

ANALYSIS OF NATIONAL INITIATIVES on DIGITISING EUROPEAN INDUSTRY¹

FRANCE:

ALLIANCE INDUSTRIE DU FUTUR

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¹ This report has been produced for DG CNECT by Jan Larosse, independent adviser (Vanguard Initiatives Consult&Creation).

The analysis is limited to the information available till September 2017 and the proposed analytical framework can be a basis for a more comprehensive policy documentation.

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1. Context

1.1. General

- France ranks **16th** out of the 28 EU Member States in the DESI-index (and belongs to the medium performing group of countries). This results from good performance in numerical skills (in particular the high proportion of S&T graduates) and good e-gov performance on the one hand, but below average connectivity (low coverage for fast broadband) and a **below average degree of integration** of digital technologies (electronic invoicing, cloud) in companies.

<https://ec.europa.eu/digital-single-market/en/scoreboard/france>

- Economic performance in France is hampered by the **decreasing productivity growth** (although the level is still among the highest in the EU). Industrial competitiveness has been deteriorating for years (negative trade balance, with only a few strong industries such as aircraft-aerospace, along with agro-food and luxury industries). R&D intensity is with 2,24% (2014) **above average**, and increasing. Government expenditures for R&D are stagnating but business R&D has increased to 1,45% of GDP (manufacturing remained stable at 0,75%, while ICT and other services increased their share). But **research performance is average** (in quality and quantity); scientific output is moderate (despite reforms in the public research infrastructure) and translates insufficiently into competitiveness. The high number of measures to support innovation is not matched by sufficient results. Because of this **underachievement** the transformation of the economy and society has become the guiding policy strategy. The urgency of structural reforms has helped the accession of president Macron. Digitisation is considered to be the axe for transformation of the industry in an Industry of the Future.

<https://rio.jrc.ec.europa.eu/en/country-analysis/France>

1.2. Political changes; new policies

- The cross-cutting programme '**Industrie du Futur**' (**IdF**) was launched in April 2015 by the former Minister of Economy, E. Macron, to lead the second phase of the overarching strategy 'La Nouvelle France Industrielle'. One of the main characteristics of this more focused and result-oriented approach was the establishment of the '**Alliance Industrie du Futur**' (**AIF**) in order to secure coordination with stakeholders through a bottom-up approach.
- The new French Government is continuing and reinforcing the efforts for economic transformation and industrial modernisation. The presidential election programme of E. Macron announced an investment plan of 50 billion euro for this objective. This has been confirmed in the **general policy statement** of the Government Philippe. The main areas of this plan will be:
 - the energy transition, skills' development, health, transport, agriculture and modernising the State;
 - industry, the aim being to forge a powerful industrial network of SMEs and mid-caps, aligning them more with multinationals, to give them greater room for manoeuvre – especially in terms of export;

- the digital revolution and artificial intelligence, which is going to impact all production sectors across the board².

<http://www.gouvernement.fr/en/edouard-philippe-s-general-policy-statement-key-points-at-a-glance>

- The headlines of this '**Grand Plan d'Investissement 2018-2022**' were presented by the Government on 25 September 2017 (see further). The Government has the ambition to accompany the transition of the economy to a new growth model, including an ecological and digital transition, with a **mix of institutional reforms and targeted investments**. The Plan will mobilise over 5 years €57 billion (instead of 50) on a broad spectrum of actions in 25 initiatives under 4 action lines for the transformation: ecological transition; vocational training; innovation; digital transformation of the public services. The government aims to strengthen to role of public investment through a global and coherent approach that is consistent with regulatory reforms. The Plan will be implemented through a system of active monitoring by the government to (re)orient the efforts towards the highest impact. (<http://www.ladocumentationfrancaise.fr/var/storage/rapports-publics/174000710.pdf>)
- Another important institutional change that has a big impact on transformation policies is the implementation of the **territorial reform** started in 2015 for decentralising the administration. This reform has transferred new competences to the regions (which have become stronger through merging the former 22 Regions into 13 in 2016) and to metropolitan areas. The role of the Regional Councils has become a key-factor in the success of the economic policy, including the strategy for digital transformation, because many instruments are now directed at regional level. A key challenge therefore is the alignment between the top down modernisation strategy of the government and bottom-up strategies from the regions (such regional smart specialisation strategies and cluster strategies of the Pôles de Compétitivité).
- The 'Direction General des Entreprises' (**DGE**) is the administration within the Ministry of Economy and Finance that holds a central role in the implementation of the Industrie du Futur programme and important related initiatives (such as the 'Transition Numérique', the 'Conseil National de l'Industrie'). The investment policy is implemented through the 'Commissariat Général à l'Investissement' (**CGI**) under the prime minister.
<https://www.entreprises.gouv.fr/files/files/direction/Missions-DGE-english.pdf>
<http://www.gouvernement.fr/le-commissariat-general-a-l-investissement>

1.3. Status of Digital Agenda in general

- In 2012 the government (through the DGE) launched the programme '**Transition Numérique**' that supports SMEs in using digital technologies with the aid of a network of hundreds of consultants from the public and private sector which have a direct contact to the companies. The public consultants come from Chambers of Commerce, Tourism Offices and business support organisations to provide information and training on good digital practices. In 2016 about **800 consultants** are working in this programme. and benefit from support to better accompany the SMEs they meet in their daily contacts in digital practices. This support is

² In policy statement is announced that the Secretary of State for the Digital Sector will come up with a proposal for more effectively involving the very best specialists in the field in defining a national strategy for artificial intelligence.

provided through **regional resources centers** that have signed a cooperation charter that engages them to organise the deployment of the Digital Transition in their regions and coordinate actions at regional

- In March 2017 the government announced the **modernisation** of this programme, after consultation of the '**Conseil National du Numérique**'³. In addition to the network there will be a platform that provides resources to support these consultants and the companies themselves; new local actors and pilot actions will be integrated in close cooperation with the regions, in particular to generalise the use of digital vouchers.
- This work of consultants in the Digital Transition programme is completed by an '**Association Transition Numérique**' (organised through a convention with the DGE) that brings together all private organisations and representatives of public institutions (professional associations, the Association of Regional Councils, ...) that want to support the programme (nearly 100 members). E.g. it has organised in 2015-16 'Rencontres Régionales Transition Numérique' in 13 towns, at the occasion of professional fairs, to mobilise SMEs to engage in digital transition.
- In June 2015 the Government published its '**Digital Strategy of the Government**' to set a framework for a '**Loi pour une République Numérique**' according to the three republican values:
 - Liberating innovation by better circulation of information and knowledge to be prepared for the global challenges of the data driven economy (Liberté)
 - Creating a trustful framework, ensuring the rights of users and protecting personal data (Egalité)
 - Building an open and inclusive digital Republic, providing opportunities for all in the digital transition (Fraternité)

<http://www.gouvernement.fr/partage/4492-strategie-numerique-du-gouvernement>

- On 7 October 2016 the 'Law for a Digital Republic' was promulgated (see below).
<https://www.economie.gouv.fr/republique-numerique>

1.4. Role of ICT and of digitalisation of industry in R&I policy and in industrial policy of the country.

- The 'Industrie du Futur' programme is the corner stone of the new industrial policy of France, '**La Nouvelle France Industrielle**' (New Industrial France), that was launched in 2013 and streamlined further in 2015 under Minister Macron. Its goal is to modernise France's industrial fabric by engaging all companies on the road for the modernisation of their production instruments and the transformation of their business models through digitalisation. The "Alliance pour l'Industrie du Futur" is the **governing body** composed of representatives of industrial players, research centres, trade unions and professional organizations. Its objective is to support 3400 SMEs and mid-market companies

³ The former chairman of this advisory body, Mounir Mahjoubi, has been appointed Secretary of State for the Digital Sector in May 2017.

- In addition to 'Industrie du Futur', the programming for the new industrial policy is based on '**9 industrial solutions**', that provide real-world responses to key economic and social challenges: Data economy; Smart objects; Digital trust; Smart food production; New resources; Sustainable cities; Eco-mobility; Medicine of the future; Transport of tomorrow. Digitalisation is perceived as an opportunity to rejuvenate the industrial production infrastructure in general. The investments in solutions for Data economy, Smart objects, Digital trust and others have the most direct digital focus. Large-scale means have been implemented (in particular via the " Programme Investissement d'Avenir") to support ambitious industrial projects and step up the deployment of the goods and services of tomorrow in a world in which digital technology is erasing the boundary between industry and services.
- The **Programme Investissement d'Avenir (PIA)** was launched in 2010 with a dotation of **€47 billion**, at the initiative of President Sarkozy and the support of a high-level bi-partisan Commission to identify priorities for investments in long-term growth. Six strategic axes were identified: higher education, research and training; valorisation of research and transfer to the economy; the consolidation of strategic industrial 'filières' and development of innovative SMEs; sustainable development; **digital economy**; health and biotechnology. A first tranche of €35 billion was opened in March 2010 (PIA1); a second tranche of 12 billion (PIA2) in December 2013; a third tranche of €10 billion (PIA3) is foreseen in the Grand Plan d'investissement. The programme is managed through the 'Commissariat Général à l'Investissement' (CGI) and supported by the BPI France (the public investment bank).
- Another feature of the broader programme Nouvelle France Industrielle is the focus on key technologies for France. The "**Key Technologies 2020**" report (<https://www.entreprises.gouv.fr/politique-et-enjeux/technologies-cles-2020>) presents a list of 47 key technologies in which French companies need to be present within 5 to 10 years in order to maintain a competitive advantage and uphold the appeal of France in growth markets. These key technologies provide a medium-term direction for the development of New Industrial France solutions with real-world applications of these key technologies. The most highly-represented technologies in Key Technologies 2020 are digital technologies (artificial intelligence, HPC, autonomous robotics, IoT, CPS, simulation..).
- The development of the Industry for the Future programme and its support structure 'Alliance pour l'Industrie du Futur' (AIF - Industry of the Future Alliance), is also connected to the role and activities of the **Conseil National de l'Industrie (CNI)**. The CNI is a permanent consultation body for the government on matters of industrial policy, presided by the premier and involving all ministers concerned, with representatives of stakeholders (industry federations, trade unions, territorial organisations) and individual experts. It emerged out of the 'States-General for Industry' in 2010. In 2012 the CNI was mandated to develop strategies and action plans for the strengthening of strategic 'filières industrielles' (industrial value chains)⁴. At this moment CNI counts 14 strategic filière committees and also five transversal thematic groups (the most recent is on 'industry of the future') in support of the committees.
<https://www.entreprises.gouv.fr/conseil-national-industrie/cni>

⁴ The 'filière' approach (value chains in strategic sectors) is a singularity of French industrial policy. It is often resumed to 'sector policy' build around the national champions, but in fact contains strong cross-sectoral elements characteristic for a value-chain approach.

The **14 strategic filière committees** are chaired by the Minister of Economy to develop value-chain contracts for priority actions in which all stakeholders are aligning their engagements according to the challenges and opportunities for their value-chain. These contracts have been finalised for these **14 strategic value-chains**: aeronautics, food, automotive, consumer goods, wood, chemistry and materials, eco-industries, railways, extractive and heavy industries, health industry and technologies, fashion and luxury goods, shipyards, nuclear and digital.

The contract on the '**filière digital**' of July 2013 is structured around seven axes: the sector strategy will concern companies, training, export, regional planning and other related issues. This was translated in a roadmap with 100 actions directed to youngsters, to values of social responsibility and to competitiveness.

- The government announced early 2017 the launch of a **partnership** between the AIF and the CNI to unleash the industry of the future in all industrial value-chains. To this end the government has engaged a consortium of consultants (Accenture, Ernst&Young and Roland Berger) to accompany the implementation of this mission, with an in depth **diagnosis** of the technological disruption, the evolution of business models and the skill development that are necessary to the diffusion of the industry of the future in these value-chains. The results of **study** on 6 filières were presented in June 2017.

<http://www.mtom-mag.com/article4311.html>

<https://www.entreprises.gouv.fr/conseil-national-industrie/etudes-filieres-industrielles-du-futur-du-grand-groupe-a-la-tpe-toute-la>

- The **Pôles de Compétitivité** (regional clusters, combining R&D, industry and education) are also an important channel to enhance digital transformation across all sectors. The programme started already in 2004 to support industrial policy with a cluster approach in the territories. There are now 71 labelled 'Pôles de Compétitivité'. They can receive subsidies and fiscal advantages for projects, mainly on collaborative R&D at the level of renewal of specific value chains. In its third phase (2013-2018) the government has focussed the objectives of this programme more strongly on economic impact and accompaniment of SMEs. The Association Française des Pôles de Compétitivité (AFPC) became a member of AIF. It established in March 2016 a 'Plateforme de Coordination pour L'Industrie du Futur', with 34 Pôles that are most engaged in "Industrie du Future" (IdF), to promote inter-cluster projects in line with the dF.

The cluster policy through Poles now has two objectives : better anchoring these Poles in their regional eco-systems, and better articulating their actions with national priorities. With this aim the regional axis of PIA3 (which will be supported at parity by the regions) will be opened to the Poles for financing projects and contributing their experience.

- The **BPI France** is the public investment bank (that replaced the former OSEO end of 2012) provides support for R&D and innovation projects to businesses, especially SMEs. It has been endowed in 2013 with a fund of €21 billion. It is the principal operator for PIA towards start-ups and SMEs. In 2016 additional development funds at BPI were oriented towards large projects ("French Tech initiative" , "French Tech Accélération and Large Venture Funds") in some **specific areas** : health, **digital**, and environment (a €600M fund with €10 M tickets).

French Tech is an initiative launched by the French government to promote French **startups** in France and abroad. It has several components. The promotional labelling of "French Tech

Metropolis"13 concerns 13 metropolises in France in the provinces. Paris as a world class metropolis is outside this classification. In addition, startups are also grouped into **thematic networks throughout the country**. Finally, networks of French startups abroad have been labelled as "French Tech Hubs" in 22 cities around the world. In addition to this, the French Tech initiative also includes a **French Tech Acceleration Fund** managed by BPI France for equity investments with an endowment of EUR **200 million**. Finally, French Tech awards **grants** of between EUR 10 000 and EUR 30 000 **as seed money**.

- The French **smart specialisation** policy is influencing the investment policies of the regions, following other important evolutions. These include:
 - The elaboration of other national specialization strategies such as France-Europe 2020 (2013), Innovation 2030 (2013), "New Industrial France" (2013), National Research Strategy (2015)
 - Recent bills (law ESR 2013, loi MAPTAM, 2014 and NOTRe in 2015) reinforced the leadership and competences of regional authorities.
 - The recent merging of French regions.

2. Status of the National Initiative

2.1. Political commitment

- The 'Alliance Industrie du Futur' (AIF) has been launched by the **President** of the Republic in 2015 and brings together manufacturers, engineering schools, research and technical institutes, through their representative organisations, to implement the programme with an action-oriented and bottom-up approach. It is an open, non-for-profit association, composed of (now) **33 member organisations** that are grouped in **4 colleges**: professional organisations, technology partners, academic partners and organisations for financing business (starting with Bpi France, the public investment bank). This governance structure reflects the mission to establish a broad partnership and organise a coordinating capacity in the field.
- The AIF has been entrusted **three missions** to support the Industrie du Future programme: 'Develop' (the supply of technologies of the future and the normalisation at international level) – 'Accompany' (help companies and prepare human resources for industrie of the future) – 'Diffuse' (promotion of Industrie of the Future and valorisation of results). It is organised in 7 working groups to accomplish these missions, each headed by 'pilots' coming from the member organisations. The link with the regions is also established via the member organisations through a network of correspondents.
- The AIF is **presided** by Philippe Darmayan, CEO of Arcelor Mittal in France. There is a small **secretariat** to support this association. The Steering Group which ensures coordination with the political level meets four times a year under the presidency of the Minister in charge of Industry, but will be extended to all ministries concerned. This Steering Group is managed by the DGE (Directorate General for Enterprises)⁵

2.2. Strategic roadmap / action plan

Industrie du Future

⁵ See also Digital Transformation Monitor – France: Industrie du Futur, January 2017

The 'Industrie du Futur' programme is built on 5 pillars and on strong governance for spearheading its implementation: the 'Alliance pour l'Industrie du Futur' (AIF). Digitisation is dominating the roadmap of IdF.

The **5 pillars** of the 'Industrie du Futur' programme are:

1. Develop **cutting-edge technologies**: supporting companies developing major projects in
 - Additive Manufacturing
 - The Virtual Plant and the Internet of Things
 - Augmented Reality

A **network of regional platforms** will enable companies to pool and test new technologies and train their workforce to use these new tools.

Financing within the PIA programme, €305m in subsidies and repayable loans under the PIAVE (promising industrial projects) initiative, and €425m from the SPI (industrial project companies) fund could partly finance this ambition.

2. **Help companies adapt** to the new paradigm, through
 - **Personalised support**: regional platforms will offer audits to industrial SMEs and mid-tier firms, with the support of the AIF. The objective is to support **2.000** companies over two years.
 - **Financial support**: €2.5bn in tax incentives (over one year); €2.1bn in loans earmarked by Bpifrance for SMEs (over two years) investing in Industry of the Future projects (digitization, robotics, energy efficiency, etc.)

3. **Employee training**

Upskilling the industrial workforce and training the next generations in these new jobs, involving trade unions active in the National Council for Industry (CNI) with the training aspect, through two dimensions:

- A **forward-looking dimension** with the launch of interdisciplinary research programmes on the Industry of the Future and the role of human beings in this new paradigm.
- An **operational dimension** with formulation and implementation of initial and ongoing training responding to the challenges of the Industry of the Future

4. **Promoting** the Industry of the Future

With emblematic projects on a national or even European scale; creation of a joint Industry of the Future banner to bring together all the industrial firms contributing to this ambition; organisation of a major internationally visible event around the Industry of the Future in Paris, along the lines of the Hanover Fair.

5. Reinforcement of European and international **cooperation**

Establish strategic European and international partnerships, in particular with Germany (joint pilot and technology development projects that will be presented in the framework of the European investment plan); cooperation on European and international norms and standards On the European level, the Alliance for the Industry of the Future will represent French interests in European initiatives; support French companies responding to European «Horizon 2020» calls for projects; strengthen France's influence in the field of European standards, which will facilitate deployment of its cutting-edge technologies developed.

<https://www.economie.gouv.fr/files/files/PDF/web-dp-indus-ang.pdf>

https://www.economie.gouv.fr/files/files/PDF/pk_industry-of-future.pdf

Grand Plan d'Investissement

The 'Grand Plan d'Investissement' of **57 billion** that was presented in September 2017 gives the financial framework of the government for its efforts for accelerating the economic transformation in the period 2018-2020. Its 4 major investment priorities are:

- Accelerating the **ecological transition**: **€20 billion** will be dedicated mainly to the energy transition (among these the energy efficiency in buildings). Smart solutions will require digital technologies and application.
- Building a society of **competences**: **€15 billion** invested in people (vocational training), among other things to train 1 million of non-employed and 1 million of young drop-outs. This will be connected with the skills agenda for digitisation.
- Anchoring competitiveness in innovation: **€13 billion** is budgeted for new initiatives such as consolidation of world-level integrated universities (€3,5 billion); supporting new research priorities such as artificial intelligence, exploitation of big data, nanotechnologies or cybersecurity and the accompaniment of sectors in transformation (€4,6 billion); modernisation of agriculture, fisheries and agri-food (€5 billion). There is a prominent place for digital technologies.
- Constructing the **state of the digital age**: **€9 billion** is allocated for digital transformation of public services, in particular €4,9 billion for digitisation of health and social protection services.

This Investment Plan follows a long-term and broad approach to public investments as societal investments.

The 'third wave' of PIA (foreseen by the previous government, without budget) will be integrated with a new credit of **€10 billion** (€6 billion for subsidies and €4 billion for capital investments). About €24 billion of the 57 billion is new money. The rest is covered by changes in budget priorities, and financing through loans and guarantees that have no impact on the budget deficit.

http://www.gouvernement.fr/sites/default/files/document/document/2017/09/dossier_de_presse_-_le_grand_plan_dinvestissement_2018-2022.pdf

In addition the '**Plan d'Action pour l'investissement et la croissance de entreprises**' of 12 September 2017 also promotes 'digitisation and innovation' in its Action Plan for growth as 5th priority theme (with a **new fund** for industry and innovation that will support **breakthrough innovations**) and Initial and continued education as the 6th priority (to match supply of competences to needs)

<http://www.gouvernement.fr/plan-d-actions-pour-l-investissement-et-la-croissance-des-entreprises>

2.3. Implementation

The **priorities** for strengthening 'Industrie du Futur' in **2017** are:

- Launching – together with the regions – a new phase for accompaniment of SMEs (with new objectives), by reinforcing the coordination of regional programmes.
- Develop 'testbed' platforms to allow companies to test innovative products or new advanced production technologies

- Improve the integration of start-ups in the 'Industrie du Futur' programme
- Increase efforts on competences and training (in particular with a big conference in Autumn), labelling of training and education for 'Industrie du Futur', and launch of new ways of instruction on technologies for industry of the future (thanks to PIA support)

Alliance Industry Du Futur (AIF)

The objectives for AIF, in the framework of its convention with the DGE, reflect these priorities as well as the continuity of its actions. The AIF plays an **increasingly important role** in the implementation of the transformation policies in industry, through its central role in aligning different actors and implementation channels. The AIF coordinates in particular the actors at the **technology supply side**, including education and vocational training. The network approach among all actors in this supply chain, from research and innovation to training and normalisation, is a critical success factor for the acceleration of modernisation investments at the level of the companies.

The **three missions** (Develop-Accompany-Diffuse) have been translated in a **working programme with 6 axes**, managed through 6 working groups that are composed of and piloted by member organisations.

WG 1 : Development of technologies for the future:

- This group supports actions for **integration** of modern production technologies, in particular solutions by virtualisation, and connection of equipment. They have identified **seven key-themes**: digitisation of the value-chain, automatization/robotization, additive manufacturing, monitoring and control, composites and new materials, workers in the factory, energy efficiency and environmental footprint/eco-system integration
- Three sub-groups are active on **additive-manufacturing**, on **energy efficiency** and on **cybersecurity** in production systems. The group on additive manufacturing has succeeded in putting together with more than 120 stakeholders a common roadmap that is now rolled-out by the DGE. A '**3D Start PME**' experimental plan is started in the second half of 2017 for one year with 600.000 euro from PIA, for a targeted support to SMEs through experts and a feasibility test platform to evaluate the interest in this technology and the impact on their strategy.
- Another sub- group (composed of AIF members and of financial support services) is organising a '**patronage**' **system for R&D projects** that are in line with the Industry of the Future approach. This identification method will ensure more coherence in the national innovation system and promote access of projects that are part of the AIF roadmaps to financing institutions and give them national visibility.

WG2 : Deployment in companies at regional level

- The mobilisation and enticement of companies to engage in the Industry of the Future is supported with different instruments and a network of appointed **correspondents** (representing the members) and **ambassadors** (business leaders) in the regions. Also the 'Chambres de Commerce et d'Industrie' (**CCI**) play an active role in this mobilisation.
- A **three step methodology** has been elaborated for the accompaniment of companies into investing in Industry of the Future: the **diagnostic** that would identify the priority projects;

the **coaching** of implementation; the support in **financing**. The government has opened a new financial support channel through loans of BPI.

- The initial **objective** of the IdF to reach **2000** companies with accompaniment by the end of 2016, has been largely met. At the end of 2016 already **4100** SMEs were accompanied, of which more than half in regional schemes. More than 8000 others are identified as potential candidates. In all regions there are programmes to support SMEs in their industrial modernisation and digital transformation, with strategic diagnostics, technology coaching, human resources management and investment support (more than 550 experts). The regional correspondents of the AIF ensure alignment with the AIF at national level.
- Promotion of Industry of the Future is organised through more than 170 **use-cases** (with a **mapping** tool) and regional **promotion** events ('Caravanes Industrie du Futur').
- Another important instrument to help the accompaniment trajectories is the '**Technological Referential**'. This is a common reference framework developed by the AIF professionals, and shared with all actors of IoF, to help companies identify the main dimensions of their digital transformation, encompassing all necessary technologies and disciplines (nearly 400 blocks, 60 macro-blocks and six scenarios to lever competitiveness).

WG3 : Humans and Industry of the Future

- How to attract youngsters with future-oriented education, and how to train employees for new jobs? One sub-group is developing the **specifications** for new professional competences: this resulted in a first specification for **maintenance functions** in the Industry of the Future. A prospective group explores the long-term impact of IoF, e.g. on the **relations between humans and machines**.
- '**Osons l'Industrie du Futur**' is a project (with a dedicated portal) that will inform youngsters and employees about the professions, trainings, recruitment needs for IoF aspects and will be delivered as a portal

WG4: Normalisation at international level

- Because international standards are an instrument for technology watch and economic intelligence and contribute to diffuse innovation (establishing confidence, in particular regarding interoperability in cyber-physical systems of IoF), the AIF developed a **strategy on normalisation** to support the valorisation of the national technology supply and influence international norm setting. To increase the capacity for European leadership a close partnership with Germany is established (lately joined by Italy during Q1 2017)
- AIF identified the need to revise standards in **four strategic domains**: robotic systems for collaboration, additive manufacturing, digitisation, multi-material assembly. Regarding standards for digitalisation it is important to support the adoption of digital technologies and the working of a community of developers that are able to offer solutions for industry. Therefore recommendations have been formulated to make the different reference architectures converge at international level, to federate companies for sharing digital solutions and involve SMEs, to develop an ecosystem of suppliers that can host and secure data used for solutions.
- Members of AIF will present the recommendations and implement the strategy of AIF on the levels they have access to. There are **41 working groups** on standards related to digitisation.

WG5: Promotion of existing technology supply

- AIF support French companies in their technology shift with information on existing technologies. Therefore a **'Repository' of technology providers** is put together that provides information at regional level of available offer in the fields of digitisation, control-command, production equipment and maintenance.
- AIF support French technology providers to export by providing a **common label 'Creative Industry'** to present themselves in international fairs (Hannover). At national level there are reference **exhibitions** such as 'Convergence vers l'Industrie du Futur', including conferences 'Forum of Industry of the Future', and that are presenting also companies that are labelled as 'Vitrines d'Industrie du Futur' (see below).

WG6: Show-cases of Industry of the Future

- This group is responsible for the labelling of companies as "**Vitrines Industrie du Futur**". This label is attributed to companies that developed a concrete demonstrator project for modernising their production, often through digitalisation, that is show-casing the transformation of industry.
- Mid-2017 there are **26 companies labelled** "Vitrines d'Industrie du Futur". AIF seeks to enlarge this group with a good regional, sectoral and size distribution. To be eligible these companies have to demonstrate solutions that are using technologies in majority developed in France. This label gives a visibility at national and international and helps to diffuse good practices with inspiring examples. The labelled companies become **part of a 'club'** that meets three times a year to exchange experiences on specific topics, such as predictive maintenance. Before the end of 2017 AIF wants to enlarge its club of 'Vitrines d'Industrie du Futur' to 35 companies.

Toolbox of AIF

The AIF is developing a set of practical instruments to enhance the adoption of modern production technologies and business models by companies (in particular SMEs) and integrate the human factor.

- A practical reference guide on IoF, and the app 'Brick4Future' as navigation tool to support sensibilisation and help implementation

<http://industriedufutur.fim.net/>

<http://www.referentiel-idf.org/>

- Mapping of use-cases to promote learning-by-example

- 'Vitrines d'Industrie du Futur' as a club of (labelled) lead-companies in the industrial transformation

- Catalogue of suppliers of 'Offreurs des Solutions IdF' to promote business relations with potential users companies or technology partners for specific building blocks of the IdF Referential.

- 'Patronage' of research proposals to competitions if they are in line with the AIF programmes

- 'Caravanes AIF' to promote the IdF in the regions

2.4. Evaluations/studies

- On 2 June 2017 the conclusions of the study on Industry that was commissioned to a consortium of Accenture, EY and Roland Berger were presented by AIF, CNI and other industrial federations. This study was directed at analysing industrial dynamics in **six French industrial value chains** (aeronautic, automotive, construction, agro-food, railways and shipyards). The diagnosis was that they suffer from heavy under-investment (an average age of production equipment of 19 years) although there are strong disparities. Therefore the six studies have identified the specific challenges for IoF and propose a first roadmap at the level of the entire value-chain. The CNI will use this to accelerate the deployment of technologies and competences in each of its 14 value chain strategies.

<https://www.alliancy.fr/wp-content/uploads/2017/09/AIF-Etudes-Fili%C3%A8res-Industrie-du-Futur-Septembre-2017-1.pdf3>.

3. Other policy support to digitising industry

3.1. Boosting innovation

- Innovation policy is shared by two ministries (the Ministry for Education, Higher Education and Research (MENESR); the Ministry for the Economy, Industry, and Digital Affairs). In addition the 'Commissariat général à l'investissement' (CGI) plays a leading role (since 2010) because it runs the PIA and supervises the agencies responsible for implementation of the policies.
- The government has already put in place many measures that can finance directly or indirectly the innovation and transformation actions of the IdF programme.
- One important channel for funding innovation contributing to the IoF agenda are the '**Projets structurants des pôles de compétitivité**' (PSPC). They offer subsidies or refundable advances for 25 to 40% of project costs (collaborative R&D, training and platforms), through calls that are dedicated to labelled Poles for their strategies to reposition the cluster in promising markets by structuring industrial value-chains and facilitating emergence of new ones.
- The most important funding source is the **Programme Industrie d'Avenir** (PIA) that operates for the government different types of investment support for innovation.
 - A dedicated call for projects on 'Grands Défis du Numérique' has been launched as third thematic call for 'Projets Industriels d'Avenir' (PIAVE), closing September 2017. This will grant 100 million euro for projects to support excellence in **five digital technology domains**: augmented reality/virtual reality/simulation and modelling/ 3D imaging; blockchain; artificial intelligence; big data; IoT and industrial internet.
 - In addition Bpi France operates the '**Loans for Industry of the Future**' program of the PIA (1 billion euro). This provides loans to companies with less than 2000 employees, guarantees for financing technology development of industrial processes or building new production capacities, future processes or commercialisation of new products
 - PIA also offers funds for experimental programmes such as '**3D Start SME**', to accelerate adoption of additive manufacturing in SMEs (with 600.000euro).
- The **tax credit for R&D** (Credit Impôt Recherche) is considered to be a generous scheme for business R&D. In addition the government also has put in place specific fiscal measures, such as accelerated depreciation of new investments for IoF at 140% of the value or reduced depreciation period of 2 instead of 5 years, to improve cash-flow.

- Finally a ‘New Fund for Industry and Innovation’ is announced to fund public co-investment in setting-up capital intensive pilot and demonstrator projects for breakthrough innovations.

3.2. Skill development

- The Grand Plan d’Investissement has confirmed the importance attributed to the human factor in the industrial transition with an investment of **€ 15 billion** over 2018-2020. Competence building is decentralised over many institutions, but the state holds steering role.
- Measures will in particular address the problem of less qualified people, becoming unemployed and leaving prematurely school, to leverage the human potential for the transformation:
 - The Grand Plan will finance the training of **1 million** unemployed (older than 25), with long traineeships that match the needs of these persons and their recruiters, and also the training of **1 million** of drop-outs (leaving secondary school without diploma), to respond to the high number of unemployed with less qualifications.
 - The Grand Plan will also finance projects for **innovative experiments in the training of teachers and professors**, in order to find solutions to increase the success of pupils, in particular the ones with difficulties (along reforms to improve education, orientation and integration in professions). A number of higher education institutes for professorship and education (ESPE) will be selected as research poles to invent such new educational practices. The ESPE laureates will benefit from an initial dotation of €35 million to set-up projects.
- Education of the work force to adapt skills to technological evolutions and future challenges is the third axis of the ‘Industrie du Futur’. The PIA (programme for investments in the future) will support the development of the supply of training and education.
 - First, a **joint prospective vision** need to be constructed: the studies that are conducted by the strategic committees of the 14 filières (CSF) in 2017 will help to anticipate evolutions in each sector
 - Second, appropriate training and education **programmes** have to be prepared. In PIA3 the action on ‘Adaptation and qualification of the workforce’ (€100 million) will be used for the engineering of new training.
 - Already mid 2016 a call for projects for **‘Partnership for vocational training and employment’** (€126 million) has been closed, organised by the Ministry (DGE) to mobilise pilots developed in the working parties of the CSFs on ‘competences and employment’.
- The **‘Grand école du numérique’** (GEN) has been started in 2016 to assemble all existing structures for digital education under one label and favour interconnections between the courses. More than 400 vocational training courses for digital professions have already been labelled. Already 5000 people have received short training to qualify better for the labour market. The objective is to train 10000 apprentices before the end of 2017 (compared to the gap of non-fulfilled jobs estimated between 50 and 190.000).
The new training programmes, such as the GEN (that should evolve to a unique portal for the needs of SMEs), will need to gain recognition and stabilise their business model. Therefore the Ministry (DGE) participates actively in the GEN platform (e.g. through its influence on certification) to make sure that the supply of training meets the expectations of the market.
<https://www.grandecolenumerique.fr/>

- « **Osons l'Industrie du Futur** », will be a portal that informs youngsters and their families, and employees, about professions, training and the recruitment needs of the industry of the future. It is selected under PIA2 for a pilot on specific technologies and the presentation of new offers for training.
- The '**Campus des métiers et des qualifications**' (Campus for professions and qualification)' offer training and education customised to the needs of the regions and the sectors. There are 78 labelled Campuses (valid for four years) that group secondary and higher education, initial and continued professional education around economic activities and challenges that are considered important by the regional communities and companies. About five are more focused on digital competences.

<http://www.education.gouv.fr/cid79563/les-campus-des-metiers-des-qualifications.html>

3.3. Standardisation

- The AIF published context analysis and recommendations regarding work on norms and standards in three domains: robotic systems for collaborative use; additive manufacturing; digital. This underpins an active international outreach to position the French interests.
- In particular the international cooperation regarding the 'Industrie du Futur' has received a strategic role. discussing norms:
 - With Germany a joint action plan between AIF and Industrie4.0 has been concluded in April 2016. This has been enlarged to a trilateral cooperation with Italy (Industria 4.0)
 - With Japan a cooperation on Industrie du Futur and IoT that was launched in January 2017 will facilitate partnerships between companies
 - With China this cooperation that was formalised in march 2017, will be shaped through a dialogue between AIF and the counterpart CIETC.

http://docs.wixstatic.com/ugd/7f22a7_45e730a4fcfb44108c829b5daf49ec0c.pdf

3.4. Regulation Framework

- On 7 October 2016 the '**Loi pour une République Numérique**' (Law for a Digital Republic) was promulgated. This Law is a framework for dispositions and decrees on a wide range of topics to advance digitisation. The key-points of this law deal with open data (access by default), issues of education and research (free access to scientific publications of public research and secured access to public statistics), platforms (portability and transparency of data), protection of the internet users and accessibility of the different networks, new usages and provision of territorial strategies by regional councils.

<https://www.economie.gouv.fr/republique-numerique/15-points-cles>

4. Investments

- The investments that are directed to the digitisation of industry are distributed among many instruments.
- The public budget expenditure for R&D (GBOARD) has decreased from €17,5 to €14 billion between 2009 and 2016, but the fiscal expenditure has increased since the reform of the 'Crédit Impôt Recherche' in 2008, allowing companies to benefit from a tax reduction for a large range of research related spending. The tax credit covers up to 30% of R&D expenses. The foregone revenue due to R&D tax credit has passed to €5,600M in 2013. The new government has decided to maintain the CIR at a high level. In addition to the CIR, other R&D tax incentives have been developed in France such as the innovation tax credit (Crédit Impôt Innovation, 2013).

- The Grand Plan d'Investissement has provided new funding (€10 billion: €6 billion for subsidies and €4 billion for financing) for a third wave of the PIA in the next five years and additional new funds for new priorities such as AI.
- The public investment bank BPI France is playing more and more a central role in the management of innovation aid. It has been endowed in 2013 with a fund of €21 billion.
- (See figures in the brochure)

5. Good practices

- Setting-up PPP
- Development of the eco-system
- Services to companies
- Pilots and demonstration
- Promotion of standardisation
- ...
 - 'Factory Lab' has been started in 2016 by CEA List (public research institute specialised in technological innovation in digital systems) together with major industrial partners such as PSA and Dassault Systems. It is a multi-sector collaborative platform for integration of technologies provided by technology suppliers in industrial environments (at higher TRL-levels), for providing short demos of common interest, and for training of SMEs. The focus is on industrial feasibility for the digital factory and for operator assistance. It has a budget of €40 million for 5 years (for about 20 demo-projects a year).
<https://factorylab.fr/images/pdf/depliant-factorylab.pdf>
 - AIF develops a toolbox of practical instruments (see above) that together cover different aspects of the networked approach to consistent and sustained mobilisation of companies for digital modernisation.

6. Contribution to European priorities

- a. Investments in key-technologies:
Robotics, AI, Big Data, Cloud Computing, IoT

(See 42 key-technologies)
- b. Development and networking of Digital Innovation Hubs
 - The DGE supports the development of **fablabs**⁶, as new spaces for innovation, with a first call for projects in 2013. 14 projects that have been selected to test different models. They will be finished in 2017. Early 2018 a synthesis will be made and the network will be continued. They can be integrated in the Digital Transition programme.
 - The programme **CAP'TRONIC** is a programme of JESSICA France that support SMEs in integrating micro/nano-electronics in their products via advise services of a

⁶ Fab labs are spaces open to the public, equipped with manufacturing equipment such as laser cutters, milling machines, 3D printers, production of printed circuits. They promote discovery and sharing of know-how and attract not only do-it-your-selves but also PME and companies experimenting with new ways for innovation.

networked of experienced engineers. This programme benefits to nearly 3500 companies each year for advises and about 300 for technical support in a research project. This programme has a proven high leverage effect on company turnovers.

- Therefore this type of technical accompaniment will be enlarged by an initiative to identify **specialised centres of competence** in particular technologies (such as Big Data, cybersecurity, IoT, etc ...). This will be part of the European effort for establishing digital innovation hubs. A first **census** of existing innovation support structures has been initiated by the regions, coordinated by the DGE. A specific mission could be mandated to propose sustainable **business models** for such structures and to experiment on targeted support to promote the emergence of **new** competence centres and digital innovation poles.

c. Participation in industrial platforms

The French government promotes strategic European cooperation (cfr the Siemens-Alstom merger for rail transport)

7. Other issues

The French government (together with Germany) has taken the lead in the European efforts to impose fair taxes to the all companies in the digital sector, with adoption of a first a directive in 2018.