Opinion of the European Economic and Social Committee on 'Industry 4.0 and digital transformation: where to go'

(COM(2016) 180 final)

(2016/C 389/07)

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On 19 April 2016, the European Commission decided to consult the European Economic and Social Committee, under Article 304 of the Treaty on the Functioning of the European Union, on:

'Industry 4.0 and digital transformation: where to go'

(COM(2016) 180 final)

The Consultative Commission on Industrial Change (CCMI), which was responsible for preparing the Committee's work on the subject, adopted its opinion on 22 June 2016.

At its 518th plenary session, held on 13 and 14 July 2016 (meeting of 14 July 2016), the European Economic and Social Committee adopted the following opinion by 98 votes with no abstentions.

1. **Conclusions and recommendations**

1.1. The EESC strongly welcomes the communication on 'Industry 4.0 and digital transformation: where to go' ([1]). It considers the entire package ([2]) to be the first step in a vast European work programme to be carried out in close mutual cooperation between all interested public and private parties.

1.2. The EESC appreciates the coherent and ambitious strategic vision in industrial policy being displayed in the Communication and its focus on four key issues: (1) technologies and platforms; (2) standards and reference architectures; (3) geographic cohesion, embodied in a network of regional Innovation Hubs; (4) skills at all levels.

1.3. The urgency arises from the analysis performed by the EC. It stresses the strengths of European digital industry, but it equally expresses fear that the value added may massively shift away from industrial players towards the owners of proprietary digital platforms, and it underlines the lack of common standards and interoperable solutions. There is also a great need for digital skills.

1.4. Industry 4.0 is essentially a bottom-up process. But the public sector should develop strategic orientations and has a decisive role to play as regulator, facilitator and financial supporter.

1.5. Digitisation and Industry 4.0 profoundly affect business models and the entire context in which companies currently operate. Awareness building and a common sense of purpose among all stakeholders are paramount: in addition to business, this means social partners at all levels, academia, research institutes, regional and local public actors, the education sector and consumers.

1.6. No single European country is able to grasp on its own all opportunities in the digital era successfully. Europe as a whole is the critical scale, comparable to big markets such as the US and China. Digitisation of industry requires a shared industrial strategy for the EU and MS. This should strengthen Europe's industrial base, attract new investments and re-shore investments and jobs. It will keep Europe sharp concerning the target of industrial output to 20 % of its GNP by 2020.

([1]) (COM(2016) 180 final).
([2]) Refer to the other parts of the package, Cloud Initiative and others.

1.7. A reliable and predictable environment is vital. Start-ups and scaled-ups deserve focused attention. The Council, notably the Competitiveness Council, should, at the initiative of the EC, urgently decide on an EU 4.0 industrial strategy and a Digital Single Market (DSM), replacing the current fragmentation resulting from 28 digital policies. DSM should be an integral part of the revamped single market to avoid fragmentation of the European digital environment.

1.8. Cooperation is key. National and regional 4.0 Platforms must bring together all relevant actors. Within a common EU framework, each should develop its own characteristics. Partnerships of all kinds, synergies and clustering, cross-border arrangements and European benchmarking should be promoted.

1.9. In the same vein, Public Private Partnerships and Important Projects of Common European Interest ([3]) as well as e-government initiatives must be fostered.

1.10. Increasing disparities between MS in terms of industrial output and technological performance are worrying. The EESC urges that properly designed cooperation should kick start convergence instead.

1.11. The EESC welcomes the planned EUR 5 billion R & D funding for ICT in H2020 as well as funding from a range of other European funds, including the Juncker Investment Plan. The EC must clarify how these policy intentions will be put into effect.

1.12. Substantial additional financial resources are apparently needed. The EC is speaking of EUR 50 billion only in ICT investments. This means serious financial involvement by the public and private sectors across Europe. It is as yet unclear how these financial provisions will be implemented within a reasonable timeframe.

1.13. Private equity has a central role in financing. Banks should be encouraged to play their part in Industry 4.0. A fully-fledged European Capital Market would provide appropriate support.

1.14. Customised products at mass production prices will greatly benefit users and consumers. Most areas of personal consumption will benefit from higher performance and quality.

1.15. The Communication is disappointingly concise on the considerable social consequences of digitisation in industry. Net effects are unpredictable. In order to avoid a split society specific attention is needed for those generations and income groups that may be hard hit. For many others, there will be new opportunities.

1.16. Digitalisation will have considerable consequences for the labour market and work organisation, such as greater income disparities and reduced access to social security systems, which can be prove negative if not properly countered ([4]).

1.17. Ensuring stable social relations, a cohesive society, and a well-educated and motivated work force with a decent income and quality jobs requires active involvement by all parties concerned. Social and comprehensive dialogues at all levels — EU, national, regional and company-level — are necessary to ensure a fair adaptation for employees, impacted by digitisation, with timely anticipation and sufficient support for professional adaptation.

1.18. There is a direct link between education programmes and facilities and social cohesion. Up-to-date skills and qualifications for digital technology users and reskilling are key issues. Business and social partners should be closely involved in developing curricula for all levels and forms of education.

([3]) As defined in Art. 107 3b TFEU, and further specified in EC Communication (2014/C 188/2).

([4]) See EESC opinion on *The effects of digitalisation on the services sector and employment* (OJ C 13, 15.1.2016, p. 161), point 1.2.

1.19. The EESC expects the Commission to act as a catalyst by effectively implementing the strategic plan. This implies notably effective coordination of competing approaches, avoiding uncertainty and fragmentation of the market. The Digital Single Market is key. An accelerated process of European standardisation will be decisive.

1.20. Furthermore the EESC expects an active role of the EC in:

— raising awareness in all parts of society, in particular to promote acquisition of digital skills,

— analysing the worldwide picture and providing improved statistical data on services,

— presenting EU effective coordination as an example to national governments,

— increasing pressure on investments in infrastructure (telecommunication, broadband),

— ensuring that the implementation of the GDPR ([5]) will not lead to disharmony in the EU market,

— pushing for transparent public and private financial arrangements,

— monitoring, benchmarking and evaluating, including CSRs in the annual Semester,

— promoting 4.0 platforms and PPPs as well as cooperation among stakeholders, including by bringing them together at EU level,

— promoting the Digital Innovation Hubs as centres for advanced training of the workforce,

— deepening EU social dialogue at all levels to discuss labour market consequences as well as adjustments in the field of social and labour law, in particular concerning economic and political measures that should ensure protection for the entire workforce ([6]).

2. **Introduction**

2.1. Digitalisation in industry is a key part of a broader transformation of the economy that includes robotisation, material sciences, and new production processes, referred to as Industry 4.0. This paradigm shift will radically change business and society. As recently as 2014, the EU did not yet have a clear view of the economic, technological, social and societal aspects of Industry 4.0. The EESC presented a list of desirable measures ([7]).

2.2. In September 2015, the EESC adopted an opinion that discussed the socioeconomic consequences of digitisation of industry and disruptive labour markets ([8]).

A. ***Global developments***

2.3. Crosscutting developments are notably taking place in the US, China, the EU, Japan and Korea. Others will follow. Big data, as a new raw material, are a catalyst for changing patterns of products and services. Previously disjointed fields ([9]) are interacting, while servicing (especially digital) in value chains is generating substantial additional value to production processes.

([5]) General Data Protection Regulation.
([6]) See EESC opinion (OJ C 13, 15.1.2016, p. 161), point 6.3.
([7]) See EESC opinion on *The impact of business services in industry* (OJ C 12, 15.1.2015, p. 23), notably point 1.15.
([8]) See EESC opinion (OJ C 13, 15.1.2016, p. 161).
([9]) Artificial intelligence and machine-learning, robotics, nanotechnology, 3D-printing, and genetics and biotechnology.

2.4. Today, no business can operate without a digital strategy. This strategy simultaneously affects products, services and processes in the industry as a whole. In view of developing new markets, digitisation of industry generates fierce competition between companies as well as between economic blocks. Pre-competitive cooperation across the globe is usual in business as well.

2.5. Measures are driven by a focused industrial strategy, notably in the US and China, where business benefits from big internal markets. This is high politics. In 2011, the Obama administration launched a vast ongoing programme on new technologies, notably ICT, involving business, research institutes and universities across the country.

2.6. As usual, private projects will benefit substantially from new technological programmes recently announced by Federal agencies.

2.7. The US intends to use digital transformation to regain lost ground in industrial markets while taking advantage of the American freedom of operating, and the dominance of world players in ICT and big data such as Google, Amazon, Microsoft, Cisco and others ([10]).

2.8. A consortium of leading industrial companies is working to the same end. A list of the 50 most innovative companies of 2014 reveals that seven in ten leading companies are based in the US ([11]).

2.9. Chinese authorities are using digital transformation to reinforce the Chinese position worldwide. Official documents underline the goal of matching the US.

2.10. The deliberate ambition of China is highlighted in a crosscutting state-driven programme entitled *Made in China 2025*, based on the objectives of the German *Industrie 4.0*. This is a totally new concept in Chinese economic and manufacturing processes, with a high degree of coordination among decision-makers, economic actors and innovative forces.

2.11. Vast financial resources have been earmarked. Despite the economic downturn, these specific programmes are not affected.

B. ***State of play in Europe***

2.12. Interest in Industry 4.0 has increased dramatically. In parallel, digitisation is a high priority for the Juncker Commission. It will require optimal coordination among EC services.

2.13. A clear focus in the Competitiveness Council is crucial for a common sense of purpose among EC, national and regional decision-makers. Digitisation of industry and big data in European manufacturing must ensure a strong position for the future. This is essentially a bottom-up process involving all stakeholders. The public sector is in charge as regulator, facilitator and financial supporter.

2.14. Since 2011, the initiative has come from Germany through combined efforts by the Federal Government, academia and business. Following the launch of *Industrie 4.0* in 2013, the process has been streamlined in *Platform 4.0* and a cooperation agreement between government, business and the trade unions. Business is increasingly involved in crosscutting initiatives, often in cooperation with regional authorities.

2.15. Meanwhile, there are *Industrie 4.0* in Austria, *L'Industrie du Futur* in France, *Catapult* in the UK, *Smart Industry* in the Netherlands, and others. It is a diverse landscape, each country developing its own vision on 4.0 and the future of industry. The intensity of cooperation and sense of urgency, however, differs greatly from country to country.

2.16. National, regional and local (cities) initiatives are complementary. The EC is rightly envisaging cross-border arrangements and partnerships as well as exchange of best practices.

([10]) The 'Digital-Big-Five' in the US have a higher market capitalisation than the sum of all German Dax-30.
([11]) Analysis by the Boston Consulting Group.

2.17. Big and specialised medium-sized companies are taking the lead. Main concerns are the great disparities between countries, backlog or insufficient awareness in SMEs and trailing public involvement. A very challenging issue is the fragmentation of the European market and the usual depressing European picture of 28 industrial and digital policies.

2.18. Digitisation of industry and Industry 4.0 embraces much more than technology. Business has to prepare for radical changes due to a range of factors: speed, scale and unpredictability of production as well as further fragmentation and reorientation of value chains, new relationships between research institutes, higher education and the private sector, new business models, new links between big and smaller companies, new ways of cooperating between all levels in business (design, production, sales, logistics, maintenance), the need for updated and new skills alongside new ways of working, and closer links between business and the user. Traditional industries in particular are challenged by brand new concepts ([12]).

2.19. The consumer can be more in the driver's seat than ever. By combining manufacturing and services, digitisation entails customisation and tailor-made production at the same or lower costs than series production, often in a new setting. At the same time, consumers must be enabled to obtain appropriate information about products social and environmental effects that will facilitate an informed opinion about intended purchases.

3. **Industrial policy and current and desired actions**

3.1. In supporting Industry 4.0 and its stakeholders — entrepreneurs, personnel, social partners, suppliers and clients, education providers — the EU needs an industrial strategy with an appropriate division of labour among all parties concerned. The role of the Competitiveness Council is crucial. Like all industrial policies, it is a matter of shared competences.

3.2. The European Council ([13]) has set the goal that by 2020, European industry should make up 20 % of European GNP instead of the present 12 %. However, hesitation among investors and a lack of (European) direction is instead resulting in a decline in manufacturing.

3.3. Underscoring the need for coherent policies, the Commission services are currently preparing an impressive work programme — regulations, standardisation, R & D and financial resources — in close cooperation with the MS and business.

3.4. The EESC notes with satisfaction that most of the 17 recommendations it presented in its opinion in 2014 ([14]) are currently under discussion.

3.5. The EC, governments, business and stakeholders will rightly take part simultaneously in policy meetings on Industry 4.0. European PPPs should be encouraged ([15]) as well as the planned Important Project of Common European Interest on low-power electronics for the IoT. A detailed roadmap for business and governments is needed.

3.6. One major concern is the ongoing existence of 28 digital policies. This is fundamentally counterproductive to the need for scale, and a major argument to accelerate the DSM.

3.7. The Digital Single Market (DSM) should become an integral part of the revamped Single Market. Smart legislation and regulation must be speeded up. The agenda embraces:

— removal of internal trade barriers and renewal of outdated legislation,

— uniform treatment of big data in Europe,

([12]) See for instance the self-driving car in the automotive industry or FinTech in the banking sector.
([13]) European Council, 11 December 2013.
([14]) See footnote 7, specifically Chapter 1, Conclusions and Recommendations.
([15]) For instance, FoF (Factory of the Future), SPIRE.

— digital infrastructure (telecommunications, broadband),

— open standardisation with usage of the Standard Essential Patents made available under fair, reasonable and non-discriminatory (FRAND) economic and legal conditions,

— a legal regime for the licensing and protection of data, including worker-related data,

— the significance of data protection for current and future uses of data and access to real-world data,

— liability and safety of autonomous connected devices, machines and vehicles,

— cloud-computing and standards in 'cloud' processing platforms,

— cyber security and confidentiality,

— copyright,

— implementation of social and tax regulations in the gig economy and in online labour relations (e.g. 'crowd working'),

— up-to-date, detailed statistics on services.

3.8. The EESC urges consultations to strike an appropriate balance between legislative provisions and room for manoeuvre for economic actors.

3.9. Europe must make efforts to set worldwide standards, in close cooperation with non-European actors.

3.10. The General Data Protection Regulation (GDPR) contains multiple flexibilities for MS. It is important that the GDPR will not lead to outcomes that restrict access and re-use of data, increasing disharmony in the EU market.

3.11. Cyber security is still largely underestimated in business and by states. Cyber crime is spreading over the world. The EU has an obvious role to play.

3.12. The EESC urges the EC to pay specific attention to statistics that are still systematically overlooked. More detailed statistical evidence concerning services is crucial for business and policy makers.

4. **National and regional measures**

4.1. An increasing number of countries and regions are now working seriously on digitisation.

4.2. However, increasing disparities between countries and the uneven awareness in business in the various countries are a major concern. A major issue is interoperability between companies and suppliers.

4.3. Awareness-raising programmes are set up for business and stakeholders. Each country finds its own methods. Platforms, often at regional level, are very important for enhancing cooperation between big and small companies, as well as between these and research institutes and universities.

4.4. Broadening regional and national PPPs should be encouraged. They bring partners from various backgrounds together and promote cross-fertilisation. They promote cooperation and can be a welcome source of badly needed financial support.

4.5. Platforms, centres of excellence and field labs often focus on specific parts of digitisation, for instance on changing value chains, new business models and social and work place innovation ([16]) with active participation of employees and trade unions. One-stop-shops must be encouraged. Sector organisations play a role in addressing sector-specific issues.

4.6. (Technical) universities around which incubators are assembled — business campuses — also play a proactive role. The concept of the entrepreneurial university, which is spreading over the continent, is most helpful ([17]).

4.7. Networks of companies, platforms, sector organisations and universities intensify desirable trends. DSM should improve conditions for cross-border cooperation. Economic and legal conditions for sharing value creation through digitisation in industry may be needed to foster cooperation between players of (very) different sizes. Particular focus on SMEs and start-ups is necessary. Most of these lack targeted information and many lack tools for improvement.

4.8. In comparison with the US, start-ups and scaled-ups are rather a weak point in Europe. Cross-fertilisation between big and small and networks of (cross-border) incubators is paying off. Coaches such as part-time, retired and experienced entrepreneurs and mentors can play a very supportive role.

5. **Funding**

5.1. Digitisation is becoming a priority for European funds (Horizon 2020, regional and other funding). The Joint Research Centre in Seville and forthcoming innovation hubs with worldwide experience can be very beneficial.

5.2. From the point of view of the EESC, the issue of financing all necessary investments is far more complicated than it appears in the Communication. Substantial additional financial resources are apparently needed. The EC is speaking of EUR 35 billion only in ICT investments. This implies close cooperation between EU, national, and regional funding, as well as active industrial involvement via Platforms and PPPs. Clarification is needed on how these financial provisions will be implemented within a reasonable timeframe. The usual question can be posed: who is expected to pay what and to what purpose?

5.3. European funding is rightly often criticised for being too slow and too bureaucratic, which is usually very costly and discourages small business. Look at the US! Adjusted procedures and less bureaucracy are imperative, while maintaining fairness. Reducing the number of mandatory partners in R & D consortia may be useful ([18]).

5.4. The University Business Incubation Rankings for small business can be a helpful tool for measuring promising start-ups and speeding up EU bureaucratic procedures.

5.5. Innovative digital business processes are driven by start- and scaled-ups such as unicorns ([19]). The Americans are leading. In addition, American innovation-watchers are very active in Europe and looking for profitable take-overs.

5.6. Besides the banking sector private equity is actively involved. Private banking itself is also digitising. FinTech operates alongside this. As an offshoot of the digital world, it promotes speed, increased efficiency and transparency as well as a changing attitude to clients. More FinTech hotspots in Europe besides London would be helpful.

([16]) As illustrated by the European Workforce Innovation Network EUWIN.
([17]) See also EESC opinion on *Engaged universities shaping Europe* (OJ C 71, 24.2.2016, p. 11).
([18]) This has already been implemented in some parts of Horizon 2020.
([19]) A unicorn is a mature start-up worth at least USD 1 billion.

5.7. Banks and FinTech should be key partners in DSM, with a higher level of performance and value creation. They should be encouraged to act as a strategic partner for industry, professionally assessing the economic, social and environmental benefit of projects. Radically new forms of interlinking platforms and value added services may help.

5.8. Financial regulation (or the review thereof) should not hinder the banking sector in taking calculated risks in investing in Industry 4.0.

5.9. A fully-fledged European Capital Market is needed to create a financial level playing field comparable to that of the US.

6. **Society and the labour market**

A. ***Society***

6.1. Industry 4.0 and the digital society concerns everybody. Awareness must be raised. Risks and uncertainty about the future as well as chances and opportunities, societal conditions and acceptance are under discussion.

6.2. In North West Europe, the digital revolution is already in the media everyday (TV, press, social media). In some countries, public opinion is reasonably well informed, but information must be considerably improved across Europe.

6.3. Customised products at mass production prices will greatly benefit users and consumers. Substantially higher performance is to be expected in the following fields:

— agriculture and food,

— the circular economy, COP 21,

— automatic testing & diagnostics, repair and maintenance, dismantling,

— e-health, m-health and e-care,

— health robotics (proximity and interaction),

— buildings and civil engineering ([20]),

— lower energy consumption,

— transport and mobility,

— e-government,

— smart cities,

— development of remote areas,

— underdeveloped countries.

B. ***Labour market***

6.4. Industry 4.0 profoundly affects all professions in the labour market. This puts labour market policies at the heart of future developments. In this respect the argument of the Communication is disappointingly concise and rather flat.

([20]) See the Dutch initiative BIM, a 3D Building Information Model, in which various disciplines — architect, constructor, installer, and contractor — cooperate with one common database.

6.5. In 2015, the EESC discussed a broad range of effects of digitisation on the service sector and employment ([21]). Changes are occurring in job description, skills and qualifications, education and training, work environments and process organisations, contractual relations between companies and employees, working methods, career planning, etc.

6.6. How to deal with technology that is going to race ahead, but could leave some (potentially many) people behind is one of the great challenges of our time ([22]). Politics and society as a whole, the business sector, trade unions, non-profit organisations and the public sector, sector organisations and NGOs all need to be committed.

6.7. In the digital era social cohesion will largely depend on education. Education at all levels and training systems across Europe urgently require up-to-date skills and qualifications if people are to keep pace with developments and the need for (international) mobility. Creativity and entrepreneurship should be promoted ([23]).

6.8. In order to provide the EU workforce with the skills it requires in the digital age, public and private investment in vocational education have to be promoted and it must be examined whether European measures are required in order to generalise across the EU the positive experiences in Members States regarding training leave ([24]).

6.9. The EU needs a skills agenda on the basis of a list of key competences. A EU education — business forum, including social partners, will provide excellent support. The social partners of user sectors should equally be involved in the definition of digital skills for industry. The EU Grand Coalition for Digital Jobs and corresponding National Coalitions should be well coordinated.

6.10. Digitisation opens up opportunities and generates more choices for people in terms of personal responsibility and freedom (for example time and place to work). Very many are benefitting from this, either in existing companies, or by shifting to new companies or working for themselves. It should be examined how various forms of flexibility should be implemented by national social partners according to national practices and national law in order to fairly balance the interests of workers and employers ([25]).

6.11. Mainly due to robotisation, large groups of workers, including tiers of managers, are currently being laid off. The lower middle class is being hard hit, as is the older generation. Society has a clear responsibility towards those who, due to age or insufficient qualifications, are no longer able to take part in the labour market.

6.12. In order to bolster employment despite declining demand for labour, potential problems need to be identified through discussion involving all stakeholders and the corresponding strategies established in line with individual Member States' requirements (e.g. including in the sphere of public investments, job-creating innovation and distribution and reduction of work) ([26]).

6.13. In parallel, mismatches on the labour market must be rectified. Up-skilling of all those considered able to skill up, must be facilitated. Across Europe, there are hundreds of thousands of vacancies in the technical and ICT sectors. This requires appropriate communication.

([21]) See EESC opinion in footnote 4.
([22]) See, amongst many other studies and analyses, *Digitalisation of the economy and its impact on labour markets*.
([23]) See, amongst others, the EESC opinion on *Engaged universities shaping Europe* (OJ C 71, 24.2.2016, p. 11).
([24]) See EESC opinion (OJ C 13, 15.1.2016, p. 161), point 1.5.1.
([25]) See EESC Opinion in footnote 4 (OJ C 13, 15.1.2016, p. 161), notably points 1.5.6, 1.5.8, 1.5.9.
([26]) See EESC Opinion (OJ C 13, 15.1.2016, p. 161), points 1.5.9.

6.14. Business and trade unions are facing the same challenges. A well-educated and motivated work force with a decent income and quality jobs is in everyone's interest. If not managed well, resistance in public opinion and among workers may cause damaging tension.

6.15. Social dialogue at all levels — EU, national, regional and corporate — is necessary. The state of the economy and the social environment, traditions and culture vary from country to country. It is essential that all stakeholders assume joint responsibility.

6.16. At EU level, social dialogue in Industry 4.0 should concern:

— analyses of economic and social complexities, and anticipation of change at sectoral level, promoting a shared understanding,

— mapping consequences for various segments — lower, middle and higher — of the labour market as well as vulnerable groups,

— transformations in employer-employee relationships,

— occupational health and safety liability, given automated and connected machines and vehicles,

— job descriptions,

— 'flexicurity' and mobility due to further fragmentation of value chains,

— skills and qualifications focused on the needs of digital technology users, and reskilling are therefore key issues,

— education and schooling, from primary school to university, and

— continuous re- and upskilling,

— attention to gender balance,

— best practices, focus on promoting convergence between MS,

— mobility (Schengen),

— communication and information.

6.17. In parallel, social dialogue is taking place at sector level. One example is the dialogue between Ceemet and industriAll in the metal, engineering and technology-based industries. The European Banking Federation (EBF), the insurance sector and the central banks are holding a similar dialogue with Uni-Europa Finance. Moreover, the EBF and Uni-Europa are working on a Europe-wide retraining project, involving 40 000 employees.

6.18. The same approaches are being or should be applied at national level taking into account huge differences in culture, agenda and practice between countries and disparities as regards social dialogue itself and government involvement as legislator and facilitator.

6.19. At regional and company level, social dialogue will focus on shifts in business models and on specific situations for individuals, regional specialisations and cross-fertilisation between companies, schools and higher education and business campuses. National and regional platforms can also be a great help in all these areas ([27]).

6.20. To sum up, well-managed social dialogue is crucial to generate a common mind-set and common objectives for society, companies and directly concerned stakeholders in an area that is still full of economic and social pitfalls.

Brussels, 14 July 2016.

The President
of the European Economic and Social Committee
Georges DASSIS

([27]) An interesting example is a Dutch field lab on social innovation at Ypenburg, Netherlands.