DIGITAL ETHICS

A GUIDE FOR PROFESSIONALS OF THE DIGITAL AGE

OCTOBER 2018

syntec numérique

Cigref
RÉUSSIR
LE NUMÉRIQUE

WHAT IS THE PURPOSE OF THIS GUIDE?

AI technology is a fast-growing field, and people are becoming very anxious about the ethical issues raised by the growth in digital uses. However, this area is about much more than just the dilemmas that might hypothetically relate to, for example, a driverless car. Tool bias, environmental impacts and the ethical issues solution designers have to address are just some of the points that merit discussion from an ethical standpoint.

The public authorities have grappled with the issue of ethics and digital technology, including the proposal, made in the Villani report, and in the report from CERNA (the Research Ethics Board of Allistene, the Digital Sciences and Technologies Alliance), to set up a national digital ethics council modelled on the existing consultative ethics committee for life sciences and healthcare.

While praising this approach, Cigref and Syntec Numérique, as representatives of the main players in digital society, wanted to provide an initial, operational take on the subject. The aim of this guide is to describe the topics that are being – or should be – considered by people working with digital technology in their current practice, and to provide some pragmatic answers to the questions they have.

This guide is an educational tool for digital professionals, and a first step on the way to a common vision of ethics we can all share, a key element in building trust in the digital economy. This is a tool everyone can use!

Bernard Duverneuil
President of Cigref Group
Chief Digital & Information Officer of Elior Group

Véronique Torner
Director of Syntec Numérique
Co-CEO of Alter Way

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

We would like to thank Bernard Duverneuil, Chief Digital & Information Officer of Elior Group and President of Cigref, and Véronique Torner, co-CEO of Alter Way and Director of Syntec Numérique, who led this initiative, along with everyone who took part in the working group:

Frédéric Allard – IBM

François Banos – RENAULT

Olivier Fouillard – DASSAULT AVIATION

Thierry Hanau – SCHNEIDER-ELECTRIC

Katya Laine – KWALYS

Jean-Claude Laroche – ENEDIS

Gilles Mezari – SAASWEDO

Emmanuel Monzies – PSA GROUP

Rosanne Serrano – DASSAULT AVIATION

Federico Smith – SCALIAN

Corentin Voiseux – HYPRA Isabelle Zablit - CLAVESIS

Laurent Zeller – AIR FRANCE KLM

Cigref and Syntec Numérique also extend their thanks to the following people for their contributions and input:

Jérôme Beranger - ADEL

Jérôme Fortineau – ADEL

Michel Guesquiere – IBM

Claude Kirchner - INRIA

This initiative was coordinated and managed by Sébastien Duplan (Syntec Numérique), Flora Fischer (Cigref), and Raphaëlle Frija (Syntec Numérique).

BACKGROUND

Digital technology is bringing about a radical change in business, a paradigm shift that has an impact on organisational practices, business models, management methods and human relationships. The nature of work is changing, and the boundaries of business are shifting. This transformation is giving rise to new opportunities for the new digital economy, but is also raising new and related ethical issues. There has never been so much talk about the issues around data protection, respect for privacy, neutrality, the transparency of algorithms and the right to be forgotten. Every business stakeholder must therefore be urged to grip the potential opportunities linked to new digital tools and uses, and at the same time the ways in which they might be misused. But how can we come to terms practically with this subject in business, and what ethical issues need to be addressed with departments and/or operations teams?

Cigref and Syntec Numérique, as representatives of the main players in digital society, believe that a common and shared vision of digital ethics needs to be developed as a matter of urgency, in order to build, together, the solid basis needed for trust going forward.

That is why our two organisations were keen to develop a practical frame of reference that companies and their partners can all use, in order to educate teams and managers about the ethical challenges of digital technology, and give them the tools to deal with them.

HOW SHOULD THIS GUIDE BE USED?

The “Digital Ethics” guide from Cigref and Syntec Numérique is intended to categorise the ethical issues linked to digital technology, from the point of view of both the user (Cigref) and the designer of digital solutions and/or services (Syntec Numérique). It offers food for thought (which questions might companies ask themselves about the ethics of digital technology?) and suggests avenues to pursue.

This guide is not exhaustive. It is designed to be generalist and open to any contributions. Nor is it intended to restate a company’s regulatory duties; the regulations state precisely what is and is not allowed, and the applicable sanctions. Companies are obliged to comply, and this has nothing to do with ethics. However, there might be ethical issues around how they achieve compliance.

This guide does however address a number of key points in the GDPR, the regulation which writes into law a range of concepts that had previously been discussed from an ethical standpoint, such as the notion of privacy by design.

The guide is made of two sections:

- The first section presents the questions to ask oneself, and then the resources and measures to implement in response.
- The second section identifies existing initiatives relating to the ethics of digital technology in business (with a focus on France).

ETHICS: NOT TO BE CONFUSED WITH COMPLIANCE

Ethics and compliance should be considered as separate domains. Compliance is all about operating in accordance with a standard or a law – something external which has authority. It is therefore everyone’s responsibility to abide by the law or face sanctions. Ethics, on the other hand, is a personal or collective approach (at company level, for example) which entails setting guidelines for oneself. This approach is based on values or principles that can guide one's actions. Ethics is an act of empowerment (and not only responsibility), engagement and integrity.

That is why this guide is not about GDPR compliance, because ethics begins where regulation ends. As the Villani report says: “Where standards are non-existent, silent or insufficient, the developer has an increased moral responsibility.” (p.147 of the report)

COMPARATIVE TABLE OF ETHICS AND COMPLIANCE

(Source: Flora Fischer – Cigref)

ETHICS	COMPLIANCE
• Provides a basis for making our own decisions about courses of action based on the values and/or principles we hold dear	• Entails respecting standards/laws/principles issued by one or more external bodies
• Addresses value dilemmas and conflicts specific to each context, on a case-by-case basis	• Forms part of a universal framework (at the national/international level)
• Draws on ideas relating to values, deliberation and recommendations	• Draws on notions of standards and obligations
Provides a basis for choosing how best to consider an issue and then act on a case-by-case basis, and for considering different and conflicting values/principles	***Provides a basis for action in accordance with the law or any other measures having a legal and moral dimension (contract, specifications, etc.)***

DIGITAL ETHICS, AN APPLIED ETHICS

There are various branches of ethics, all derived from moral philosophy, including normative ethics, meta-ethics, and applied ethics. It is the latter that interests us here. It can be argued that digital technology opens up a new sphere of action, which is not neutral and must therefore implement a number of ethical principles. Some debates may be wholly new, because each technology raises its own issues. The ethics of digital technology is therefore first and foremost an applied ethics which must, depending on the context and the technologies in place, adapt or reinvent itself.

THE MAIN BRANCHES OF ETHICS

- NORMATIVE ETHICS encompasses various conceptions of what we might call ethical behaviour. It is made up of three major schools of thought:
  - **Virtue ethics**: describes the moral character of an action according to the accompanying virtue. People talk of courageous, just and generous acts, for example. In this conception, it is the courses of action and moral attributes of the person that are most important.
  - **Consequentalism**: focuses on the effects of actions, and their short- and long-term positive or negative consequences. Utilitarianism, which is also regarded as a branch of consequentalism, starts from the premise that we should aim for outcomes that maximise the life chances and well-being of the greatest number of people.
  - **Deontology**: examines whether an action complies with a duty (often a professional duty), or an established norm. It tends to translate into codes specific to a profession. It builds into a framework intended to establish behavioural principles within a group.

- META-ETHICS, meanwhile, examines the grounds for morals. This constantly feeds into normative ethics by discussing afresh the proposed principles, the criteria for the ethical evaluation of an action, etc.

- APPLIED ETHICS puts normative ethics into practice, by comparing a concrete situation with principles derived from various schools of normative ethics. Ethical dilemmas are always resolved using applied ethics.

Applied ethics demands a form of vigilance on the part of the person concerned, who may be subject to contradictory demands, in an urgent context specific to the business environment. If an ethical dilemma is raised, the person may follow this path, for example:

TAKE A STEP BACK

This entails putting some distance between you and your everyday reality in order to better evaluate and gain perspective on various dimensions (social, environmental, divergent interests, etc.) before acting in accordance with a purely economic rationale. It also means having an ability to forecast possible future events, and more modestly the medium- and long-term consequences of our present actions.

For example, developers of artificial intelligence algorithms may draw on tools enabling them to limit the biases of their solutions by design because they haave studied, in advance, the risks of using their solution.

CHOOSE THE "BEST" POSSIBLE ETHICS

There are always multiple possible choices when thinking ethically. That is why people often talk about "ethical dilemmas". Ethical choices often put to the test the various ethical theories (consequentialism, deontology, virtue ethics, etc.), which can contradict each other, depending on the context. In ethics, there is never an absolute answer, but more likely "best" possible choices in different situations.

For example, during their career developers may encounter a conflict between their duty-based ethics and their personal ethics (or virtue ethics).

ARBITRATE WITH A THIRD PARTY IF NECESSARY

Arbitration means resolving an ethical dilemma by calling on an external third party because the interests of the parties concerned are too substantial to settle a situation fairly. This third party may be a code (e.g. an ethical charter), a moral entity (e.g. an ethics committee or an ethics department), or a legal entity (e.g. a contract).

For example, a robotics company may reserve the right to forbid its customers from reprogramming its robots, if the reprogramming does not comply with its usage policy, which in this case acts as a third party.

3 MAIN CATEGORIES FOR AN ETHICS APPLIED TO DIGITAL TECHNOLOGY

The ethics of digital technology can be segmented into three separate categories.

1 ETHICS BY DESIGN

This ethics focuses on the design phase of digital tools. It directly concerns technology in all its technical complexity and the know-how of engineers, programmers, etc. This ethics therefore touches in particular on the deontology (duty-based ethics) of digital creators of all kinds (developers, digital designers, project managers, etc.). Indeed, they have an ethical responsibility from the design stage onwards, insofar as data or algorithms may or may not reproduce human biases, reveal new discriminations (or reproduce them on a larger scale), give rise to injustices, etc.

2 ETHICS OF USE

This ethics aims to examine how the customers and employees as well as the managers and partners of a company use digital technology. This entails conducting an ethical evaluation of how people use the technological resources at their disposal.

3 SOCIETAL ETHICS

This ethics examines, at a macroscopic level, the impacts of digital technology on society. It thus deals with the acceptability of digital innovations and solutions, “attention economics”, the environmental and energy footprints of digital tools, and social inclusion.

These three categories of ethics are of course interconnected, but they need to be separated in order to better define the issues at stake, which are often located on very different scales.

SOME DIGITAL-SPECIFIC ETHICAL ISSUES

In this section we will highlight several digital-specific ethical issues, some of which have emerged recently or are still unclear. More conventional and better-known issues such as cross-referencing data, and transparency with customers, are not discussed below but are mentioned quite frequently in the guide.

THE DESIGN OF ATTENTION

While grabbing a customer's attention and trying to keep it for as long as possible is a well-known marketing strategy that can easily be spotted, it is worth noting that with digital tools this type of strategy is less perceptible, because the attention-grabbing techniques are more subtle, and may also harness apparently playful mechanisms. The term "dark patterns" is used to describe some interface design tricks intended to trick the user.

THE DUTY-BASED ETHICS OF DEVELOPERS, SUPPLIERS AND INTEGRATORS OF DIGITAL SOLUTIONS AND SERVICES

Following breakthroughs and major progress in data science and in AI algorithms capable of learning, there is a growing awareness of the ethical responsibility of the developers of digital solutions. Their profession is particularly liable to be asked these questions, because they are the ones who oversee machine learning, using databases that may contain biases (see "Algorithmic ethics and AI" below), which demands an aptitude for impartiality and the default consideration of these issues at the earliest possible stage. Suppliers and integrators have a high de facto level of responsibility for the way in which digital solutions or services are designed and put together.

ALGORITHMIC ETHICS AND ARTIFICIAL INTELLIGENCE

AI raises specific ethical issues. Machine learning algorithms are mushrooming in numerous sectors. These algorithms, which learn from multiple examples, lack transparency and traceability tools that can explain their results. Hence the expression "black box", which is often used to characterise the opacity of some systems.

For algorithms to be explainable, we need to take account of multiple factors:

Database selection: some databases used as learning resources for algorithms may spread cognitive biases. Some databases may, for example, in a particular domain, contain a cultural and historic bias when it comes to gender representativeness. It seems important to be able to explain the content of the data selected and used by learning algorithms in order to ensure their neutrality.

Supervised learning: there is a risk that injustices or discrimination may be reproduced in machine learning. That is why the supervision of machine learning is particularly important. Some developers put in place an evaluation process dedicated specifically to the issue of neutrality in learning, and set aside pre-live release test phases.

Social acceptability: some algorithmic systems have a non-negligible social impact; they might, for example, have a huge influence on political behaviour by means of “filter bubbles”.

THE ENVIRONMENTAL AND ENERGY FOOTPRINT OF THE DIGITAL SECTOR

Digital technology is generating a large rise in energy consumption, through both the production and the use of devices. The digitalisation of the world (leading to an increase in data flows, data processing, data storage, etc.) is having serious negative effects on the planet (climate change, extraction of scarce metals, health impacts, etc.). Yet there is still a low level of awareness of the environmental and energy footprint of digital technology.

> DIGITAL ETHICS GUIDE

3 preliminary questions	***Is ethics specifically addressed in the digital company (are there ad hoc committees, awareness programmes focusing exclusively on the ethics of digital tools and AI, etc.)?***	***Is ethics one of the overall governance issues relating to the digital transformation?***	***Is ethics clearly defined and distinguished from compliance issues/the work of legal departments?***

ETHICS BY DESIGN

Duty-based ethics of the developers and creators (publishers, integrators, designers, etc.) of digital solutions and services	*Does the IT department offer training programmes on ethics in the creation of digital tools?*	Set up training workshops and/or skills refresher courses within the IT Department
	Are solutions designers representative of the social and gender diversity of society?	Draw up a HR policy ensuring social and gender diversity in the workplace
Protection of privacy and personal data	*Are new projects evaluated for their impact on privacy?*	Set up an ethics committee to approve sensitive projects
	Do tools and solutions protect personal data by design?	Adopt a privacy by design approach, in accordance with the requirements of the GDPR: this means building the protection of personal data into products and services by design, but also by default (notably by abiding by the data minimisation principle introduced by the GDPR); this is also a cultural challenge because this concept needs to be factored into a project early on
	Is the right to be forgotten factored into the design chain?	
	Does the correlation of data collected from various sources result in the production of personal information (as part of big data and AI projects, for instance)?	Put in place a system that measures the personalisation of data after processing operations
Algorithmic ethics and artificial intelligence	*Are the risks of bias in the datasets identified and addressed?*	Train designers in the risks of bias in the datasets used for machine learning
		Carry out a DIA (discrimination impact assessment) as suggested in the Villani report (p.148), inspired by the PIA (privacy impact assessment) introduced with the GDPR, in order to analyse the possible design-induced discriminatory impacts of algorithms
		Put in place checks and balances at each stage of development to ensure there is no bias in the results
	Can the operating rationale of the algorithms deployed for artificial intelligence be explained?	Have a systems explainability policy encompassing the whole chain (data provenance, explanation of the reasoning followed)
		Develop algorithms that are transparent by design, in order to make it easier to explain them and to analyse how they reason
		Adopt a labelling (with an ethical scoring/rating system) and ethical support approach

ETHICS OF USE
(with employees, users, partners)

Accessibility of solutions for people with disabilities	*Are digital tools designed with the accessibility needs of disabled people in mind?*	By default, design solutions that are accessible for people with disabilities
Access to data by employees	*Are ethical rules for data collection and processing defined and shared internally?*	Raise teams' awareness with data ethics workshops
	Is there a framework for internal rights of access to personal and/or sensitive data?	Define procedures for access to sensitive data based on employees' profiles and roles
Managerial ethics	*Are ethics-related issues addressed on a cross-functional basis within the company?*	Put in place an awareness-raising programme for all employees (information and examples of best practice)
		Appoint a Chief Digital Ethics Officer tasked with ensuring the overall coherence of the company's "ethics and digital" policy
	Are employees informed of how their data will be stored and processed, and their rights in this area?	Inform employees of how their data will be stored and processed, and their rights in this area (display, updating of the company's internal regulations)
	Are the consequences of the internal use of certain digital tools assessed?	Carry out an assessment of the impact of digital tools on the day-to-day experience of employees in the company
Ethics with users	*Are the users of personalised services given the option to manage their settings?*	Ensure that the information given to users is clear and transparent
		Make it easy for users to change their personal data management settings, and to make informed choices
	Are users informed of the terms of use of a digital solution or application?	Draw up a digital user charter setting out the ethical terms of use of a solution
		Set out the framework for the use of a solution in contractual form, and allow the designer to object to non-compliant use
Partnership ethics	*Is there a policy allowing you to check, when digital solutions are built by a number of partners, that the whole process is ethical?*	Ensure that the ecosystem is trustworthy and give each partner a vision of the purpose of the overall solution
		Call on trusted third parties, certifications and/or labels, demonstrating the ethical commitment of each stakeholder

SOCIETAL ETHICS
(impact of digital solutions on society)

Environmental and societal footprint of solutions	*Has an approach designed to improve the environmental footprint of the IT system been introduced?*	Identify a manager and draw up an action plan including raising the awareness of all IT department staff and users, building on recognised standards
		Factor in environmental impact when entering into any contract that has consequences for the environmental footprint of the IT system
	Does the evaluation of the IT system's environmental impacts cover primary energy, greenhouse gas emissions, water, the depletion of abiotic resources, paper and WEEE (waste electrical and electronic equipment)?	Conduct a regular assessment of the environmental footprint of the IT system (at least every two years), based on recognised and auditable indicators (Green IT or WWF France)
	Is the societal impact of projects (origin of materials, partners' good practices) taken into account?	Carry out a societal impact assessment of projects
		Use companies that form part of the solidarity economy and those that provide sheltered employment
Economic impact and acceptability of innovations	*Is an assessment carried out of the impact of innovations on jobs in the company, especially when automation occurs?*	Forecast, with the help of teams specialising in forward-planning and strategy, the impacts of technological change on the company's jobs and activities.
		Include the impacts of automation and more broadly of digital technology in strategic workforce planning
Attention economics and information bubbles	*Are addiction phenomena factored into the design of digital solutions?*	Formally discourage the use of "dark patterns" (interface design tricks intended to trick the user)
		Pursue "high attention quality" standards or "responsible attention labels" ("Ethics by Design" conference, May 2017)
	Are the risks of human cognitive biases factored into the design of digital solutions?	Ensure that digital applications and solutions have not been designed in such a way as to deliberately manipulate users by exploiting cognitive biases

EXISTING INITIATIVES for business

	DESCRIPTION	TARGET AUDIENCE	TYPE OF TOOLS PROPOSED
ADEL Algorithm Data Ethics Label **www.adel-label.com**	Label, created by researcher Jérôme Béranger, evaluating the ethics of digital data processing algorithms. ADEL builds an ethical framework around automated information systems. It can be used to audit systems and platforms, big data projects in various economic sectors, and healthcare institutions' databases.	Large companies, SME, research establishments.	A labelling methodology that can be used to produce: a report including detailed mapping of the applicant's current position in terms of digital data processing, a final ethics score, and best practice recommendations; a white paper entitled "Guidelines for the ethical processing of digital data in healthcare".
DEDA Data Ethics Decision Aid **www.dataschool.nl/deda/deda-workshop/?lang=en**	DEDA is a toolbox helping to map the ethical issues in projects requiring data processing. Developed in collaboration with data "practitioners" by the Utrecht Data School and the University of Utrecht.	Data analysts, project managers, political decision-makers and anybody wishing to publish data in a public forum.	Worksheet/mapping (free to download, on the site), workshop.
HR Ethics and Digital Charter **www.youscribe.com/BookReader/Index/2920150/?documentId=3220177**	An initiative by CFE-CGC and Le Lab RH, the charter takes the form of a best practice framework for digital solutions in the field of HR.	HR functions.	The charter builds on the main planks of the GDPR. It provides recommendations at the various steps in the data lifecycle.
Ethics Charter and Big Data Facilitate the creation, exchange and dissemination of data (06/2013) **http://wiki.ethique-big-data.org/chartes/CharteEthiqueBigDatav8.pdf**	An initiative from Aproged, Atala, AFCP and Cap Digital, the charter provides a descriptive framework for data and acts as a memorandum of the points to include when publishing data, whether for commercial or academic use, on a free or paid-for basis, and internally or externally. The charter has four strands: description of data, traceability, intellectual property, regulations specific to the type of data being processed.	Data controllers and data providers.	Data and processing description sheets/Memorandum of points to address in order to produce ethical datasets and processing operations.
WeGreenIT **https://club.greenit.fr/doc/2016-03-ClubGreenIT-Benchmark-synthese.pdf**	Study conducted by Club Green IT and WWF with the aim of helping companies to begin thinking about or drill down into the subject of responsible digital technology (identification of issues around digital and environmental change, analysis of the environmental footprint of their IT systems, evaluation of their maturity in this area, and exchange of best practices).	CIOs, internal users, researchers.	Measure environmental impact, definition and dissemination of best practice guides.
TransAlgo **www.economie.gouv.fr/files/files/PDF/Inria_Plateforme_TransAlgo2016-12vf.pdf**	Project in progress, conducted by INRIA: the aim is to develop methods to check whether a decision generated by algorithms is ethical. There are three goals: to encourage the design of "responsible and transparent by design" data processing algorithms; to aid the verification and testing of these algorithms (do they behave as they are supposed to, i.e. legally, and how they say they do, i.e. reliably?); and to help disseminate know-how and best practices to state and industrial actors and citizens.	Developers, public authorities, researchers, etc.	Scientific platform/technical methods and tools to help deliver responsible, transparent algorithms.

EXISTING INITIATIVES for business

	DESCRIPTION	TARGET AUDIENCE	TYPE OF TOOLS PROPOSED
Lean ICT www.theshiftproject.org/article/lean-ict-pour-une-sobriete-numerique-intermediaire/	This project is coordinated by The Shift Project (an energy transition thinktank) and has three objectives: > Establish a digital environmental framework (REN – Référentiel Ecologique du Numérique) to describe the environmental footprint of digital technology, on the basis of verified data > Describe the best practices to aim for in the digital ecosystem, particularly in businesses and developing countries > Formulate a concrete short-term action plan fostering the emergence and implementation of priority initiatives and practices; it will cover in particular business governance and public policy aspects (in coordination with the Jacques Delors Institute on a European level).	Companies, politicians, NGOs, general public, researchers.	Quantitative data, Best practice, Action plans.
Les Designers Ethiques www.designers ethiques.org/	The Designers Éthiques collective, founded in September 2016, brings together design professionals, consultants, engineers and researchers committed to the design of user-friendly digital services. The collective began by organising “Ethics By Design” conference and now works on a wide range of topics (attention design, ethics applied to UX design, open source design, eco-friendly design, legal design) with a focus on putting professional practice at the heart of its work. The collective always seeks to analyse how the design of a service impacts on its users and its environment, and to champion the most transparent and respectful professional practice. Founded at the École normale supérieure de Lyon by Jérémie Poiroux, Karl Pineau and Thibault Savignac, the collective now has a France-wide footprint, with a strong presence in Paris, Lyon, Bordeaux and Nantes.	Design professionals, businesses, researchers	Conferences and workshops
Holberton-Turing Oath https://www.holbertonturingoath.org/	The Holberton-Turing Oath, written by Franco-American scientists, seeks to bring together AI professionals, worldwide, in pursuit of shared moral and ethical values, to urge them to use their skills in a way that respects humankind and avoids any threat to life.	AI professionals.	Charter.
Hippocratic Oath for Data Scientists or for anybody working with data www.hippocrate.tech	Promoted by a team of volunteers under the banner of the “Data for Good” association, the Hippocratic Oath for Data Scientists has involved more than one hundred data scientists and experts who collect, store, process, model and analyse data and make predictions as part of their professional activities. These data scientists work for start-ups, large companies, consultancies, SME, and government agencies, are freelance, or are researchers. The charter centres on both fundamental ethical principles and best practice for data use.	Data scientists and anybody working with data	Charter.
Montreal Declaration “Responsible AI” www.montrealdeclaration-responsibleai.com/the-declaration	An initiative of the Université de Montréal: principles and recommendations are identified to provide ethical guidelines for the development of AI. Seven values underpin these ethical guidelines: well-being, autonomy, justice, privacy, knowledge, democracy and responsibility.	Any audience.	Principles and recommendations, open to contributions.

Syntec Numérique is the trade body representing digital service companies, IT suppliers and technology consulting companies. It represents over 2,000 member companies accounting for 80% of total turnover in the sector (more than €54bn in turnover, 447,000 employees in the sector). Its members include 30 large groups, 120 mid-cap firms, 1,000 SME, 850 start-ups and micro enterprises; 11 regional delegations; and 20 collectives (competitiveness hubs, associations and clusters).

www.syntec-numerique.fr

CIGREF is a network of major French corporations which was created in 1970. It counts among its members some 140 major French and European corporations operating in all business sectors (banking, insurance, energy, retail, manufacturing, services, etc.).
CIGREF aims to develop businesses' ability to adopt and master digital technology.

www.cigref.fr