High scientific and technical potential	
Recruitment procedure (notably composition and method of appointing the selection committee)	Methods implemented: ***Chaires d'attractivité*** International call for projects: the candidates shortlisted by the Federal University institutions are selected by the CAr to work on-site for a minimum of 12 months, which can be spread over 5 years. A maximum of €1 million is allocated for each chair. This amount is used exclusively for funding the research environment: travel expenses, research budget, post-docs and PhD contracts. Several LABEX have set up additional schemes for the *Chaires d'attractivité* programme in the form of fellowships for visiting researchers for periods ranging from a few months to three years, the third year being renewed subject to a mid-term evaluation. In these cases, specific recruitment committees are set up, with the support of the LABEX, often international, scientific councils. The applicant's records as a researcher are, of course, the main selection criterion, but his ability to interact with the teams on site and his main research topic are also considered in most cases.
	Developments envisaged: A review of the scope of funding is being envisaged (see below).
Type of contract (and name of employer)	Methods implemented: The Board of Directors of the Federal University voted to grant the beneficiaries of the *Chaire* programme with the status of "egregious scholar", which allows each institution to host the chair holders in the best possible conditions during their stay(s). This shows a great deal of flexibility in the contractual arrangements. The scholars selected can have a specific assignment, a secondment contract, a posted position, or be directly employed by their host establishment (Research organisation, university or *Grande Ecole*).
	Developments envisaged
Remuneration policy	Methods implemented: When compensation is offered, it is provided by the institution hosting the Chair on the basis of the current regulations.
	Developments envisaged: Chair's salary paid on the IDEX budget and based on the salary grid for university professors. A bonus may be provided by Chair's host institution.
Career Management	Methods implemented: The goal of the *Chaire d'Attractivité* programme is to attract high-profile researchers for periods of up to five years.
	Developments envisaged: To construct an attractive and flexible permanent recruitment policy, with the support of the IDEX and under the arbitration of the CAr.
Planned supporting resources	Methods implemented: Installation and research expenses (running costs, equipment, human resources): up to €1 million.

	Developments envisaged: None at this time, since the environment package seems sufficiently well resourced.
Principal recruitments	**Ludovic Orlando, who is hosted by the Molecular Anthropology and Image Synthesis laboratory (*UMR* 5288) *CNRS* – University of Toulouse III-Paul Sabatier. Project: OURASI (A genomic, epigenomic and metagenomic perspective on the history of horse domestication and management).** Ludovic Orlando, 36, who holds a PhD from the University of Lyon, is recognised as a world leader in paleogenomics (ancient DNA studies). In 2013, as a researcher at the University of Copenhagen, where he led an international team of 56 scientists, he sequenced the oldest genome ever discovered, that of a horse from Alaska which lived some 700,000 years old. Paleogenomics is a multidisciplinary field, involving archaeology, biology, and social sciences, which investigates the adaptation process of hominids, through the various contacts that they established, particularly when settling in what is now Europe. It aims, for example, to identify the reasons why the genomes of certain populations have gradually disappeared, or how others have failed to adapt to their environment. For the IDEX's *Chaires d'attractivité* programme, Dr. Orlando, who had already been collaborating with teams from his host laboratory, has proposed a project based on the most recent developments in the field of genomics and the study of ancient DNA. The project aims to trace genomic, epigenomic and metagenomic changes introduced during the domestication of horses and their subsequent use. He will explore how the emergence of chariots and cavalry transformed the behaviour, physiology and, in short, the biology of the horse, and will compare these situations to natural situations where horses have evolved in the absence (or near absence) of human influence, drawing on the analysis of horses of the late Pleistocene age in North America and Yakutia. The project will represent a major contribution to understanding the phenomenon of domestication, a process that has changed the face of the human race. It will begin a new phase in approaches to evolutionary biology. **James K. Hammitt,** hosted by the Laboratory of Natural Resources Economics (UMR 1081) INRA - University of Toulouse I-Capitole. Project: AMEP (Advancing methods for evaluating environmental/health policies). Dr Hammitt is a professor of economics and decision sciences at the Harvard School of Public Health, and is also director of the Harvard Center for Risk Analysis. He is a world leader in the field of economic analysis of risks. After receiving a Pierre de Fermat Chair in 2005, James built a group of researchers at LERNA, with whom he had already collaborated in the past. This network is particularly interested in studying theoretical developments and empirical methods for evaluating public policy. Dr Hammitt's *Chaires d'attractivité* project continues these collaborations. His objective is to develop an internationally renowned research group at the Toulouse School of Economics (TSE). This group will improve and implement methods for evaluating social effects/public decisions that affect the quality of the environment and human health. He will work in connection with the Harvard Centre for Risk Analysis.

This chair will also help to support a team of researchers from TSE, supported by two post-docs and four PhD students, as well as two law and political science researchers from Duke Law School (Durham, North Carolina).

Peter Haynes, hosted by the *Observatoire Midi-Pyrenees*, the Aerology Laboratory, the Laboratory for Studies in Geophysics and Space Oceanography and the National Centre for Meteorological Research (Atmospheric Meteorology research group), CNRS - University Toulouse III-Paul Sabatier. Project: TEASAO (Turbulence Effects on Active Species in Atmosphere and Ocean).

Dr Haynes, a researcher at Cambridge University (United Kingdom), is an international expert in large-scale fluid dynamics of the atmosphere and oceans as well as in the transport and mixing of trace species, including reacting chemical and biological species. In his previous research, he has tackled the theoretical aspects and applications of these questions. Much of his work focuses on atmospheric problems and he has applied his results to the study of oceans.

His project supported through the *Chaire d'attractivité* programme aims to create the next generation of atmospheric and ocean forecasting systems. One of the major scientific challenges in doing so is to improve understanding and modelling of the turbulence effect on a small scale, and vertical mixing on the evolution of chemical or biological species in the ocean and atmosphere. These processes are key to our ability to understand, model, and predict the evolution of freshwater resources, air and water quality, the development and dispersion of certain pollutants, primary production (plankton) and the evolution of resources (fishing) in the ocean, which represent major challenges for society in terms of management and sustainable exploitation of the environment.

Given the similarities between oceanic and atmospheric dynamics, the project is designed to bring together scientific communities studying the atmosphere and ocean on the basis of an original approach which combines theory and applied studies to create an effective long-term partnership between the laboratories involved in the project.

Ted Gragson - hosted by the TRACES laboratory - UT2J/CNRS
Professor Gragson is an international expert who conducts high-level research in ecology, using a global and historic approach which covers human behaviour, current social organisation, landscapes, natural resources and their conservation as well as regional planning and the management of natural spaces. Currently a professor at Georgia State University (United States), where he heads the Department of Anthropology, he earned his PhD in anthropology from the University of Pennsylvania in 1989. Professor Gragson leads several research programmes in the USA, South America, South-East Asia, Africa and France. He speaks fluent French and Spanish and has been a visiting professor at the University of Pau and the Pays de l'Adour and the University Jean Jaures Toulouse II since 2005.
His experience, at the crossroads of ethnology, archaeology and historical ecology, makes it possible to consider numerous collaborative efforts with the different research units in Toulouse (Geode, Ecolab, Framespa, IMT, IRIT, Moulis) as well as through the vast global network of LTESR, with which he is associated. The research project he has developed within the TRACES laboratory through the *Chaire d'attractivité* programme is based on dynamics of social and environmental space in the piedmont area. The objective is to compare several French catchment basins in the Pyrenees (Garonne, Adour) with similar geographical situations which until recently had low population

density (the Appalachian Mountains, Little Tennessee, Broad, USA). The modelling will be focused on research activities designed to further knowledge of the complex system that makes up these spaces. This work will provide a holistic approach to the social and environmental phenomena that can "force" the organisation of past and present settlements in order to better understand Euro-Asian situations with high population density.

Annie Ross, hosted by the Clement Ader Institute – Institut Supérieur de l'Aéronautique et de l'Espace. Project: CHASC (Hybrid Control of Damping in Sandwich Composites).

A Professor of Mechanical Engineering at the Polytechnic Institute of Montreal for the past 16 years, Dr Ross has been the director of the Laboratory of Acoustics and Vibration Analysis since 2013. Her previous experience includes six years in the Canadian aviation industry. Her research focuses on the passive damping of composite sandwich structures in aeronautics.

Her project aims to reduce the vibration levels of composite sandwich structures with a honeycomb or foam core, which leads to a reduction in the sound emitted by these structures. The ambitious solutions offered combine different technologies and research results, including: sonic black hole, the dissipation by fibrous materials and viscoelastics, as well as the transfer of energy to a non-linear auto-adaptive oscillator.

Today, aircraft comfort and compliance with new environmental standards for sound levels are significant issues leading to intense research and development. The benefits of this project are therefore considerable for both the environment and aviation firms' competitiveness. This five-year project will be co-funded by the IDEX-University of Toulouse and the ANR. It will result in the recruitment of three PhD students, two post-doctoral students and trainees, and will give rise to a long-term partnership between the two establishments involved.

Piet van Leeuwen, hosted by the Physics Laboratory for Nano-Objects (UMR 5215) CNRS - University of Toulouse III-Paul Sabatier. Project: NANOS-ON-WINGS (Design of a ligand for metal nanoparticles in catalysis).

Dr van Leeuwen is a Danish researcher and a leader in the field of homogeneous catalysis. He is the author of two books on the topic as well as numerous publications in peer-reviewed journals. He received an Advanced Grant from the ERC (European Research Council), and continuing his research at the Institute of Chemical Research of Catalonia, after a stint as a professor of homogeneous catalysis at the science faculty of the University of Amsterdam. He also has extensive and fruitful experience in both industry (26 years with Shell) and academia (1995).

The host group has been a pioneering research team for more than 20 years in the field of controlled preparation of nanoparticles and their characterisation using sophisticated methods developed over the years, as well as their use in various fields. The project concerns the use of metallic nanoparticles (NPMs) in an area of research that is currently very important: catalysis.

New synthesis methods developed by the LCPNO team have made considerable progress in this area. These new materials have demonstrated surprising properties in catalysis compared to conventional metal catalysts. Over the past 10 years, thanks to spectroscopy technology, important steps have been taken at LPCNO for far more detailed characterisation of metallic nanoparticles.

Catalysis is a very complex field and the arrival of Piet van Leeuwen, within the framework of the *Chaires d'attractivité* programme, is helping to contribute new skills which are currently lacking at LPCNO.

Jorgen Weibull is hosted by the IAST LABEX.

A researcher at the Stockholm School of Economics, Dr Weibull is known for his work on the frontier between economics and evolutionary biology. He uses high-level mathematics as a tool to study evolution by the natural selection of social behaviour. His work has been published in the world's leading economics and theoretical biology journals. His arrival at IAST will strengthen a very active biology programme, with seminars and symposia attracting the world's best researchers. This programme has already given rise to collaborations with other laboratories in the Toulouse region, including the LABEX TULIP and the CNRS station in Moulis, as well as with biologists from Montpellier and Lausanne.
Manuel Barranco, hosted by the Laboratory for Collisions, Aggregates and Reactivity (*UMR* 5589) *CNRS* - University of Toulouse III-Paul Sabatier.
Project: IMDYNHE (Impurity dynamics in superfluid helium nanodroplets: a real-time TDDFT-MD approach).
Dr Barranco, a professor of physics at the University of Barcelona, is an internationally recognised expert in the field of describing multibody quantum effects and their dynamics in mixed helium nanodroplets.
Helium nanodroplets are quantum multibody systems with unique properties. As such, they are very useful and matrices and practically ideal for high-resolution spectroscopy and the reactivity of atoms, molecules or aggregates. The recent development of a method based on time-dependent density functional theory (TDDFT) by Dr Barranco's laboratory requires the input of the molecular physics to become quantitative. The contribution of the Toulouse group will be crucial in this respect, and is the main reason for the proposed collaboration.

Dr Barranco's arrival in Toulouse, through the C*haire d'attractivité* programme, aims to initiate long-term collaboration between his original and host laboratory. The purpose of the project itself is to provide the community working on helium nanodroplets with a free user-friendly simulation tool to interpret or propose cutting-edge experiments. It is based on the complementary expertise of Dr Barranco's lab at the DFT and the molecular physics theory groups at LCAR, as well as their numerous fruitful collaborations with leading international experimental groups in the field. In the longer term, the project could lead to the creation of a European network which would also benefit from existing collaborations with several other theory groups in Europe and the United States, and the organisation in Toulouse, of the Quantum Fluid Clusters conference, a forum for the helium-nanodroplets scientific community since 1989, on whose committee both groups are represented**.**

Patrizia Ettorre, hosted by the Center for Research into Animal Cognition (*UMR* 5169) *CNRS* - University of Toulouse III-Paul Sabatier. Project: PHEROMOD: (Pheromones as general modulators of insect behaviour).
Dr. Ettore, who holds a PhD in Biology from the University of Parma, spent the early part of her career in Europe (Italy, France, Germany and Denmark). Since 2009, she has taught at Paris 13 University and continues her research at the Laboratory of Comparative Experimental Ethology. She is considered the most influential scientist worldwide in the field of insect ethology and her research on the recognition of social insects is quoted more than any other.
Professor Ettorre's chair project comes in the wake of several collaborations with the director of the host laboratory (CRCA, *UMR* 5169), on learning and

	memory processes in ants, resulting in several publications and a thesis co-directorship. The purpose of her research is to highlight that pheromones, in addition to the communication of specific messages, can also affect animals' ability to learn and memorise. It has been recently been shown that certain pheromones can modulate cognitive processes by facilitating or inhibiting learning and memory. The study of this pheromonal modulation in two species, the honey bee *Apis mellifera* and the ant *Lasius niger,* would distinguish the acquired mechanisms from those inborn in a species. Since the use of pheromones is an alternative to pesticide, understanding the mechanisms for controlling non-innate behaviour through pheromonal modulation offers very significant economic and ecological potential. The project will provide greater knowledge of the mechanisms by which pheromones influence learning performance in insects, which are modelled in fundamental and applied research.

IDEX Business Impact Level Table for the first 4 years

Number and funds totalled over the period	Doctoral students	Post-docs	*Tenure track*	High potential
Number of recruitments made solely with IDEX funds	*19 (including 12 LABEX)*	*40 (including 27 LABEX)*		*2 (LABEX)*
Funds devoted by the IDEX for these recruitments	*€ 1,732,774 (including € 997,774 LABEX)*	*€1,700,957 (including €1,115,957 LABEX)*		
Number of recruitments made with joint IDEX / IDEX partner investments.	*1(LABEX)*	*16 (LABEX)*		*11 (including 2 LABEX)*
Funds devoted to these recruitments by the IDEX	*(LABEX €105,000)*	*(LABEX €720,000)*		*€ 8,064,520 (including €1,633,000 LABEX)*
Number of recruitments made with joint IDEX/LABEX investments.	*11(LABEX)*		*15 (LABEX)*	
Funds devoted to these recruitments by the IDEX	*€1,155,000 (LABEX)*		*€489,085 (LABEX)*	

How are these instruments used to serve the strategic orientations of the IDEX?

The institutions proposed candidates for the *Chaires d'attractivité* in the strategic areas; 6 world-class scholars were selected by the CAr:

- **Elen Robey (UC – Berkley):** New cancer treatments;
- **Ted Gragson (**University of Georgia): Heritage;
- **Peter Haynes (**University of Cambridge): Aerospace;
- **Hussain Gaitee (**South European Observatory): Aerospace;
- **Annie Ross (**Ecole Polytechnique Montréal): Aerospace;
- **Gene Cooperman (**Northeastern University): Aerospace.

Thanks to the quality of the IDEX's programmes, their objectives and their rigorous selection process, we have succeeded in convincing a high number of partners to join forces. This has generated a leverage effect and reduced significantly the number of funding bodies researchers have to apply through:

- Co-funding for the *Transversalités* programme by the CNRS (€600,000 contributed on top of an IDEX budget of €1.3 million);
- Co-funding for the *ATS* programmes by the *Fédération de Recherche pour l'Aéronautique et l'Espace* (FRAE, agreement signed) and the *Toulouse Cancer Santé foundation* (TCS signing process under way);
- Co-funding for the *Equipement* programme by the TCS foundation (€125,000), Airbus (€60,000) Total (€100,000), the Midi-Pyrenees Regional Council (€244,000, outside the scope of the CPER).

The IDEX encourages external recruitment by granting a €14,000 signing bonus to each assistant professor or junior researcher hired, provided that they do not hold a PhD from the University of Toulouse, did not previously have a research and teaching assignment exceeding 24 months in a laboratory of one of the members of the Federal University, and have no more than 5 years of experience as a faculty in France or abroad.

1.5.3) Research and training

What are the strategic lines with regard to research and training?

Research
The Federal University has two research priorities:

- to support "high-risk / high-reward" scientific initiatives, in particular multi-disciplinary projects involving different research units;
- to foster an interdisciplinary approach to current global challenges, in particular by partnering with the region's socio-economic players on four key areas:

- Aeronautics, space and embedded systems;
- Multidisciplinary research and new technologies for innovative cancer treatments;
- Systems for the sustainable management of natural resources and the environment in the context of climate change, with a view to provide human and animal feed, fibres and fuel;
- Heritage.

To do so, the Federal University works on three areas:

- Generating excellence, by promoting the site's attractiveness for senior and junior researchers and by developing strong support for PhD students;
- Research infrastructure and breakthrough scientific equipment, with a focus on resources that serve the community at large;
- World-class disruptive research projects.

The Federal University also dedicates exceptional resources to the European projects office to increase its researchers' participation rate in European calls (ERC, H2020, InterReg, etc.).

Education

The IDEX Education programmes support the Federal University's ambition to be ranked as a high-ranking institution by:

- Defining a coherent, complementary programme portfolio, with the most comprehensive choice of courses, designed to meet the needs of business, social, cultural, and research communities;
- Managing and monitoring the course portfolio development process;
- Enhancing the visibility of the course portfolio to optimize overall access to the best possible programmes;
- Upgrading education programmes.

As part of the 2016-20 accreditation process, the Department of Education and Student Life spearheaded the design of the courses offered at the Bachelor's, Professional Bachelor's and Master's degree levels; the application for accreditation was filed in July 2015, with the Ministry of Education. This offer includes many majors that are common to all the institutions and to map out all the majors to be deployed for the 2016-17 academic year.

As part of this process, an inter-institutional working group, led by the Department of Education and Student Life, was formed for each IDEX education programme. This working group has been entrusted with the definition of the guidelines for implementing and monitoring these programmes and submitting them to the Council of Members.

For example, the *Innovation en Licence* programme has led to the creation of 15 Bachelor's tracks part of the majors on offer; all of them are either research tracks or "enhanced tracks" (additional work required from the students), based on active learning approaches.

The *Masters pluridisciplinaire* programme has led to the deployment of 10 new Master's tracks among the common majors. They are divided into three categories: Master's designed for positions that require a multidisciplinary approach (e.g. Master's degree in Mathematics and Applications), Masters' courses in which students choose learning units from different disciplines (e.g. the Network project including 11 *Structuration des Mondes Sociaux*, Masters) or Masters which take a multi-disciplinary approach to a single field (e.g. the *Stratégie Urbaines Locales* Masters course).

With regard to partnerships with socio-economic stakeholders, **seven continuing education projects** have been implemented together with the competitiveness clusters and major companies, including Airbus, SigFox and the IRT (e.g. "Connected objects: radio frequencies in networks" and "Embedded systems - cyber-physical systems").

The process of developing an innovative and attractive course portfolio is supported by the two IDEFIs, *FREDD* and *Défi Diversité*, as well as by the LABEX initiatives for education.
The *FREDD* IDEFI has brought the Toulouse School of Economics (TSE) up to the highest international standards by taking on the challenge of providing a comprehensive, multidisciplinary and top-ranking educational offer, while channelling students into different tracks as their talents are revealed.

The *Défi Diversité* IDEFI puts innovative teaching styles at the heart of an effort to improve the quality of the site's engineering courses to ensure that they meet the needs of students and of socio-economic players.

	Themes	Number of researchers concerned	Number of students concerned	Funds allocated
Specific investment of the IDEX in research	1-BABS – Biology and Life sciences	1 / 224	30	1 / 6,166,904 €
	2-DSPEG: Law, Economy, Management	2 / 90		2 / 3,569,476 €
	3-HSHS: Humanities, Human and social Sciences	3 / 112		3 / 2,515,821 €
	4-SDM: Physics, Chemistry, Material Sciences	4 / 106		4 / 2,778,660 €
	5-MSTII: Mathematics, Sciences and technology of Information and Engineering	5 / 210		5 / 6,837,978 €
	6-UPEE: Universe, Planets, Space and Environment	6 / 72		6 / 2,175,370 €

Specific investment of the IDEX in training	Bachelor, Master	DEG		400	170,430 €
		SHAS-ALL		1 063	329,024 €
		STS		3 270	615,314 €
		Engineering		2 985	752,750€
	Doctoral training (2014 et 2015)	DEG		272	29,822€
		SHAS-ALL		424	46,487€
		STS		2 831	310,387€
		Engineering		2 500	274,097€
Joint IDEX/IDEX partner investment					13,400,000 €
Joint IDEX/LABEX investment	BABS DSPEG HSHS SDM Scientific Facilities				368,001 € 1,889,080 € 204,676 € 1,395,250 € 965,000 €
Joint IDEX/IDEFI investment		Engineering		To be started from Sept. 2016	109,250 €
Joint IDEX/other PIA project investment	1 / Material sciences 2 / Systems 3 / Physics				1 / 1,013,000 € 2 / 1,850,278 € 3 / 630,000 €

PIA projects' contributions to the development of research and education policies

PIA1 projects	Key structural impact	Synergies with partners external to the Initiative	Other contributions of the project to the Initiative	Any enhancement of the project's potential by the Initiative
LABEX	Involved in the site's strategy through membership on the *ATS* programming committees. Promoting projects funded in the strategic areas (TOUCAN for Cancer, NEXT for aeronautics, TULIP and IAST for sustainable development, SMS for "Heritage".	The *ATS* programming committees bring together other players, including businesses, competitiveness clusters and local and regional authorities.	Complement the IDEX Chair projects with short-term invitations offered through the LABEX.	

	Also involved in the building and deployment of the site's four strategic research areas Promoting many of the research projects funded through the *Emergence, Transversalités,* or *Equipements* programmes.			
IDEFI	The *Défi Diversité* IDEFI supports the IDEX *Formes* programme by enabling new faculty to work together in order to foster collaborative and group work on educational issues. The *FREDD* IDEFI gives new impetus to the Toulouse School of Economics (TSE) by deploying innovative teaching methods and developing partnerships with businesses, high schools and prestigious foreign universities.		The *Défi Diversité* IDEFI supports the IDEX's innovative teaching projects by providing courses based on international benchmarking.	
EQUIPEX	Integrated into the *ATS* strategy.			
Institut Carnot	Represented on the *ATS* programming committees.		A beneficiary of the IDEX's *Equipement* programme. It implements some scientific facilities on behalf of the University.	

IRT	The IRT is a member of one of the *ATS* programming committees in order to structure the academic and technological research continuum with socio-economic players.		The IRT supports the IDEX's *Ecole des Docteurs* initiative by signing the thesis charter of each hosted PhD student and by opening some of its courses to all the other PhD students of the site.	
SATT	Valorization process previously fragmented, now much more structured and organized: a major achievement. Enhancing skills and resources for stronger, faster, more effective valorization.	SATT is at the cross-roads between industrial partners interested in the outcomes of public research, and all the players involved in innovation. SATT nurtures the synergies between the IDEX stakeholders.		Conducting a permanent watch on research outcomes to be valorized. Raising researchers' awareness on the advantages of striking partnerships with the socio-economic world. Shaping and promoting research and technology opportunities for companies

Are these strategic lines embodied by a specific structure (e.g. collegium, departments, institutes, schools, etc.)?

Research: Six research coordination hubs have been established. These hubs bring together the laboratory and LABEX directors in the following fields: Humanities, Social Sciences and Societies / Mathematics, Computer Science, Information Technology and Engineering / Biology, Agriculture, Biotechnology, Health / Materials Sciences / Universe, Planets, Space, Environment / Law and Political Science, Economics, Management.

Education: The Federal University boasts a comprehensive programme portfolio (122 Bachelors' programmes, 396 Masters' programmes and 49 Engineering programmes) through a broad range of institutions (22 universities and *Grandes Ecoles*). The site has been structured in line with this offer and with a visible multi-disciplinary strategy:

- Each of the three universities covers one major field: SHS-ALL (social sciences and humanities), DEG (law, economics and management) and STS (science-technology-health). 95% of the courses on offer at each university match its field of study and with hardly any overlap between the institutions;

- Two multi-disciplinary hubs have been created: the Engineering hub is supported by the Toulouse Engineering Collegium, which gathers all the institutions teaching engineering; the Technology hub is supported by the Federative Institute of IUTs which includes all the Federal University's IUTs.

What competences are exercised by these new entities?

Research
Research co-ordination hubs act as a cooperative space for the Federal University's institutions and research organisations. They share views with the laboratories to better apprehend their programmes and activities. Their purpose is to contribute to the work of the Academic Councils, of the relevant bodies and of the involved research organisations. Their main responsibilities are international benchmarking studies, scientific forecasting, and contributing to the Federal University's international policy.

Education
The cross-disciplinary education hubs provide a space within which the different institutions can work together and seek to develop synergies and partnerships and ultimately set up and monitor joint projects. For example, the **Toulouse Engineering Collegium** includes all of the site's engineering institutions, Toulouse III University and the JFC National University Institute. Toulouse Engineering has implemented a broad range of initiatives, including the creation of common course modules shared by all the *Grandes Ecoles* (8 modules, e.g. "Biomechanics" and "Statistics and Information for Big Data"), the creation of two new elective tracks available to students from different institutions ("Engineering for Sustainable Development" and "Computational Biology for Green and White Biotechnologies"), and the creation of a bridge year towards Toulouse Engineering courses to widen the selection of degree programmes on offer at the end of the first year of health studies (PACES) and diversify recruitment.

1.5.4) Policy for transfer to industry

What are the main successes of the IDEX policy for transfer to industry?

The SATT is the common tool for valorization. It clearly illustrates the pooling and streamlining efforts triggered by the Federal University and its community thanks to the PIA. The projects managed by the IDEX vary widely in terms of nature and time frame. Some, like the LABEX projects (NEXT, CIMI, etc.), that were initiated only three years ago are academic-oriented. Yet TWB for instance, that was designed in close cooperation with industry boasts nearly a ten year experience with its partner laboratories. The examples listed below testify to the dynamics created by the IDEX's resources.

Designation	***Tag's sécurisés***			
Socio-economic sector	Security of national ID documents.			
Research themes involved	Nanosciences / Nanotechnologies			
Names of the partners within the sector	LABEX NEXT, Laboratoire Physique et Chimie des Nano-Objets, Nanolike (SME).			
Form (framework agreement, contract...) and nature of the contributions obtained, (payments in €, provisions of human resource, equipment sharing, sponsorship, skills-based sponsorship, etc.)	Two years of academic research carried out as part of NEXT. Estimated annual cost: €75k. CIFRE grant plus research contract funding via the relevant company. Funding of the project maturation in view of its transfer by SATT (12 months) - €375K.			
Flagship result or achievement obtained thanks to the IDEX	Making tags secure by introducing nanoparticles. Patent filed and licensed to the company. First returns on licensing expected in 2016			
Funding (including IP revenues) received from companies under these collaborations	*2012*	*2013*	*2014*	*2015*
		€10K	€10K	
Other funding received from external partners on the project (ANR, Europe, etc.)	*2012*	*2013*	*2014*	*2015*
		€273K		

Designation	***Dermoscan***
Socio-economic sector	Oncology (skin cancer) and dermatology.
Research themes involved	IT - imaging and image processing.
Names of the partners within the sector	LABEX CIMI, IRIT Laboratory, Pixience (SME)

Form (framework agreement, contract...) and nature of the contributions obtained, (payments in €, provisions of human resource, equipment sharing, sponsorship, skills-based sponsorship, etc.)	The SATT's first maturation project and a transfer into the field of augmented reality for virtual fittings for glasses A second transfer into a different field: Pixience had identified a potential technology in a laboratory but it proved to be ill-suited. Thanks to the cross-disciplinary nature of the IDEX, SATT detected Pixience's needs and redirected it towards the LABEX' technology. SATT invested in a maturation project to develop the technology applied to melanoma detection (€100k). A license is signed with the company. First returns estimated at € 500k.			
Flagship result or achievement obtained thanks to the IDEX	Valorization of the same LABEX invention in several different applications fields. 2 licenses (risk reduction and increased income).			
	2012	*2013*	*2014*	*2015*
Funding (including IP revenues) received from companies under these collaborations	na	na	na	€10k + funding of IP
	2012	*2013*	*2014*	*2015*
Other funding received from external partners on the project (ANR, Europe, etc.)	na	na	na	na

In addition to these two examples, other projects provide further evidence of the importance of the IDEX's resources, with transfers to companies for a very wide range of applications: fall detection for elderly people, simulation of skin folds or clothing for the cinema or even the detection of free tumour DNA. The example of TWB is also noteworthy:

Designation	**Creation of a start-up: *Carboyeast***
Socio-economic sector	CO2 capture
Research themes involved	White Biotechnology
Names of the partners within the sector	Toulouse White Biotechnology (TWB)

Form (framework agreement, contract...) and nature of the contributions obtained, (payments in €, provisions of human resource, equipment sharing, sponsorship, skills-based sponsorship, etc.)	Maturation of a pre-competitive project within the structure. Technical support and business plan for the start-up.			
Flagship result or achievement obtained thanks to the IDEX	3 patents filed. Start-up created. Significant investment by major venture capital companies.			
	2012	*2013*	*2014*	*2015*
Funding (including IP revenues) received from companies under these collaborations	id	id	id	id
	2012	*2013*	*2014*	*2015*
Other funding received from external partners on the project (ANR, Europe, etc.)	id	id	id	id

Share of these three partnerships in the funding received by companies out of all the IDEX project actions (as a %)	No information available

What relations are established with the SATT (society for accelerating technology transfer)? For what results?

There are many links between the Federal University and the SATT: premises, coordination of SATT services towards laboratories, *Instituts Carnot* and LABEX, regular exchanges of information on programmes and projects. SATT's ramp-up keeps pace with the Federal University's ambitions.

By the end of October 2015, SATT had taken on 134 maturation projects worth a total of €16.5 million, most of them implemented in the laboratories. SATT signed 42 transfers to companies, mainly to SMEs, the great majority of them from the region.

These transfers have already generated €250,000 in revenue for SATT in 2014, and should reach €500,000 2015. After assessing SATT outcomes, at the end of 2014, the government has decided to grant it another €24 million funding.

What areas are excluded from the SATT's scope of cooperation? How are these exclusions justified?

SATT is the linchpin of the Federal University's valorization strategy, and manages all transfers from member institutions. The CNRS also banks on it for its local laboratories, and SATT has signed agreements with the key research institutions (INRA, CNES, CHU) or is in the process

of doing so (INSERM). It has also signed agreements allowing it to entrust the valorization process to national players, such as the CNRS or France Brevets, through joint valorization. Similarly, it works with other national players (INRA and INSERM) to implement the best possible strategy, particularly by building up on the synergies with other laboratories outside the region (the cluster effect). SATT also interfaces with the subsidiary companies to national research organizations. The TWB agreements are a typical example: SATT detection and protection of LISBP's results, SATT and INRA joint analysis, and in the field of white biotechnologies, further developments primarily by TWB and INRA transfer.

1.5.5) Student life and life on the Campus

The two focal areas, welcoming students and student life, are directly supported by the Federal University. Many different actions have been or are in the process of being undertaken:

Welcoming students
The objective is to welcome and support freshmen, particularly with the ***Welcome Desk*****:** the Federal University has set up a one-stop-shop that delivers many of the services that international students and visiting researchers need for a successful move in a single location: the *Prefecture* for residence permits; the *CAF* for students and family benefits; the *CROUS* for student housing, catering and other related services; Federal University services, including accommodation, culture and the *Toul'Box*.

Improving student life
The Federal University's Student culture and initiatives office aims at enhancing students experience on the campuses and supporting students associations. A Student Initiatives Support Fund (FSIE - IDEX) provides funding for inter-institutional student association projects through calls. This office also organises cultural activities (dance and circus arts classes, the *Entre en scènes!* festival, student concerts, etc.). It also circulates cultural information to the students (*Exploreur*, *U'Zoom*). In compliance with the law dated 22 July 2013, the Federal University is also working with *CROUS* to design the students life scheme in the following nine areas: housing, transport, health, food/nutrition, disability, cultural activities, sport, associations and student initiatives.

1.5.6) Culture, Science and Society

The Federal University includes a science and technology promotion office that aims to highlight and disseminate research and its outcomes for the general public. It works in three key focal areas:

- **Preserving and promoting universities' scientific heritage** through activities such as *Virtual Exhibitions - Back to the Future*, a virtual exhibitions site which displays heritage collections in the Midi-Pyrénées;
- **Editing and publishing works,** for example with the online science and technology education agenda. The first release of the scientific *Exploreur* magazine dates back to April 2015, valuable tool for promoting the university's inter-institutional research policy;
- **Staging scientific events and workshops** highlighting the history and topicality of research and connecting the scientific community with the general public: *la nuit européenne des chercheurs* the Science Festival, la *Novela*.

1.5.7) Construction of the identity

For all the students enrolled in courses developed or promoted thanks to the IDEX funding,

- ***does or will (specify the time frame) enrolment take place in the "Target University?***
- ***does or will enrolment take place jointly in one of the member establishments of the "Target University"?***
- ***how is the feeling of belonging to the "Target University" developed?***

On arrival, students have access to the services of the *Welcome Desk* and the *Toul'Box*, the welcome package offered by the Federal University which features all the site assets: cultural, social, sports, and documentary services. (See. 1.5.5). They enrol at the member or associate institutions, where they will study. Their student ID card bears mention both of the Federal University and the institution in which they are enrolled.

What is or will be (specify the time frame) the formal link between the "Target University" and the researchers and the lecturer-researchers recruited thanks to the IDEX funding?

Based on the work done by the Research Department, the Council of Members has adopted a single signature charter for publications. Chair scholars must use this signature format when co-signing work, including written, oral, poster or audio-visual presentations fully or partially done within the framework of the Chair.
Currently the LABEX and IDEX project managers decide which institution or research organization will sign the employment contract. From 2016, a scientific agreement will bind all recipients of IDEX funding (senior and junior chairs, post-docs) to the Federal University.

Indicate how, thanks to this identity, the "Target University" does or will (specify the time frame) simplify interfacing with the socio-economic world and become its point of contact.

The Federal University is already a single gate to players like the competitiveness clusters, local and regional authorities, e.g. through the Regional Council for the State-Region Plan funding scheme (*CPER*), the Campus Plan, calls for Research projects (grants for PhD contracts), and the scientific and technical promotion policy. The Federal University is the Regional Council's sole partner for its regional site policy (10 site contracts), and works directly with the other local and regional authorities. It has also signed a cooperation agreement with the *Délégation Générale à l'Armement* (DGA) in the name of and on behalf of all members.

1.5.8) International visibility

The development of an international identity, which makes the site more attractive, rests on two strategic pillars: overseas offices and enhanced international students/researchers life environment. **Three leading initiatives in this respect**: offices in China, Brazil and Indonesia, *Toul'Box*, and English-taught programmes.

The office in China (Chongqing / Shanghai) makes it possible to directly select incoming students and develop meaningful partnerships with the top 20 Chinese universities, including Peking University, Tsinghua and Sun-Yat-Sen. **Several steps have already been taken:** i) a *Study in China* programme launched by the Federal University; 80 students have already enrolled; ii) the creation, of a foundation year for studies in France for Chinese students (*L zero*), which will take in 100 students in 2016; iii) the launch of double degree Masters courses, (Aeronautics and Law), involving 90 students.

The office in Brazil has been set up at a university in Recife (*Nordeste*) through the provision of a two-year visiting professorship. The objective is to divert the *Science without Borders* programme towards the Federal University and to develop research partnerships. Several concrete actions have been implemented, including joint degree programmes (3 Masters: Oceanography, Civil engineering, Urban development) and further relationships with industrial players in Brazil (e.g. Thales Alenia Space).

The *Toul'Box* programme is also key to attracting international researchers and students. It is a welcome and international move support package specially designed for these two populations, and includes a customized welcome and a tailor-made package of services. The *Toul'Box* has been operational since July 2014 and has been used by 1,000 students and researchers so far.

Finally, the Federal University has promoted **the creation of an English-taught Masters' degree** intended primarily for international students through an annual call for projects since November 2013 (12 applications for 5 funded projects).

Targeted collective actions focus on strategic regions, particularly China, Brazil, Australia, New Zealand, the USA and Canada. **These actions have enabled** the proliferation of partnerships with very highly ranked universities worldwide, which would not have entered into a partnership with only one Federal University member institution: Peking University, the University of San Paulo (USP), the University of Melbourne, TU Munich and the University of British Columbia.
The Federal University will soon join the Times Higher Education and QS international rankings, which has agreed to the principle. The ARWU (Shanghai) ranking refuses to list federal universities as defined under French law (COMUE). However, researchers from the Paris Observatory have simulated the rankings of French federal universities under the ARWU classification. The Federal University of Toulouse was ranked 99th in this simulation.

1.5.9) Focus: remarkable achievements

- The creation of the only *Ecoles des Docteurs* in France that provides an integrated and interdisciplinary approach for supporting PhD students to help them mature their career plans and offers them personalized courses, thus creating ideal conditions for pursuing an international career.
- We have launched an innovative bridge between law and medicine by funding the *Assess legal and economic uncertainties weighing on the collection of biological resources (tumours, tissues, cells) in oncology, the provision and the economic development of these materials* project within the *ATS* programme.
- The IDEX has allowed us to invest in exceptional scientific facilities in a very short timeframe, including:
    - a new storage system, thanks to the support of the IDEX (Research and Digital, €850k). This Big Data centred project, named DATAMIP and with a 2015 budget of €1.6M, will lead to the creation of a storage infrastructure with a total capacity of 7 Petabytes, which will complete the "Equip@meso" Equipex;
    - A multimodal cell and tissue analysis platform, allowing for the characterisation of the properties of the living from cell level to tissue level. This set-up, which would consist of units for thermophoresis, dynamic determination of excited state lifetimes, multispectral imaging (LabelFree) and a fast TIRF photonic microscope and would combine single particle tracking technologies (HT-TMP) and *in-vitro* FRET would be the first and only one of its kind. This operation is supported by the TULIP LABEX;
    - An ultimate microscopy unit (I2TEM - Hitachi) equipped with a high frame-rate camera (> 100 frames/sec) in order to observe *in situ* plastic deformation mechanisms and phase or structure change in advanced materials subjected to external stresses (electrical, mechanical,...). This system, promoted by the Next Labex, will be the first and only one of its kind.
- We have completed a series of projects on the issue of "Drones" in a very short period:
    - Two research projects were funded as strategic initiatives in key areas: (*Autonomous Exploration of Confined Environments by Compact Micro Air Vehicles* and *Intelligent assistance for Supervised Control in drones swarms Operations: providing intelligent software assistance in tasks and authority allocation among human operator and autonomous artificial agents*;
    - A project was funded as part of the *Equipement* programme (the facilities include a remote remains-sensing UAV (multispectral imaging and laser micro-topography) and three-dimensional mapping equipment for remains buried below the surface of the soil (radar, electrical resistivity, magnetometer). It draws on the expertise of 2013 Chair Ted Gragson;
    - These operations supported by the IDEX come in addition to the construction of a *drone aviary* funded through the CPER. All of these results justify the recent creation of a Drones *Groupement d'Intérêt Scientifique* (GIS) project involving the CNRS, the ENAC, the ONERA, the ISAE, the INPT, UT2J, UT3 Paul Sabatier, the INRAP and Météo-France.

- The coherent whole formed by *Toul'Box* and the *Welcome Desk* remains unequalled in France and is a major outcome of the IDEX. The dual objective of anticipating the mobility issues and making life easier for newly arrived students and researchers is now achieved through the combination of these two tools.
- The training of new faculty and educational counsellors in all the *Grandes Ecoles* and universities coordinated by the *Défi Diversité* IDEFI of the IDEX Form project.
- The IDEFI *FREDD* supported by TSE scientific excellence, has successfully taken up the challenge of offering a high-flying training programme combining the equality of chances to all students for them to succeed, an in-depth transformation of the skills acquisition scheme, a solid career path guidance, and a greater international reach.

The creation of the IDEX education and research programmes has supported the emergence of other PIA instruments. By starting slightly earlier than the IDEX, players have a better vision of the activities completed so far and of their impact: the LABEX projects were awarded to some of our most advanced research communities, represented by the Toulouse School of Economics and by its director Jean Tirole.
When looking at the LABEX, two points stand out: the structuring role they have played in their communities and beyond, and the fact that they are not restricted to and only focused on their own work. They have gotten the wider community involved, taken part in calls for IDEX projects, impacted education (sometimes by direct funding) and interacted with each other. Today, they are involved in developing our research strategy.

Due to their early start, SATT and all of the LABEX were already evaluated a few months ago. The very positive assessment and feed-back strongly encourages us to capitalise on their structuring impact in order to replicate this mechanism in other communities.

Finally, let us note that the decision to take a collective approach to the UNITI project was the catalyst for the creation of a single federal university. The project has helped to federate all the resources dedicated to education and research over an area larger than Belgium not only by the French Ministry of Education, but also by five other ministries and five national research organizations, and to combine public and private players as well as foundations, beyond the boundaries of disciplines, with the utmost respect for the individuality of each structure and discipline. If we compare our initiative with other university sites of equivalent size in the world, we can see the sign of a great collective political maturity which guarantees a solid foundation so that excellence in the research and education of tomorrow can continue to develop on our site.

2. PROJECTION INTO THE FUTURE

With respect to the "Target University" and the major objectives that have not yet been achieved (see table in 1.4), what - if applicable - are the main milestones remaining to be crossed?

Our ambition is to tackle today's great scientific, economic and societal challenges, many of them interdisciplinary, by committing the best teams in an environment of excellence created by the Federation's member institutions. To that end, we will make full use of the resources and practices that have been developed and successfully tested during the probationary period, and which are based on a cross-disciplinary approach to research.

The governance of the Federal University (the Target University) will be completed in April 2016 with the election of its board of directors. **Our three long-term strategic objectives constitute the structural framework for the initiatives and commitments of the members/associates of the Federal University. Each of these objectives aims to contribute to the construction of a world-ranked research university on the site by 2022:**

- **Enhance the site's attractiveness and visibility** in order to attract the best researchers, faculty and students and to make the Federal University one of the top 100 international universities;
- **Develop cross-disciplinary research and education** in order to take on the key scientific challenges of tomorrow, to innovate on the cutting edge of knowledge and to prepare students to face ever more complex socio-economic challenges. Only an academic institution of this size is able to offer a cross-disciplinary approach in a broad range of fields;
- **Boost the socio-economic impact of the Federal University players** by further increasing our investment in the Aerospace Valley competitiveness cluster and by banking on this experience to generate similar ecosystems in other fields by developing partnerships with a wide range of businesses.

These objectives and related ambitions compel us to follow the trajectory launched three years ago and to implement new actions and endpoints in the next six years.
A Strategic Orientation Committee, composed of members from outside the Federal University, will be set up in 2016 to monitor progress.

Objective 1: Enhance the site's attractiveness and visibility

- Initiatives to increase our international visibility, in particular:
  - A wider use of the single signature: University of Toulouse *(cf. Commitments)* and applications for the top international rankings (*cf. commitments*);
  - From 2017 onwards, the PhD degree is to be issued by the Federal University within the framework of joint accreditations. The certificate will display the seal of the institutions at which the students are enrolled;

- Developing English-taught Masters' programmes in order to attract more English-speaking foreign students and to better prepare French-speaking ones to join international research networks (*cf. Commitments*);
- Increasing teams' involvement in European research and education schemes. To this end, the dedicated European project support staff from the different institutions and research organizations will join forces as of 2018 (*cf. Commitments*);
- Strengthening joint programmes of excellence by supporting complementary structures to LABEX, in order to develop collaboration and resource-sharing among teams to attain the highest scientific standards: federated structures (Fluids, Energy, Reactors, Materials, and Transfers Federation, Federation of Research in Agrobiosciences, Interactions and Biodiversity, Centre for Integrative Biology, Genotoul, Federative Institute of Research in Law) or services and research units (Institute for Human Sciences and Society), joint services units (Raymond Castaing, CALMIP);
- At the end of the LABEX programme (2019), each LABEX or IDEFI will have the chance to be granted further funding from the IDEX capital, subject to two prerequisites: request must be made by the relevant LABEX or IDEFI PI and by the coordinating institution; approval by the CAr, which will set the level of funding. The LABEX and IDEFI renewal evaluation process shall be carried out every 5 years. Any commitments made by a LABEX for projects validated by the CAr will be transferred to the IDEX, should funding not be renewed or should the LABEX budget be reduced to such an extent that it cannot meet its commitments;
- Enhancing the visibility of the site's course portfolio thanks to interactive international portals (overall mapping and engineering portal). Opting for a more Anglo-American theme-based approach (e.g. distinction colleges/departments), fostering summer schools initiatives and joint international degrees (e.g. *Ecole Européenne de Droit)* will also be an added asset;
- Developing targeted partnerships through Toulouse Engineering with universities including Cornell University (NY) and Georgia Tech (Atlanta), the Hong Kong University of Sciences and Technologies, or the Delft University of Technology.

- Initiatives to identify and welcome leading international talents, such as:
  - On-going funding for the *Chaires d'attractivité* to host top-ranking international researchers and the creation of *Chaires Juniors* (*cf. Commitments*);
  - Expansion of the *Toul'Box* and *Welcome Desk* programmes, which provide newcomers with a range of services unique in France and in line with the highest international standards. Mobility grants to attract top students may be added to the *Toul'Box* (*cf. Commitments*);
  - Enhancing our international reach by striking new partnerships with the USA, Canada, Australia, New Zealand, Japan and Mexico and encouraging strategic alliances with some leading European universities which share common features with the Federal University, such as Bologna University, the Technical University of Munich (TUM) and the University of Mannheim (*cf. Commitments*).

Objective 2: Develop cross-disciplinary research and education

- Implementation of a research strategy for the 2016-2020 period:

In addition to the initiatives aiming at coordinating research strategy among institutions through research hubs, the stress is laid on a dual objective which consists in providing specific support for disruptive research and in encouraging interdisciplinary studies that address challenging societal or economic issues. To that end, we will rely on the appraisals and choices made by the CAr in accordance with the procedures set out in the grant award agreement. The Car's scope shall be extended, in particular to cover the *Chaires Juniors* programme.

Seven key measures will form the backbone of our policy:

1) **Continuation of the senior *Chaires d'Attractivité* programme and creation of *Chaires Juniors.***
2) **Developing the training to and by research:** the *Ecole des Docteurs* will intensify its training, international mobility and career preparation initiatives in particular thanks to the development of an interface with companies in order to help doctoral students start their careers.
3) **Regeneration of disciplinary or interdisciplinary research topics:** this implies changing the orientation of the *Emergence* programme to open it up to interdisciplinary work while maintaining its focus on disruptive research, without any systematic link with socio-economic issues.
4) **Specific support for the creation of inter- and cross-disciplinary research networks** to explore new concepts and fields upstream of research projects, potentially in partnership with international researchers.
5) **Development of strategic actions;** their interdisciplinary character will be emphasized, and will become a criterion for IDEX support. This evolution will be accompanied by an enhanced part played by the programming committees; they will be led by a director appointed by the Council of Members upon recommendation of the DRDV in order to ramp-up the drive of strategic initiatives and to give momentum to in-depth work upstream of calls for projects.
   The *Aeronautics, Space, Embedded Systems* and *Heritage ATS* will be maintained. The *ATS Multidisciplinary research and innovative technologies for innovative treatment of cancer* will become a sub-theme of a broader line of action on healthcare, which will also include the *Integrative Approach to Ageing* and *Systematic Approach to Health-Society-Environment interactions* themes. Similarly, the *Sustainable transformation of natural resources* initiative, which was supported during the first three years, will be included in a broader *Sustainable development* initiative, which will cover interdisciplinary issues related to water and energy, in partnership with the *Water* and *DERBI* competitiveness clusters.
6) **On going strong support for the joint acquisition and running of exceptional research facilities and equipment.** The IDEX *Equipement* programme will be continued.
7) Increased funding for the **interdisciplinary doctoral programme**; its current budget of 1.2 million Euros per year provided by institutions will reach 2 million Euros in 2018.

- Initiatives to shape a joint approach to training and to facilitate the design of cross-disciplinary courses based on the education hubs:
  - Implementation of an international approach to quality assessment and upgrading of courses. This approach is largely based on The European University Association (EUA) reference document;
  - Development of an inter-institution teaching community to allow dissemination of new teaching practices and broader experience sharing via, in particular, the educational advisors and services of the Federal University (*cf. Commitments*);
  - Ramp-up and promotion of Toulouse Engineering members to define 10-year forecasts (plenary working group and foresight committee);
  - Increased coordination of the course portfolio, in particular through joint coordination of Masters majors;
  - Design of new multidisciplinary programmes and enhancement of their attractiveness based on the site's course offer map (Majors/minors, double degrees).

Objective 3: Boost the site's socio-economic impact

- Initiatives to improve our visibility to business and the broader community:
  - Description of our portfolio of initial and continuing education in terms of skills and jobs to improve its visibility and make it more legible to the socioeconomic community worldwide. This initiative will also help promote our lifelong learning programmes, based on initial education existing skillsets;
  - Setting-up of foresight committees in the cross-disciplinary education hubs.

- Initiatives to enhance our relationships with business and society
  - For the *Ecole des Docteurs*, co-working workshops to increase the visibility of doctoral studies and to promote know-how transfer and the hiring of newly PhD graduates;
  - Promoting in-house senior and junior consultant services to companies;
  - Ramp-up of the PEPITE initiatives (training and support for students who have a start-up project);
  - Greater emphasis on the valorization initiative to meet businesses' needs for scientific and technical skills;
  - Intensification of licensing activities and business creations by SATT, thus offering a showcase for start-ups and technology transfers;
  - Development of a research-education-business ecosystem in the healthcare and energy sectors.

Beyond these 3 strategic objectives, **the Federal University also aims at developing pooling of human, technical and financial resources in order to boost the efficacy of joint initiatives:**

- More consistent campus initiatives and funding:
  - The Federal University will become a model for contractual relationships with stakeholders including the Ministry of Education, regional authorities and research organizations from 2016;
  - A Federal University observatory will be created to enable the sharing of indicators in research, education, valorization, international relations, with the hubs, the Council of Members and the Board of Directors.
- Better coordinate human resources on the site:
  - 25% of new academic positions each year dedicated to initiatives supported by the IDEX. The resources will be provided in the site contracts signed with the research organizations.
- Intensify the use of resources:
  - Pooling of equipment and facilities: on-going implementation of an integrated policy for research facilities and support to joint services units (UMS) by the Federal University; encouraging companies to open their facilities to researchers and start-ups (laboratories, workshops, clean rooms, analytical platforms, mainframe computation facilities). The initiative will lead to more numerous exchanges within our unequalled innovation ecosystem;
  - Digital technology initiatives will include an architectural project which should enable interoperability among the information systems of the Federal University institutions, as well as the development of a private and secure cloud, for enhanced shared digital services.

Nature of the commitment	Description of the indicator	Target	Date of achievement
ATTRACTIVENESS AND VISIBILITY			
Increase the site's scientific excellence	The Federal University's position ranking.	Top 100	2022
Deploy a single signature	% of researchers using the single signature.	90%	2017
Host leading foreign researchers	Current number of *Chaires d'attractivité*, including junior chairs.	6 senior chairs per year and at least 6 junior chairs	2022
Increase the number of English-language degree programmes (either by modifying existing Masters programmes or creating new ones)	The number of English-taught Masters programmes: creation of English-taught tracks in all disciplines.	4/year	2022

PhDs granted by the Federal University and co-signed by a member establishment	% PhDs	100%	2017
Presence of teams in European programmes: increase the success rate to 30% and encourage project submissions (increase by 15 % per year the number of projects submitted in coordination or partnership)	Number of projects submitted as coordinator.	30%	2022
Quality of welcome for international talents	Number of *Toul'Box* provided.	2,500	2017
Stronger international partnerships	Number of MoU with ARWU top 150 universities.	20	2022
	Growth of incoming mobility.	5%	2018
	Creation of dual or joint degree programmes (including Engineering programmes).	2/year	2018
	Creation of joint research structures.	1 UMI 6 LIA/GDRIs	2022
CROSS-DISCIPLINARY WORK			
Improve course quality	% of faculty involved in teachers' individual or collective training initiatives.	50% of faculty per year	2017
Resources assigned to interdisciplinary research	Number of PhDs earmarked for interdisciplinary research per year.	30	2020
Shared budget to promote cross-disciplinary research	Pooled budget (PhD grants).	2M€/year	2022
Cross-disciplinary research projects	Number of projects funded per year.	30	2020

SOCIO-ECONOMIC IMPACT			
Enhance the Federal University' relationships with businesses and society	Number of Federal University consultants called in by companies and number of beneficiary companies.	40 consultants 40 companies, including at least 20 SMEs or MSCs	2022
Support business creation	Number of businesses created per year.	8 per year (cf. SATT)	2022
Develop student - entrepreneur status (PEPITE)	Number of students joining the initiative.	1,000	2022

What are the main difficulties to overcome in order to achieve this agenda?

The member institutions' boards have approved the above-stated agenda without any restrictions. Fulfilling our objectives remains tightly connected to the continuation of the IDEX label and related funding.
Moreover, the fact that it is still difficult for our federal structure to be part of some international rankings (ARWU, Leïden…) is damaging to our international visibility and attractiveness.

With which university (or universities) does the IDEX intend comparing itself to adjust its strategy and pursue its development trajectory?

Approach:
Our objective is to identify a university in which the organisational structures that have arisen from a research and education strategy similar to ours have proved to be effective and could serve as a model for us. Below, the first set of criteria used to identify this target:

- Ranking among the world top 100 universities;
- Topology similar to ours (disciplines covered / number of students / research structures)

Based on these criteria, we have drawn up a shortlist of institutions from all over the world. We then took a closer look at and established direct contacts with universities on that list which have a specific approach similar to ours, and whose main goals are: i) Boosting the University's attractiveness; ii) Developing cross-disciplinary research and education iii) Increasing the university's socio-economic impact.

Target:
We have selected the Pennsylvania State University (Penn State), ranked 60th in the ARWU, whose key features are listed in the table below:

Penn State University	**Federal University of Toulouse**
24 campuses across Pennsylvania	20 campuses across Midi-Pyrenees
16 Colleges	24 members/associates
95,000 students	96,000 students
17,000 staff members	12,000 staff members
4,500 PhD students	4,500 PhD students
1 University Hospital	1 University Hospital

Penn State's pro-active human resources management policies (start-up and welcome packages, career development professorships) are quite common in large North American universities, and we have identified them as points of reference for our *Nouveaux Entrants*, *Chaires d'attractivité* and *Chaires Juniors* IDEX programmes, the latter being a recent addition to our strategy. The differentiating element that led us to select Penn State is the existence of 12 interdisciplinary institutes within the university, founded two decades ago. The areas of studies of these structures echo particularly well our strategic initiatives as stated in the table below. We are particularly interested in the nature of the governance of these institutes (they are led by councils and directors holding the status of department head), in their role in the university, where they interact with research departments when setting up interdisciplinary projects and in their assignments. Some of the institutes even manage research equipment and facilities for a group of research departments.

Penn State University	Federal University of Toulouse
Creation of 12 "Interdisciplinary Institutes" (1995)	Strategic Actions (2013 then 2016)
Clinical and Translational Science Institute and Huck Institutes of the Life Sciences	Health: Cancer, Ageing, Health-Environment Connection
Institutes of Energy and the Environment Sustainability Institute	Sustainable Development: Conversion of natural resources, Water, Energy
Social Science Research Institute	Heritage
Materials Research Institute Institute for CyberScience	Aeronautics, Space, Embedded Systems

Approaching the target
Landmarking

Our objective is to benchmark 7 of our programmes (*Nouveaux entrants*, *Chaires Juniors*, *Chaires d'attractivité*, structuring and role of *ATS* programming committees, joint management of scientific facilities, organisation of educational hubs, SATT) with reference to those already operational at Penn State, leading to a comparative critical analysis of objectives, implementation and outcomes. As an example, during the 2010-2015 period, Penn State released 45,660 publications that received 68,848 citations for an H factor of 153, while the University of Toulouse issued 44,400 publications, which received 38,365 citations for an H factor of 142 (Source: Scopus, consulted 5/12/15). The annual rate of publications per sector and their H factor, the jobs gained by PhD students, the number of patents or the percentage of international students are some of the key indicators to be used in the comparative study of our trajectory.

3. OPTIONAL ASSESSMENT AND ANALYSIS

1. From the diversified University of Toulouse to the centralised Federal University

The University of Toulouse, founded in 1229, is one of the oldest universities in Europe. It remained a single entity until 1969, when it was split up into four separate universities.
During the course of its history, many other higher education institutions were founded in the region, the first in 1805 and the majority in the twentieth century. Today, our site boasts 14 *Grandes Ecoles*, 7 of which are federated as the INPT. These schools are overseen by six different line ministries.
During the twentieth century, six research organisations also set up centres on the Toulouse site: CNRS, INRA, INSERM, IRD, ONERA, CNES.
Consequently, our site reflects both the wealth and the complexity of the French higher education and research system. All of these forces add up to around 96,000 students, 5,500 researchers and faculty, 6,500 support personnel and 136 laboratories with a consolidated budget of €1.2 billion.
This diversity is a genuine source of wealth as it enables us to provide a very wide range of training programmes and research teams with exceptional possibilities in terms of acting in the most proactive and responsive manner.
In order to develop a common policy applicable across the site, we opted for the federal model. This choice has enabled our site to both step up cooperation between universities, *Grandes Ecoles* and research organizations and, at the same time, to remain on a human scale and as close to the site players as possible, ensuring responsiveness and innovation while also fostering cross-disciplinary synergies in order to take up major scientific challenges.

2. Current features of the Federal University of Toulouse

When mention is made of our site, the first thing that comes to mind is Economics, thanks to the highly successful School of Economics (TSE), which is a component of the University Toulouse 1 Capitole, and to Jean Tirole's 2014 Nobel Prize, and at the other end of the spectrum thanks to aeronautics and space, with the concentration of world-class training and research institutions (UPS, ISAE-SUPAERO, ENAC), a research organization (ONERA) as well as a large number of research laboratories, CNES and global companies including AIRBUS, THALES Rockwell, SAFRAN and ATR. All these players cooperate in the Aerospace Valley global cluster of competitiveness.
Our site also harnesses other outstanding forces that contribute to its development. The scientific challenges faced by the Federal University are very much in line with France's national research strategy (SNR). The probationary period made it possible to identify and share the strengths of the site. The 10 challenges of the SNR are represented with variable specifics and weightings. Some of them had already been identified and have been the subject of cross-cutting strategic actions such as space and embedded systems. Others will need to be supported in the future given the site's major involvement in their fields: energy, health, social and cultural innovation, modelling and managing the big data that irrigates the majority of our strategic actions and relies on a very high-level computing and storage data infrastructure. In parallel to these challenges, the site is heavily involved in the progress of knowledge and upstream research.

These include, but are not limited to, the economics of contracts and organisations, archaeology, research on decision-making and optimisation, fundamental mathematics, fluid mechanics, upstream research in areas ranging from synthesis to characterisation and modelling, integrative and evolutionary biology, animal cognition, upstream research into infectious diseases, studying the interstellar medium and oceanography. The site is also identified as France's leading engineering research centre in France.
Prior to the advent of the IDEX, the Toulouse site was characterised by research shared between universities, *Grandes Ecoles* and research organizations conducted in laboratories overseen by various institutions (this is true of 82 of the site's 136 laboratories). The laboratories have always been set-up in accordance with the scientific strategy and their thematic scope and not based on which institution the researchers belonged to. This particularity has enabled genuine synergies and has forged a culture of sharing and cooperation that is now deeply rooted in the community and which is illustrated by the following developments:

- Research federations in Engineering (FERMaT), Chemistry (IST), and Agrobiosciences (FRAIB, Genotoul) which are technical platforms and also places for scientific cooperation and the incubation of interdisciplinary ideas. Most of these federations receive significant support from the IDEX, in particular through five *Chaires d'Attractivité*;
- Joint Service Units (UMS) and EQUIPEX: in the field of Intensive Computing (CALMIP), materials (CMCRC) and the Regional Centre for Functional Exploration and Experimental Resources (CREFRE), which operate cutting-edge materials for the whole site;
- Research and Service Units such as the Humanities and Social Sciences Centre (MSHST), the Institute for Advanced Life Science Technologies (ITAV) and the CNRS's Experimental Ecology Station in Moulis, which combine outstanding technical platforms with research programmes enabling researchers to work there on a temporary or permanent basis;
- National facilities, such as the National High Magnetic Field Laboratory or the National Spark Plasma Sintering Platform, which this year received IDEX funding amounting to 50 % of its research investment;
- We will, of course, continue to make use of LABEX structures to develop upstream cross-disciplinary projects. This includes but is not limited to bio economics, the mechanisms governing decision-making processes and collective organisations (SHS-Economics-Biology-Physics), integrative human and animal biology (Sociology-Health-biology-agronomy), as well as integral ecology (SHS, agronomy-ecology). The new Cross-Disciplinary programme will be perfectly suited to these approaches.

An illustrative example is one of the largest centralised centres we have created on the Montaudran campus (which borders the Rangueil scientific campus), which is currently home to major scientific strengths essentially dedicated to materials and structures *(Institut Clément Ader*: centralisation of the laboratories of three engineering *Grandes Ecoles* and one university) in particular for aerospace and intensive computing. The IRT Saint Exupéry research institute and *Météo France* have been attracted by the research potential, scientific instrumentation and facilities of this campus dedicated to scientific computing. The Campus Plan has provided the funding for buildings while the State/Region Project Contract has facilitated the purchase of scientific equipment: computing (274 TeraFlops) and scientific instruments (two electron microprobes, four field emission scanning electron microscopes electronic microscopes one of

which is a dual-beam instrument, five transmission electron microscopes, and one secondary ion mass spectrometer).

Instruments previously installed in three different locations in Toulouse have now gathered on a single site. The same applies to the engineers who are tasked with using them, conducting maintenance and training users. This centre is now one of the most powerful and best organised in southern Europe. The Montaudran campus will be completed in 2017 with the installation in a new location of the IRT Saint Exupéry which specialises in aeronautics and space and the *Jacqueline Auriol* education centre. Driven by the Campus Plan, this centre will centralise the site's mechanical engineering courses, which are currently provided by UPS, INSA and ISAE. Organised around seven high-level technological platforms, the centre will host 1,200 students, apprentices and trainees (IUT, professional Bachelors, Masters and engineers) and will also be home to the AIP-PRIMECA (Inter-University Production Workshop/Mechanical IT Resource Centre).
The opening of the *Jacqueline Auriol* education centre will complete the "research-innovation", "transfer-service", "initial-continuing education" higher education triangle by bringing together all of the forces, expertise and facilities on the same campus. By 2017, the Montaudran Campus, which has been expanding since 2013 will have seen its number of researchers increase from 200 today to 500.
With regard to common services for research and training, the considerable experience of inter-university services, some of which were initiated 20 years ago, have enabled us to develop, amongst others, the all-purpose digital pass for students and all the staff, health services for students, as well as documentation services for training and research.
As part of the Campus Plan, an overall scheme for the 10 campuses in Metropolitan Toulouse has been developed. Within this context, it was decided that the Federal University of Toulouse would be organised around two common centres:

- The Research and Valorization Centre, a 10, 000m^2 building located on the Rangueil scientific campus, the Research, hosting Doctorates and Valorization Department, including the *Ecole des Docteurs*, the SATT (TTT) as well as common services for digital, real estate and continuing education.
- The head office of the Federal University, located in one of the rehabilitated buildings of the initial University of Toulouse and home to the management, new student and researcher services, international relations as well as scientific and technical education departments.

These achievements would not have been possible without the convergence of the following conditions:

- The first was access to financial resources that significantly exceed the standard budgets for such operations. In this respect, the convergence of FEDER, Campus Plan, CPER and now PIA represents a genuine opportunity.
- The second was the political support of all of the higher education players, research organizations and institutions (State, Region, Metropole) and therefore the trust of their members. Political and scientific cooperation started within the framework of PRES and has been developed by PIA as described in the following paragraph.

3 - The IDEX programmes provided the catalyst for structuring our university site

In our region, the implementation of a series of policies had paved the way to developing an immense research and training capacity, but the number and diversity of the players created gradually resulted in this research and training offering being fragmented not only administratively but also geographically. While the Toulouse site is surrounded with 10 regional university sites, an in-depth analysis shows that there are over 10 campuses within the Metropole.
Applying for the IDEX was a means of sharing a common goal, and the diversity of the PIA instruments provided an ideal opportunity for everybody to achieve their ambitions and meet their requirements.
The option we chose to allow all players to have access to the IDEX acted as a catalyst at several levels. The structuring effect of the LABEX the impetus created in the area of innovation by the SATT, and the creation of research and education coordination hubs all contributed to removing the barriers between the players and the sites and resulted in switching from an individualistic mind-set to a far more collective philosophy. Allowing all of the site's players to apply for education and research programmes has also considerably contributed to making them aware that they can play a role in the excellence of the site and has convinced them their work could be optimized. The downside of the success of these calls for projects is that many are called but few are chosen, but the selection systems we have introduced are very demanding and completely impartial and hence enable us to continue to use these procedures.

The site has therefore already changed considerably in barely three years, a change exemplified with the development of the research strategy. In 2013, we realised when negotiating a site agreement with the CNRS just how difficult the Federal University was finding it to map out the research done on the site, and to develop a strategy for it. Today, this mapping is fulfilled and all the organizations, member institutions and associates, LABEX and coordination hubs, have contributed to developing it, thus enabling a set of key strategic areas to be identified. In this latest move, the IDEX helps us by providing:

- A structuring matrix, given that we have assigned a series of strategic thematic actions jointly built when preparing the UNITI in order to develop our strategy which, by choice, focuses on highly important economic or societal concerns that are essentially interdisciplinary.
- Resources for the implementation of our policy, as our strategic actions will sit comfortably, at least partly, in the IDEX programmes, which make it possible to obtain extra funding. These resources, managed by the Federal University, finance the cross- disciplinary strands of our policy by drawing on the combined expertise of teams from the whole site. This mechanism automatically results in a contribution on the part of the member institutions, as for each euro invested in a project by the IDEX, the teams' home institutions invest two euros.

The results are clearly visible on the ground, for instance through the very high number of cross-disciplinary projects with their quality having been underlined by our CAr. They can also be seen in the structures through the diligence of all the participants in the different bodies (Council of Members, Departments boards, etc.), and through the determination of numerous players on the site join and/or to work with the Federation. As a result, a large part of the programme is now in place. The university has now identified its fundamentals and has created the bodies required for its operations and to enable it to adapt to a changing environment. Moreover the Federal University has been selected to handle the 2018 European Science Open Forum (ESOF) making Toulouse the European city of science on that year.

This federal university system is now up and running, enabling us to develop our international reach. This explains why a large part of the IDEX budget is earmarked for attracting high-level researchers, both promising young talents and very experienced professionals.
We also count on enhancing our image thanks to the mobility of our students and researchers, by creating companies and transferring the research results to markets through the success of calls for projects, in particular European, by loaning personnel for our pooled scientific platforms, by exporting our courses and by creating international research units.

4. Potential for improvement

While it is already possible to assess the impact that the IDEX has had on our collective organisation, the structuring of research, particularly with regards to the LABEX and EQUIPEX structures, and on innovation through the SATT, it is still too soon to measure its impact on research at international level and on students' success because this type of assessment requires a longer timeframe.
Nevertheless, we have already identified the potential for improvement in the following areas:

- The impact of our publications: by way of an example, in the 2010-2015 period, Penn State University, which has the same scientific scope and approximately the same resources as the Federal University, published 45,660 articles which received 68,848 citations for an H factor of 153, while we published 44,400 publications which received 38,365 citations for an H factor of 142 (Source: Scopus, visited on 5/12/15). It is clear that our flow of publications meets the international standards and that our best publications almost match those of a university in the ARWU, but that part of our work is used far less than that of our counterparts. We plan to analyse this situation and launch an information and awareness campaign aimed at researchers and doctoral students in order to increase this impact.
- In conjunction with the SATT and IRT, a comparable analysis could be conducted with regard to enhancing the visibility of our research. We will pay close attention to analysing the impact of the Penn State University policy, which does not keep the intellectual property rights to inventions if their industrial partners request them.
- We must increase our involvement in European calls for projects in a significant manner in order to become the French leader, as indicated elsewhere in this report. Our aim is to increase the number of projects submitted by 15 % a year to double the number of projects submitted by 2022.
