

## Preface

# The Programme for International Assessment of Adult Competencies – An Overview

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Policymakers have become increasingly concerned not only over the levels of traditional literacy skills in their populations but also the growing importance of human capital and the broadening of the skills that will be needed to sustain productivity and social cohesion. The increased importance of human capital and the learning that is associated with it has led to a critical need for information about the distribution of knowledge, skills and characteristics that are needed for full participation in modern societies. The Organisation for Economic Co-operation and Development (OECD), in recognition of this need, initiated the development and implementation of an international comparative survey of adults named the Survey of Adult Skills, as part of its Programme for the International Assessment of Adult Competencies (PIAAC), with the following goals and objectives:

- provide policymakers in each participating country with a baseline profile of adults in their country in terms of the knowledge, skills and competencies that are thought to underlie both personal and societal success;
- assess the impact of these competencies on a variety of social and economic outcomes at the individual and aggregate levels;
- gauge the performance of education and training systems in generating the required competencies; and
- help clarify some of the policy levers that could contribute to enhancing competencies.

The OECD Skills Strategy report (OECD, 2012a) identifies three key areas for action by governments in developing policies on skills designed to support sustainable long-term growth and employment creation, and contribute to a fairer distribution of income and opportunities.

- **Developing relevant skills:** Ensuring that the supply of skills is sufficient in both quantity and quality to meet current and emerging needs is a central goal of skills policies. Supply can be ensured by developing the right mix of skills through education and training and by influencing the flow of skills through attracting and retaining talent. Supply is not only responsive to demand; it can also have an important influence on demand.
- **Activating skills:** People may have skill but for a variety of reasons may decide not to offer them to the labor market. Individuals withdraw from the labor force for a range

of reasons, including personal preferences, life circumstances, or the lack of financial incentives to work. Encouraging inactive individuals to enter or reenter the labor force can increase the skills base of an economy. This requires identifying inactive individuals, possibly retraining them, ensuring that the benefit system offers them financial incentives to enter or return to the labor market, and removing demand-side barriers to hiring.

- Putting skills to effective use: Investment in skills development by individuals and governments needs to be accompanied by policies that ensure that these skills are used effectively. Moreover, the match between the skills demanded in a job and those of the person doing the job has an impact on further skills development: Unused skills tend to atrophy, while new skills are, to a large extent, developed informally, often through work experience.

The Survey of Adult Skills responds directly to these themes and represents one of the key sources of empirical evidence which is available to help understand these issues. In particular, PIAAC considerably enhances knowledge about the stock of skills in the population by providing direct measures of key skills in addition to traditional measures such as educational attainment and labour force experience. It also offers a rich tool for better understanding the processes through which skills are gained, lost, and retained, and the extent to which skills are effectively used to create value for the economy and individuals.

## **Features of PIAAC**

PIAAC has been planned as an ongoing program of assessment. The first cycle of the assessment has involved three completed “rounds” to date. The first took place over the period of January 2008-October 2013, the second took place between January 2012 and June 2016, and the third round between September 2014 and September 2019. The second cycle of the assessment is now under way and expected to take place over 2018-2023.

The main features of the first cycle of PIAAC are described below.

### ***Skills assessed***

PIAAC assesses three domains of cognitive skill:

- Literacy (including reading components)
- Numeracy
- Problem solving in technology-rich environments (PSTRE), computer-delivery only

The assessments of literacy and numeracy were undertaken by all participating countries. The assessments of reading components and problem solving were optional elements of the assessment in Round 1 of the study but were required of all countries in Rounds 2 and 3.<sup>1</sup> Of the countries that reported results in Round 1, most implemented the reading components assessment, with the exceptions being Finland, France and Japan. Most implemented problem solving in technology-rich environments (PSTRE), with the exceptions being France, Italy and Spain. It should be noted that the computer-delivered version of the assessment was not used

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<sup>1</sup> In Rounds 2 and 3, there were no optional components, so the assessments of reading components and PSTRE were treated as core components.

in Jakarta (Indonesia) in Round 2 of the study. Consequently, while reading components were assessed in Jakarta, PSTRE was not.

A brief overview of the domains of competence assessed in PIAAC is provided below. The conceptualization of these domains is explained in more detail in Chapter 2 (see also OECD, 2012b).

### *Literacy*

Literacy is defined in PIAAC as: “*understanding, evaluating, using and engaging with written texts to participate in society, to achieve one’s goals, and to develop one’s knowledge and potential*” (OECD, 2012b). “Literacy” in PIAAC does not include the ability to write or produce text, skills commonly falling within the definition of literacy.<sup>2</sup> However, at the same time, “literacy” is a broader construct than “reading,” narrowly understood as a set of strategies for decoding and comprehending written text primarily in prose format. It is intended to encompass the range of cognitive strategies (including decoding) that adults must bring into play to respond appropriately to a variety of texts of different formats and types in the range of situations or contexts in which they read. A unique feature of the assessment of literacy in PIAAC is that it assessed adults’ ability to read digital texts (e.g., texts containing hypertext and navigation features such as scrolling or clicking on links) as well as traditional print-based texts.

To provide more detailed information about adults with lower literacy skills, the assessment of literacy in PIAAC was complemented by a test of “reading component” skills. Reading components represent the basic set of decoding skills which provide necessary preconditions for gaining meaning from written text – knowledge of vocabulary, ability to process meaning at the level of the sentence, and fluency in the reading of passages of text.

### *Numeracy*

Numeracy is defined in PIAAC as “*the ability to access, use, interpret and communicate mathematical information and ideas, in order to engage in and manage the mathematical demands of a range of situations in adult life*” (OECD, 2012b). Numeracy is further specified through the definition of “*numerate behaviour,*” which involves managing a situation or solving a problem in a real context by responding to mathematical information and content represented in multiple ways.

It is recognized that literacy skills such as reading and writing constitute an enabling factor for numerate behaviour and that when mathematical representations involve text, performance on numeracy tasks is, in part, dependent on the ability to read and understand text. However, numeracy in PIAAC involves more than applying arithmetical skills to information embedded in text. In particular, numeracy relates to a wide range of skills and knowledge (not just arithmetic knowledge and computation), a range of responses (which involve more than just numerical responses), and contending with a range of representations (not just numbers in texts).

### *Problem solving*

In PIAAC, problem solving in technology-rich environments is defined as “*using digital technology, communication tools and networks to acquire and evaluate information,*

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<sup>2</sup> The practical difficulties of assessing writing skills in the context of an international assessment made it impossible to include this as part of the assessment.

*communicate with others and perform practical tasks.*” The first wave of PIAAC focused on “*the abilities to solve problems for personal, work and civic purposes by setting up appropriate goals and plans, and accessing and making use of information through computers and computer networks*” (OECD, 2012b).

The PSTRE domain of PIAAC covers the specific class of problems people deal with when using information and communications technology (ICT). These problems share the following characteristics:

- The existence of the problem is primarily a consequence of the availability of new technologies.
- The solution to the problem requires the use of computer-based artefacts (applications, representational formats, computational procedures).
- The problems are related to the handling and maintenance of technology-rich environments themselves (e.g., how to operate a computer, how to fix a settings problem, how to use the Internet browser in a technical sense).

PSTRE represents a domain of competence that involves the intersection of the set of skills that are sometimes described as “computer literacy” (i.e., the capacity to use ICT tools and applications) and the cognitive skills required to solve problems associated with information contained in various digital environments. Some knowledge of how to use basic ICT input devices (e.g., use of a keyboard and mouse and screen displays), file management tools, applications (word processing, email) and graphic interfaces is essential in order to be able undertake assessment tasks. However, the objective is not to test the use of ICT tools and applications in isolation, but rather to assess the capacity of adults to use these tools to access, process, evaluate and analyze information effectively.

### ***Other information on skills***

Literacy, numeracy and PSTRE constitute a subset of the skills and competencies that are demanded in the labour market and mediate access to resources and services more generally in society. Along with specific technical and professional skills, other generic skills such as communication, interaction (such as the capacity to relate to others and work cooperatively), skills related to learning and the transmission of knowledge, as well as physical skills are valued to a greater or lesser extent on the labour market. In order to provide a more complete picture of the skills endowment of the adult population, PIAAC collected a considerable amount of information on the skills possessed and used by adults in addition to the measures of proficiency in literacy, numeracy and PSTRE. This information was collected in the form of self-reports as these skills are, for the most part, difficult, if not impossible, to assess directly in an international comparative context or through population surveys.<sup>3</sup>

### ***Qualifications and work experience***

Educational qualifications and work experience are commonly used proxies for individuals’ skill endowments. PIAAC collected information on respondents’ highest level of educational attainment as well as regarding the duration of work experience and mobility. This was

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<sup>3</sup> A framework for the measurement of teamwork was developed for the Adult Literacy and Lifeskills study, but was not considered robust enough for inclusion in an international comparative assessment (Murray, Clermont and Binkley, 2005). See Baethge and Arends (2009) for the results of a feasibility study of measures of vocational skill in an international comparative context.

complemented with information on respondents' perceptions regarding the educational qualifications and work experience they believed are normally necessary to get the job they currently occupied as well as the qualifications needed to perform this job satisfactorily.

### *Use of skills at work*

Information was collected from respondents regarding four broad categories of generic work skills: cognitive, interaction and social, physical and learning.<sup>4</sup> Cognitive skills encompass reading, writing, mathematics and the use of ICT. Interaction and social skills cover collaboration and cooperation, planning the work and time of one's self and others, communication and negotiation, and customer contact (e.g., selling products and services and advising). Physical skills involve the use of gross and fine motor skills. Learning skills cover activities such as the instruction of others, learning (formally or informally) and keeping up to date with developments in one's field of professional activity.

The approach used in PIAAC owes much to the Job Requirements Approach (JRA) pioneered in the UK Skills Survey (Felstead et al., 2007). The JRA method consists of asking individuals about the importance of different types of tasks performed at work and subsequently inferring the types of skills that are required from their answers. By focusing on job tasks, this approach is considered to provide a more objective description of these skills than an approach relying on subjective self-assessments by individuals of the type and level of skills they possess.

Respondents were also asked about the extent that they believe their skills (considered globally) match the requirements of the job in which they were currently working.

### *Work-related training*

Given the importance of work-related training as a potential source of skills and as an element of a strategy for the maintenance and upgrading of workforce skills, information was collected on participation by respondents in training of both a formal and informal nature over the 12 months prior to the interview.

### *Personal characteristics, background and outcomes*

The PIAAC background questionnaire (BQ) included a range of information regarding the factors that influence the development and maintenance of skills such as education, social background, engagement with literacy and numeracy and ICT (both in and outside of work), language background. Information was also collected on outcomes that may be related to skills. This included the current activity of respondents, employment status and income. In terms of noneconomic outcomes, PIAAC included questions on health status, volunteering, political efficacy and social trust.

### ***Test delivery***

PIAAC was designed as a computer-based assessment (CBA) and was delivered on a laptop computer. The BQ was administered in a computer-assisted personal interview (CAPI) format by the interviewer. The cognitive assessment was taken by most respondents in the CBA format under the supervision of the interviewer. Respondents with no (or extremely limited experience) with the use of computers were given a pencil-and-paper version of the literacy and numeracy components of the assessment. Respondents with computer skills but who possessed poor literacy and numeracy skills were directed to the reading components test,

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<sup>4</sup> The exact questions can be found in OECD (n.d.).

which was taken in pencil-and-paper format only. However, interviewers timed the completion of the reading components tasks using the computer application.

Respondents took the assessment in their own homes or in another location to which the interviewer agreed. They were free to take as much or as little time as required to complete the test. However, interviewers were trained to encourage respondents that took an excessive amount of time to undertake the assessment or were obviously experiencing difficulties to move through the test or terminate it.

The assessment was delivered exclusively in pencil-and-paper format in Jakarta (Indonesia) due to the relatively low level of familiarity with computers among the general adult population,

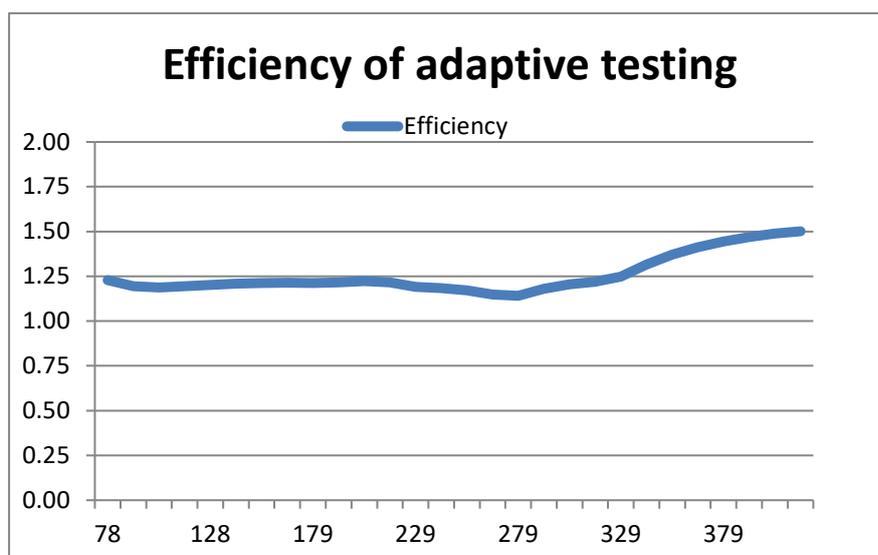
### ***Adaptive testing***

One outcome of introducing CBA in PIAAC was the use of adaptive algorithms to optimize the delivery of test items within a domain to estimated proficiency levels of individuals, thereby allowing PIAAC to provide more reliable information about skills in a relatively short period of time. Adaptive tests can be roughly distinguished as belonging to one of two groups: item-level adaptive tests and multistage adaptive tests. Item-level adaptive tests have been traditionally referred to as “computer adaptive tests” (CATs) and have been in vogue for some time. The idea of a CAT is intriguing and much research has been conducted; however, significant challenges remain. Perhaps the most important one is that CATs assume (in practically all cases) that multiple-choice items, or at best automatically scored short constructed-response items, are used. Items that cannot be automatically scored are not usable in a CAT.

The multistage adaptive design used in PIAAC is a natural generalization of a CAT. It is an extension in the sense that the CAT algorithm “decides” on the choice of the next item after each response, whereas multistage algorithms allow the choice of the next cluster of items either after one or multiple responses. This provided more information and therefore the opportunity to accumulate greater accuracy in the decision. An additional advantage of a multistage CAT is that item types can be mixed – a multistage test can be designed to decide about the next cluster of items to be administered solely based on the automatically scored responses after a cluster of mixed item types has been administered. Moreover, using item clusters instead of individual items for adaptive decisions reduced the likely dependence of the stage adaptive selection on item-by-country interactions compared to the effects to be expected when using item-level adaptive tests.

Figure 1 shows the efficiency of the PIAAC literacy scale multistage adaptive test over a more traditional linear test using the same identical literacy item set defined as the ratio of two test information curves. The ratio of the two test information curves is shown on the vertical axis, whereas the literacy scale is shown on the horizontal axis. As shown here, the adaptive test is 15 to 47 percent more efficient, which means that we can obtain the same amount of test information as we might expect from a test that is 15 to 47 percent longer. In addition, it should be noted that there is no proficiency range where adaptive testing is less informative. The success of using a multistage adaptive test design in PIAAC was largely due to being able to optimize the design, as we did not have any open-ended items that required human scoring and we had empirical evidence that the item parameters for trend items were identical regardless of the position of items in the assessment. This is not always the case with school-based comparative surveys.

**Figure 1: Efficiency of the multistage adaptive testing model of the literacy scale used in PIAAC**



## Countries participating in PIAAC Cycle 1

In total, 29 countries participated in the first round of PIAAC at some point over 2008-2013. Of these, 26 completed the Field Test and 24 completed the Main Study and reported results. Nine countries started and completed the second round of PIAAC. Three of the countries that dropped out of the first round (Chile, New Zealand and Slovenia) subsequently participated in and reported results as part of the second round of the study. Five countries started and completed the third round of PIAAC. The countries starting Cycle 1 of the study are listed in Tables 1-3 together with whether they completed key phases of the study and reported results.

For two of the countries participating in Round 1 and one country in Round 2, PIAAC did not provide full national coverage of the adult population. In Belgium, PIAAC was implemented only in the region of Flanders. In the UK, the assessment was undertaken in England and Northern Ireland only. In Indonesia, the assessment was administered only in the Jakarta municipal area. It is also worth noting that, in addition to participating in Round 1 of PIAAC Cycle 1, the United States also collected additional data using the PIAAC instruments in 2014 and 2017. These additional national samples included additional populations such as the incarcerated and older adults (66-75), as well as broadened the coverage of the target population to include additional primary sampling units. The additional data collections in the United States were undertaken as national projects and, therefore followed, a different timetable to the data collections forming part of Rounds 2 and 3 of PIAAC. The results of the 2017 PIAAC data collection in the United States have, however, been reported together with those of the five countries participating in Round 3 in the OECD international report for Round 3.

**Table 1: Participation in PIAAC Cycle 1 – Round 1**

Country	Field Test completed	Main Study completed	Results reported
Australia	yes	yes	yes
Austria	yes	yes	yes
Canada	yes	yes	yes
Chile	yes	no	no

Country	Field Test completed	Main Study completed	Results reported
Cyprus <sup>5</sup>	yes	yes	yes
Czech Republic	yes	yes	yes
Denmark	yes	yes	yes
England/N. Ireland (UK)	yes	yes	yes
Estonia	yes	yes	yes
Finland	yes	yes	yes
Flanders (Belgium)	yes	yes	yes
France	yes	yes	yes
Germany	yes	yes	yes
Ireland	yes	yes	yes
Hungary	no	no	no
Italy	yes	yes	yes
Japan	yes	yes	yes
Korea	yes	yes	yes
Netherlands	yes	yes	yes
New Zealand	no	no	no
Norway	yes	yes	yes
Poland	yes	yes	yes
Portugal	yes	no	no
Russian Federation <sup>6</sup>	yes	yes	yes
Slovak Republic	yes	yes	yes
Spain	yes	yes	yes
Slovenia	no	no	no
Sweden	yes	yes	yes
United States	yes	yes	yes

**Table 2: Participation in PIAAC – Round 2**

Country	Field Test completed	Main Study completed	Results reported
Chile	yes	yes	yes
Greece	yes	yes	yes
Israel	yes	yes	yes
Jakarta (Indonesia)	yes	yes	yes
Lithuania	yes	yes	yes
New Zealand	yes	yes	yes
Singapore	yes	yes	yes
Slovenia	yes	yes	yes
Turkey	yes	yes	yes

<sup>5</sup> Please refer to notes A and B regarding Cyprus in the *Note to Readers* section of this report.

<sup>6</sup> Please refer to the note regarding the Russian Federation in the *Note to Readers* section of this report.

**Table 3: Participation in PIAAC – Round 3**

Country	Field Test completed	Main Study completed	Results reported
Ecuador	yes	yes	yes
Hungary	yes	yes	yes
Mexico	yes	yes	yes
Kazakhstan <sup>7</sup>	yes	yes	yes
Peru	yes	yes	yes

## **The development and implementation of PIAAC Cycle 1**

The process of the development and implementation of PIAAC can be seen as involving four broad phases: scoping, development, implementation, and data preparation and analysis.

### ***The scoping phase (2002-2007)***

Work within the OECD on a data development strategy regarding adult skills began in 2002 with the convening of an expert group on adult skills. A paper based on the conclusions of that meeting was presented to the OECD’s Education and Employment, Labour, and Social Affairs committees in late 2003. The paper provided a rationale for an OECD strategy for the assessment of adult skills and identified four key issues for decision in the course of developing such a strategy:

- whether the strategy should be based on undertaking an assessment of the whole adult population or on a sequence of assessments targeted at different age groups,
- which competencies should be assessed,
- what relationship a program of adult assessment should have with the Programme for International Student Assessment (PISA), and
- what weight should be placed on trend data.

While not presenting any conclusions, the paper argued strongly that the implementation of a series of assessments targeted at particular population subgroups rather than an “omnibus” survey of the adult population should be considered. It also argued that the model of competence developed by DeSeCo (Rychen and Salganik, 2003) should guide selection of the domains of competence to be assessed.

In line with the recommendations of the paper, an international expert group (IEG) was established to develop an operational strategy for an international assessment of adult competencies over the following 18 months.

In October 2005, the IEG considered a strategy for PIAAC based on its work as well as on policy priorities identified by the OECD’s education and employment policy committees. The main elements of this strategy were as follows:

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<sup>7</sup> Please refer to the note regarding Kazakhstan in the Note to Readers section of this report.

- PIAAC was to constitute a multi-cycle program of assessment, with each cycle lasting five years. The first cycle of data collection would be scheduled for 2009 (or early 2010, depending on progress with the research agenda). PIAAC would survey a representative sample of the adult population between 16 and 65 years of age, including the non-employed, in a household context and would provide the option of oversampling a cohort of young adults and/or older workers, and of resurveying the selected oversampled cohort(s) in subsequent cycles.
- The direct assessment would focus on the measurement of ICT-related competences, defined for the purpose of PIAAC as the capacity of individuals to access, manage, integrate, evaluate and reflect on information using modern technologies. This would be accompanied by a short assessment of document literacy and an assessment of reading components to be taken by respondents with poor levels of literacy.
- Subsequent waves of the assessment would repeat administration of some components of the first to allow the establishment of trends. The development and implementation of new domains (e.g., an employer survey and an assessment of interpersonal skills) would be a feature of the program. These two features were not part of cycle 1 but are now included in cycle 2 of PIAAC.

The IEG broadly welcomed the proposed strategy but expressed the view there should be a balance between the assessment of ICT competencies and reading and numeracy in order to ensure the relevance of the assessment to all adults in OECD countries. It also underlined the need to ensure that the assessment would provide reliable information regarding the entire spectrum of proficiency of adults in OECD countries.

An amended strategy was subsequently presented to the OECD's education and labor committees. While the basic features of the original strategy remained, in the revised version, the direct assessment component was conceived as an assessment of "literacy for the information age" rather than of ICT competencies. The balance of data collection was also shifted somewhat from the assessment of competencies towards the collection of information on other social and economic outcomes as well as contextual data that could be used to examine the development, functioning and impact of competencies.

In 2006, a series of expert papers were commissioned by the OECD covering topics relevant to the design of PIAAC. These included papers on planning for the direct assessment, the measurement of work-related training, adult learning, the description and discussion of approaches to the identification of the skill content of jobs using self-reports, school-to-work transition, and human capital and economic development. This work led, in particular, to the establishment of the basic features of the direct assessment in the form that would be subsequently implemented.

In particular, the concept of a single measure of "literacy for the information age" encompassing elements of reading, numeracy and problem solving as proposed in the 2005 strategy was replaced by the measure of three distinct domains – literacy, numeracy and PSTRE. The reporting of these domains as separate scales was proposed with the aim of facilitating interpretation of the results as well as facilitating linking PIAAC to the International Adult Literacy Survey (IALS) and the Adult Literacy and Life-skills (ALL) survey.

Work began on the development of the proposed JRA module of PIAAC in 2007 and continued into early 2009. The objective was to develop and test around 15 minutes of questions relating to the task content of the main job held by the respondent (if employed) covering a range of

the generic skills that were required in performing that job. Five countries agreed to participate in a pilot of the JRA: Australia, France, Greece, Korea and the United States.

The first draft in English of the pilot questionnaire and technical specifications for implementing the pilot were sent to participating countries at the end of May 2007. An extensive pretesting stage was then carried out. This involved carrying out cognitive interviews in each of the five participating countries to check on the wording of questions and the scales being used.

Piloting of the JRA module took place during 2008 and involved administration of the pilot questionnaire to a random sample of 500 employed persons as well as a sample of 100 primary-school teachers. The pilot questionnaire contained both JRA questions and a limited number of background questions on demographic and labour-market characteristics of respondents included to help establish the international comparability of the results. A series of country reports (written by national experts) plus a summary validation report (written by a consultant) was produced in the second half of 2008. The results were presented at an international validation seminar in early 2009 hosted by the European Centre for the Development of Vocational Training, or Cedefop.

Following a meeting of countries interested in participating in PIAAC in November 2007, a call for tender for services relating to the development and implementation of the first wave of PIAAC was finalized and released in late 2007 with a closing date of January 2008. Bids were sought for three distinct groups of services – the development of assessment instruments (Module 1), the development of the BQ and JRA (Module 2) and survey operations and project management (Module 3). A Consortium led by Educational Testing Service (ETS) of Princeton, NJ, involving institutions from the United States, the Netherlands, Belgium, Germany, and Luxembourg, was selected by the PIAAC Board of Participating Countries (BPC) to undertake all three modules.

### ***Development phase (2008-2009)***

The first phase of the implementation of PIAAC involved work in three main areas:

- development of the PIAAC assessment frameworks, the instruments and questionnaires, the delivery platform, and other IT tools and technical standards
- preparation of national versions of the instrumentation
- preparation for the Field Test

The development of frameworks for the new assessment domains in PIAAC (PSTRE and literacy components) and the updating of the frameworks for literacy and numeracy used in ALL for use in PIAAC largely took place during 2008. This work was guided by three subject matter expert groups – covering the domains of literacy, numeracy and PSTRE, respectively. Draft framework documents were reviewed by the BPC in October 2008 and the final versions approved in April 2009. The selection of items from IALS and ALL to serve as linking items in literacy and numeracy and the development of new items took place in parallel with the development of the frameworks. Final selection of items for the Field Test took place in March 2009.

Development of the BQ took place over 2008 and 2009, with the Field Test version being finalized in 2009. This was guided by the BQ Expert Group and also involved input from the

other subject matter expert groups, particularly in relation to questions regarding the use of and engagement with literacy, numeracy and ICT. The BPC was also closely involved in the development process, reviewing the contents of the proposed BQ twice before its finalization in early 2009.

The PIAAC Technical Standards and Guidelines (TSG), which define the quality standards that were to be met throughout the process of the development and implementation of the assessment, were prepared over 2008 and early 2009. A first draft of the TSG was reviewed by the BPC in November 2008 and subsequently by the Technical Advisory Group (TAG). A final version (which incorporated comments made by the BPC and the TAG) was agreed upon by the BPC in April 2010. A final version of the TSG was released in December 2010 for the Field Test and revised in December 2012 for the Main Study.

A major challenge in developing PIAAC was building a test delivery application for use on a laptop computer that combined a CAPI application for administering the BQ and a CBA application for administering the direct assessment that could be released in over 30 different country and/or language versions. Initial versions of the CAPI application, the Virtual Machine (VM) and the cognitive modules were released in 2009. National versions of the delivery platform (in national test languages) for use in the Field Test were released for testing by countries in February-March 2010. Countries tested the platform using predefined scenarios. Two rounds of testing were undertaken. Reported problems were evaluated in terms of their potential impact on quality of the data from the Field Test and either fixed in subsequent releases of the VM prior to the Field Test or identified as a problem to be fixed in the Main Study version of the VM.

Participating countries were responsible for the translation and adaptation of the master English language versions of the BQ and cognitive instruments into the national survey languages. Translations were undertaken using a specially developed tool to facilitate the loading of translations into the PIAAC delivery platform. Following review and verification, the approved national versions were loaded into the delivery platform to create national versions of the PIAAC VM – the application running the assessment.

## ***Implementation***

### *Round 1*

The Field Test data collection for Round 1 took place from April-June 2010. Twenty-six countries participated in the Field Test. Analysis of the outcomes of the Field Test was undertaken from October to early December 2010. The conclusions of this analysis and the overall assessment of the quality of the data from the Field Test were presented along with recommendations regarding the items to be included in the Main Study BQ and cognitive instruments to the TAG, the subject matter expert groups, NPMs and the BPC in a series of meetings in December 2010. Following their approval by the BPC, the necessary changes to the BQ and cognitive instruments were implemented by countries and verified by the international Consortium.

Main Study versions of national VMs were released to countries for testing starting in March 2011. Two rounds of testing took place. Final Main Study VMs were released in May 2011.

The main data collection was scheduled to take place over the period August 2011-March 2012. Most countries completed data collection at the end of March 2012 as planned. A number of countries extended the data collection period by varying durations to improve response rates.

Two countries collected data on different timetables. Canada started collection in November 2011 to avoid having PIAAC in the field at the same time as the Canadian census and completed collection in June 2012. France undertook the main data collection over the period September-December 2012.

### *Round 2*

The Field Test for Round 2 of PIAAC took place between April and June 2013. The Main Study data collection was scheduled to be implemented between August 2014 and January 2015. The data collection period was extended to end in February 2015 in several countries with the objective of improving response rates. Data collection took place between December 2014 and March 2015 in Jakarta (Indonesia).

### *Round 3*

The Field Test for Round 3 of PIAAC was scheduled to take place between April and June 2016; however only one country began collecting data in April and the end dates for all countries varied from July to September 2016. The Main Study data collection was scheduled to be implemented between August 2017 and April 2018. The data collection period was extended to end in May 2018 in two countries and June 2018 for one country with the objective of improving response rates.

## Data preparation, analysis and reporting

### *Round 1*

All but two of the participating countries submitted national datasets to the Consortium from the end of May to the end of August 2012. France and the Russian Federation<sup>8</sup> submitted their data in 2013. Cleaning, weighting and scaling were undertaken in the second half of 2012. Scaled national datasets were released to countries in January 2013 for review. Final datasets were released in April 2013 and loaded into a tool called the Data Explorer. From this point, participating countries had access to anonymized<sup>9</sup> output from the international dataset through the Data Explorer in addition to their own data to allow preparation of national reports on PIAAC.

Following the release of the national databases in January, the public-use dataset and associated documentation were produced for release in October 2013.

Planning for the analysis and reporting of the results from PIAAC began at the end of 2009 when the BPC discussed a first draft outline of the contents of the first international report. Further discussions regarding the contents of the report took place from 2010 to 2012, informed by presentations of some exploratory analyses of the data from the Field Test. A final outline was approved in May 2012.

The first international report was written from September 2012 to July 2013 by a team from the OECD Secretariat with the assistance and support of the Consortium. A first draft of the report was reviewed in May 2013 by participating countries and an external panel of reviewers. The final draft was reviewed by countries in June 2013.

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<sup>8</sup> Please refer to the note regarding the Russian Federation in the *Note to Readers* section of this report.

<sup>9</sup> Countries were identified by codes rather than actual names.

## *Round 2*

The process for data preparation and reporting for Round 2 of PIAAC was similar to that followed in Round 1. A preliminary international database (excluding the data from Jakarta-Indonesia) and national databases were released at the end of November 2015 to participating countries and the OECD. Final datasets were released to countries at the end of January 2016 (again with the exception of Jakarta-Indonesia). Data for Jakarta (Indonesia) was released in preliminary form in February 2016 with the final database being released in June 2016.

An updated version of the Data Explorer containing data for countries in both the first and second rounds of PIAAC was released on 28 June 2016 along with public use files for the nine participating countries in Round 2.

The second international report for PIAAC was prepared over the period December 2015 to June 2016 by the OECD Secretariat and released on 28 June 2016. This presented the results for the nine countries in Round 2 as well as for the 24 countries in the first round of the study.

Analysis of the data from PIAAC by the OECD will continue after the release of the Round 2 data with the release of a series of reports addressing some of the issues of particular interest to countries participating in PIAAC.

## *Round 3*

The process for data preparation and reporting for Round 3 of PIAAC was similar to that followed in Rounds 1 and 2. A preliminary international database and national databases were released in early April 2019 to participating countries and the OECD. Final datasets were released to countries at the end of August 2019.

An updated version of the Data Explorer containing data for countries in all three rounds of PIAAC was released in October 2019 along with public use files for the nine participating countries in Round 2.

The third international report for PIAAC was prepared over the period April to October 2019 by the OECD Secretariat and released on 5 November 2019. This presented the results for the five countries in Round 3 plus the results for the 2017 data collection in the United States, nine countries in Round 2 as well as for the 24 countries in the first round of the study.

Analysis of the data from PIAAC by the OECD will continue after the release of the Round 3 data with the release of a series of reports addressing some of the issues of particular interest to countries participating in PIAAC.

## **Relationship to previous surveys**

PIAAC is the third of a series of international adult skills surveys that have been implemented since the mid-1990s by OECD countries. It was preceded by IALS (1994-98) and ALL (2003-06).<sup>10</sup>

Table 3 presents the skill domains assessed in the three assessments. Shading indicates that the assessments in these domains can be linked across surveys.

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<sup>10</sup> See OECD and Statistics Canada (2000), Statistics Canada and OECD (2005), and OECD, and Statistics Canada (2011) for information on the methods and results of IALS and ALL.

**Table 3: Skills Assessed in PIAAC, ALL and IALS**

PIAAC	ALL (2003-2006)	IALS (1994-1998)
Literacy (combined prose and document)	Literacy (combined prose and document*)	Literacy (combined prose and document*)
	Prose literacy	Prose literacy
	Document literacy	Document literacy
Reading components		
Numeracy	Numeracy	
		Quantitative literacy
Problem solving in technology-rich environments		
	Problem solving	

\*Rescaled to form a single literacy scale combining the former separate prose and document literacy scales.

IALS assessed three domains of literacy – prose literacy, document literacy and quantitative literacy. Prose literacy was defined as the knowledge and skills needed to understand and use *continuous* texts – information organized in sentence and paragraph formats. Document literacy represented the knowledge and skills needed to process documents, or *information organized in matrix structures* (i.e., in rows and columns). The type of documents covered by this domain included tables, signs, indexes, lists, coupons, schedules, charts, graphs, maps and forms. Quantitative literacy covered the skills needed to undertake arithmetic operations such as addition, subtraction, multiplication or division either singly or in combination using numbers or quantities embedded in printed material.

The major change between IALS and ALL was the replacement of the assessment of quantitative literacy with that of numeracy and the introduction of the assessment of problem solving. Numeracy represented a broader domain than that of quantitative literacy, covering a wider range of quantitative skills and knowledge (not just computational operations) as well as a broader range of situations in which actors had to deal with mathematical information of different types (not just situations involving numbers embedded in printed materials) (Gal, van Groenestijn, Manly, Schmitt, & Tout, 2005, p.151). Problem solving was defined as “goal-directed thinking and action in situations for which no routine solution procedure is available” (Statistics Canada & OECD, 2005, p.16).

PIAAC has been designed to link to IALS and ALL in the domain of literacy and ALL in numeracy. To ensure strong links in literacy and numeracy with IALS and ALL, approximately 60% of the assessment items in these two domains in PIAAC have been drawn from these previous surveys.

In the domain of literacy, PIAAC differs from IALS and ALL in two main ways. First, literacy is reported on a single scale rather than on two separate (prose and document literacy) scales. For the purposes of comparison, the results of IALS and ALL have been rescaled on the PIAAC literacy scale. Second, while the measurement framework for literacy in PIAAC draws heavily on those used in IALS and ALL, it expands the kinds of texts covered to include electronic and combined texts in addition to the continuous (prose) and noncontinuous (document) texts of

the IALS and ALL frameworks. In addition, the assessment of literacy was extended to include a measure of reading component skills which was not included in previous assessments.

The domain of numeracy remains largely unchanged between ALL and PIAAC. PSTRE constitutes a new domain. While it has some relationship to problem solving as conceived in ALL, the emphasis is on the skills necessary to solve “information problems” and the solution of problems in digital environments rather than on analytic problem skills per se presented in paper and pencil format.

#### *Comparability between background questions*

The PIAAC BQ differs in a number of areas from the background questionnaires of IALS and ALL. In particular, the PIAAC BQ seeks more information about the use of skills in the workplace than does either IALS or ALL. In key areas such as educational attainment and labour-force status, the information in PIAAC and IALS and ALL is sought using comparable questions.

#### *Countries participating in PIAAC and previous adult surveys*

In total, 21 of the countries or regions participating in PIAAC participated in either IALS, ALL or both (see Table 4 below), with 20 countries participating in IALS, 8 in ALL and 7 in both. Results for France from IALS and for Korea from ALL have never been reported.

**Table 4: Countries and Regions in PIAAC – Participation in IALS and ALL**

Country/Region	IALS			ALL	
	1994	1996	1998	2003	2006/7
Australia		X			X
Canada	X			X	
Chile			X		
Czech Republic			X		
Denmark			X		
England (UK)		X			
Finland			X		
Flanders (Belgium)		X			
France	X*				
Germany	X				
Hungary			X		X
Ireland		X			
Italy			X	X	
Korea				X*	
Netherlands	X				X
New Zealand		X			X
Northern Ireland (UK)		X			
Norway			X	X	
Poland	X				
Slovenia			X		
Sweden	X				
United States	X			X	

\* Results not reported

As can be seen from Table 4, IALS was undertaken in three separate waves with data collection occurring in 1994, 1996 and 1998, and ALL was undertaken in two waves with data collection taking place in 2003 and 2006. Table 5 shows the number of observations of the performance

in literacy and numeracy available for countries that undertook IALS or ALL prior to PIAAC as well as the period between observations. This varies significantly between countries in the case of literacy, depending on whether a country participated in IALS only or both IALS and ALL.

**Table 5: Participation in literacy and numeracy assessments, dates of and periods between observations**

Country/Region	Domain	Observations	Date(s) of survey	Years between observations
Australia	Literacy	3	1996, 2006, 2011	10, 5
Australia	Numeracy	2	2006, 2011	5
Canada	Literacy	3	1994, 2003, 2011	9, 8
Canada	Numeracy	2	2003, 2011	8
Chile	Literacy	2	1998, 2014	16
Czech Republic	Literacy	2	1998, 2011	13
Denmark	Literacy	2	1998, 2011	13
England (UK)	Literacy	2	1996, 2011	15
Finland	Literacy	2	1998, 2011	13
Flanders (Belgium)	Literacy	2	1996, 2011	15
Germany	Literacy	2	1994, 2011	17
Hungary	Literacy	3	1998, 2006, 2017	8, 19, 11
Hungary	Numeracy	2	2007, 2017	10
Ireland	Literacy	2	1996, 2011	15
Italy	Literacy	3	1998, 2003, 2011	5, 8
Italy	Numeracy	2	2003, 2011	8
Netherlands	Literacy	3	1994, 2006, 2011	12, 5
Netherlands	Numeracy	2	2006, 2011	5
New Zealand	Literacy	3	1996, 2006, 2014	10, 8
New Zealand	Numeracy	2	2006, 2014	8
N. Ireland (UK)	Literacy	2	1996, 2011	15
Norway	Literacy	3	1998, 2003, 2011	5, 8
Norway	Numeracy	2	2003, 2011	8
Poland	Literacy	2	1994, 2011	17
Slovenia	Literacy	2	1998, 2014	16
Sweden	Literacy	2	1994, 2011	17
United States	Literacy	3	1994, 2003, 2011	9, 8
United States	Numeracy	2	2003, 2011	8

## Management structure

The development and implementation of PIAAC was steered by the BPC. The BPC is formally constituted as a body of the OECD and its role is defined by a mandate approved by the OECD Council. OECD countries participating in PIAAC are automatically members of the BPC. Non-

member countries participating in PIAAC are invited to join the BPC. With two exceptions, Cyprus<sup>11</sup> and the Russian Federation,<sup>12</sup> all countries participating in the first and second rounds of PIAAC are members of the BPC. While countries have only one vote on the BPC, most are represented on the BPC by delegates from both ministries of labour and education.

The BPC is the main decision-making body regarding PIAAC with responsibility for setting priorities for the project, developing a program of work and budget, monitoring the implementation of the program of work, and evaluating its impact and disseminating results. It usually meets twice a year. All key elements of the design of PIAAC, its implementation and the reporting of results were reviewed and approved by the BPC. Decisions that needed to be made on a timetable that did not fit the BPC's meeting schedule were made through a process of written procedure.

The BPC reports to the Education Policy Committee and the Employment, Labour and Social Affairs Committee of the OECD. It consults with these two bodies regarding policy priorities for PIAAC and reports to them on the progress of PIAAC on a regular basis. The budget and program of work of PIAAC (and any changes to it) were agreed upon by the two committees before submission to the OECD Council for approval.

The OECD Secretariat is responsible for supporting and advising the BPC and for ensuring that the work program of the BPC and its decisions are implemented. In particular, the OECD Secretariat managed the contract with the Consortium covering the development and international component of the implementation of PIAAC. It was also responsible for the preparation of the international comparative report.

The Consortium was headed by ETS, which reported directly to the OECD and had responsibility for each of the subcontractors, plus the TAG and the subject matter expert groups. Other contractors working on PIAAC included cApStAn, DIPF (the German Institute for International Educational Research), GESIS (Leibniz Institute for the Social Sciences), IEA- (the International Association for the Evaluation of Educational Achievement), ROA (the Research Centre for Education and the Labour Market) and Westat. Each organization had particular areas of responsibility associated with the development of the instruments and delivery platform; the development of operational procedures and standards; translation verification quality assurance and quality control; the support of countries in key areas such as sampling, scoring, interview training and platform testing, undertaking data processing, scaling and data analysis; as well as the preparation of data analysis tools.

National implementation of PIAAC was managed by a range of organizations within participating countries. These included national statistical offices, public or private research and survey organizations contracted to manage implementation, government ministries, public research institutes and universities. In each participating country, the team responsible for the implementation of PIAAC was headed by a National Project Manager (NPM). Participating countries were responsible for aspects of survey implementation such translation and adaptation, sampling, data collection, scoring and coding and preparation of their national data base.

Close contact was maintained between the Consortium and national implementation teams throughout the project. Meetings of NPMs were held on a regular basis over the life of the

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11 Please refer to notes A and B regarding Cyprus in the Note to Readers section of this report.

12 Please refer to the note regarding the Russian Federation in the Note to Readers section of this report.

project (approximately two meetings per year) and were attended by all participating countries. These constituted forums for the provision and exchange of information, the delivery of training and discussion of progress with the project and matters of concern raised by countries. The Consortium was responsible for managing NPM meetings. The OECD Secretariat was present at meetings and provided a regular update on discussions and decisions at the BPC as well as other relevant issues.

## Organization of the report

This is the third edition of the technical report for PIAAC. It is a revised version of the original technical report, incorporating the description and outcomes of the Round 2 and Round 3 participating countries.

It was written by members of the Consortium and is organized into six sections.

**Section One:** This contains four chapters that focus on assessment design, development of the cognitive instruments, development of the BQ, and the adaptation, translation and verification of the complete set of survey materials.

**Section Two:** This includes five chapters, with three dealing with development of the functionality to support development of the cognitive items. It also has a chapter covering development of the CAPI questionnaire software including the authoring tool and data export formats. In addition, it has a chapter focusing on the development and testing of the integrated computer platform that was used to deliver both the Field Test and main survey instruments.

**Section Three:** This consists of four chapters that cover field operations, quality control, scoring reliability and data management. Field operations include issues dealing with staffing, field management, production and response rates, and contact and outreach. Quality control includes activities that were undertaken prior to, during and after data collection during both the Field Test and the Main Study. Scoring focuses on preparing countries to score their paper-and-pencil cognitive booklets as well as to code open-ended questions in the BQ. It also deals with the design and procedures associated with obtaining estimates of within and between country inter-rater agreements. The chapter on data management covers data management systems, manuals and training that were provided to countries, as well as the tasks and responsibilities of each national centre as well as the responsibilities and tasks conducted by the Consortium.

**Section Four:** This contains three chapters that focus on topics associated with sample design, survey weighting and variance estimation and indicators of overall sample quality.

**Section Five:** This is the largest section in the report, containing seven chapters. These chapters cover data analysis and the preparation of the data products. Included are chapters describing the approach taken to scaling the cognitive data, evaluating the scaling outcomes and creating the proficiency scales for the cognitive domains. Other chapters deal with the validation of the BQ the creation of derived variables that are used in the analyses and that are available through the data products. Others cover the process of working with the expert groups to create described proficiency levels, reporting the results, and the development and use of data analysis tools.

**Section Six:** A set of appendices is provided here to help in understanding and using the PIAAC data.

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## Notes to Readers

### General note

Throughout this report “PIAAC” refers to the Survey of Adult Skills (PIAAC). This differs from the terminology used in the *OECD Skills Outlook 2013: First Results from the Survey of Adult Skills* and *The Survey of Adult Skills: Reader’s Companion* in which the assessment undertaken over 2008-2013 is referred to as the Survey of Adult Skills (PIAAC) and “PIAAC” refers to the program of activities of which the survey is a product.

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### Cyprus

Readers should note the following information provided by Turkey and by the European Union Member States of the OECD and the European Union regarding the status of Cyprus:

*A. Note by Turkey:* The information in this document with reference to “Cyprus” relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognizes the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the “Cyprus issue.”

*B. Note by all the European Union Member States of the OECD and the European Union:* The Republic of Cyprus is recognized by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

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### Kazakhstan

Kazakhstan identified 70 interviewers during their quality control efforts who had falsified 239 cases out of a randomly sampled 1,961 cases for verification among the entire sample of 6,343. ETS ran quality control checks on all the data and further identified 19 interviewers who had duplicated 55 cases. The TAG recommended that both the 239 falsified cases and the 55 duplicated cases be deleted; one of these cases was both falsified and duplicated. Accordingly, a total of 293 unique cases were excluded and Kazakhstan’s remaining data of 6,050 cases received their final weights.

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### Russian Federation

Users should note that the sample for the Russian Federation does not include the population of the Moscow municipal region. The data published, therefore, do not represent the entire resident population aged 16-65 years in Russia but rather the population of Russia *excluding* the population residing in the Moscow municipal area.

## Acronyms

The following is a list of acronyms used throughout this report.

ALL	Adult Literacy and Lifeskills Survey
BPC	Board of Participating Countries
BQ	Background Questionnaire
CAPI	Computer-Assisted Personal Interview
CBA	Computer-Based Assessment
IALS	International Adult Literacy Survey
ICT	Information and Communications Technology
IRT	Item Response Theory
JRA	Job Requirements Approach
NPM	National Project Manager
OECD	Organisation for Economic Co-operation and Development
PBA	Paper-Based Assessment
PIAAC	Programme for the International Assessment of Adult Competencies