



Department
for Education

Labour market information (LMI) for all

**Stakeholder Engagement and Usage,
Data and Technical Developments**

Research report

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Executive Summary

The idea underpinning LMI for All is to provide a comprehensive careers labour market information¹ (LMI) database that links and opens up career-focused LMI. Its aim has been to optimise access to, and use of, core national data sources that can be used by developers to create websites and applications² to support individuals make better decisions about learning and work. It has been created as an open data project, which supports the wider government agenda to encourage use and re-use of government data sets. LMI for All was funded by the UK Commission for Employment and Skills (UKCES) up to 2017 and is currently funded by the Department for Education.

The development of LMI for All service spanned a five-year period (2012-2017). During this time, the feasibility of developing a comprehensive career LMI data tool that exploits open data sources that can be mainstreamed into service provision has been demonstrated. The overall aims of the project have remained constant:

- To identify and investigate which robust sources of LMI can be used to inform the decisions people make about learning and work; and,
- To bring these sources together in an automated, single, accessible location (referred to as the LMI for All database), so that they can be used by developers to create websites and applications for career guidance purposes.

The purpose of this report is to document the progress of the LMI for All project during its fourth phase (2016-2017). The report details: the stakeholder engagement activities supporting the integration of LMI for All into careers practice and raising the profile of the LMI for All service offer; statistics on usage and users; LMI for All developments underway; technical developments supporting the service, including changes to the infrastructure; updates to a number of datasets; and, data developments (such as new data mappings and updates to the occupational structure. The report updates the material presented in the progress report for the project during its third phase (2015-2016) (available at: http://www.lmiforall.org.uk/wp-content/uploads/2015/07/LMI_for_All_Final_report_v020715-for-website.pdf) and highlights new developments.

Stakeholder engagement

- The stakeholder engagement activities that have taken place within the scope of the current contract (since July 2016) have included: keynotes; conference

¹ Labour market information is data, graphs and statistics that describe the condition of the past and current labour market, as well as make future projections.

² An App or application is a computer software application that is coded in a browser-supported programming language (such as JavaScript, combined with a browser-rendered mark-up language like HTML) and reliant on a common web browser to render the application executable. Apps are accessed by users over a network.

presentations; workshop presentations; webinars; LMI for All symposium; and the redevelopment of the Careerometer widget. Based on feedback received, these events have all been very successful in increasing awareness and understanding of LMI for All, supporting those wishing to develop web interfaces and apps and driving traffic to third party users of LMI for All. This is demonstrated, from the feedback received immediately after the event, and by the continued interest from the variety of organisations who have invited project members to events to talk about LMI for All. Also, increasing numbers of organisations embedding Careerometer in their websites, increasing traffic to the Application Programming Interface (API³) and international interest in the project (see below).

Selected outcomes of stakeholder engagement activities

- An exploratory meeting took place with a representative from the Careers Enterprise Company (CEC) in March, to identify potential synergies. One outcome was to deliver a webinar for enterprise advisers in May 2017.
- There is international interest in LMI for All. Whilst the primary stakeholder engagement activity has been across the UK, invited presentations have been made to audiences across Europe and in Canada where there is interest in LMI for All. Policy makers in Canada and Norway are keen to learn how LMI for All is being used, as have the European Commission, Cedefop and the Ministry of Labour in Chile.
- LMI for All has been included as a case study in an international research investigation carried out by Cedefop into the innovative use of LMI and ICT in career organisations across Europe. The final report is due to be published in 2017.
- The LMI for All symposium, organised in collaboration with the Department for Education, attracted 50 participants from: local councils, government departments, Local Enterprise Partnerships (LEPs), career service providers, charities, careers professional body, universities, school/academies and colleges. Seven adopters of LMI for All presented at the symposium.
- Five webinars have resulted in organisations interested in embedding LMI for All in their websites (including 'I can be a...', Health Education England), an article in Career Matters and interest from organisations wishing to develop their own app (e.g. Ambitious About Autism).

³ API, an abbreviation of application program interface, is a set of routines, protocols, and tools for building software applications. A good API makes it easier to develop a program by providing all the building blocks. A programmer then puts the blocks together.

LMI for All usage

- The LMI for All service delivers data to organisations who in turn use it with a much larger number of their customers/clients, so the reach of LMI for All is extensive. So, while the ultimate beneficiaries are individuals making informed career decisions based on reliable and up-to-date LMI or the career/employment practitioners supporting these individuals, organisations as intermediaries make these data available at the individual level. It is complex determining usage, but the following provides some indicators of the increasing use of the service and the engagement activities supporting that use.
- Between May and October 2016, the LMI for All service handled 10.5 million queries. This accelerated in January 2017; the service handled 5.3 million queries in this month alone, which could be the result of applications coming online.
- 58 organisations have requested access to the LMI for All API since the service was initially launched in 2014. The majority have developed applications or embedded LMI for All in their website.
- Current statistics from the LMI for All monitoring service show that usage is increasing; quadrupling in the last 2 years. Usage is mainly measured by the number of unique internet addresses that query the service. Depending on configuration, a system can be one end user computer, a mobile phone, or an entire school network hidden behind a router. So the number 3,000 does not reflect the actual real-world user numbers. Rather, it is the best base-line minimum that can be estimated.⁴
- Measuring impact by queries can yield more information. A “query” is a request for a piece of data, i.e. a request for the average pay for a job, or a request for workforce estimation for a certain year. Daily queries to the API ranged from 25,000 to 50,000 queries per day in April 2015 and in June 2017 reached on average 200,000 queries per day. On very busy days, the service can process 400,000 queries.
- It is important to note that a portion of the afore-mentioned queries is generated by automated systems and, again, does not reflect real user numbers. Also, the average user will probably cause around 5 queries to be performed while looking up reasonably complete information on an occupation. In general, estimating the true usage numbers in terms of actual people remains difficult, so unique addresses and query volume are used as indicators. Both of these are increasing.
- Working Futures⁵ remains the most popular dataset accessed through the API. This is probably as these data are not available elsewhere and consistently popular with those working as intermediaries in career guidance.

⁴ Without implementing a registration system it is not possible to be more precise. During the development of the service it was felt a registration system would go against the open data principles of the project and could discourage use of the service.

⁵ Detailed historical and projected employment estimates produced on behalf of UKCES (for details see: <http://www.warwick.ac.uk/go/ier/research/wf/>)

LMI for All users: Applications achieved and in progress

- As the business model is free market, it was decided from the outset that barriers to access by developers be minimised. There was no requirement, therefore, for registration of adopters in the early phases of the project. It was optional for adopters to notify us and/or acknowledge the source of data they were using came from LMI for All.
- At the time of writing, at least 12 organisations or consortia had developed a website or web interface to LMI for All, plus 3 organisations had developed mobile applications. Currently, 10 organisations or consortia are progressing with websites and applications using LMI for All. Two notable examples include:
 - HS2/Construction – exploratory meetings took place in 2017 with a consortia of organisations working on HS2 in the West Midlands. A decision has already been made by the consortia to use LMI for All in this development and further discussions will explore possible avenues of collaboration;
 - National Careers Service (Ex/offender) – (further) discussions are ongoing with representatives from the National Careers Service to explore the potential exploitation of LMI for All for the prison population.
- Examples of 11 organisations that have created or embedded LMI for All data in their websites and 3 organisations that have developed mobile applications are presented in section 4. One of these is the Department for Work and Pensions, which has been rolled out to 16,000 employees.

Careerometer users

- By June 2016, Careerometer (and Careerometer 2) had been embedded in an estimated 32 websites and at the time of writing, this had increased by a further 28 websites to June 2017, including Northern Ireland.

Technical developments

- An IT infrastructure upgrade involved: data cubes⁶ being retired; the development of automated real-time monitoring of current API status, distributed server load and an automated 3-month usage report; and the re-development of query error monitoring.

⁶ A data cube is commonly used to describe a time series of image data representing data along some measure of interest. It can be 2-dimensional, 3-dimensional or higher-dimensional. Each dimension represents some attribute in the database and the cells in the data cube represent the measure of interest. Queries are performed on the cube to retrieve decision support information.

- The LMI for All widget has been completely redeveloped to provide better functionality and more data.
- There have been major improvements and upgrading of the technical infrastructure underpinning LMI for All. This was necessitated by a substantial increase in the number of daily queries to the LMI for All API.
- There have been iterative up-dates of the LMI for All website, including the provision of a regular blog and an extended Frequently Asked Questions section.

Data developments

The LMI for All database has been refreshed and updated during the year 2016/17 with the data sets below.

- Unemployment rates by occupation: Added data for 2016 and revised data for 2012-2015.
- Pay estimates, derived from Annual Survey of Hours and Earnings (ASHE⁷) and the Labour Force Survey (LFS⁸): Added data for 2016 and ASHE change in weekly pay data for years 2012-2013, 2013-2014 and 2014-2015.
- Analysis of higher education courses previously undertaken by people in particular jobs: Updated variables using data from 2014/2015 Higher Education Statistics Agency (HESA) first destination of leavers survey.
- Occupational Information Network (O*NET⁹) data: Updated O*NET data relating to skills, abilities, Interests, knowledge associated with occupations, from v21.0 release, and linked to Standard Occupational Classification (SOC¹⁰)2014 4-digit occupational categories.
- Updated apprenticeship frameworks: added a lookup table from new apprenticeship frameworks to SOC2010 occupation codes.
- Update of index of job titles: added new and revised job titles for SOC2010 occupation codes Index.

⁷ The Annual Survey of Hours and Earnings (ASHE), from the Office for National Statistics, provides information about the levels, distribution and make-up of earnings and hours worked for employees in all industries and occupations.

⁸ The Labour Force Survey, conducted by ONS, is a quarterly sample survey of households living at private addresses in the UK. Its purpose is to provide information on the UK labour market.

⁹ The Occupational Information Network is a US program providing a primary source of occupational information. Central to the project is the O*NET database, containing information on standardised and occupation-specific descriptors. Information from this database forms the heart of O*NET Online <http://www.onetonline.org>, an interactive application for exploring and searching occupations.

¹⁰ The Standard Occupational Classification is a common classification of occupational information for the UK. Jobs are classified in terms of their skill level and skill content. The latest version is SOC2010. SOC 4-digit provides a list of occupations at a more detailed level.

Future developments

A number of areas for further development of LMI for All have been identified in order that it can link to information which provide more comprehensive information for career planning:

- A key question for future data development is to ensure that the projections of employment and replacement demand at the core of LMI for All are updated, to ensure that the system remains relevant;
- Another pressing need is to find a way of incorporating comprehensive information on education and training courses coded to SOC 4-digit occupation;
- The system would be greatly improved by adding a way of linking to vacancies coded to 4-digit occupation. Given that this data is not collected, this would involve investment in developing techniques to generate information as close to the ideal as possible by web-scraping and automatic classification (or similar); and,
- Another improvement would be to provide more detailed geographical information on the current and projected structure of employment. Given the limitations of official data sources, this might require creating synthetic data (e.g. using microsimulation techniques).

1. Introduction

1.1. The context of careers labour market information and intelligence

The European Centre for the Development of Vocational Training (CEDEFOP) has recently concluded that user-adapted, attractive and engaging tools that bring the individual closer to LMI is a challenging task. Further, that it requires cooperation and collaboration between different stakeholders, with close scrutiny of the type and quality provided. An increasingly popular strategy to overcome both barriers to accessibility and fragmentation is to create national or regional single online access points to LMI, combined with a career guidance offer (CEDEFOP, May 2016: Workshop briefing on labour market information in lifelong guidance (LLG)).

In the UK, the political importance attached to the accessibility to high quality, reliable and up-to-date LMI for the purpose of supporting labour market transitions into and through the labour market has not diminished. For England, statutory guidance for governing bodies, school leaders and school staff, published by the Department for Education in 2017 mandated that:

“Schools must secure independent guidance that includes information on the full range of education and training options, including apprenticeships and vocational pathways. This should help inform a pupil’s decision about their 16-19 study programme and beyond.”¹¹

Additionally, a House of Commons Briefing Paper in 2016¹², set out the policy position (for England only) for careers guidance. Quality assurance of the careers guidance is emphasised along with access to high quality LMI.

The importance of LMI in lifelong guidance has also been highlighted in a publication from the European Lifelong Guidance and Policy Network (ELGPN). Specifically, *Guideline 6: Improving Careers Information of the Guidelines for Policies and System Development* (2015) defines LMI for lifelong guidance, discusses its importance, identifies examples of good practice and provides resources for policy makers.

From these examples, it is clear that whether taking an English perspective, or a European view, LMI is acknowledged to be important. The LMI for All service was

¹¹ DfE (2017) Careers guidance and inspiration in schools: Statutory guidance for governing bodies, school leaders and school staff. [Online]. Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/608259/Careers_guidance_and_inspiration_in_schools.pdf

¹² House of Commons Briefing Paper (2016). *Careers Guidance in Schools, Colleges and Universities* (Briefing Paper Number 07236, 24 February 2017). London: House of Commons Library. Retrieved from: <http://researchbriefings.files.parliament.uk/documents/CBP-7236/CBP-7236.pdf>

developed in 2012. An initial feasibility study, followed up with three iterations of pilot studies has established the viability and the need for this innovation. Its usage across various established websites is testimony to its efficacy and usefulness. Interest in the service remains significant and is growing.

1.2. LMI for All: Project overview

Despite a policy emphasis on the importance of labour market information and intelligence for supporting individual labour market transitions, access to a number of publicly funded and open large-scale longitudinal databases (including the ASHE, the LFS and the Business Register and Employment Survey (BRES¹³)) has been limited. The ultimate aim for LMI for All was to provide a single access point for multiple, high quality sources of LMI, which is openly accessible, shared in a way that would allow it to be used by a number of career related interfaces and is viable in the longer term.

The LMI for All project was funded and managed by the UKCES up to October 2016. Subsequently, this contract was novated to the Department for Education (DfE). Operational work has consistently been undertaken by a consortia led by the Institute for Employment Research at the University of Warwick, who were successful in open competitions for a sequence of contracts. Pontydysgu and Raycom led on the technical aspects and development of the LMI for All service, database and Application Programming Interface (API) until 2016, when Raycom withdrew. The project has opened up and linked career focused LMI, optimising access, so that individuals can be better supported in making decisions about learning and work. Four sequential, but distinct, research and development phases have ensured a successful outcome; these are documented in Table 1.1., below.

¹³ Business Register and Employment Survey collects data to update local unit information and business structures on the Inter-Departmental Business Register (IDBR) and produce annual employment statistics, which are published via the NOMIS website. It replaces the Business Register Survey and the Annual Business Inquiry.

Table 1.1. Overview of LMI for All development

Phase	Date	Activity
1	2012	<p>Tested the feasibility and viability of the foundation concepts and ideas</p> <p>Bimrose, J., Wilson, R., Elias, P., Barnes, S-A., Millar, P., Attwell, G., Elferink, R., Rustemeier, P., Beaven, R., Hay, G. and Dickerson, A. (2012). <i>LMI for All Career Database Project - Processes Adapted and Lesson Learned</i>. London: UKCES. Summary available to download at: http://www2.warwick.ac.uk/fac/soc/ier/research/prototypecareerslmi/bimrose_et_al_2012_lmi4all_summary.pdf</p>
2A	2012 - 2013	<p>Expanded and updated the database, tested and evaluated the API, improved the technical infrastructure, explored data sets that could add value to services, raised awareness of the service through a number of stakeholder events</p> <p>Bimrose, J., Wilson, R., Barnes, S-A., Owen, D., Green, A., Li, Y., Millar, P., Bosworth, L., Holden, A., Attwell, G., Rustemeier, P., Elferink, R., McGreggor, A., Wicks, D., Long, A. and Dickerson, A. (2013). <i>LMI for All Developing a Careers LMI Database Phase 2A report</i>. London: UKCES. Retrieved from: http://www2.warwick.ac.uk/fac/soc/ier/publications/2012/bimrose_et_al_2012_lmi4all_summary.pdf</p>
2B	2013 -15	<p>Continual development of the LMI for All service, implemented recommendations from Phase 2A</p> <p>Bimrose, J., Wilson, R., Barnes, S-A., Owen, D., Li, Y., Green, A., Bosworth, L., Millar, P., Holden, A., Attwell, G., Rustemeier, P., Elferink, R. and Higginbottom, J. (2015). <i>LMI for All: Developing a Careers Database (Final report)</i>. London: UKCES. Available online: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/446332/LMI_for_All_Final_report_v020715_FW.pdf</p>
3	2015 -16	<p>Continual development of the LMI for All service, updated database and technical infrastructure, continued to raise awareness of the service through stakeholder events, worked with stakeholders to develop LMI for All applications</p> <p>Bimrose, J., Sofroniou, N., Barnes, S-A., and Attwell, G. with Rustemeier, P., Stieglitz, D., Elferink, R., Hughes, D., Li, Y., Owen, D., Wilson, R., Bosworth, L. and Millar, P. (2016). <i>LMI for All: Technical, Stakeholder engagement and data development services</i>. Wath-upon-Deane: UKCES. Retrieved from:</p>

Phase	Date	Activity
		https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/545324/LMI For All for web.pdf
4	2016 - 17	This report describes the activities undertaken during the fourth stage of the project

1.3. Project aims and objectives for 2016-2017

The overall aims, consistent throughout all phases of development of the LMI for All project have been two-fold:

- To identify and investigate which robust sources of LMI can be used to inform the decisions people make about learning and work; and,
- To bring these sources together in an automated, single, accessible location (referred to as the LMI for All database), so that they can be used by developers to create websites and applications for career guidance purposes.

As with phases 1 to 3, during phase 4 of the project, these overall aims were operationalised in three separate, but inter-related work strands, specified by the UKCES. These are specified below, together with their related objectives. Whilst the objectives have been fully met, further engagement with stakeholders would be beneficial. Further work could also be undertaken to reach other audiences.

The programme of services to support the delivery of LMI for All (2016-2017) comprised three interrelated work streams with their own aims: stakeholder engagement; management of technical infrastructure (IT); and data development (see below).

1.3.1. Stakeholder engagement

- To encourage third parties to exploit this free resource by developing applications or enhancing existing applications. This is to increase the reach of LMI for All among end-users (i.e. individuals making careers decisions).
- To encourage third-parties to implement the LMI for All “widget” (named Careerometer).
- To drive end-user traffic to existing applications that offer access to LMI for All data.
- To foster positive and supportive attitudes towards the LMI for All service among key groups, including policymakers.
- To engage with partners who offer applications that draw upon LMI for All with a view to evaluating the service from an end-user perspective.

1.3.2. Management of technical infrastructure (IT)

- To maintain a secure and robust infrastructure for the data providing an environment that could be extended in the future as new data becomes available and as the number of end-users increases.
- To implement processes to ensure that the data made available to developers and end-users meets required quality standards.
- To provide modern and flexible software tools to allow the querying of the database by external users.
- To provide software tools and spaces for documenting the process and allowing public access to the LMI for All database.

1.3.3. Data development

- Refreshment of existing data sets held on LMI for All.
- Management of documentation relating to the datasets.
- Quality assurance and checking, including checks to ensure data rendered by the API are consistent with values contained in the dataset generated by the data development team.
- Provision of advice on issues and questions relating to the data, both to UKCES/DfE and to third-parties, as part of customer care support arrangements.
- Contribution to internal data management processes, including liaison with the technical team around documentation and quality assurance of data.

1.4. Report structure

This report focuses on the activity, processes and developments of the fourth phase of the LMI for All service (2016-2017). The fourth phase of LMI for All has involved: updating and maintaining the database and technical infrastructure; raising awareness of the service through stakeholder events, such as workshops, conferences and webinars; and working with stakeholders to develop LMI for All applications and, where appropriate, writing these as case studies for the website.

Section 2 outlines stakeholder engagement activities undertaken to promote the service, increase awareness and support those developing a web interface or application using LMI for All. Section 3 details LMI for All usage statistics, while section 4 details websites, interfaces and applications using LMI for All that have been achieved and those in progress. Section 5 provides an overview of the technical developments and changes to the infrastructure of the service undertaken as a consequence of significant increases in traffic to the LMI for All API. Data developments and processes are also detailed in section 5, together with a discussion of other potential indicators that could enhance the LMI for All service.

2. Stakeholder engagement

The overall aim for LMI for All during the first four phases of the project (2012-2017) was to create a data tool that developers would use to create products to support individuals in making better decisions about learning and careers. It was necessary that work should, therefore, not focus solely on the development of the data tool, but also on raising awareness and demand across the broad community of careers and employment practice, as well as publicising the completed data tool. The development of strong partnership arrangements across a range of different categories of stakeholders and partners has characterised the success of the LMI for All service to date. This approach, pursued during the first three phases of the project, continued during the fourth phase (2016-2017). It has been particularly important during the latest phase of the project to maintain the momentum of stakeholder dissemination and engagement, as well as increase active use of the service.

This section outlines the objectives and activities undertaken to raise awareness and promote the LMI for All service.

2.1. Objectives and outcomes for 2016-2017

The key focus of the proposed activities for stakeholder engagement for this phase of the project (2016-2017) was to build on activities that have been undertaken in earlier phases, which have been successful in raising awareness and understanding of the LMI for All service among key target audiences. Stakeholder audiences include: careers professionals and careers organisations; government departments; developers and information service providers; schools, further education colleges and universities; and, organisations that offer LMI for All data via their applications and websites.

This phase of the project has been organised around the following objectives:

- Facilitation and organisation of events and workshops to promote LMI for All to one or more of the key stakeholders;
- Participation in third party events and fora, which target the relevant audiences;
- Bi-lateral engagement with priority stakeholders to support them in the development of an application that uses LMI for All;
- Authoring of articles for relevant publications to raise awareness of LMI for All;
- Facilitation of user fora and/or KIT meetings involving organisations that draw on LMI for All to gather feedback on support needs and potential improvements to the service and gain insights into who end-users are, how they use the data and the benefits in terms of careers decision-making;
- Development of engaging case studies that demonstrate how third-party developers have used LMI for All and the benefits accrued.

These objectives have been achieved through six integrated work clusters, comprising:

1. Development of stakeholder engagement plan, in collaboration with UKCES;
2. Dissemination of the LMI for All service, current users, case studies and Careerometer through various media (e.g. career and related conference presentations, training workshops, use of social media and publications);
3. Symposium (involving up to 50 participants) to showcase achievements, up-date on progress, and share experiences and the practice of implementing the LMI for All service;
4. Five webinars;
5. Extension of case study development, and updating of current studies:
 - a. Production of two new exemplar case studies in the use of the LMI for All service drawing upon existing organisational contacts and knowledge of developments underway identified in the 2015-2016;
 - b. Updating of existing case studies, where necessary; and,
6. Enhancement of LMI for All website with additional case studies, Careerometer map updates and more information on current users of the LMI for All services.

These interrelated work clusters illustrate a consistent end-user focus, demonstrating a clear engagement strategy with those third parties that continue to be the primary data/service users. The aim of these activities is to continue to stimulate demand and promote the completed data tool. All activities have been UK-wide, but there has been some international interest (Europe and Canada) in the project with others wishing to learn from our experience. For instance, the Cedefop Skills Panorama team were particularly interested in the development and use of the LMI for All API.

2.2. Stakeholder plan

The first activity for this strand of the project was the development of a stakeholder engagement plan in close consultation with UKCES. This set out a forward schedule of activity and identified key stakeholder audiences. After each dissemination event, audience/participant numbers, type of activity and any follow-up arising from the dissemination was recorded. The dissemination activities were focused on raising awareness of LMI for All amongst career key stakeholder groups, as well as stakeholders from the devolved nations, government departments and LEPs.

2.3. Stakeholder activities and dissemination of LMI for All service

In the UK, LMI for All was promoted at 24 dissemination events ranging from national conferences and fora, local and regional events and invitational meetings. These activities reached approximately 1,600 stakeholders from education, training providers, employers, local authorities, local enterprise partnerships and other community/voluntary partnerships. Internationally, LMI for All was promoted at 8 dissemination events

reaching approximately 300 stakeholders. A full list of all dissemination activities, plus details are presented in Appendix A.

As a result of dissemination activities, the LMI for All team have:

- Engaged directly with individual schools and colleges, as well as supported local career development partnerships working with schools and colleges, including the National Careers Service Inspiration Teams (North East, West Midlands, Yorkshire and the Humber, South East, South West), Careers and Enterprise Company (CEC), Education Business Partnerships, Local and Combined Authorities and LEPs;
- Supported existing developers to cascade good practices to other potential users, such as the prison service HMPS;
- Promoted the practical use of LMI for All to support government infrastructure skills and employment priorities, such as for the Department for Transport and the Department for Work & Pensions (DWP); and
- Facilitated working links between and across organisations to support their ongoing work on LMI, such as work with LEPs, Combined and Local Authorities on the HS2/Construction application.

These activities were supported by the LMI for All symposium and webinars.

2.4. LMI for All symposium

A symposium was organised in London in December 2016, which included presentations from the LMI for All team and UKCES/DfE project director, plus adopters of LMI for All (DWP, icould, SkillsMatch, U-Explore, Next Steps Cornwall, KareerHub and Prospects). The aim of the symposium was to:

- Raise awareness of the LMI for All service, the Careerometer widget and existing users of the service (including those presented as case studies on the LMI for All website) to drive up usage;
- Foster positive attitudes to the LMI for All service; and
- Encourage third parties to develop applications.

Fifty signed up for the symposium and a waiting list was in operation within 2 weeks of advertising the event. The event attracted a range of participants from: local councils, government departments, LEPs, career service providers, charities and not-for-profit organisations, careers professional bodies, universities, school/academies and colleges. Feedback from participants was positive with comments mainly on LMI for All being 'a fantastic resource'. As part of the event and to support future promotion of the LMI for All service, a promotional video was created with interviews of some current adopters of LMI for All. This is available on the LMI for All website, see: <http://www.lmiforall.org.uk>.

2.5. Webinars

Five webinars were organised throughout this phase of the project. This provided an effective way to reach more stakeholders that were not able to attend events. Webinars were promoted at dissemination events, through IER networks, social media (@LMIforAll, @CareersResearch, @WarwickIER and @DeirdreTalks) and the IER newsletter.

Webinars included:

- One in association with Assessment Services Ltd.;
- Three webinars were organised and managed by IER; and,
- One ‘coffee break’ webinar was organised by The Careers and Enterprise Company (CEC), 32 participants attended the live webinar and the recorded webinar was distributed to the CEC’s network of 1,000 enterprise advisers working with schools. CEC estimated a further 100-150 people would engage with the recorded webinar in future meetings.

Participants attending the webinars were drawn from all the key stakeholder groups across the UK. The webinars were successful as they increased awareness of LMI for All, promoted the service and third-party users of LMI for All, but importantly gave an opportunity for individuals to have queries answered. The webinars resulted in organisations interested in embedding LMI for All in their websites (including ‘I can be a...’, Health Education England), an article in Career Matters and interest from organisations wishing to develop their own app (e.g. Ambitious About Autism, Next Steps Plymouth). Participants were positive about LMI for All, its potential and welcomed being pointed to third party users of LMI for All where they could be confident in the data.

2.6. Case studies

Building on the success of the four previous case studies in the use of the LMI for All service developed, a further three case studies have been developed. The aim of these exemplars is to further evidence the process of designing, developing and implementing a web interface or an application, to demonstrate the broad potential of the LMI for All service in practice. New case studies have been produced with: U-Explore (start.com); and the Department for Work and Pensions (DWP) (work coach). Where possible, feedback and impact of the development has been captured and reported in consultation with the participating organisations.

‘Work coach’ by DWP represents an exceptional case, since matching funding was secured from a European funded project that was running in parallel to LMI for All. The funding support was substantial, extending across three years, enabling support for developing and presenting the business and management cases within the organisation, technical support for the development of the application, three phases of evaluation, as well as support necessary to launch the application across the whole business (e.g. production of a user video). Throughout the project, funding also went directly to DWP,

as an application partner for the project, to fund staff time and other collaborative activities.

Three of the four existing cases studies (icould, KareerHub and Prospects) were also updated during this period. Updates have included: information on how icould have redeveloped the visualisation of the LMI for All data in response to feedback; details of how KareerHub have progressed with their development, changes to their design and some early screenshots of their website; and, further information on the Prospects app and where to download.

All of the case studies are available to view on the LMI for All website:

http://www.lmiforall.org.uk/case-study_intro/

2.7. Summary and recommendations for future stakeholder engagement activities

There has already been substantial uptake of the LMI for All resource. Its ultimate success is likely to be contingent on this uptake being sustained and expanded, not only in the sectors already represented by the early adopters, but also by those absent to date such as schools and colleges. Consequently, it is necessary to continue stakeholder engagement activities. Some recommendations include:

- An increase in activities relating to the targeting and awareness raising schools and colleges, exploring different models for implementation and integration of the resource.
- There remains a real need to continue working with those stakeholders who have started designing and developing LMI for All web interfaces and application.
- In order to start to capture evidence of impact of LMI for All, there is a need to undertake a small-scale end-user evaluation. As previously suggested, this could be undertaken with third parties and their users to gain feedback on the service, or involve broader audiences.

3. LMI for All usage statistics

This section details the usage of the LMI for All service and how it is measured.

3.1. Measuring LMI for All usage

Current statistics from the LMI for All monitoring service shows that usage is increasing; it has quadrupled in the last 2 years. Usage is measured mainly by the number of unique internet addresses that the service receives queries from. Every computer system connected to the internet has an address, and by aggregating over these addresses it is estimated that the service is being accessed from over 3,000 different systems daily. Depending on configuration, a system can be one end user computer, a mobile phone, or an entire school network hidden behind a router. So, the number 3,000 does not reflect the actual real-world user numbers. It is the best base-line minimum that can be estimated.

Measuring the impact by queries can yield more information. A 'query' is a request for one piece of data, i.e. a request for the average pay for a job, or a request for workforce estimation for a certain year. Daily queries to the API ranged from 25,000 to 50,000 queries per day in April 2015 and currently reach an average of 200,000 queries per day. On very busy days, the service can reach 400,000 queries.

It is important to note that a portion of these queries is generated by automated systems and, again, does not reflect real user numbers. Also, the average user will probably cause around 5 queries to be performed while looking up reasonably complete information on an occupation. Therefore, estimating the true usage numbers in terms of actual people remains difficult, so the service has to rely on unique addresses and query volume as indicators. Both of which are increasing.

Working Futures remains the most popular dataset accessed through the API. This is probably as these data are not available elsewhere and consistently reported as required by those working as intermediaries in career guidance. Between May 2016 and October 2016, the LMI for All service handled 10,569,335 queries. This accelerated in January 2017, as the service handled 5,373,693 queries in this month.

3.2. API queries

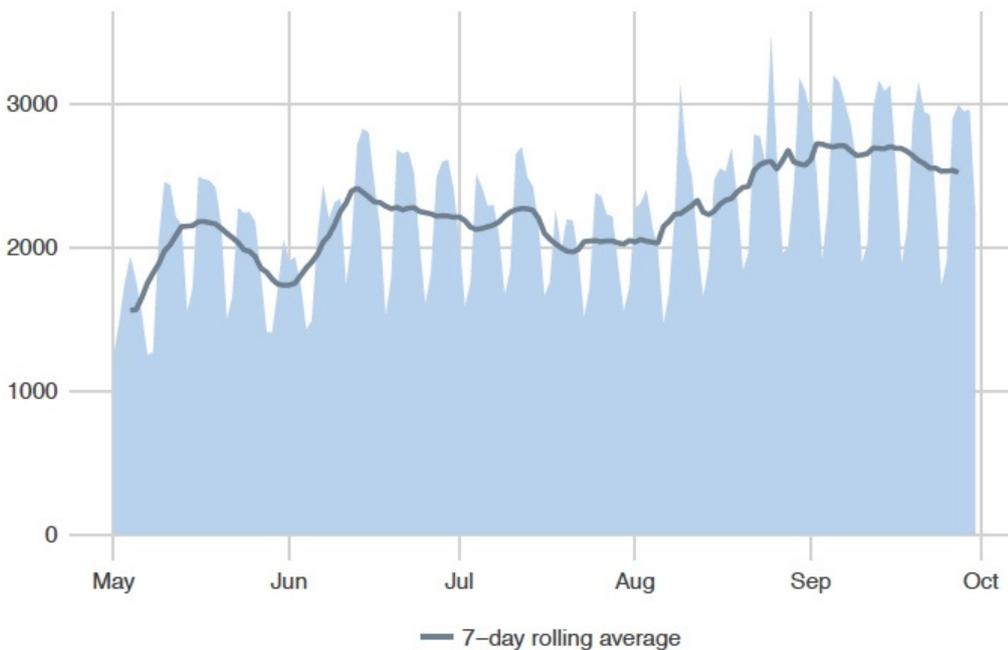
Due to the significant increases in traffic to the LMI for All API, a new infrastructure was put in place. This means that unique users are no longer monitored. Data show that the queries to the API peak between 10am-4pm and the service handles around 1.1 queries per second. Figure 3.1 shows the number of API queries from April 2017 (4/8) (when the new system was implemented) to June 2017 (6/1). During this period, queries peak at around 275,000 per day, but average around 140,000 queries per day.

Figure 3.1 LMI for All API queries, April – June 2017



Figure 3.2, below, shows the number of unique users of LMI for All between May 2016 and October 2016. It shows how the number of queries have steadily increased over the period. This trend has continued.

Figure 3.2 LMI for All unique users, May 2016 – October 2016



3.3. Traffic by endpoint

Evidence on usage statistics from earlier on in the project showed that vacancy data was the most requested data available from the LMI for All API. This has been overtaken with

the highest query by unique IP for Working Futures and ASHE data (see Figure 3.3). Figure 3.4 shows the number of queries by each data source in a recent 24-hour period; queries to Working Futures dominates.

Figure 3.3 LMI for All traffic by endpoint, May 2016 – October 2016

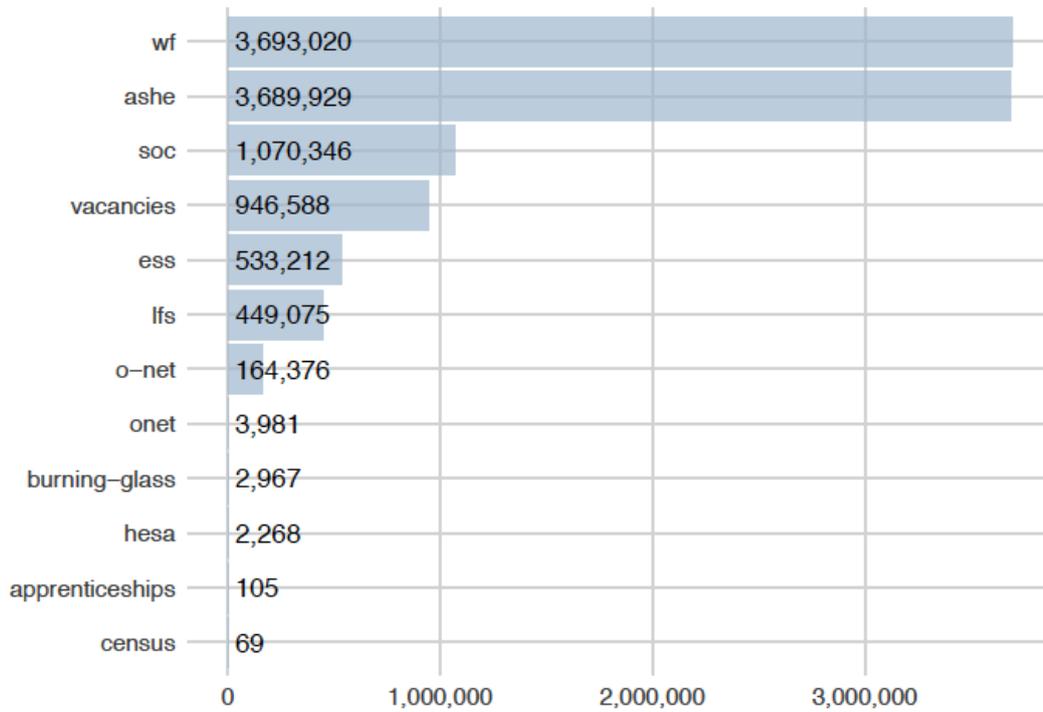
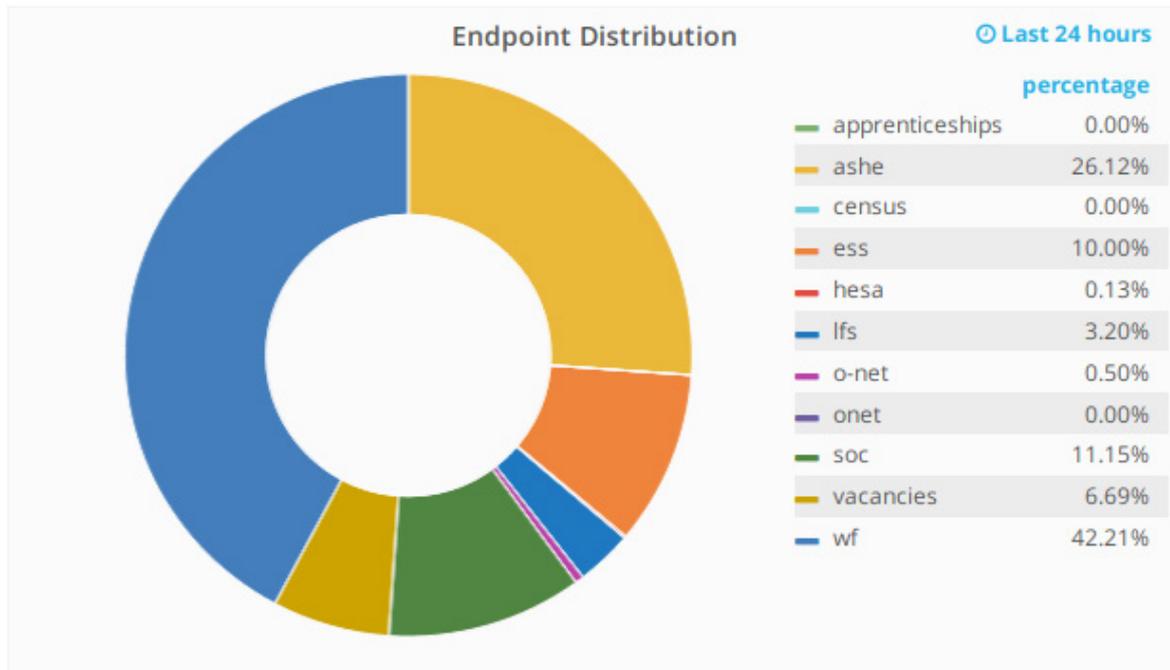


Figure 3.4 LMI for All traffic by endpoint, for a 24-hour period in May 2017



4. LMI for All users: Applications achieved and in progress

There are a number of third-party websites, web interfaces and applications that have been developed throughout the lifetime of the project and targeted at a range of users, including careers guidance professionals, clients/customers, students in compulsory and post-compulsory education, schools and colleges, and policy-makers, etc. This section provides details of the developments achieved and those in progress. The LMI for All system does not allow us to easily identify third party users, so the list of users is likely to be incomplete.

58 organisations have requested access to the LMI for All API since it was initially launched in 2014 (a detailed list is provided in Appendix B). There is no way of assessing whether these requests have resulted in a development.

4.1. Third party users LMI for All: Websites, web interfaces and apps

The following lists third party users of LMI for All namely, websites, web interfaces and apps.

Table 4.1. Third party users of LMI for All: websites, web interfaces and apps

Websites and web interfaces	
Active Informatics http://www.activeinformatics.com	Developed by Active Informatics. Provide software applications for business and the public sector.
Career Smart http://www.careersmart.org.uk	Developed by Prospect Union. Website aimed at professionals seeing career advice. LMI for All is embedded throughout their site as part of the information package.
DWP work coach (Case study on LMI for All website: http://www.lmiforall.org.uk/case-study_intro/dwp)	Developed with Department for Work and Pensions. The Department for Work and Pensions (i.e. the public employment service in Great Britain) is collaborating with the European FP7-funded EmployID project. They have developed and implemented a dashboard, called Career Coach. This is being used by Job Centre Plus work

	coaches as well as by Employment Advisers working with companies. This has been rolled out to 16,000 work coaches in England.
eCLIPS http://www.adviza.org.uk	Developed by Adviza. LMI for All part of a careers product aimed at schools and colleges, eCLIPS provides data on over 1,000 jobs and careers.
icould http://icould.com (Case study on LMI for All website: http://www.lmiforall.org.uk/case-study_intro/icould/)	Careers videos and information aimed at young people. LMI for All data presented at the bottom of the careers videos.
Labour Market Explore https://my.sacu-student.com/	Developed by SACU. Source of careers information to students, parents and teachers.
My World of Work https://www.myworldofwork.co.uk/my-career-options	Developed by Skills Development Scotland. Source of careers information to students, parents and teachers.
Planit https://www.planitplus.net/	Planit is produced by Gateway Shared Services, a not-for-profit organisation managed by a consortium of Scottish local authorities. Interactive careers tools for young people in Scotland, LMI for All part of job profiles.
Plotr http://www.plotr.co.uk	Careers software aimed at young people, parents/carers, teachers and employers. Careers profiles contain LMI for All data.
RCU Ltd. https://datahub.rcultd.co.uk/blocks/labour-market-information	Developed by RCU Ltd and Association of Colleges. Provides data for colleges, mainly uses forecast data.

<p>SkillsMatch London http://skillsmatch.intelligentlondon.org.uk (Case study on LMI for All website: http://www.lmiforall.org.uk/case-study_intro/skillsmatch/)</p>	<p>Developed by London Councils.</p> <p>Interactive website that uses LMI for All, alongside a number of other datasets and local information.</p>
<p>Start https://app.startprofile.com (Case study on LMI for All website: http://www.lmiforall.org.uk/case-study_intro/uexplore/)</p>	<p>Developed by u-explore.</p> <p>Brings together LMI for All, with other data</p> <p>Aimed at students, parents/carers, and teachers.</p>
<p>Applications</p>	
<p>Help Build London http://helpbuildlondon.co.uk (Case study on LMI for All website: http://www.lmiforall.org.uk/case-study_intro/prospects/)</p>	<p>Construction industry app developed by Prospects (careers service organisation with several National Careers Service contracts)</p> <p>Available to download from Google Play: https://play.google.com/store/apps/details?id=com.prospects.helpbuildlondon&hl=en_GB</p> <p>Available to download from Microsoft phone apps store: https://www.microsoft.com/en-gb/store/p/help-build-london/9nblggh4qn9v</p>
<p>Careers Advisor</p>	<p>Developed by LogToMobile.</p> <p>Application has been designed to support those making career choices. It provides access to information and visualisations on jobs, salary, skills information and job descriptions.</p> <p>Available to download from Google Play: https://play.google.com/store/apps/details?id=com.logtomobile.jobscomparsion</p>

LMI for You	<p>Developed by CogniSoft Limited.</p> <p>Free application for advisers, work programme staff and those wishing to view information on jobs.</p> <p>Available to download from itunes: https://itunes.apple.com/gb/app/lmi-for-you/id726216936?mt=8</p>
Other developments using LMI for All	
Next Steps Career Card Challenge https://www.nextstepscornwall.co.uk/info-and-resources/for-teachers-and-advisers/career-card-challenge	<p>Developed by Next Steps Cornwall.</p> <p>A freely available game that can be downloaded from the Next Steps Cornwall website. The game has been developed to be used in schools with both large and small groups. It is one of a number of resources made available to teachers and careers advisers.</p>

4.2. LMI for All developments in progress

The following lists developments using the LMI for All service that we are aware of. These organisations had contacted IER and, where requested, have been provided with support and guidance.

Table 4.2. LMI for All developments in progress

Websites and web interfaces	
KareerHub http://kareerhub.co.uk (Case study on LMI for All website: http://www.lmiforall.org.uk/case-study_intro/kareerhub/)	<p>NI website which is currently under development.</p> <p>Aim at young people, will link LMI for All information to courses.</p> <p>More information at: http://www.lmiforall.org.uk/case-study_intro/kareerhub/</p>
Next Steps Plymouth	<p>Early stages of developing a careers website for the South West, collaborative venture between Next Steps Plymouth, universities and colleges.</p>

Skills Planner http://www.skillsplanner.net	<p>To be developed by a consortia of businesses, training providers and colleges across the UK.</p> <p>Open linked data platform aimed at the construction industry.</p>
North East schools and colleges	<p>Developing a website for schools and college students, led by a consortia of 16 schools and colleges.</p> <p>Funded by the Gatsby Foundation.</p>
Health Careers Information http:// www.healthcareers.nhs.uk	<p>To be developed by Health Education England.</p>
Edform https://www.edform.org	<p>(n.b. no further information known).</p>
Construction/HS2	<p>To be developed by a consortia of organisations working on HS2 in the West Midlands, including careers organisations, schools and colleges, LEP and the combined authority.</p>
Apps	
Website to be used by ex/offenders	<p>To be developed by Prospects/representatives from the National Careers Service, led by Wandsworth Prison. This will be a local pilot.</p>
Next Steps Career Card Challenge	<p>Under development by Next Steps Cornwall.</p> <p>Next Steps Cornwall are developing the Next Steps Challenge App to be launched in 2017, which is based on the card game detailed in section 4.1.</p>
Prospects app for London retail sector	<p>Under development by Prospects.</p> <p>To be based on the 'Help Build London' app detailed in section 4.1.</p>

4.3. Careerometer users

As part of the LMI for All service, the UKCES commissioned the development of a customisable widget, called Careerometer (see <http://www.lmiforall.org.uk/widget/>). This has been made freely available for third parties to embed in their websites as an easy interface to LMI for All. As part of improving the LMI for All service, Careerometer was redeveloped in 2016 to improve its operation and extend the data available. Careerometer 2 was launched in December 2016.

4.3.1. Redevelopment of Careerometer

Careerometer allows website developers and administrators to embed the widget on their own sites, thus providing easy access to a limited range of LMI for All data. Version 1 of Careerometer proved popular, but contained several technical bugs. The major problem was that the widget interfered with navigation tabs of common Content Management Systems. It was easier to redesign the widget from scratch than to attempt to modify the original code.

There was some discussion on what and how much data should be displayed in the redeveloped widget, with final agreement to provide access to occupational descriptions, pay, numbers employed and future predictions of employment numbers. Figure 4.1 shows the information provided in Careerometer when a user has typed in an occupation.

Figure 4.1 Screenshot of Careerometer 2

UK Average		Nurses		Nurses
Weekly Pay £505	Annual Pay £26,260	Weekly Pay £670	Annual Pay £34,840	<p>Nurses provide general and/or specialised nursing care for the sick, injured and others in need of such care, assist medical doctors with their tasks and work with other healthcare professionals and within teams of healthcare workers. They advise on and teach nursing practice.</p> <p>Common tasks in this job:</p> <ul style="list-style-type: none"> assists medical doctors and works with other healthcare professionals to deal with emergencies and pre-planned treatment of patients; manages own case load; monitors patient's progress, administers drugs and medicines, applies surgical dressings and gives other forms of treatment; participates in the preparation for physical and psychological treatment of mentally ill patients;
Hours/Week 37.5h	Hourly Pay £13	Hours/Week 39h	Hourly Pay £17	
Workforce Change (projected) Growth 6% Replacement 39.5% The workforce is projected to grow by 6% over the period to 2024, creating 1,974,000 jobs. In the same period, 39.5% of the workforce is projected to retire, creating 13,110,000 job openings.		Workforce Change (projected) Growth 10.7% Replacement 31.6% The workforce is projected to grow by 10.7% over the period to 2024, creating 73,638 jobs. In the same period, 31.6% of the workforce is projected to retire, creating 217,967 job openings.		
You might find this job in all industries combined. This is the average across all UK.		You might find this job in Health Residential care Social work Public admin. & defence Education		
Clear card		More info Clear card		Back Clear card

Powered by LMI For All.

4.3.2. Current usage of Careerometer

In June 2016, Careerometer had been embedded in an estimated 32 websites. One year later (June 2017) this had increased to 60 websites and spread to Northern Ireland. Those currently using the widget that we are aware of include:

- An online careers magazine, which a number of other websites point to as a resource (see Moving On magazine <http://movingonmagazine.co.uk/careerometer/>);
- A campaign to promote a technical education (see The Gatsby Technicians make it happen campaign have also embedded Careerometer in their website: <http://technicians.org.uk/make-it-happen/>);
- 5 online UK-wide careers resources and 1 Northern Ireland online resource;
- 5 higher education institutions, higher education and colleges consortia websites;
- 25 schools, academies and UTC;
- 6 further education colleges and sixth forms; and,
- 16 career organisations and services.

A detailed list of users is available in Appendix C. A number of organisations have also been in contact to get further information and plan to embed Careerometer in their websites in due course. So, the number of Careerometer users is likely to increase from the current 60.

5. Data developments

This section provides information on the datasets updated during this fourth phase of the project, any new processes and outlines data that could be added to the database to enhance the LMI for All service.

5.1. Objectives and outcomes for 2016-2017

The primary objective for the project during the year 2016-2017 was to increase and broaden the use of robust sources of labour market information. The project follows open data principles in developing a system which brings these sources together in an automated, single, and accessible location.

The LMI required for the data tool includes data on salaries, vacancy rates, qualification levels and training from diverse data sources, linked together by occupation classified at the unit group (4-digit) level of the 2010 SOC. An index of around 28,000 job titles mapped to SOC enables the end-user to search for and access data of interest and relevance to careers in an intuitive fashion.

These key data sources have been refreshed during the year and the capabilities of the system extended by adding new data sets and information as detailed in section 6.4.

5.2. Summary of current data and indicators in LMI for All

The labour market information within the system includes:

- Actual and projected employment trends from 1990 to 2024 (from *Working Futures* data set);
- Projected number of workers needed by employers to replace those retiring between 2014 and 2024 ('replacement demand') (from *Working Futures* data set);
- Pay (for employees only) (from ASHE data set);
- Hours worked (for employees only, not the self-employed) (from ASHE data set);
- Changes in pay by detailed 4-digit occupation (modelled on ASHE and Labour Force Survey (LFS) data);
- Unemployment rates (based on LFS data);
- Vacancy data by occupation and industry (from the UKCES Employer Skills Survey (ESS¹⁴));

¹⁴ The Employer Skills Survey conducted by UKCES provides information on business management, recruitment, skills gaps and vacancies. The surveys are designed to be representative of the employer population across geography and sector.

- 2011 Census of Population; and,
- Destinations of graduates (based on HESA data).

These data are enriched by linking to contextual information about occupations, such as:

- Occupational descriptions of 4-digit occupations (based on the Office for National Statistics (ONS¹⁵) information); and,
- Skills, abilities and interests data mapped to 4-digit occupations based on US O*NET information.

In addition, the system contains 'lookup tables', which allow the information in LMI for All to link to other sources of information related to careers choices, such as:

- Apprenticeships (Mapping of occupation to apprenticeship frameworks and live vacancy information from the Skills Funding Agency AV Live online vacancy feed); and
- Online vacancy information provided by the Universal Job Match board API with query results returned from a fuzzy matching approach in the API.

5.3. Methodology and approach to providing data

The aim of LMI for All is to provide an open source interface to the detailed data required by services that support individuals in making better informed decisions about learning and work. This includes information on the jobs available currently and in the future by industry and occupation, presenting the qualifications and other attributes necessary to obtain a job and the pay associated with those jobs (as detailed above). The 4-digit SOC occupation code provides the organising framework through which data sets are linked and searches of the data base are made.

The initial approach to developing the LMI for All database focussed on using the APIs from data providers to facilitate quick and automatic updates. However, the conditions on which data producers make data available mean that this automated approach to updating is not practical. Instead, any data which might potentially disclose information about respondents have been checked and transformed into a synthetic form which preserves useful information or presented in the form of information from a statistical model. For instance, this approach has been adopted for information on vacancies from the ESS, for which all information based on a sample size less than 50 is suppressed. A process of statistical modelling has been used for data on employment and replacement

¹⁵ The Office for National Statistics is an Executive Office of the UK Statistics Authority. It is responsible for the collection, compilation, analysis and dissemination of a range of economic, social and demographic statistics relating to the UK.

demand from the *Working Futures* dataset. This combines the various official sources to create estimates of employment (which do not breach confidentiality nor are disclosive) at a more detailed level than it is possible to obtain from the official surveys alone. Estimates of pay and hours of work at 4-digit SOC have been produced by combining the ASHE and LFS data sets through a RAS¹⁶ model (a statistical process).

Other data sources added to the database do not run the risk of disclosing information about individuals (e.g. look-up tables), but require consistency checks and presenting in a suitable format for LMI for All. All of the data sources in LMI for All and their update histories are fully documented (see Table 1.1, section 1 above).

5.4. Refreshing variables in the database: potential and additional data sources

The LMI for All database must be kept up-to-date for it to remain relevant to users of the service. Most of the statistical data sources which it incorporates are regularly updated by the organisation generating the data, and thus new editions of data sources are added as they become available. For example, estimates of unemployment by occupation based on the LFS and HESA data on employment outcomes by course of study.

However, some of the data sets required new modelling work in order to generate updated information. Due to the limitations of sample size, survey estimates of pay and hours worked cannot be used directly. Therefore, the LMI for All database incorporates a set of estimates/predictions of these variables based on combining information from the ASHE and the LFS. Regression analysis is used to estimate an econometric model which predicts pay levels and hours worked by occupation, industry and other variables and these predicted values are then adjusted to ensure they match the published data. The following updates to the pay and hours data have been undertaken during this phase:

- Mean Weekly Pay;
- Medians and deciles;
- Estimates by age;
- Annual changes in pay; and
- Weekly Hours.

Two key elements of the database were not updated during 2016-2017:

- The core employment data sets are derived from the *Working Futures* employment projection exercise undertaken by the IER in conjunction with

¹⁶ RAS is an iterative procedure where the rows and columns of preliminary estimates of a two dimensional array are iteratively changed using proportions that are based on 'target' row and column totals.

Cambridge Econometrics. UKCES funded the production of new projections every 2-3 years. The latest set of projections (for 2014 to 2024) were added during 2015-2016, and hence there was no requirement to refresh the database during the year 2016-2017.

- The ESS, conducted every two years on behalf of the UKCES, collects information on the incidence and causes of vacancies and skills deficiencies within firms in all sectors of the economy. Since the ESS database was updated during 2015-2016 with the latest data from the 2015 ESS, there was no requirement to refresh the database during the year 2016-2017.

In addition to the quantitative data sources, new information was added on occupational job titles, O*NET and lookup tables for apprenticeship frameworks.

The US O*NET database contains detailed information relating to skills, abilities and interests associated with occupations. The US information has been adapted to the UK by matching the US occupational classification to the SOC. A new release of O*NET (v21.0) became available in July 2016, so the following was undertaken:

- A refresh of the mapping of US to UK occupations; and,
- The identification, collation and incorporation of updated skills information.

The ONS releases a revised list of job titles mapped to SOC codes twice a year in order to take account of new and changed job titles. This index is used to power the search facility of LMI for All, yielding a SOC code to link to statistical data when information for a particular job is requested. Updating this information involved:

- Adding new job titles from the ONS file using the SOC code; and
- Updating existing job titles, including revised SOC codes.

The LMI for All database can be linked to information on apprenticeships held by the Apprenticeship Frameworks Online (AFO) service hosted by the Federation for Industry Sector Skills and Standards. These frameworks were derived from industry sectors, but were classified to SOC2010 occupation codes using the IER's CASCOT (see <http://go.warwick.ac.uk/ier/software/cascot/>). More focussed Apprenticeship Standards linked to occupations have recently been developed (by employer groups known as Trailblazers), which are planned to replace the previous frameworks in 2017. The mappings of the Apprenticeship Standards to SOC2010 into LMI for All was undertaken during 2016-2017. The details of data sets added and updated during 2016-2017 are presented next.

5.5. Data updates and refreshing datasets

The schedule of work undertaken to update the LMI for All data base during the year 2016-2017 was as follows:

Table 5.1. Updates to LMI for All data undertaken in 2016-2017

Data set	Update
Unemployment rates by occupation, from LFS.	Data for 2016 added. Data for 2012-2015 revised, due to changes in the LFS population weight. Data for previous years unchanged.
Pay estimates, derived from ASHE and the LFS (change in pay indicator to enable time series data).	Change in weekly pay for years 2012-2013, 2013-2014 and 2014-2015.
Analysis of HE courses previously undertaken by people in particular jobs, from HESA destination of leavers survey.	Updated the variables using data from HESA destination of leavers survey for 2014-2015.
O*NET data.	Updated O*NET data relating to skills, abilities, interests and knowledge associated with occupations from v21.0 release, and link to SOC2014 4-Digit occupational categories.
Updated apprenticeship frameworks linked to SOC 2010 occupation codes.	Mapping of apprenticeship frameworks to SOC2010 4 Digit occupations.
Update of index of job titles linked to SOC2010 based on revisions provided by ONS.	Added new and revised job titles for SOC2010 Occupation codes Index.
Pay estimates, derived from ASHE and the LFS.	Data for 2016 added.

5.6. Potential future developments

There are a number of possible areas for further development of LMI for All so as to provide a more comprehensive picture of career opportunities for potential users. These would enhance the LMI for All service.

5.6.1. Labour market projections data

Occupational and industrial projections are of key importance for understanding future job opportunities, and the shape and structure of the future labour market. The labour market data and projections at the core of LMI for All are derived from the *Working Futures* database. As there seems to be no plans to update these projections, there needs to be consideration about how the absence of these data will impact on the LMI for All service. Currently, there is no alternative source of comparable data publically available.

5.6.2. Vacancy data

The most important missing element is comprehensive and up-to-date data on vacancies (the number of jobs potentially available to jobseekers), which could be linked with data in the LMI for All database. Vacancy data coded by occupation has not existed in the UK since the Department for Work and Pensions ended the collection of notified and unfilled vacancy data by Jobcentre Plus in November 2012. This was replaced by real-time vacancy data collected by Monster which formed the basis of the DWP Universal Jobmatch service¹⁷. Whilst LMI for All uses the Universal Jobmatch API (run by DWP) to bring in live vacancies, these are not mapped to UK SOC, so within LMI for All an automated matching process is used (which results in numerous gaps in the data).

A key aspiration is to incorporate real-time vacancy data (complemented by data on trends over time in vacancies), coded to SOC2010 4-digit occupation. European organisations have developed pilot projects which scrape real time vacancies and classify them to an occupational classification, map the skills and competencies within the text of the vacancy, record pay and create a geographical mapping. In the absence of changes to the current system, consideration should be made on drawing upon such scraping technology and explore the possibility of repeating this in the UK in order to provide a robust source of vacancy data. The pilot with real-time job analytic information from Burning Glass in early 2016 demonstrated the potential and problems involved in incorporating vacancy data.

The ESS, conducted every two years, collects information on the incidence and causes of vacancies and skills deficiencies within firms in all sectors of the economy. It is a sample survey of around 5 per cent of employers across the UK, yielding information for around 80 thousand establishments. The ESS yields estimates of the total number of vacancies, hard-to-fill vacancies and skill shortage vacancies by industry and occupation for local authority districts, English regions, the other UK nations and the UK as a whole. Data from ESS 2018 will become available later in 2017 and should be incorporated into LMI for All to update the current level of information on vacancies.

5.6.3. Course data

Another gap in the coverage of LMI for All from the perspective of people who want to plan their careers is the lack of information on educational and vocational courses. There are two main problems with incorporating course data – locating databases and the classification of courses. A number of course databases exist, maintained by individual institutions, awarding bodies and professional organisations and there are databases managed by the devolved nations. Whilst a database is known to exist at the ESFA for England, the database was reported as partial and unreliable by stakeholders. Thus, in

¹⁷ Universal Jobmatch is the Department for Work and Pensions (DWP) online service, which is open to all jobseekers, regardless of whether or not they are claiming a benefit. It works by matching jobseekers to jobs based on their skills and CV.

order to establish comprehensive coverage, the various databases have to be linked, implying the need to create robust systems of data collection, input and subject classification for course data. Much of the onus for improving course data lies with data owners.

While eXchanging Course Related Information (XCRI¹⁸) and Joint Academic Coding of Subjects (JACS¹⁹) systems of classifying courses to UK SOC are available, there is neither standard practice nor a widely used system. Whilst it is possible to map course data to UK SOC (as demonstrated by the 'look up' table for the apprenticeship vacancy data), courses need some form of classification in order to create a mapping. Potentially, each course dataset could have their own classification system, which may be updated and/or changed. Yet, to be useful there must be a common link to the Standard Occupational Classification.

5.6.4. Educational destination data

Whilst LMI for All includes data on the employment destinations of graduates from higher education, there is no information on the journey from compulsory education to post-compulsory education to the labour market destinations. This returns again to the issue of how courses are coded in order that they may be mapped to UK SOC. Mapping these data to SOC enables pathways through the labour market to be created. The LMI for All database would, as a result, be significantly enhanced. There is some potential to use the Longitudinal Education Outcome (LEO) data in the future, but exploration of the data are needed.

5.6.5. Commuting data

To provide a complete picture of the operation of the labour market, it is necessary to incorporate information on the geographical accessibility of job opportunities and the likelihood of having to commute to a job opportunity. The LFS includes questions on commuting, but the small sample numbers yielded mean that occupationally coded information would be subject to considerable uncertainty. The most geographically comprehensive and detailed data on commuting is provided by the 2011 Census of Population, but the data is now 6 years old and the ONS is sensitive about the potentially disclosive nature of detailed information.

¹⁸ XCRI stands for eXchanging Course Related Information. It is the UK standard for describing course information.

¹⁹ JACS (Joint Academic Coding of Subjects) is the subject classification system used to describe the subject content of courses at UK Higher Education institutions. JACS3 is used from 2012/13. This was developed jointly by HESA (Higher Education Statistics Agency) and UCAS.

However, “big data” sources such as Oyster cards, social media and mobile phone records have the potential to provide up-to-date and geographically detailed information on travel patterns. However, these data are rarely coded to occupation and obtaining useful information involves substantial costs. It would be useful to undertake a pilot study to investigate whether such sources could yield useful information economically.

5.6.6. Better local information and geocoding

One issue that has emerged in discussions with careers professionals is the desire for more local and geocoded data. It is possible to combine data from LMI for All with NOMIS²⁰ data for smaller geographical areas in order to provide a picture of local labour market conditions. Ideally, the core employment data sets should also be available for smaller geographical areas. However, as data becomes more local, the sample size becomes smaller and thus less fine-grained results are possible for a given minimum level of reliability. Also, the risk of data being regarded as disclosive of individual characteristics increases.

One way around this problem would be to create synthetic data sets at the local scale, using the labour market data in LMI for All. Because of the risk of disclosing confidential information, local area data is generally one-dimensional. For example, there may be information on employment by industry, but this is not further broken down by occupation or qualifications. Microsimulation is a technique which can apply a multi-dimensional relationship for a larger geographical scale (e.g. the region) to a 1-dimensional vector of data at the local scale to estimate the multidimensional matrix at the local scale. The greater the difference in size between the areas for which the actual relationship is measured and the areas for which estimates are made, the greater the degree of uncertainty in the estimates yielded. It might be worth investigating whether these techniques could yield useful information (which would be presented as central estimates with a range of uncertainty around them).

An alternative approach may be the ‘crowdsourcing’ – in which employment and careers advisers and other end-users themselves add local ‘intelligence’ to the LMI provided at national and regional levels. There is nothing to stop application developers adding these features themselves. Yet, there may be benefit in including such intelligence within the national database for scaling purposes. A further possibility would be to develop scrapers to collect data from for example local newspaper websites to add to the official LMI.

²⁰ Web-based database of labour market statistics from ONS, includes statistical information on the UK labour market (i.e. Employment, Unemployment, Earnings, Labour Force Survey and Jobcentre Plus vacancies).

5.6.7. European sources

Planned revisions of the EURES job portal (see <https://ec.europa.eu/eures/public/homepage>) and the mainstreaming of European Skills/Competences, qualifications and Occupations (ESCO) framework for 2016/17 may provide useful information on vacancies and skills in a Europe-wide context, including the UK.

5.7. Recommendations for data developments

A number of areas for further development of LMI for All have been identified so that it can link to information and provide more comprehensive information for career planning. These are summarised next:

- The key priority for future data development is to ensure that the projections of employment and replacement demand at the core of LMI for All are updated, to ensure that the system remains relevant;
- Another pressing need is to find a way of incorporating comprehensive information on courses coded to S 4-digit occupation;
- The system would be greatly improved by adding a way of linking to vacancies coded to 4-digit occupation. Given that this data is not collected, this would involve investment in developing techniques to generate information as close to the ideal as possible by web-scraping and automatic classification (or similar); and,
- Another improvement would be to provide more detailed geographical information on the current and projected structure of employment. Given the limitations of official data sources, this might require creating synthetic data (e.g. using microsimulation techniques).

6. Technical developments

This section details the technical developments for the fourth phase of the LMI for All development.

6.1. Objectives and outcomes for 2016-2017

While at the outset of the current project phase the focus was on completion of the Extract, Transform and Load (ETL²¹) system, it became apparent over the course of this phase that growing usage numbers would necessitate an infrastructure upgrade to adequately prepare LMI for All for the future. Since the most important datasets (especially the ASHE data set) are now covered by automated ETL testing and the others can be managed manually with comparatively little effort, development resources were shifted to the new infrastructure design.

6.2. Database - upgrades, maintenance and monitoring

6.2.1. Extract, Transform and Load System (ETL)

While work on the ETL system has progressed, development resources were shifted to building a new IT infrastructure to manage the increased traffic to LMI for All. Automated ETL and testing processes have been developed and made available for the largest datasets (namely ASHE Pay and ASHE Hours).

6.2.2. Data cubes

Data cubes were originally introduced to allow cross-sectioning of ASHE data across years in a time series. However, this was determined to be statistically infeasible, and the data, once retrieved, were not reliable. As such, there was no productive use for the data cubes, so their development did not move beyond the beta stage. Data cubes have been retired since the infrastructure upgrade so as to simplify API server deployment.

6.2.3. Analytics/API Dashboard, usage data and monitoring

Regular, manually generated usage reports were discontinued with the infrastructure move, since the report generation relied on usage data coming from only one server. As part of the new infrastructure, automated real-time monitoring of current API status, distributed server load and an automated 3-month usage report has been developed.

²¹ Extract, Transform and Load processes are for database usage, including: extracting data from external sources; transforming it to fit operational needs, which can include quality levels; plus loading it into the end database.

These reports can be viewed in the API status dashboard at:

<https://api.lmiforall.org.uk/status/>.

6.2.4. Query error monitoring

Query error (a message that is reported when there is a problem, request, or query to the database) monitoring has also been re-developed in accordance with the new IT infrastructure. Instead of monitoring one server for query errors and e-mailing these to the developer team, each of the new redundant API servers now runs its own error monitoring agent. The agent sends any errors that occur to an error aggregation service (<https://sentry.io>) that generates reports and code inspections. These are much more detailed than the previous error reports, so developers can identify and fix errors more easily. LMI for All is an established project, so production errors are rare.

6.2.5. Outage monitoring

LMI for All continues to be monitored for server outages from the outside by Uptime Robot (<https://uptimerobot.com/>). The new API monitoring dashboard also uses a system called Prometheus on the back-end that installs reporting agents on every API server. This system can be used to create very fine-grained internal monitoring alerts in the future if the need arises.

6.2.6. Technical support and customer care

Technical support has been provided by the development team, answering technical questions and providing code samples to interested developers. This support also includes helping developers with bug fixes supporting the development process. In response to queries from developers and other interested parties, a set of *Frequently Asked Questions* have been developed by the team and made available from the LMI for All website at: <http://www.lmiforall.org.uk/questions-and-answers/>.

6.2.7. Data security and data disclosure

Data are stored in a secure database with the only access to users being made through the API. Disclosive data are filtered for and restricted. If data are deemed to be disclosive, due to limitations in sample sizes, the API returns data based on a larger scale of disaggregation.

6.3. Development and maintenance of the API

LMI for All previously relied on a single API server with no redundancy, making it a single point of failure. Over the course of the development, the API was transitioned to a multi-server redundant design behind a load balancer. The load balancer accepts queries and distributes them among a set of identical API servers, which fulfil the query. In case of

one of the API servers being unavailable due to upgrades or technical failure, the queries will automatically be redistributed to the remaining servers. This allows continuous operation of the API as a whole and upgrades with zero noticeable downtime.

Provision and deployment of new API servers has been automated. If usage increases further, additional API server installations can be automatically constructed from a programmatic blueprint and put into operation within minutes (typically less than five minutes). Together with the automatic load balancing, this makes LMI For All future-proof against increasing usage. A remaining concern is the database server, whose deployment has not been automated. However, a database server generally supplies multiple API servers with data, so usage would have to increase considerably to necessitate upgrades on the database layer as well.

Increased usage and the move to a new infrastructure have had an impact on the monitoring systems. While a new monitoring dashboard has been developed, the previous API key system could not be transitioned to the new infrastructure due to resource constraints (it would require additional servers and software licenses). However, due to the newly added capacity, throttling queries via keys is currently not necessary.

6.4. Enhancement of the LMI for All website

The LMI for All website has continued to be developed over the fourth phase of the project, mainly through iterative improvements and updating of content. Blogs have been introduced into the 'news and blogs' section covering a number of topics based on user queries. Topics have included:

- The LMI for All symposium;
- What you can do with LMI for All;
- The redeveloped Careerometer widget;
- Understanding pay data and how to use the change in pay indicator;
- How is careers labour market information and intelligence being used and making an impact across the world?; and,
- What is replacement demand?

Additionally, the Frequently Asked Questions (FAQs) page has been rewritten both to reflect changes in the project, but also to provide answers to common questions that have been received by email.

Over the fourth phase, there have been approximately 11,500 visitors to the LMI for All website; the vast majority are from the UK, although there has been some interest from Brazil and Denmark. Of these visitors, 48% were new. The Bounce Rate, which refers to the number of people who left after only visiting one page, is around 60%. This is considered an average Bounce Rate for websites such as LMI for All. The average

number of pages viewed is around two, with the average length of visit around two minutes.

6.5. Future developments

The updated technical infrastructure, which was recently implemented, is robust. However, this forecast is dependent on the number of API queries resulting in requests to the database – currently request levels are manageable as well as daily spikes of around 400,000. It is estimated that the system can handle up to 800,000 requests per day, which is twice the current level of requests. However, the new infrastructure means that should requests increase beyond 400,000 a number of new API servers can be automatically deployed.

If there is a desire to monitor usage of LMI for All in more detail, then a new API key system should be considered.

- If traffic to LMI for All increases beyond those detailed above, then resources may be needed in the future to expand API and server capacity.

Appendix A: Overview of stakeholder dissemination activity

Dissemination activity – UK	Numbers	Careers guidance service providers	Schools	FE	HE	LEP	Policy	Training providers	Others (such as developers)
<p>Employability and Skills Summit 2016, East Midlands Chamber – Derbyshire, Nottinghamshire and Leicestershire, Nottingham</p> <p><i>Audience:</i> employers, schools, colleges, training providers, universities. <i>Activity:</i> presentation, http://www.emc-dnl.co.uk/information/8922/employment-and-skills-summit-2016-post-summit-detail <i>Impact/purpose:</i> to promote project to teachers/schools, interest in creating a web interface.</p>	120 plus			X				X	
<p>Employer engagement in education and training, Education and Employers Charity and Edge Foundation conference, London</p> <p><i>Audience:</i> aimed at those in education and training sector, and policy-makers. <i>Activity:</i> LMI for All included within conference keynote, LMI for All and Careerometer leaflets distributed. <i>Impact/purpose:</i> to promote project to a non-careers audience in the education and training sector; and, to promote interest in Careerometer.</p>	250		X	X			X		X
<p>‘Future of Education’ organised by the Education Select Committee (Chaired by Neil Carmichael), London</p> <p><i>Audience:</i> policy makers, educationalists, employers and employer bodies. <i>Activity:</i> chaired session ‘Employability and Functional Skills’, in which LMI for All was introduced: http://www.parliament.uk/business/committees/committees-a-z/commons-select/education-committee/news-</p>	100		X	X	X		X		

Dissemination activity – UK	Numbers	Careers guidance service providers	Schools	FE	HE	LEP	Policy	Training providers	Others (such as developers)
parliament-2015/purpose-quality-education-conference-16-17/ <i>Impact/purpose:</i> to introduce and foster understanding about LMI for All to a new audience.									
London Ambitions, Senior Advisory Group meeting, London <i>Audience:</i> policy makers, educationalists from London schools and academies. <i>Activity:</i> follow up to London Ambitions. <i>Impact/purpose:</i> to promote LMI for All and Skillsmatch with policy makers and LEP representatives.	14		X	X		X	X		
Excellence Squared: Quality Assessors' Annual Conference, Stoke Rochford, Lincolnshire <i>Audience:</i> Merlin, matrix and Customer Excellence Assessors across England, Scotland, Northern Ireland and Wales. <i>Activity:</i> LMI for All flyer distributed. <i>Impact/purpose:</i> to introduce and foster understanding about LMI for All to new audience, promoted as a resource for schools trying to attain matrix standard.	100	X							X
Northern Ireland Skills Show, Titanic Exhibition Area, Belfast <i>Audience:</i> schools, colleges, training providers, employers and careers providers from across Northern Ireland. <i>Activity:</i> distribution of flyers in teachers and advisers' packs, chaired workshop where raised awareness of LMI for All and its potential, plus chaired an employer breakfast session with links made to the NI Skills Barometer and LMI for All. <i>Impact/purpose:</i> to promote LMI for All to NI and Irish careers community, KareerHub stand showcasing the application of LMI for All.	150 plus	X	X	X	X		X	X	X

Dissemination activity – UK	Numbers	Careers guidance service providers	Schools	FE	HE	LEP	Policy	Training providers	Others (such as developers)
Minister Weir, the Education Minister for Northern Ireland and 5,849 visitors attended across two days, including post-primary schools and further education colleges.									
<p>CDI Scottish Student Conference and Exhibition, Edinburgh Napier University, Scotland</p> <p><i>Audience:</i> QCGD students, student careers professionals and a number of leaders in the careers field. <i>Activity:</i> LMI for All included within conference keynote, and distribution of leaflets. <i>Impact/purpose:</i> to introduce project to those new to the careers community and present LMI for All as offering a possible future for careers LMI.</p>	60	X	X	X	X		X	X	
<p>London Councils Careers Clusters Network meeting</p> <p><i>Audience:</i> network of London schools and colleges. <i>Activity:</i> presentation introducing LMI for All, data, third party users appropriate to audience, and promoted new widget and webinars. <i>Impact/purpose:</i> to promote the project and Careerometer, follow up from one school to help with LMI in practice, interest from GLA Economics about API, and a number of people signed up for a webinar.</p>	40		X	X		X			
<p>Gatsby</p> <p><i>Audience:</i> two senior level members of Gatsby team. <i>Activity:</i> update on LMI for All, discussed new data available, funding, technical aspects, and Gatsby updated on their work on Benchmarks and STEM. <i>Impact/purpose:</i> to promote project and Careerometer, discussion on NE pilot, also discussion on how their activities could be linked up (what they could produce using LMI for All and where the gap in the market is). Asked IER</p>	2								X

Dissemination activity – UK	Numbers	Careers guidance service providers	Schools	FE	HE	LEP	Policy	Training providers	Others (such as developers)
to help with extend SOC mapping with the aim of creating a website showing technical pathways.									
<p>Oxfordshire County Council Annual CEIAG Conference, Oxford</p> <p><i>Audience:</i> senior leaders, careers coordinators, careers advisers, work experience coordinators, governors, and early intervention workers.</p> <p><i>Activity:</i> keynote on careers landscape including mention of LMI for All.</p> <p><i>Impact/purpose:</i> to promote project and upcoming webinars.</p>	100	X	X	X		X		X	X
<p>Prospects Group, London, Wandsworth Prison</p> <p><i>Audience:</i> Strategic Director for work in prison, Wandsworth Prison Training Provider, and Head of Learning and Skills.</p> <p><i>Impact/purpose:</i> to assess the feasibility of making use of LMI for All in a prison context, two follow up meetings to discuss scope for a customised app for work with prisoners, and embedding LMI in curriculum and training programmes.</p>	4	X						X	X
<p>City of London, Employability Team</p> <p><i>Audience:</i> Sophie Hulme, Head of Employability, City of London.</p> <p><i>Activity:</i> invitational meeting.</p> <p><i>Impact/purpose:</i> to promote LMI for All third-party users as an up-to-date source of careers information.</p>	1		X	X	X		X		
Somerset Headteachers' Association	48	X					X		

Dissemination activity – UK	Numbers	Careers guidance service providers	Schools	FE	HE	LEP	Policy	Training providers	Others (such as developers)
<p><i>Audience:</i> Headteachers/Deputy Headteachers, Local Authority representatives ‘careers policies’.</p> <p><i>Activity:</i> half-day session on career developments in a school context facilitated with LMI for All and third-party users promoted, and power-point and fliers distributed.</p> <p><i>Impact/purpose:</i> to heighten awareness of LMI for All and its application within schools and colleges, and, ongoing dialogue regarding the embedding LMI for All in schools.</p>									
<p>National Careers Service, West Midlands CEIAG Conference</p> <p><i>Audience:</i> NCS advisers and managers.</p> <p><i>Activity:</i> keynote.</p> <p><i>Impact/purpose:</i> to promote LMI for All third-party users as an up-to-date source of careers information, and to promote webinars.</p>	120	X	X	X	X	X	X	X	
<p>Kingsley School, Leamington Spa</p> <p><i>Audience:</i> parents and carers and pupils.</p> <p><i>Activity:</i> presentation to parents/carers and pupils, plus promotion of LMI for All and Careerometer to careers coordinator and teachers.</p> <p><i>Impact/purpose:</i> to promote LMI for All third-party users as up-to-date source of careers information.</p>	45		X						X
<p>National College for High Speed Rail</p> <p><i>Audience:</i> senior level representatives from Prospects.</p> <p><i>Activity:</i> initial meeting presented on LMI for All and its potential, follow up meetings to support process of app development.</p>	4			X	X			X	

Dissemination activity – UK	Numbers	Careers guidance service providers	Schools	FE	HE	LEP	Policy	Training providers	Others (such as developers)
<p><i>Impact/purpose:</i> to promote LMI for All and to explore options for app development. App development now in process.</p>									
<p>Careers network, University of Birmingham</p> <p><i>Audience:</i> Higher education career services advisers and managers. <i>Activity:</i> keynote on the future labour market and sources of LMI, using LMI for All and third party users as example of robust LMI, activity on assessing sources, and distribution of leaflets. <i>Impact/purpose:</i> to promote LMI for All and forecast data included in database, plus to discuss future possibilities of LMI for All.</p>	47	X			X				
<p>Invitational meeting with Department for Transport, chaired by Minister Hayes, supported by Catherine De Macros, Deputy Director, Infrastructure Skills</p> <p><i>Audience:</i> industry experts from STEM sectors, employers e.g. Crossrail, higher education e.g. Universities UK, University of Bolton. <i>Activity:</i> LMI for All discussed as a means to support the Infrastructure Skills Strategy e.g. strengthening LMI in schools and colleges. <i>Impact/purpose:</i> LMI for All features within a HE and Businesses paper presented to the Deputy Director, Infrastructure Skills in late April 2017.</p>	30				X		X	X	X
<p>Black Country Career Development Partnership Meeting</p> <p><i>Audience:</i> EBPs, Local Authorities x 4, CEC, National Careers Service – Inspiration Team, Wolverhampton</p>	23	X		X	X	X	X	X	X

Dissemination activity – UK	Numbers	Careers guidance service providers	Schools	FE	HE	LEP	Policy	Training providers	Others (such as developers)
University, Black Country Colleges, Chamber of Commerce and School Governors Regional Co-ordinator. <i>Activity: meeting participant.</i> <i>Impact/purpose: to raise awareness of latest LMI for All developments and to connect this into a draft Careers Offer for Young People in the Black Country.</i>									
CDI Student Conference, Coventry <i>Audience: student careers professionals and a number of leaders in the careers field.</i> <i>Activity: keynote, and distribution of leaflets.</i> <i>Impact/purpose: to introduce those new to the careers community sources of LMI and those using LMI for All future possibilities.</i>	50	X	X	X				X	
Adviza, Thames Valley with PEF Impetus – Annual Conference, High Wycombe <i>Audience: Adviza and PEF Impetus staff members.</i> <i>Activity: keynote.</i> <i>Impact/purpose: to raise awareness of latest LMI for All developments and its potential for work in schools and the wider community.</i>	137	X	X	X					X
Wolverhampton City Council: Annual Partnerships Conference <i>Audience: schools, colleges, Wolverhampton University, Local Authority representatives, and training providers and specialist community organisations.</i> <i>Activity: keynote and dissemination of LMI for All presentation and flyers.</i> <i>Impact/purpose: to raise awareness of LMI for All and third party users, and its potential to be used across a range of educational institutions.</i>	90	X	X	X	X		X	X	X
Cornwall County Council	35	X	X	X	X	X	X	X	X

Dissemination activity – UK	Numbers	Careers guidance service providers	Schools	FE	HE	LEP	Policy	Training providers	Others (such as developers)
<p><i>Audience:</i> Cornwall Careers Offer lead by Cornwall County Council working with local partners. <i>Activity:</i> seminar presentation. <i>Impact/purpose:</i> raised the profile of LMI for All – 19 references made to LMI in <i>Cornwall Careers Offer 2016 - 2020</i>, http://www.cornwall.gov.uk/media/23345753/cornwall-careers-offer-web.pdf</p>									
<p>Yorkshire and the Humber – Aspire-igen and partners, Leeds <i>Audience:</i> The Humber LEP, Leeds City Council and Sheffield City Council (All-age careers offer). <i>Activity:</i> Ongoing meetings and discussion re: opportunities to embed LMI for All within local careers offers for young people and/or adults. <i>Impact/purpose:</i> to raise the profile of LMI for All and to embed good and interesting practices within local devolved arrangements.</p>	30	X	X	X		X			X

Dissemination activity – International	Numbers	Careers guidance service providers	Schools	FE	HE	LEP	Policy	Training providers	Others (such as developers)
<p>Aarhus University, Denmark <i>Audience:</i> Different educational and labour market institutions, federal agencies, policymakers and practitioners. <i>Activity:</i> keynote. <i>Impact/purpose:</i> to promote project to international careers guidance community.</p>	100	X							X
<p>Department of Employment and Social Development, Canadian federal government Department symposium on “Learning and Labour Market Information (LLMI)”, Ottawa, Canada <i>Audience:</i> domestic and foreign experts involved in the production and dissemination of LLMI, and senior government officials. <i>Activity:</i> keynote. <i>Impact/purpose:</i> to promote LMI for All and foster interest amongst an international audience of LMI experts, gain feedback and comment on project.</p>	75						X		
<p>LMI and Careers, Oslo, Norway <i>Audience:</i> careers guidance, HE, researchers and Norwegian policy makers. <i>Activity:</i> keynote. <i>Impact/purpose:</i> to promote LMI for All to international audience – for Norway to examine the viability of model for country context.</p>	40	X					X		X
<p>e-guidance & e-governance, Oslo, Norway <i>Audience:</i> European seminar for representatives from the Baltic States. <i>Activity:</i> keynote.</p>	25	X	X	X			X	X	X

Dissemination activity – International	Numbers	Careers guidance service providers	Schools	FE	HE	LEP	Policy	Training providers	Others (such as developers)
<i>Impact/purpose:</i> to present on LMI for All as exemplar of integration of ICT into guidance.									
<p>Cedefop Skills Panorama, Thessaloniki</p> <p><i>Audience:</i> Cedefop, Skills Panorama team, Eworx (developers), representative of real time LMI project. <i>Activity:</i> presentation ‘Inspiration of LMI for All API’. <i>Impact/purpose:</i> to promote project, share lessons learnt, to forge links with real time LMI project as possible source of future data.</p>	14								X
<p>Boston University, USA webinar – LMI for All and SkillsMatch London</p> <p><i>Audience:</i> careers guidance and counselling advisers that work across a range of institutions, service managers, and policy makers.</p> <p><i>Activity:</i> webinar with Yolande Burgess (Strategy Director, London Councils) and Dr Scott Solberg (US State Leaders Career Development Network Co-ordinator) on ‘Developing Partnerships with Education and Industry for Work-based Learning Opportunities: An International Perspective’.</p> <p><i>Impact/purpose:</i> to promote LMI for All as a model of good and interesting practice.</p>	25	X	X	X	X		X		
<p>IAEVG Promoting Equity through Guidance, Madrid</p> <p><i>Audience:</i> international audience and careers professionals. <i>Activity:</i> distribution of leaflets and networking. <i>Impact/purpose:</i> to promote project to international careers guidance community, update those who are aware of project, and interest from lectures based in Ireland and the National Centre for Guidance in Education (NCGE).</p>	12	X						X	X

Appendix B: Organisations requesting API key

1. Active Informatics Ltd
2. Addison Group
3. Adviza
4. App Brahma, Inc
5. ats Community Employment
6. BDC
7. Blue Crystal Web Design
8. BlueLinkMedia
9. Bury Council
10. Cambridge Education Group
11. Careers South West Ltd.
12. CASCAiD Ltd
13. CIAG
14. City & Guilds
15. Dark Pie Studio
16. Digital Contraptions Imaginarium Ltd.
17. DWP
18. Education for Employability
19. Furness College
20. Gradcore
21. Greater Merseyside Connexions Partnership
22. Grizzly Games
23. Reizon Studios
24. icould
25. i-education Ltd
26. Incremental Productions Ltd
27. Kaikoda
28. Kanzi
29. MadMouse
30. Monster
31. Newcastle College
32. Occopus
33. Owens Consulting (UK) Ltd
34. Passbx Developers
35. Photz Tech

- 36.popsicles
- 37.PwC
- 38.Qlue
- 39.Red Ant
- 40.Reed NCFE
- 41.Rotherham Metropolitan Borough Council
- 42.Royal Borough of Windsor and Maidenhead
- 43.SACU Ltd
- 44.Screenmedia
- 45.Second-Dust
- 46.SFA
- 47.sinecode
- 48.Skills Development Scotland
- 49.Skills Funding Agency
- 50.SPS Training Solutions Limited
- 51.The Careers Group, University of London
- 52.The Work People CIC
- 53.Tribal
- 54.U-Explore
- 55.University of Warwick
- 56.Vision West Nottinghamshire College
- 57.West Nottinghamshire College
- 58.XTargetProductionsX

Appendix C: Users of Careerometer up to 1 June 2017

Those organisations marked with an asterix (*) have implemented Careerometer since June 2016.

UK-wide

1. Moving On magazine (an online careers magazine which a number of other websites point to as a resource) <http://movingonmagazine.co.uk/careerometer/>
2. The Gatsby Technicians make it happen campaign <http://technicians.org.uk/make-it-happen/>
3. Careercomp@nion <http://www.careercompanion.co.uk/pages/lmi> *
4. Talking Jobs <http://www.talkingjobs.net/blog/lmi-for-all-careerometer> *
5. Amazing People <http://www.amazingpeople.co.uk/lmi/> *
6. Prospects <http://www.prospects.co.uk/Home.aspx>
7. I can be a... https://www.icanbea.org.uk/?page_id=3675 *

East

8. Youth Connexions Hertfordshire, Hertford <http://connexions-hertfordshire.co.uk/careers/info-on-jobs-and-apprenticeships/careerometer/>*
9. SPS Training Solutions Ltd., Stevenage <http://www.sps-training.com/> *
10. John Masefield High School and Sixth Form Centre, Ledbury <http://www.jmhs.hereford.sch.uk/sixth-form/information/careers/> *
11. The Skills Service, Peterborough <http://www.theskillsservice.co.uk/stand-out/job-hunting-advice/labour-market-information/> *

East Midlands

12. Ducere <http://ducere.org.uk>
13. Vision West Nottinghamshire College, Mansfield <http://iag.wnc.ac.uk/4098-2/>
14. Da Vinci Community School, Derby <http://www.davinci.derby.sch.uk/careerometer> *
15. Landau Forte Charitable Trust, Derby <https://lfct.org.uk/> *

London

16. Connexions Ealing at Northolt High School, West Ealing, Greater London
<http://northolthighconnexions.weebly.com/lmi-and-other-resources.html>
17. The College of Haringey, Enfield and North East London
<http://www.conel.ac.uk/courses.html>
18. Spark! Kick Starting Careers, Hounslow <http://sparklondon.org/students-and-parents/advice/careerometer/>
19. Central London Careers Hub (CLCH)
<http://www.centrallondoncareershub.co.uk/stuff/lmi-for-all>
20. CLC Building Futures, (Organisation Now Closed)*
21. Bishopshalt School, Uxbridge
<http://www.bishopshalt.hillingdon.sch.uk/page/?title=CV+Builder%2C+Vacancy+Bulletin+%26amp%3B+Labour+Market+Info&pid=577> *

North East

22. The King Edward VI School, Morpeth <http://www.kevi.info/careerometer/>
23. Kenton Multi Academy Trust, Newcastle upon Tyne
<http://www.kenton.newcastle.sch.uk/careerometer.php>
24. Hartlepool College of Further Education, Hartlepool <http://www.hartlepoolfe.ac.uk/>
25. Greenfields School (on their moodle), Newton Aycliffe
<http://www.greenfieldschool.net/>
26. Teeside University, Middlesbrough
http://www.tees.ac.uk/depts/careers/careers_help/occupational_information.cfm
27. East Durham College, Durham <http://www.eastdurham.ac.uk/careerometer>
28. Connexions-TW, Tyne and Wear <http://www.connexions-tw.co.uk/compare-careers>
29. Hillside Academy, Cleveland <http://www.hillsideacademy.org/careers/labour-market-careerometer> *
30. St Joseph's Catholic Academy, Newcastle
http://www.stjosephs.uk.net/?page_id=1419 *
31. Park View School, County Durham
<http://www.parkviewlearning.net/?s=careerometer> *

North West

32. Burnage Academy for Boys, Manchester
<http://www.burnage.manchester.sch.uk/index.php/school-life/ceiag/careerometer>
33. Fazakerley High School, Liverpool <http://www.fazakerleyhigh.org/careers.php>

- 34. University of Salford, Salford <http://www.careers.salford.ac.uk/page/Labour-Market-Information>
- 35. Trinity Church of England High School, Manchester <http://www.trinityhigh.com/careers/advice.php> *
- 36. Burnley College, Lancashire <http://www.burnley.ac.uk/adult/ncs> *

South East

- 37. Hillview Sixth Form, Tonbridge, Kent <http://www.hillview.kent.sch.uk/current-students-2/careerometer/>
- 38. Career Guidance Charts, Tunbridge Wells, Kent <http://www.careerguidancecharts.com/career-comparison.html>
- 39. New Line Learning Academy, Maidstone <http://www.futureschoolstrust.com/New-Line-Learning/Skills-For-Life/Career-Comparison>
- 40. FHS Careers <http://fhscareers.weebly.com/>
- 41. Frances Cushway (career coach), Godalming <http://www.francescushway.com/careerometer>
- 42. What's your next move?, Surrey County Council <http://www.careersadviceinsurrey.co.uk/GeneralPage.aspx?sectionID=4>
- 43. The Leigh UTC, Dartford <http://theleighutc.org.uk/students/careers/research/> *
- 44. Wilmington Academy, Dartford <http://wilmingtonacademy.org.uk/careers/research/> *
- 45. Longfield Academy, Kent <http://longfieldacademy.org/careers/research/> *
- 46. Opps in Buckc Wannabe, Buckingham <https://wannabebucks.org/careerometer/> *

South West

- 47. Careerpilot, Western Vocational Progression Consortium (comprises seven higher education institutions, collaborative colleges and training provider partners in the northern sub-region of the South West), Bath <http://www.careerpilot.org.uk/info/a-job-or-career/search-job-sectors/>
- 48. Next steps Cornwall, Falmouth <http://www.nextstepscornwall.co.uk/info-and-resources/careers-advice-and-employment-op/careerometer-widget>

Yorkshire and the Humber

- 49. Higher Education Progression Partnership (for the Sheffield City Region), Sheffield <http://apprentice-forward.org.uk/careers-advice/careerometer>
- 50. C&K Careers online, Huddersfield <http://ckcareersonline.org.uk/uncategorised/93-job-trends>

51. Redcar and Cleveland Borough Council, Redcar <http://www.redcar-cleveland.gov.uk/jobs/Careerometer.html>
52. Yes Progress!, Sheffield <http://extra.shu.ac.uk/yesprogress/> *
53. Meadowhead School Academy Trust, Sheffield <http://www.meadowhead.sheffield.sch.uk/page/?title=Careerometer&pid=483> *
54. John Smeaton Academy, Leeds <http://www.johnsmeatonacademy.org.uk/parents/careers-advice-and-guidance/> *

West Midlands

55. Aim Higher West Midlands (partnership of Higher Education Institutions, schools, academies and colleges), Birmingham <http://www.aimhigherwm.ac.uk/for-learners-2/aged-11-to-14/career-planning>
56. Northern House School, Solihull <http://northernhousesolihull.schooljotter2.com/news/specific-subject-news/careers>
57. Ormiston Sandwell, Oldbury <http://www.ormistonsandwell.org.uk/Students/Careers/>
58. The Rawlett School (an AET academy), Tamworth <http://www.rawlettschool.org/advice-guidance/labour-market-information-lmi> *

Northern Ireland

59. KareerHub <http://kareerhub.co.uk>
60. St Louis Grammar School, County Antrim <http://www.stlouisgrammar.com/ceiag/careerometer> *

Others who are in the process of embedding Careerometer in their website:

1. Havering College, Essex <http://www.havering-college.ac.uk/enterprise-employability/careers-hub>
2. Littleover Community School, Derbyshire <http://www.littleover.derby.sch.uk>
3. Job Change, West Midlands, Prospects <http://www.jobchange2007.com>



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