system may, for example, predict the probability of an individual successfully obtaining a job with a given set of qualifications on leaving school, help them to apply and explore relevant alternatives. The proposed PhD will share expertise with the team involved in this partnership.

**Research Scope**

The proposed research topic is deliberately ambitious. It will combine academic research with a strong applied focus. It will involve a review of current theory, practice and capabilities of machine learning and any developments of this in the field of CIAG. It should then undertake research into current public understanding of the concept of a career and career development. The next stage will assess user requirements around an enhanced digital model. Following this, the options for a model will be considered, taking into account current best practice and theory around machine learning identified earlier. A conceptual model will then be developed, working with the SDS/IBM team on the potential design of a prototype avatar model for testing by SDS. This topic would be particularly suitable for a joint bid across the disciplines of careers guidance and information technology.

2. **Upskilling & reskilling workforces to transition from declining occupations to growth occupations**

The different kinds of occupations that people are employed in have evolved over time. From the (first) Industrial Revolution and the subsequent emergence of mass production (second Revolution) to the Digital (or third) Revolution, the variety of jobs and the structure of employment has changed continuously.

We are now thought to be in a ‘Fourth Industrial Revolution’ driven by Artificial Intelligence (AI) where rapid advances in technology, together with processes of globalisation and demographic and social change, are transforming the way that people work, changing the character of many occupations, and displacing some jobs while producing new and different kinds of employment. According to the World Economic Forum (‘The Future of Jobs’ report, 2018) by 2022, no less than 54% of all employees will require significant re- and upskilling.

The overall aim of this PhD, within an understanding of the international context, is to determine how occupations are changing across the Scottish skills landscape, to assess the implications for upskilling and reskilling, and to investigate how we can best help workers transition out of at-risk occupations into employment opportunities with greater prospects for advancement.

The project will review long term occupational trends in Scotland and identify those occupations which are expected to grow their workforce and sustain demand for particular skills as well as those which are showing signs of long term decline. It will examine evidence on the role of AI in driving and accelerating occupational change. It will then look at the characteristics of workers who exit declining occupations (for example, by age, gender and skills) and examine the growth occupations most likely to provide employment opportunities given the existing skill sets and skill requirements.

From this analysis, the research will identify distinct patterns of employment mobility and highlight future opportunities for occupational mobility across occupations both within and between employers. It will outline the challenges faced by different groups of workers and suggest innovative reskilling and upskilling strategies.
interventions to help them successfully manage occupational transitions at the individual, firm and system level. The project will also consider the role of employers in supporting individuals’ occupational mobility and career progression and recommend where retraining efforts might be focussed to help meet emerging skills gaps and enable new career paths that move towards better jobs.

Key questions for this research are:

- Which occupations in Scotland are most likely to contract and expand in the next decade or so?
- What are the likely displacement effects due to AI and the implications for skills?
- What retraining and skillsets are likely to be required to enable displaced groups of workers to transition to occupations with more employment prospects?
- Where should retraining efforts be concentrated for maximum impact?
- Are there examples of innovative and effective reskilling and upskilling initiatives to support career adaptability in response to occupational shifts?

3. Learner Journey pathways in Scotland

The Scottish Government’s 15-24 Learner Journey Review highlights the aim for all learners in Scotland to be on “the right route to the right job, through the right course via the right information”. In order to achieve this, the ambition is to improve post-15 learner journey pathways, making them more coherent and reducing duplication.

This research will investigate inefficiencies in the learner journey from school to employment, examining the different pathways young people take post-15 (including Further Education, Higher Education and Modern Apprenticeship routes). The research should allow SDS to have a deeper understanding of the effectiveness of the post-15 learner journey and critical transition points.

Initially, this will be done by conducting a literature review into the factors affecting achievement and outcomes of post-15 learners, before examining the reasons for not achieving. The research should also investigate available data and policy publications to map post-15 learning pathways and destinations, pinpointing instances of learning and qualifications that act as unnecessary friction in the learner journey. It should also pinpoint key stages of leakage in the learner journey and identify causes of these drop-outs. The research should also consider policy interventions to increase the efficiency of the learner journey.

This PhD could utilise a mixed methods approach. It is anticipated that administrative and large scale secondary datasets (and the possible linking of these) will be used to explore learnings pathways and factors affecting achievement in more detail. The research could also include primary research to explore why ineffective journeys occur and reasons for not achieving.

Key questions for this research are:

- Where in the learner journey do duplication, drop-outs and lost momentum occur?
- What are the factors that affect achievement and learning outcomes?
- What are the reasons for drop-out and duplication?
- What are the critical transition points and how can these be best supported?
- How can we allocate resource to ensure a more efficient learner journey?