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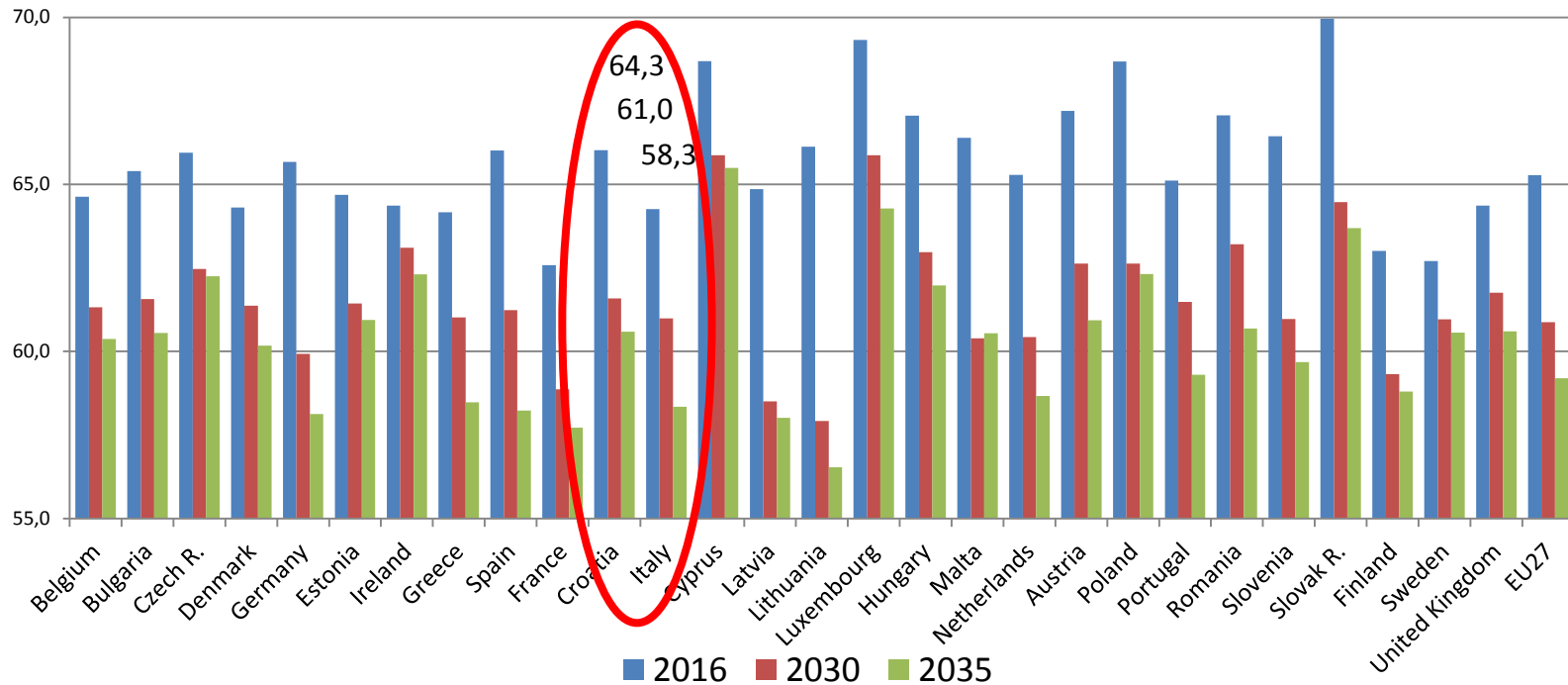
**The Silver Innovation.  
Older workers characteristics and  
digitalisation of the economy**

*Pietro Checcucci*

- ✓ Demographics and digital innovation
- ✓ Digital evolution of jobs' task content
- ✓ Adoption of technological innovation and older workers
- ✓ Conclusions and research directions

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## Working age population (15-64) as % of total population. EU 27 and UK (%)



- ✓ Share of the elderly population (65 and over) is projected to grow by 8 points, from 22.1% to 30.1% of total population.
- ✓ Share of the 55-64 age class on the Italian employed population 15-64 will grow from 17.6% in 2016 up to a maximum of 28.5% in 2030, before starting to slightly decline.
- ✓ The entering in the labour market of narrower cohorts risks to expose Italian and European enterprises to skills shortages and the loss of knowledge and experience, as a consequence of many older workers' retirement.

- ✓ The current automation/digitalisation process represents one of the tools in the hands of advanced economies and organizations to react to the shrinking of the labour force and the retirement of baby boomers.
- ✓ According to some authors only 5% of all the jobs could be fully automated....
- ✓ ... but at least 60% of jobs could have 30% of their activities which could be performed by machines.
- ✓ Transformations are more likely to affect physical activities and/or activities performed within highly predictable and standardized environments, and information/data gathering and processing.
- ✓ There seems to be a potentially negative correlation between the wage level of jobs and their exposure to the risk of being automated.
- ✓ A similar negative correlation appears between educational attainment of workers and their likelihood to be substituted by computers/robots.

Source: McKinsey&Company (2017), A future that works: automation, employment, and productivity, January;

Frey Karl Benedict, Osborne Michael A., (2017), The future of employment: How susceptible are jobs to computerisation?, Technological Forecasting & Social Change, 114 (2017), 254-280

- ✓ 51% of European employees does a job that could be automated.
- ✓ 14% of European employees has a job with a very high risk of automation, while 40% have equally a rather meaningful chance of automation.
- ✓ European men appear more likely to do jobs and/or to work in sectors with a higher automation risk.
- ✓ Workers with a higher educational attainment level have also a lower probability of being in an automatable job.
- ✓ The probability of automation also seems higher for persons in temporary contracts.
- ✓ Moreover, European workers in jobs which are more likely to be automated appear to be more frequently without career prospects and/or role and tasks changes.
- ✓ They also are less likely to have participated in training and show higher skill gaps in their digital skills and in some important generic skills (e.g. communication, team working, customer- service, problem solving and planning).

Source: Pouliakas Konstantinos (2018), Determinants of Automation Risk in the EU Labour Market: A Skills-Needs Approach, IZA DP No. 11829, September

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Digitalization can affect workers' tasks in two different ways :

- ✓ **complementarity effect**, when by means of technology (including ICTs) workers can perform their tasks in a different way;
- ✓ **substitution effect**, when workers are replaced by machines.

The susceptibility of jobs to digitalisation can be described in terms of the intensity of the use of ICTs and of routine intensity:

- ✓ high-skilled jobs (such as managers or professionals) would evolve towards a greater use of ICTs, reducing their routine tasks;
- ✓ jobs with a low use of ICTs and a high routine intensity would suffer a massive digitalisation, as robots and artificial intelligence technologies will be able to take over routine tasks.



When a job become more digitalized:

- ✓ workers are asked to perform more cognitive skills, jointly with communication, marketing and management ones;
- ✓ STEM skills (Science, Technology, Engineering, Mathematics) are also required;
- ✓ these workers show a higher readiness to learn if compared to those who work in less digitalized environments;
- ✓ less specialized workers, with an adequate level of cognitive basic skills, appear more ready to the coming changes at organizations and labour market level.

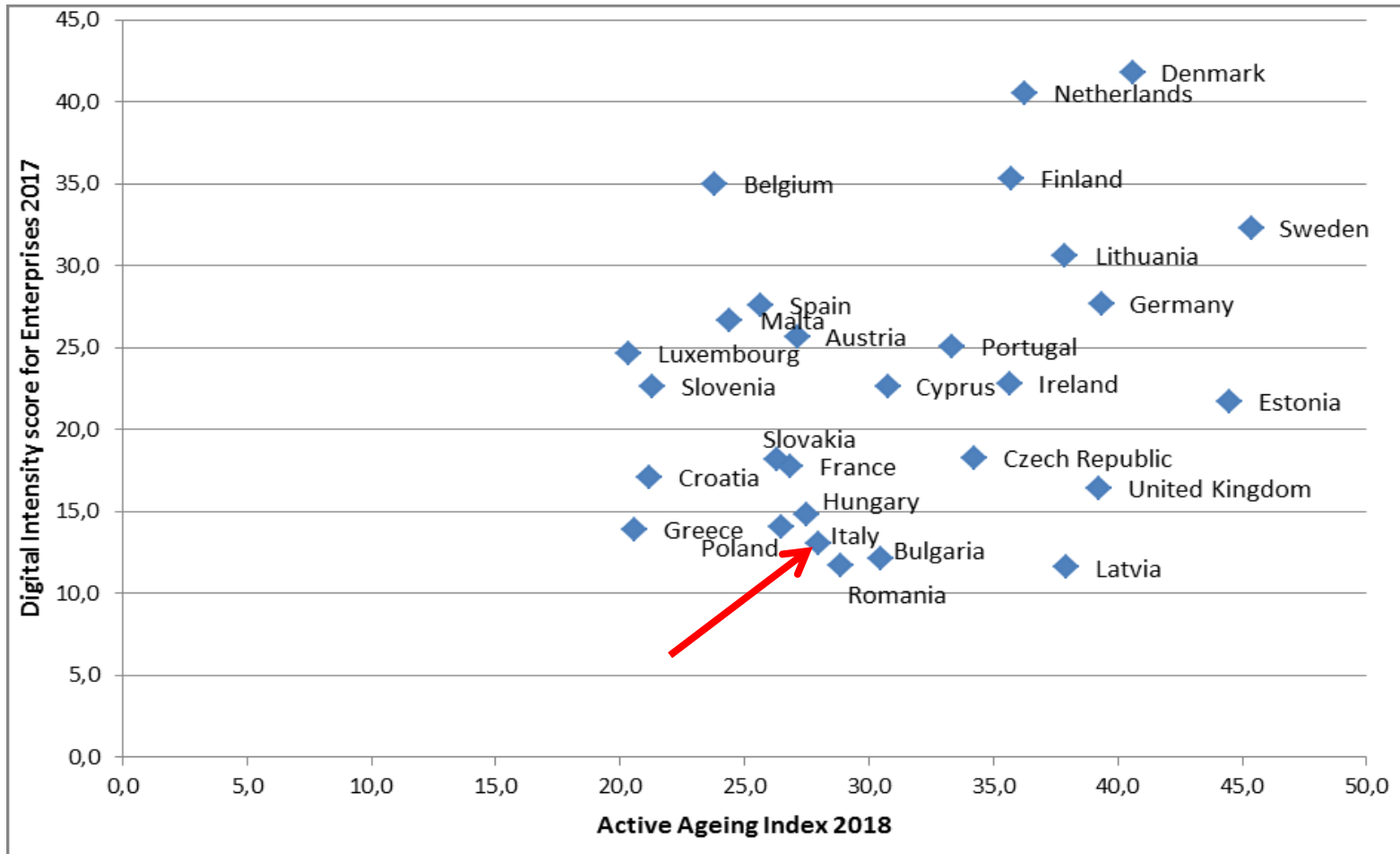
Italy, which has a particularly specialized work force, could be less prepared for digitalisation:

- ✓ our workers would master to a lesser extent cognitive, communication, management, marketing and STEM skills;
- ✓ these skills should be possibly reinforced by transversal ones, such as critical and creative thinking, problem solving, decision-making ability and collaborative behavior.

Source: Bechichi Nagui, Jamet Stéphanie, Kenedi Gustave, Minea Andreea (2017), Digitalisation: an opportunity for workers to develop their skills?, OECD

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**AAI Indicator Employment vs Digital Intensity Score for Enterprises (High and Very High).  
Last available years. (v. %)**



Source: Author's elaboration on data by Eurostat and Active Ageing Index project  
<https://statswiki.unecce.org/display/AAI/Active+Ageing+Index+Home>

## AAI Indicators Employment, Use of ICT and LLL vs Digital Intensity Score for Enterprises. Last available years. (v. %)

	AAI Employment 2018	AAI Employment 2018 - Gender Gap	AAI Capacity and enabling environment for active ageing - Use of ICT (ICT Survey 2016)		Independent, healthy and secure living - Lifelong learning (LFS 2016)		Digital Intensity score for Enterprises 2017 High (7-9) + Very High (10-12)
			Men	Women	Men	Women	
Belgium	23,8	-6,7	74,0	61,0	2,6	3,2	35,0
Bulgaria	30,5	-5,7	26,0	25,0			12,1
Czech Rep.	34,2	-11,3	54,0	50,0	3,0	3,4	18,2
Denmark	40,6	-9,8	86,0	88,0	12,5	25,9	41,8
Germany	39,4	-8,2	73,0	64,0	2,3	2,5	27,7
Estonia	44,5	2,8	60,0	62,0	3,9	10,0	21,7
Ireland	35,7	-14,5	50,0	51,0	1,9	2,6	22,8
Greece	20,6	-10,7	33,0	23,0	0,6	0,7	13,9
Spain	25,7	-7,0	51,0	43,0	2,5	3,5	27,6
France	26,9	-2,5	63,0	63,0	7,0	12,2	17,8
Croatia	21,2	-8,5	41,0	30,0		0,2	17,1
Italy	28,0	-14,0	46,0	34,0	3,5	4,0	13,1
Cyprus	30,8	-12,6	42,0	30,0	2,1	4,1	22,7
Latvia	37,9	-1,2	50,0	48,0	1,9	3,3	11,6
Lithuania	37,9	-3,3	36,0	40,0		2,8	30,7
Luxembourg	20,4	-7,4	95,0	86,0	7,0	5,1	24,7
Hungary	27,5	-10,0	50,0	51,0	1,8	2,0	14,8
Malta	24,4	21,1	50,0	41,0	2,7	3,4	26,7
Netherlands	36,3	-14,0	87,0	82,0	8,4	9,1	40,5
Austria	27,2	-9,8	68,0	50,0	4,9	7,6	25,7
Poland	26,5	-12,2	39,0	36,0	0,6	1,0	14,1
Portugal	33,4	-11,7	40,0	32,0	3,4	3,9	25,1
Romania	28,9	-11,1	27,0	21,0			11,7
Slovenia	21,3	-5,2	43,0	39,0	2,7	5,5	22,6
Slovakia	26,3	6,4	51,0	47,0	0,7	0,8	18,1
Finland	35,7	-1,1	76,0	77,0	9,8	17,0	35,3
Sweden	45,4	-5,3	87,0	86,0	11,9	23,6	32,3
UK	39,3	-10,1	82,0	79,0	6,3	8,7	16,4

Some UE Member States, out of the top 25 manufacturing export economies, with a high Digital Intensity Score, rank higher than Italy in some important features:

- ✓ a lower gender gap among older workers;
- ✓ a use of ICTs among 55+ clearly higher than ours;
- ✓ in the case of UK and Northern European Countries, a higher rate of participation to life-long learning initiatives of the older population.

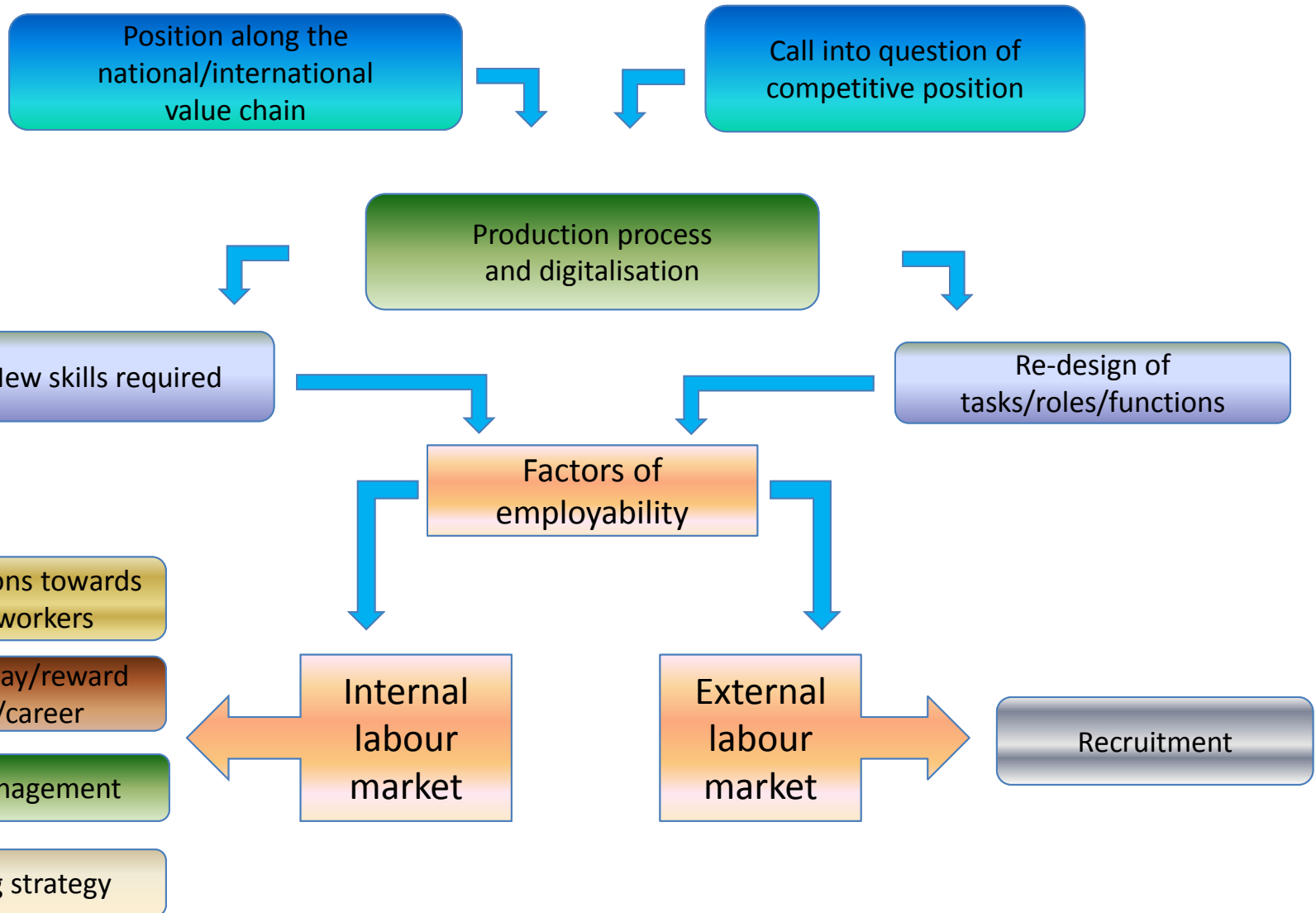
The Fourth Industrial Revolution could thus root involving 50+ workers too, which by now represent an important portion of the work force of the advanced economies.

The quality of human capital, and the adoption of strategic age management measures at organizational level represent two key elements to enhance the employability of this group of workers.

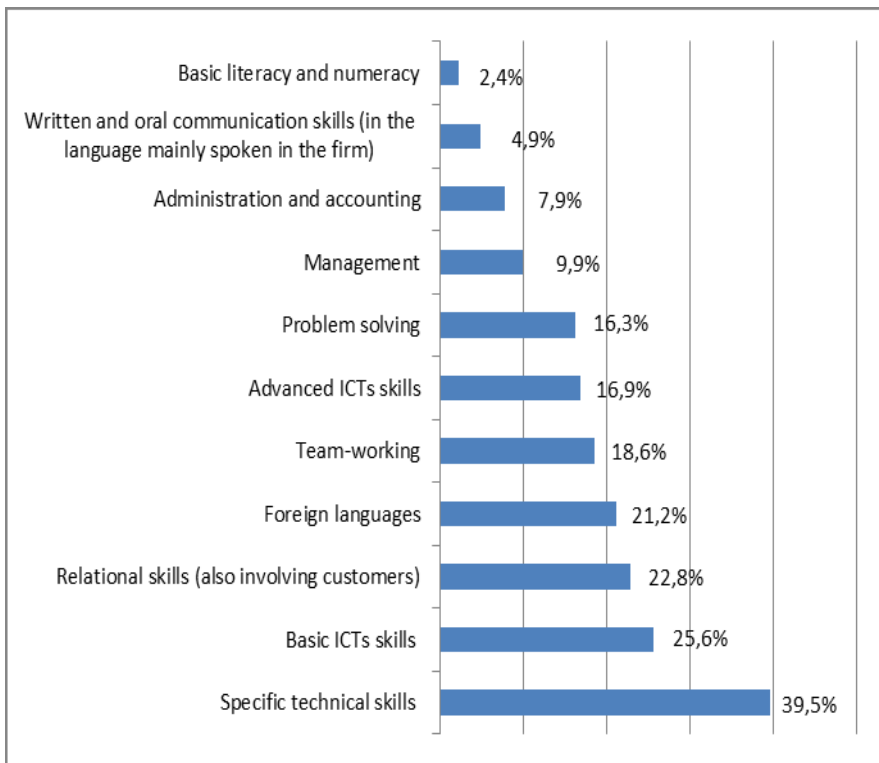
# Digitalisation, employability and age management



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## Skills to be developed in view of a longer working life. (%)



Source: INAPP, 2014

- ✓ The priority given to specific technical skills (39.5%), in connection with the tasks already performed, seems to confirm a propensity to maintain a high specialization level of the work force, consistently with a perception of older workers as a guarantee of stability and know how.
- ✓ The importance given to basic ICTs skills (25.6%) and to a lesser extent to the advanced ones (almost 17%) suggest probably a positive attitude in investing resources in business digitalisation, aiming at not excluding older workers from innovation processes.
- ✓ Communicative skills show a share similar to basic ICTs skills.
- ✓ Communicative skills were reinforced by a certain level of importance given to transversal ones, such as problem solving and team working.
- ✓ Not the same for management, administration and accounting.
- ✓ Basic numeracy, literacy, written and oral communication skills received very little attention: a part of employers underestimated the weaknesses already reported by the PIAAC survey in the same period of time.

Considering the main structural variables (enterprise dimension, economic sector and geographical area):

- ✓ it seems to emerge a preference for specialization in middle dimension enterprises, in the industrial sector and in the constructions;
- ✓ bigger enterprises, industry and services show the most relevant interest for ICTs;
- ✓ similar situation for relational skills, where services show a higher percentage;
- ✓ transversal skills, especially team working, appear to have more attention in SMEs with more than 50 employees, in the industrial sector and the constructions;
- ✓ management, administration, written and oral communication skills see a certain prevalence in high value added services.



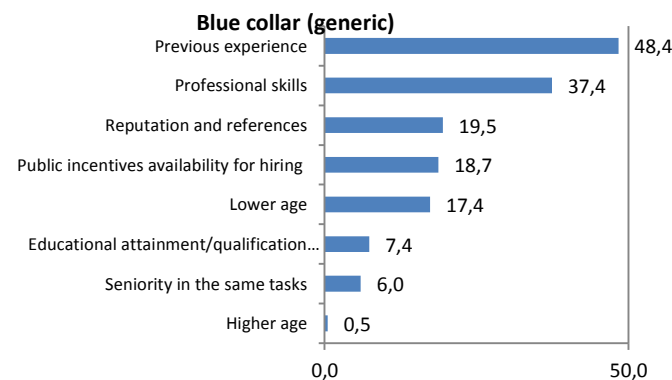
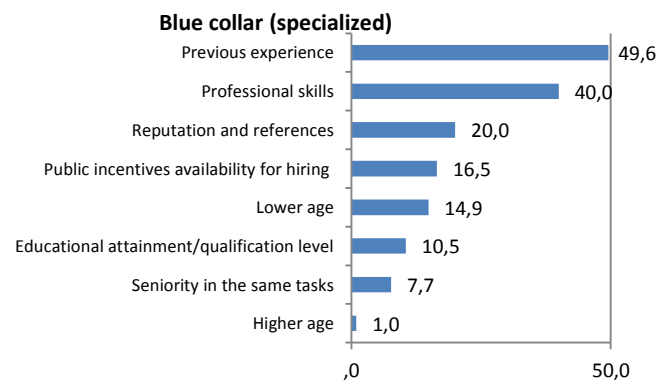
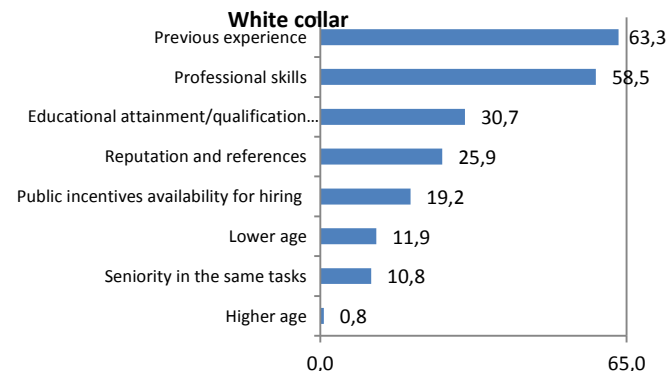
## Knowledges required by type of profession. 2017 (%)

	Technicians and Associate Professionals	Clerical Support Workers	Services and Sales Workers	Craft and related Trades Workers etc.	Plant and machinery operators and assemblers	Elementary occupations
Management and administration	32	44	6	2	1	1
Office work	37	77	6	2	1	1
Economy and accounting	29	45	4	2	1	1
Marketing and sales	30	22	37	6	3	3
Services to customers and people	49	51	64	21	15	22
Personnel management	15	15	3	2	1	0
Production and industrial process	23	4	16	43	50	17
Computer science and electronics	51	61	10	24	23	13
Engineering and technology	18	2	1	11	9	0
Technical design	23	2	0	16	10	1
Building and construction	8	1	0	20	10	16
Mechanics	9	1	1	39	45	11
Telecommunications	11	7	2	7	3	3
Transportation	7	7	1	6	54	30
Mathematics	14	11	5	7	7	4
Physics	6	1	0	3	2	0
Chemistry	9	1	11	5	4	3
Biology	6	0	2	1	0	2
Psychology	10	9	13	1	2	1
Sociology and Anthropology	4	2	2	0	0	0
Geography	1	1	0	0	1	1
Italian language	49	54	69	41	47	54
Foreign language	89	91	74	24	37	38
Media and communication	25	18	7	2	1	4

Source: INAPP, web site [professionioccupazione.isfol.it](http://professionioccupazione.isfol.it), 2018

- ✓ A certain concentration on specialization (e.g. production and industrial process in the case of Plant and machinery operators and assemblers);
- ✓ Growing importance given to informatics, even with a lasting concentration on technical profiles and clerical workers;
- ✓ Very limited priority given to mathematics as well as to other sciences;
- ✓ Clear priority given to Italian and even more to foreign languages, with a concentration on technical, clerical and services profiles.

## Main factors taken into consideration for recruitment. 2014 (%)



Source: INAPP, 2014

- ✓ Previous experiences and professional skills represented two major factors to be considered when looking at the employability of job seekers.
- ✓ In addition to reputation and references which were very frequently chosen in relation to all the profiles, educational attainment and qualification level were considered prior for managers and white collars.
- ✓ Public incentives showed a higher share in the case of blue collars.
- ✓ Seniority in the same tasks didn't seem so important, while lower age was considered more often than the higher one.

## Expected hiring in 2017 in which enterprises require digital skills and average job demand 2018-2022, by major professional groups (%)

	Expected hiring in 2017 in which enterprises require:			Job demand - average share 2018-2022 (%)
	Skills in mathematical and computer languages and methods	Digital skills and knowledge about visual and multimedia communication tools	Management of innovative solutions by means of 4.0 technologies	
<b>Managers</b>	97,4	96,7	70,8	0,9
<b>Professionals</b>	86,2	91,9	63	16,8
<b>Technicians and Associate Professionals</b>	80,8	90,1	56,6	18,2
<b>Clerical Support Workers</b>	78,1	87,2	45,2	8,9
<b>Services and Sales Workers</b>	45,4	55,2	28,9	26,0
<b>Craft and related Trades Workers etc.</b>	48,5	50,3	37,9	10,3
<b>Plant and machinery operators and assemblers</b>	40,1	47,3	26,3	6,6
<b>Elementary occupations</b>	22,6	26,2	15	11,9

Source: elaboration on Unioncamere-ANPAL, Sistema Informativo Excelsior

- ✓ Expected hirings in which enterprises require digital skills appear higher for managers, professional, technicians and clerical workers.
- ✓ More than 54% of average job demand 2018-2020 referred to major professional groups for which digital skills are required to a lesser extent.
- ✓ Comparing Technicians and Associate Professionals with lower groups, we find a growing distance in the share of enterprises requiring digital skills.

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- ✓ In the INAPP survey of 2014 employers appear to have given priority to consolidate the specific technical skills of older workers, in line with their vision of being these latter a guarantee of know-how and a reliable staff in every situation.
- ✓ The survey also captured the awareness of the opportunity to introduce or strengthen ICT skills, jointly with communication, management and marketing, as well as transversal ones (problem-solving, team working etc.).
- ✓ Three years later, the knowledges required by Italian enterprises in training programs can confirm a certain concentration on specialization, a growing importance given to digital skills, a limited weight of mathematics as well as to other sciences and a good relevance given to Italian and even more to foreign languages.
- ✓ As for the external labour market, in 2014 job seekers were evaluated mostly looking at their experiences and specific professional skills, while their higher age was kept in low consideration.
- ✓ In 2017, information from Excelsior seem to show a greater attention to digital skills, with a higher concentration on managers, professional, technicians and clerical workers.

- ✓ The implementation of 4.0 systems is going to be realized gradually, following a path which entails the mapping of processes, the horizontal and vertical integration of the organization and its information sets, in order to reach a level of self-controlling manufacturing and logistic.
- ✓ Thus the positive opinion about older workers could recall the importance of their knowledge and experience in the mapping of processes and the integration of existing information.
- ✓ Specialization issues recall research topics on the relationship between age and work experience, for instance the Experience Concentration Theory which states that as workers age, their experiences naturally increase in quantity, while at the same time a decrease in experience diversity will occur, leading to the **experience concentration**.
- ✓ Both broadness (variation) and restriction (concentration) of experience can become quite extreme, leading to **experience fragmentation** or **experience deprivation**, both of which have not a positive influence on employability.
- ✓ We have **functional concentration**, when the structure of experience at older age is restricted to minor task adaptation, and drastic changes in the tasking package and/or mobility are usually avoided.

Source: Thijssen Johannes, Rocco Tonette, Editors (2006), Older Workers, New Directions. Employment and Development in an Ageing Labor Market, Center for Labor Research and Studies, Florida International University.  
Thijssen Johannes, Rocco Tonette (2010), Development of older workers: revisiting policies, in: European Centre for the Development of Vocational Training (Ed), Working and ageing - Emerging theories and empirical perspectives, Publications Office of the European Union, Luxembourg, pp. 13-27.

- ✓ The association between ageing and cognitive decline is not considered correct any more, especially in the working domain.
- ✓ We can observe a decline in the so called “fluid intelligence” (linked to abstract, inductive and quantitative reasoning and to problem solving).
- ✓ This decline is often counterbalanced by an increase in “crystallized intellectual abilities” (related to educational attainment and represented for example by lexical richness, comprehension, individual level of information and culture, capacity to use personal skills, knowledge and experiences).
- ✓ On the personality side, we can find a decrease in the readiness to new experiences and the prevalence of scrupulosity, the attitude to be generative (taking care of relatives, other people, the society and future generations in a broad sense), control of emotions and self-awareness, the preference for situations and contexts which strengthen the self and the individual identity.

Source: Kanfer Ruth, Ackerman Phillip L. (2004), Aging, adult development, and work motivation, *Academy of Management Review*, vol. 29, No. 3 (2004), pp. 440-458.

- ✓ Active Ageing Index shows that a higher participation of the older population in the labour market is not in contradiction with the capacity of enterprises to adopt digital innovations.
- ✓ Future research on the 4.0 paradigm should intersect age management issues, considering the interrelations among skills and employability factors of older workers.
- ✓ Further research should explore strategic options adopted by enterprises about digital transformations, in the light of their demographic structure.
- ✓ Transformations in specific working environments, and the impact of innovation on the skills, tasks and roles actually performed by older workers should also be addressed.
- ✓ Training strategies and programs about digitalisation should be described, looking at the involvement of older workers and if/how their cognitive characteristics are taken into account.
- ✓ Changes of employers' attitudes towards the external labour market should be surveyed, focusing on recruitment strategies and the skills required of job seekers.
- ✓ The role of national and regional policies on innovation should be also investigated.



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