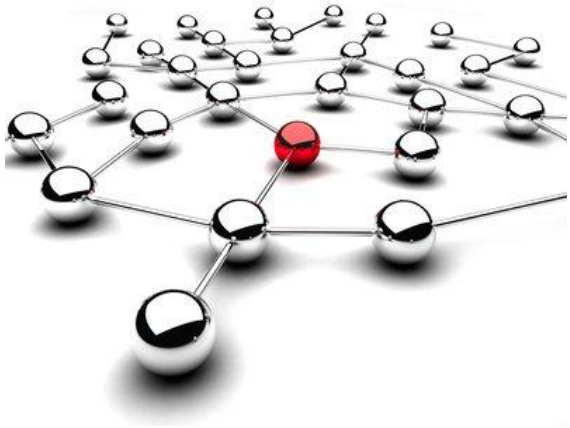
UBL

Université Bretagne Loire

UBL+



Project acronym	**UBL+**
Project title in French	Initiative d'Excellence UBL+
Project title in English	**UBL+ Excellence Initiative**
Project coordinator	Olivier Laboux Contact details: president@univ-nantes.fr +33 (0) 631 052 297
Institution leading the project (initiator)	ComUE (Community of Universities and Establishments) Université Européenne de Bretagne (UEB)
Capital funding requested under the Initiative, in €[1] million	€ 700 M

Has the working group, represented by the initiator, determined what kind of Initiative corresponds to its project: IDEX (Excellence Initiative) or I-SITE (Science-Innovation-Regions-Economy Initiative)? Specify the selection below:

IDEX ☒ I-SITE ☐ Selection not made ☐

[1] Excluding Labex and Idefi

TABLE OF CONTENTS

Glossary

Acronyme	English	Français
AERES	Evaluation Agency for Research and Higher Education	Agence d'évaluation de la recherche et de l'enseignement supérieur
AIC	The Advisory International Committee	Comité d'évaluation international
ANR	National Research Agency	Agence Nationale de la Recherche
ASU	Arizona State University	Univerisité d'Arizona
CIFRE	Financing mechanism for companies to recruit young PhD Students	Convention Industrielle de Formation par la Recherche: Dispositif financier permettant aux entreprises de recruter de jeunes doctorants
CNRS	National Centre for Scientific Research	Centre National de la Recherche Scientifique
ComUE	The Community of Universities and Establishments	Communauté d'Universités et d'Etablissements
CSTI	Disseminetion of scientific culture, technical and industrial	Centre de culture scientifique, technique et industriel
DIRD	Domestic Expenditure on research and developpment	Dépenses intérieures de Recherche et Développement
EC	Executive Committee	Comité exécutif
EEC	Excellence Ecosystems Council	Comité des écosystèmes d'excellence
EPSCP	Scientific, Cultural and Professionnal Public Institution	Établissement public à caractère scientifique, culturel et professionnel
Equipex (PIA)	Equipment of Excellence	Equipement d'Excellence (PIA)
ERC	European Research Council	
FIAS	Frankfurt Institute for Advanced Studies	Institut d'Etudes Avancées de Francfort
H2020	R&D european Program for the period 2014-2020	Programme européen pour la période 2014-2020
HER	Higher Education and Research	
ISC	Internnational Sustainability Centre	Centre International de la Soutenabilité
ICT	Information and Communication Technologies	Technologies de l'Information et de la Communiation (TIC)
IGO Labex (PIA)	Immuno Graft Oncology	Immunologie - Greffe - Oncologie
IHU (PIA)	University Hospital Institute	Institut Hospitalo-Universitaire
InCAS	International Centre for Analysis and Synthesis	Centre d'Analyse et de Synthèse
IOI	The Institute for Open Innovation	Institut d'Innovation Ouverte
IRT (PIA)	Technology Research Institute	Institut de recherche technologique
ITE (PIA)	Institute for energy transition	Institut de la transition énergétique
JEI	Young Innovative Companies	Jeunes Entreprises Innovantes
KIC	Knowledge and Innovation Community	Communauté de la Connaissance et d'Innovation (CCI)
Labex (PIA)	Laboratory of Excellence	Laboratoire d'Excellence
LIA	Associated International Laboratories	Laboratoire International Associé
MOOC	Massive Open Online Course	Cours en ligne
Nominations IUF	French University Institute	Institut Universitaire de France
Obex (PIA)	Subject of excellence	Objets d'Excellence (labellisés dans le cadre du PIA)
OST	Observatory of Sciences and Technologies	Observatoire des Sciences et des Techniques
OSU	Observatory of Sciences of the Universe	Observatoire des Sciences de l'Univers
PACA	Provence Alpes Côte d'Azur	Région Provence Alpes Côte d'Azur
PE	Perimeter of Excellence	Périmètre d'excellence
PI	Principal Investigator	Chercheur principal
PIA	Future Investment Program	Programme d'Investissement d'Avenir
PME / SME	Small and Medium Size Entreprises	Petites et Moyennes Entreprises
R&D	Research and Development	Recherche et Développement
S3	Smart Specialisation Strategy	Stratégie régionale de Spécialisation Intelligente
SATT	Technology transfer acceleration company	Société d'Accélération du Transfert de Technologie
SC	Steering Committe	Comité d'Orientation

Acronyme	English	Français
SHS	Humanities ans Social Sciences	Sciences Humaines et Sociales
STRATER	Territorial Strategy for Research and Higher Education	Stratégie territoriale de l'Enseignement supérieur et de la Recherche
STS	School of Transdisciplinary Studies	Ecole des hautes études transdisciplinaires
TICs	Transdisciplinary Institute for Complex Systems	Institut transdisciplinaire des systèmes complexes
UBL	Bretagne Loire University	Université Bretagne Loire
UC	University of California	Université de Californie
UCLA	University of California Los Angeles	Université de Californie Los Angeles
UMI	International Mixed Units	Unités Mixtes Internationales
UNAM	Nantes Angers Le Mans University	Université Nantes Angers Le Mans
UEB	European University of Brittany	Université Européenne de Bretagne

List of figures

Résumé opérationnel

■ Un démonstrateur d'un nouveau modèle universitaire

L'ambition de l'Initiative UBL+, composante de la ComUE Université Bretagne Loire, est de constituer un démonstrateur d'un **nouveau modèle universitaire fédéral français** dont les fondations sont : une forte implication dans les programmes de recherche et de formation qui s'attaquent aux **grands défis sociétaux**, une **ouverture internationale** systématique, et un **lien profond avec son territoire** par le biais de la formation tout au long de la vie, de l'innovation et de la valorisation de la recherche.

Pour développer cette ambition, nos points de repère principaux sont **University of California** pour son organisation fédérale, **Arizona State University** pour son modèle transdisciplinaire et son modèle de valorisation et, pour l'organisation de ses programmes transdisciplinaires, **l'association Helmholtz.**

En nous appuyant sur les leaderships scientifiques et économiques du territoire, nous avons construit notre Initiative sur **cinq défis majeurs** auxquels la société est confrontée : **les transitions, les ressources naturelles, l'anticipation, la diversité et la démocratie.**

L'Initiative contribuera à la réponse à ces grands défis sociétaux par une **approche transdisciplinaire,** en associant des chercheurs de disciplines différentes autour de questions de recherche liées à un ou plusieurs de ces défis, en croisant les disciplines et les questionnements scientifiques aux interfaces. Cette approche favorisera l'émergence de nouveaux champs de connaissances et de nouvelles activités économiques.

L'orientation de l'Initiative repose sur cinq axes transdisciplinaires :

- Interface Océan et littoral et sociétés en transition
- L'homme au cœur de la société numérique
- Recherche en santé, thérapies de demain et qualité de vie
- Construire durablement l'aliment de demain
- Naissance et vie des matériaux et des structures

Ces axes sont construits comme des **programmes de recherche collective,** permettant de dépasser les frontières des disciplines, des établissements et des continents. Ils offrent ainsi une double opportunité d'effet d'entrainement : **renforcer le périmètre d'excellence actuel et préparer celui de demain.**

Nous tirons la légitimité de notre ambition des **forces scientifiques en présence,** en particulier avec **cinq Labex** mobilisés au niveau des axes transdisciplinaires (Mer, Immunologie, Médecine nucléaire, STIC, Mathématiques), ainsi qu'**une spécialisation forte sur certaines grandes disciplines** (sciences de l'Univers, santé, mathématiques …) et une forte progression de la visibilité des publications.

Le site se démarque également par un **potentiel d'innovation très important** lié à une structuration avancée de son système de valorisation de la recherche avec la présence de nombreux outils de haut niveau du PIA1 : **2 Instituts de recherche technologique (IRT) sur les huit labellisés nationalement** (advanced manufacturing et telecom), **1 Institut pour la transition énergétique (ITE)** (marine renewable energies), **1 Institut hospitalo-universitaire (IHU)** (immunology and transplantation), **9 Instituts Carnot et 1 Société d'accélération de transfert technologique (SATT) Ouest Valorisation,** demain filiale de Université Bretagne Loire (48%), du CNRS (15%), fondateurs de l'UBL+. Dans le cadre du PIA2, il faut y ajouter **2 labellisations French Tech** sur les 9 au plan national.

Enfin, **le territoire présente une masse critique scientifique** (27 380 personnes travaillant dans la recherche et plus de 4000 chercheurs travaillant dans des laboratoires A/A+) **et de formation** (225 000 étudiants inscrits dans l'ESR) **qui permet à l'Initiative un ancrage, un effet d'entrainement, et des perspectives de réussite très favorables** sur notre territoire.

Par ses **principes fondateurs** et son **ancrage territorial exceptionnel** auprès des acteurs publics et du secteur économique, l'Initiative répondra à ces différents objectifs : faire avancer nos méthodes

pédagogiques en y introduisant une culture de l'interdisciplinarité, renouveler les approches disciplinaires en recherche et accompagner l'évolution des Labex, accélérer le transfert de l'innovation, et développer l'internationalisation du site.

- **Des actions emblématiques et structurantes pour ancrer l'Initiative et permettre la diffusion des meilleures pratiques**

Pour remplir ces objectifs dans la durée, l'Initiative va nouer des **partenariats stratégiques internationaux structurants**, parmi lesquels en priorité **Arizona State University, Université Laval et University of California.** L'ambition de coopération avec ces acteurs porte sur les différents volets scientifiques, formation, vie étudiante, valorisation, permettant d'amplifier les mobilités et la mise en synergie de dispositifs communs (laboratoires internationaux, MOOCs, workshops, etc.).

Par ailleurs, quatre actions du programme proposé par l'Initiative sont remarquables et représentatives de la mobilisation du groupement. Ces actions incarnent les axes stratégiques de l'Initiative UBL+, particulièrement la transdisciplinarité. Elles ont vocation à soutenir le déploiement du périmètre d'excellence et sont ainsi caractérisées :

- **The Transdiciplinary Institute for Complex Systems (TICs)** est l'élément phare de la recherche de l'Initiative. Imaginé sur le modèle du **Frankfort Institute for Advanced studies**, il offrira différents programmes et services de manière intégrée. Son programme central consiste à créer et gérer des **chaires internationales transdisciplinaires**, financées pour partie par des fonds privés, dédiées à la **recherche théorique, à la modélisation et à la simulation**. Ces chaires permettront de développer des projets de ressourcement et des projets à risques, au croisement des disciplines de la physique, de la chimie, de l'informatique, de la biologie, des sciences pour l'ingénieur, des sciences de la terre, des sciences humaines et sociales et des mathématiques. Pour les sciences humaines et sociales, le TICs collaborera avec l'Institut d'Etudes Avancées de nantes (membre du Labex RFIEA+). Le **Center for Analysis and Synthesis (INCAS)** permettra de fournir à des groupes d'experts les moyens et les infrastructures nécessaires pour mettre en commun des jeux de données, conduire des réflexions ou produire des *white papers* autour de nouveaux concepts en lien avec les axes de l'Initiative. **L'agence des mathématiques** est destinée à renforcer les interfaces existantes entre les mathématiques, les autres sciences et le monde industriel. C'est une structure légère, pilotée par le **Labex Lebesgue**, qui favorise la recherche interdisciplinaire à fort contenu mathématique.
- **La School of Transdisciplinary Studies**, aura pour vocation première de regrouper, de structurer et de gérer une offre de formations transdisciplinaires en lien avec les axes de l'Initiative et en associant les principaux IDEFI du territoire, ainsi que de développer de méthodes pédagogiques innovantes. Au sein de la School, les actions concernant la formation doctorale seront déterminantes pour le développement du périmètre d'excellence et la visibilité du site à l'échelle internationale. Il s'agit pour UBL+ de positionner le docteur comme vecteur de l'innovation, en favorisant son insertion professionnelle et sa participation, notamment à la création d'entreprises et à la montée en innovation des PME ;
- **L'Institute for Open Innovation** amplifiera l'accès des entreprises à l'excellence académique. Il coordonnera un réseau d'*Innovation Centers* qui mobiliseront des communautés d'acteurs académiques et des entreprises d'une ou plusieurs filières industrielles pour conduire sur un même lieu des projets d'innovation et appuyer la création d'activités et de start ups. Ils seront constitutifs du système de valorisation performant en place sur le site, en s'appuyant notamment sur l'existant ou les développements en cours au niveau des IRT, ITE, IHU, Technocampus, et plateformes. L'Initiative soutiendra sur chaque lieu un axe transdisciplinaire avec mise à disposition de plateformes numériques, de plateaux technologiques, d'espaces de co-working, de fab labs, qui faciliteront l'émergence, la conception et la réalisation des projets innovants. La SATT Ouest Valorisation, opérateur de l'Initiative, en facilitera les montages opérationnels. Les start-ups pourront profiter de services fournis par des accélérateurs privés adossés aux Innovations Centers (juridique, marketing, finances…). Avec le concours d'un community manager, l'IOI créera et animera un large réseau d'incubateurs, d'accélérateurs et start-ups qui pourront s'appuyer sur les compétences de formation et de recherche de l'Initiative pour développer ou accompagner leurs activités. Enfin, l'IOI mettra en place et animera un think tank mobilisant des

experts scientifiques et technologiques, des entreprises, qui sera un outil de réflexions et de propositions sur les meilleures pratiques d'open innovation et d'entrepreneuriat. Le think tank appuiera les développements des Innovation centers en se positionnant comme leader d'opinion sur le sujet avec un enjeu de renforcement du maillage des acteurs de la valorisation et du transfert sur le territoire et en tant que levier de lobbying national et international ;

- **L'International Sustainability Centre (ISC)**, a vocation à être le premier de ce type en France. Interface entre le monde académique et la société civile (acteurs publics, ONG, partenaires socio-économiques, etc.), il proposera d'une part un programme de workshops internationaux, ouverts à tous et centrés sur les liens entre nos axes transdisciplinaires et la notion de soutenabilité, pour enseigner et interroger les principes de l'approche transdisciplinaire et participative en réponse aux grands défis sociétaux. D'autre part, un programme pluriannuel d'ateliers expérimentaux sera également mis en place visant notamment le lancement ou la participation à des grands projets démonstrateurs sur les thèmes ciblés (lien terre/mer/alimentation/homme).

Une gouvernance efficiente

La gouvernance proposée a pour ambition de prendre et mettre en œuvre rapidement les décisions stratégiques tout en permettant la consultation et la mobilisation des parties prenantes. Elle s'appuiera sur 5 instances clés :

- **Le Conseil d'Orientation (CO)** qui définit les grandes orientations stratégiques de l'Initiative pour l'exercice et se prononce sur les projets emblématiques et transformants.
- **Le Comité Exécutif (CE)** qui a pour mission la mise en œuvre et le pilotage opérationnel des actions en lien avec l'ensemble des parties prenantes.
- **Le Conseil des Ecosystèmes d'Excellence (CEE)** qui réunit les *Principal Investigators* (PI) en charge d'animer les écosystèmes du périmètre d'excellence de l'Initiative. Il coordonne l'avancement des différents programmes thématiques transdisciplinaires avec un rôle de partage et d'homogénéisation des pratiques
- **Advisory International Committee (AIC)** qui rassemble des partenaires stratégiques externes à l'Initiative et formule des recommandations sur les orientations stratégiques et le développement de l'Initiative. Il sélectionne les programmes financés par les axes et propose la répartition des financements entre les axes et entre les programmes au sein des axes.
- **Un congrès de l'Initiative** UBL+ est organisé chaque année avec l'ensemble des parties prenantes de l'Initiative.

Un réel effet transformant

La combinaison de nos **défis sociétaux**, de nos **axes** et du **développement de la transdisciplinarité au cœur de l'ensemble de nos activités** (recherche, formation, innovation, relations internationales, vie étudiante) **constitue la signature de l'Initiative et en fait un objet unique dans le paysage français**.

Le déploiement des outils pour **l'innovation et la valorisation du PIA1** (IRT, IHU, ITE, SATT, Carnot) **et du PIA2** (French Tech) **positionnent très favorablement notre territoire** au plan national. En y ajoutant les **outils spécifiques au projet** (Open Innovation Institutes, continuum Université-entreprise), **l'impact sur l'économie et sur la création d'emplois sera démultiplié.**

La vocation de ce nouveau modèle universitaire incubé par l'Initiative, est d'être un démonstrateur pour **l'Université Bretagne Loire (UBL)**, qui sera créée le 1er janvier 2016, venant ainsi parachever le projet commun des acteurs académiques de Bretagne et des Pays de la Loire, en pariant sur leurs complémentarités. **UBL regroupera six universités, une quinzaine d'écoles d'ingénieurs, des organismes de recherche nationaux majeurs et agences (CNRS, Inria, IFREMER, IRD, Irstea, Anses)** et couvrira un territoire de la superficie de l'Irlande. **UBL** sera également le **cadre de développement de l'Initiative.**

Executive summary

Establishing a new University model

The goal of the UBL+ Initiative, part of the ComUE Université Bretagne Loire, is to establish a demonstrator of **a new French federal university model** whose foundations are as follows: a strong involvement in the research and educational programmes that tackle **society's major challenges**, a systematic **international openness**, and **deep links with its region** through ongoing lifelong education, innovation and commercially viable research.

Our principal benchmarks in the development of this goal are the **University of California** for its federal organisation, the **Arizona State University** both for its transdisciplinary model and its model of commercial viability, and the **Helmholtz** association for the organisation of its transdisciplinary programmes.

Backed by the region's scientific and economic leadership, we have constructed our Initiative around **five major challenges** facing society: **transition, natural resources, anticipation, diversity and democracy.**

The Initiative will use a **transdisciplinary approach** to contribute to the response to these major societal challenges, bringing together researchers from different disciplines to work on research questions linked to one or several of these challenges, crossing the disciplines and scientific questions with the interfaces. This approach will foster the emergence of new fields of knowledge and new economic activities.

The direction of the Initiative is based on five transdisciplinary focus areas:

- Oceans, land-sea interfaces and societies in transition
- Humans at the heart of digital society
- Future therapy and quality of life
- Sustainably constructing the food of the future
- The birth and life of materials and structures

These focus areas are built as **collective research programmes** that will go beyond the frontiers of disciplines, establishments and continents. They will thus offer a double opportunity with a knock-on effect: **to strengthen the current standards of excellence and to prepare those of the future.**

The legitimacy of our goal is based on the **scientific capacities involved**, particularly with **five Labex** ('Laboratory of Excellence') operating in the transdisciplinary focus areas (Ocean, Immunology, Nuclear Medicine, ICT, Mathematics), as well as **a strong specialisation in certain major disciplines** (Earth and Universe Sciences, health, mathematics, etc.) and a significant increase in the visibility of publications.

The site also stands out due to its **substantial potential for innovation** linked to the advanced structure of its system for making research commercially viable with the presence of numerous high-level PIA1 (the '1st Future Investments Programme') tools: **2 out of the eight nationally branded technical research institutes (IRT)** (advanced manufacturing and telecoms), **1 institute for energy transition (ITE)** (marine renewable energies), **1 university hospital institute (IHUp)** (immunology and transplantation), **9 Carnot Institutes and 1 technology transfer acceleration company (SATT) "Ouest Valorisation"**, which will become a subsidiary of Université Bretagne Loire (48%) and of CNRS (15%), founding members of the Initiative UBL+ . As part of PIA2 (the '2nd Future Investments Programme') **2** out of the 9 nationally branded **'French Tech'** players are involved.

Finally, the **region has a critical mass in science** (with 27,380 people working in research and over 4,000 researchers working in A/A+ laboratories) **and education** (with 225,000 students registered in higher education and research), **which provides the Initiative with anchorage, a knock-on effect, and very promising prospects for success** in our region.

Through its **founding principles** and its **exceptional regional anchorage with public players and the economic sector**, the Initiative will respond to these different objectives: advancing our pedagogical methods by incorporating a culture of interdisciplinarity, renewing disciplinary approaches in research and supporting the evolution of the Labex, accelerating the transfer of innovation, and developing the site's internationalisation.

■ Symbolic and structuring actions to anchor the Initiative and enable best practice dissemination

To achieve these objectives in the long term, the Initiative will form **international strategic structuring partnerships**, giving priority to **the Arizona State University, the Université Laval and the University of California.** The goal of cooperation with these players will focus on different areas such as science, education and training, student involvement, commercial viability, enabling the development of crossovers and the creation of synergy within shared arrangements (international laboratories, MOOCs, workshops, etc.).

Moreover, four actions from the programme proposed by the Initiative are notable and representative of the working group's mobilisation. These actions embody the strategic focus areas of the UBL+ Initiative, particularly transdisciplinarity, and are intended to support the deployment of the standards of excellence. They are characterised as follows:

- **The Transdisciplinary Institute for Complex Systems (TICs)** is the Initiative's research flagship. Designed to emulate the Frankfort Institute for Advanced studies (FIAS), it will offer different programmes and services in an integrated way. Its central programme consists of establishing and managing international transdisciplinary chairs, partially financed by private funding, devoted to theoretical research, modelling and simulation. These chairs will enable the development of resourcing projects and risky projects, situated at the crossroads of physics, chemistry, Information Technology (IT), biology, engineering sciences, earth sciences, humanities and social sciences, and mathematics. For humanities and social sciences the TICs will cooperate with Nantes Institute of Advanced Study (member of the Labex RFIEA+). The **Centre for Analysis and Synthesis (InCAS)** will provide groups of experts with the means and infrastructures necessary to pool data sets, lead discussions or produce *white papers* on these new concepts connected to the Initiative's focus areas. The **Mathematics Agency** is intended to reinforce existing interfaces between mathematics, other sciences and the industrial world. This is a simple structure, managed by the Lebesgue Labex, promoting interdisciplinary research with high mathematical content.
- **The School of Transdisciplinary Studies** primary vocation is to bring together, structure and manage a range of transdisciplinary educational courses connected to the Initiative's focus areas and by combining the region's main IDEFI ('excellence initiatives in innovative educational courses'), as well as developing innovative pedagogical methods. Within the School, actions concerning doctoral education will be decisive in developing the standards of excellence and the site's visibility on an international scale. For UBL+, this involves positioning Ph.Ds. as a vector of innovation, by promoting their professional integration and their participation, particularly in starting new businesses and in the increased innovation of SMEs;
- **The Institute for Open Innovation (IOI)** will allow companies to have a better access to academic excellence. It will coordinate the network of *Innovation Centres* which will mobilise communities of academic players and companies in one or several industrial sectors so as to undertake innovation projects at the same location and support the creation of companies and particularly start-ups. The Initiative will support on each location a transdisciplinary focus area, ensuring the availability of digital platforms, technological platforms, co-working spaces and fab labs which will ease the emergence, the conception and the realisation of innovative projects. The SATT Ouest Valorisation will facilitate operational arrangements. The IOI will put in place and lead a think tank wich will support the developments of the Innovation Centres by positioning itself as an opinion leader on the subject, with the challenge to strengthen the networking of those involved in commercial application and transfer in the region and as a lever for national and international lobbying;

- **The International Sustainability Center (ISC)** is intended to be the first of its kind in France. An interface between the academic world and civil society (public players, NGOs, socio-economic partners, etc.), it will, on the one hand, offer a programme of international workshops, open to all and centred on the link between our transdisciplinary focus areas and the notion of sustainability, in order to teach and examine the principles of the transdisciplinary and participatory approach in response to the major societal challenges. On the other hand, a multi-year programme of experimental workshops will be put in place, with the specific aim of the launch of or participation in large demonstrator projects on the targeted themes (linked to land /ocean/food/humans).

Efficient governance

The goal of the proposed governance is to take and rapidly implement strategic decisions while enabling stakeholder consultation and mobilisation. It will rely on 5 key bodies:

- **The Steering Committee (SC)** which will define the Initiative's broad strategic outlines for the year and state its position on emblematic and transformative projects.
- **The Executive Committee (EC)** whose job is to ensure the implementation and operational supervision of our actions in cooperation with all of the stakeholders.
- **The Excellence Ecosystems Council (EEC)** which brings together the *Principal Investigators* (PI) tasked with running the ecosystems of the Initiative's standards of excellence. It coordinates the progress of the various transdisciplinary topic-based programmes and has a role in the sharing and standardisation of practices.
- **The Advisory International Committee (AIC)** which brings together the Initiative's external strategic partners and makes recommendations on the Initiative's strategic guidelines and development. It selects the programmes financed by the focus areas and proposes the breakdown of funding between the focus areas and between the programmes within the focus areas.
- **A UBL+ Initiative conference** shall be held every year with all Initiative stakeholders.

A real transforming effect

The combination of our **societal challenges**, our **focus areas** and the **development of transdisciplinarity at the heart of all our activities** (research, education and training, innovation, international relations and student involvement) **constitutes the Initiative's signature and makes it an exclusive entity on the French landscape**.

The deployment of the **PIA1 and PIA2 tools for innovation and commercial viability means that our region is very well placed** at a national level. The addition of **project-specific tool, will magnify the impact on the economy and on job creation.**

The eventual aim of this new University model incubated by the Initiative is to **be a demonstrator for the entire Université Bretagne Loire (UBL),** which will be established on 1st January 2016, thus completing the communal project of the Bretagne and Pays de la Loire regions' academic players, by backing their complementarities.

1. Characterisation of the working group

1.1. Presentation of the initiator and its partners

The Community of Universities and Establishments (ComUE) ***Université Bretagne Loire*** (UBL) will be established on 1st January 2016. In total, 6 universities (with the project of merger of the Rennes 1 and Rennes 2 universities), 15 *Grande Ecoles* and 5 bodies will constitute the heart of UBL. In addition, 14 other establishments (Grandes Ecoles, university hospitals and organisations), apart from UBL members, are fully committed to this dynamic and federate the forces of the territory.

Higher Education and Research (HER) players have decided to promote their development by combining the forces of two administrative regions, Bretagne and Pays de la Loire, and by drawing on the strong complementarities and cooperation that exist both in terms of research and education. At this level, in fact, there are already structured educational courses (Bachelors and Masters), communal research units, high-performing and pooled R&D structures.

- 224,000 students
- 27,380 people working in research
- 21,000 Master students
- 3rd national ranking 5,300 Doctoral students
- 4th national ranking Over 4,000 researchers in A/A+ rated laboratories
- 3rd national ranking patents filed (605)
- 4th national ranking involvement in Equipex and other PIA1 targets
- 4th national ranking IUF nominations (43) and volume of scientific publications
- 5th national ranking number of Labex
- 6th national ranking ERC (19)
- 10th national ranking CNRS gold and silver medals

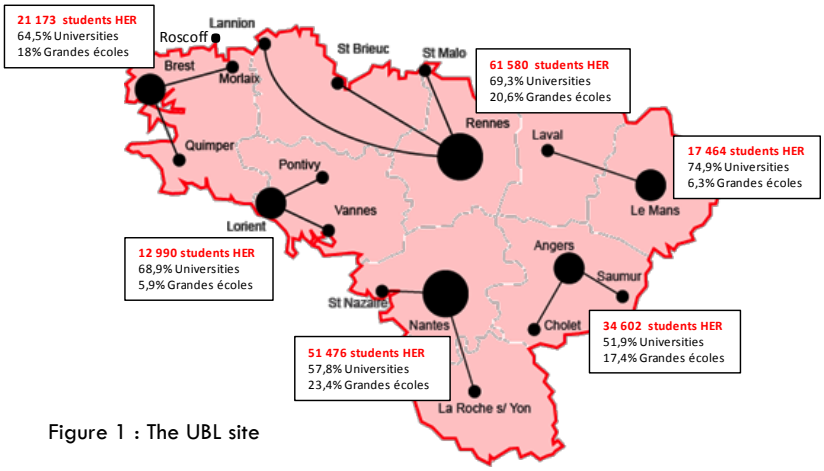


Figure 1 : The UBL site

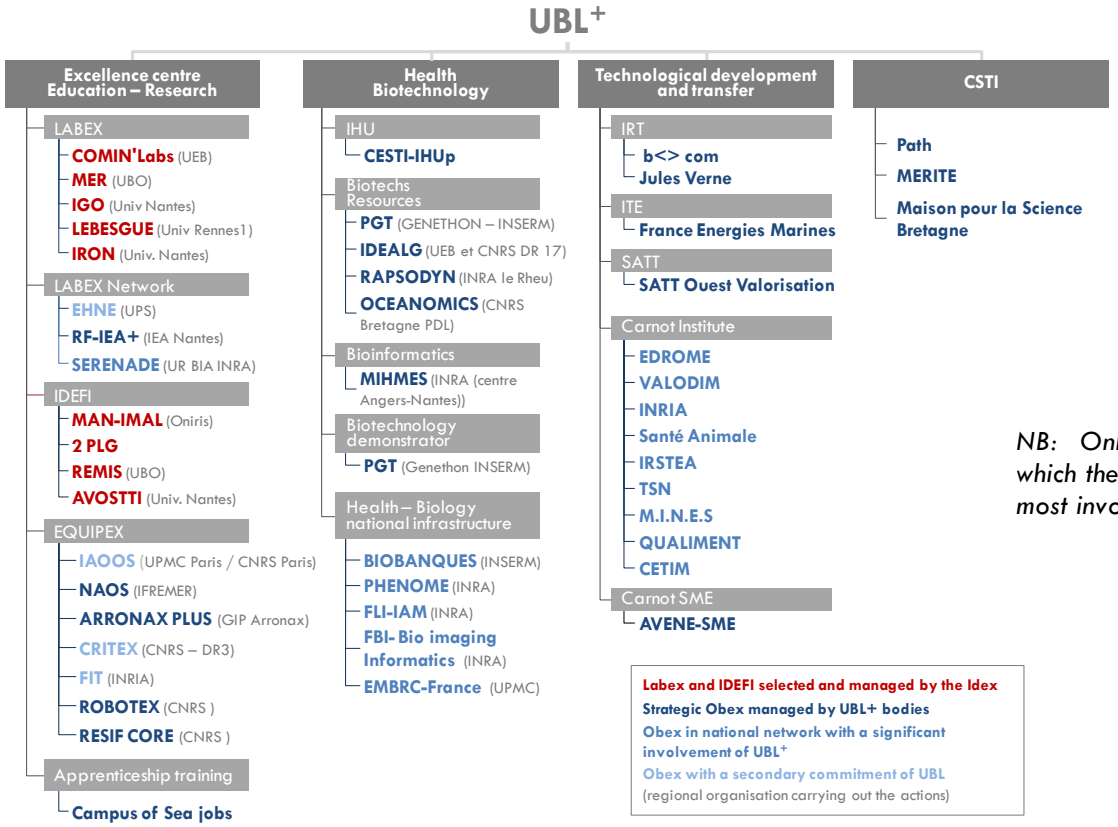
The site is also notable in many respects because it is:

- developing a networked federal model that changes the positioning of each establishment,
- transcending the administrative boundaries of the regions,
- magnifying scientific power by interdisciplinary research departments,
- enabling, through its diversity and networking, a transfer as close to companies' expectations as possible in a dynamic region (with a lower unemployment rate than the national average, a notable creation rate of innovative companies, a preserved industrial fabric, a growing population, etc.).

The UBL thus prefigures the first large French university federation. It represents a large and stable base, enabling in our opinion the formulation of research and educational standards, leading to new dynamics for the region's academic communities and socio-economic players.
In this context, the goal of the UBL+ Initiative is to produce a different science, by guiding it towards societal challenges, towards the interfaces between several disciplines and through transdisciplinary approaches, which will also irrigate education, transfer and student involvement. The UBL+ Initiative must therefore demonstrate the efficacy of these new transdisciplinarity practices with the aim of excelling and innovating more rapidly than its competitors in the face of societal challenges. It is positioning itself as a "flagship", that is to say that it has a vision of tightened standards and of thus experimenting with a University model for the 21st century.

As the ComUE UBL is in the process of being established, the legal initiator of the UBL+ project shall be the ComUE UEB.

1.2. PIA awarded projects



NB: Only the Obex in which the working group is most involved feature here

Figure 2 : OBEX managed by UBL+

5 Labex and 4 Idefi are managed by the Initiative and participate in the Initiative's excellence:

- **COMIN'Labs Labex** (Communication and Information Sciences Laboratories): centred on the fields targeted by UBL+ with regard to the transdisciplinary focus areas (cybersecurity, connected devices, digital culture, etc.) with important interactions in humanities and social sciences, it aims to federate the digital scientific community at an interregional level.
- **MER Labex**: this will be heavily involved in the new areas of research (ocean-coast, health, etc.), innovative educational courses (MOOCs), and the International Sustainability Centre (ISC). It aims to strengthen the internationalisation of research by securing the future of international chairs and coordinating its actions with Europole Mer.
- **IGO Labex** (Immuno Graft Oncology): this will rely on the UBL+ Initiative to increase its visibility, particularly through the establishment of an Erasmus+ curriculum and its regional anchorage through the Open Innovation Institutes.
- **Lebesgue Labex** (Mathematics): this will lead the Mathematics Institute, which is unique in France.
- **IRON Labex** (Innovative Radiopharmaceuticals in Oncology and Neurology): very dynamic internationally (a partner of the Isotop4life radiopharmaceutical consortium, many industrial collaborations), it aims to create a transdisciplinary Radiation, Nuclear and Health centre within 10 years through UBL+.
- **MAN-IMAL Idefi**: this will contribute to the efforts ensuring the visibility of the "One health" concept, an integrated approach to seamless human and animal health, at a European scale.
- **2 PLG Idefi** (professional experience at general Bachelor level) will secure the future of innovative educational schemes in the Initiative's universities.
- **REMIS Idefi** (Network of Healthcare Management and Engineering Schools): this will make its network of educators available to UBL+ and is aiming to develop an interactive educational infrastructure on the scale of the site and in partnership with manufacturers.
- **AVOSTTI Idefi** (improving the attractiveness and making the technological educational courses of the Polytech network commercially viable): this will contribute to the implementation of links between different educational subjects and is aiming, through UBL+, to consolidate an international network of technological universities.

1.3. Strengths and weaknesses

THE SITE	*Essential points*

- **The region stands out due to its interregional synergies, transdisciplinarity, rapid transfer toward the economy thanks to PIA objects (€427M[2]) and non-PIA objects (clusters, technopoles, Incubators, CEA Tech…), work in networks and pooled innovation (SATT Ouest Valorisation)**
- **By virtue of this extended area, the model is federal and these relative distances must be compensated for, as has been done for two years for the ComUE (extension UEB C@mpus, etc.)**
- **There is a unique potential to experiment with innovation linked to the geographic and natural characteristics of the region (coastal areas, islands, etc.) and strengthen the Initiative's scientific standards of excellence in its themes (Ocean, coast, food, etc.)**
- **The regional demographic and economic dynamics in operation are particularly favourable for the integration of the benefits of the Initiative's education and commercial viability**

Cooperative ventures:

- An advanced interregional structuring of the CNRS, Inria, INSERM, and the Agrocampus Ouest
- A networked operation of research laboratories, and winning cooperative strategies (cf. 5 Labex)
- A tight base of cooperation and competence sharing, through the implementation of ComUE UBL allowing training, education and innovation to be articulated around communal actions. It will enable the Initiative's strategy to be anchored by relying both on the defined scientific structuring (federation of scientific themes within 10 interdisciplinary departments) and the work already commenced to pool services: engineering of European projects, implementation of digital campus, etc.

KEY FIGURES

Demography and economic growth

- Wealth GDP/inhabitant: 3rd national ranking
- Population: 10,6% of French population
- Growth rate: 9.6% 2009/1999 (6.7% national rate)
- Unemployment rate: 8.6% (9.6% national rate)
- Job creation: Bretagne and Pays de la Loire, respectively 5th and 3rd regions in 2014

National leverage of flagship sectors

- Agri-business: 1st national ranking with 120,000 employees, 500+ companies, €30bn + in turnover
- Nautical activity, Blue biotechs: 1st national ranking in terms of jobs

The region and the existing cooperative projects favour a **high level of ambition, characterised by large federating projects** that are strong catalysts for synergies, as demonstrated by the average funding for the PIA1, which was particularly high compared with the national level (€9.4M on average for a Labex in Bretagne Loire, compared with €7.5M at the national level).

The remarkable attractiveness of the site enables the following to stand out at the national level:

- **Unprecedented demographic growth** at the national level, and positive net migration;
- **Regional economic indicators that are positively evaluated** with regard to the national situation (employment rate, job creation). In particular, the site shows resistance in terms of manufacturing jobs faced with the general decline observed, even if maintaining France's productive capacity appears to be of primary importance for the country's competitiveness. These strategic sectors are agri-business, ICT, materials, electronics, transport and shipbuilding.

RESEARCH	*Essential points*

- **The site's quality and scientific capacity are established and have high visibility. Even so, the accumulated scientific capacity does not enable the site to gain the national podium. This is why we have chosen, in a forward-looking manner, to develop transdisciplinary excellence**
- **Research is also distinguished by its potential for international-level scientific development, which still needs to prove itself and will be able to do so by crossing several disciplinary fields**
- **The site's establishments have built many research partnerships with global TOP 15 players in the disciplines of excellence (e.g. the University of Kyoto and Tokyo in applied chemistry). The Initiative must enable the reinforcement of international visibility via the structuring of strategic partnerships**

[2] For projects led by a site establishment; consumable funding + interest from non-consumable funding

According to the OST's latest bibliometric figures, the region has a **strong specialisation in the major disciplines**[3] and a significant increase in the visibility of publications:

- **Earth and Universe sciences:** IF 2010-2013, +3%, notably on the environment IF=1.26 (+10%) *Specialisation index 2013:1.65. European share of publications: 1.89*
- **Applied biology-ecology** with high visibility for food
- processing, ecology, marine biology (impact factor IF[4] 1.27) - *Specialisation index 1.32. European share of publications: 1,77*
- **Chemistry**, notably nuclear, organic and mineral
- Publications: IF +7% 2010-2013 European share of publications: 1.62
- **Medical research**: figures between 2010 and 2013
- (% growth): in cancer research (IF (2013) 1.69, +10%, biotechnology/genetics (IF (2013) 1.59, +33%)
- **Mathematic**s which have shown growth since 2010 and
- are also distinguished in the Shanghai 2013 ranking, *Specialisation index 2013: 1.28*
- **ICT** the site is distinguishing itself as the 2nd region
- in France for ANR 2013 credits in the ICT sector and with 3rd national ranking for scientific production in ICT[5]. *Specialisation index 2013 (IT and telecommunications: 1.26)*

KEY FIGURES

- 3rd national ranking by number of permanent researchers – 11,000 researchers, of which 36% in businesses
- 4th French region by number of IUF members over 2009-2013 period
- 3rd national ranking by number of PhDs 2010 (865), behind PACA and Rhône-Alpes (excl. Ile de France)
- 3rd French region by number of tenured FTE research staff by bodies present in region, compared to national staff levels: 8.5% of national staff levels, with strong presence of INRIA: 12.5%, IFREMER: 72%, INRA: 12%, IFSTTAR: 24%, ANSES: 44%. Region-wide CNRS presence (4% of its research staff), characterised by high rate of joint units and strong investment in support and back-up positions.
- Scientific production 2008: Bretagne 4th region (4.1%) and Pays de la Loire 10th region (3.1%) excl. humanities & social sciences, source OST
- Chemistry and Mathematics (University of Rennes 1) in Shanghai 2014 ranking

The leverage of scientific production is getting stronger with a 7% increase (in number of publications) between 2010 and 2013, with a few salient points on the flagship disciplines: medical research (+12%), fundamental biology (+11%), Earth and Universe sciences (+11%), chemistry (+7%) and strongly growing visibility in social sciences (+38%). 45.5% of publications are produced with counterparts abroad[6].

RESULT EXPLOITATION,TRANSFER AND SOCIO-ECONOMIC PARTENERSHIPS

Essential points

- **Potential for innovation, structured by the two regions' converging fields of smart specialisation (S3[7]) with a 85% rate of homology**
- **High performance level, with PIA1-labelled tools (2 IRT, representing a ¼ of national IRT, 1 ITE, 1 IHUp and 9 Carnot Institutes) and a merger of result exploitation and transfer system already materialized within the SATT**
- **Dynamism of the local economic fabric: the leverage of private R&D (64% of R&D expenses made by companies, domestic expenditure on R&D (DIRD) of €1,668M[8]), dynamism in new business creation, and 'young innovative companies' (JEI) for which the region is in 4th place nationally**

[3] Data: WoS, Thomson Reuters, processed by OST – 2014: Specialisation index as a worldwide reference

[4] Data WoS, Thomson Reuters, processed by OST – 2014, Impact factor noted at 2 years as a worldwide reference based on worktime and levelled out over the years

[5] STRATER 2014

[6] Data from CNRS - DASTR/SAP2S Nov. 2014

[7] The S3 (smart specialisation strategy) aims to better mobilise all European structural funds, by encouraging regions to adopt economic develoment models that are adapted to their assets and by reinforcing the synergies between European policies in favour of research and innovation (Horizon 2020, cohesion policy, but also FEADER, FEAMP).

[8] STRATER 2014

The **smart specialisation fields** are identified in a very convergent manner by the two SRI-SI ('research and innovation strategy for smart specialisation') in the following themes: sustainable agriculture and agri-business, ocean and renewable energy (maritime activities and industries), digital/IT technologies, technologies for industry, health and wellbeing (future therapies), tourism-culture-design and social innovation, and a final complementarity to explore in depth in ecology-environment. Moreover, a **strong tradition of partnerships between public and private research has been built** around the **competitiveness clusters** positioned on these themes (Mer Bretagne Atlantique, Image et Réseaux, Valorial, EMC2- production technologies, ID4Car – vehicles and sustainable mobility, Végépolys, Atlanpole Biothérapies, Elastopôle, S2E2). There is ongoing collaboration in the commercial viability field via the SATT *Ouest Valorisation*, whose shareholders are the UEB, LUNAM, CNRS, INSERM and IRD, and propose to companies attractive innovation ressources from 170 laboratories via contractal activities and the establishment of technological development structures such as *IRT* and *ITE*. The 9 Carnot Institutes are also structuring tools for the socio-economic partnerships. The site has significant potential for innovation and technology transfer, with robust ecosystems around the digital and manufacturing fields in particular.

KEY FIGURES

- 10,000 researchers in companies, 7.5% of national weight in 2009
- Technological production (European patent requests) in 2010: 7.5% (OST data) Bretagne 4th region and Pays de la Loire 8th region
- Domestic Expenditure on R&D for Enterprises (DIRDE): €1,668M, or 64% of DIRD
- 4th position in France for number of JEI
- 1 out of 4 Carnot Institutes in France on site
- Patents filed: 3rd national ranking (605)
- 4 PIA successes with €350M funding (2 IRT, 1 ITE, 1 SATT) (above Midi-Pyrénées, PACA, Aquitaine)

The entire site has **positive results in terms of the growth of innovative companies and the creation of activities:** Nantes is equivalent to Lyon and Grenoble for the 2005-2010 aggregate for winners of the fast50france award for the technological companies with the highest growth (excl. Ile-de-France); Rennes is in 3rd place[9] in terms of successful new business creation, with equivalent results to Montpellier; Bretagne is part of the top three nationally for first-time registrants for the Research Tax Credit. The region is in 4th place for the dynamism of its JEI, particularly in the digital sector.

EDUCATION AND TRAINING

Essential points

- **The diversified educational offering strategy takes the requirements of businesses into account, with the objective of increasing the qualifications of the regional educated population**
- **The Initiative also relies on a large number and variety of Grandes Ecoles at the site level**
- **Education and training relies on innovative pedagogical methods (e.g. "One Health", "Healthcare Engineering", and "Manufacturing", in the targeted cutting-edge themes**
- **The UEB-C@mpus digital campus, with its geographic configuration spread across the entire site, articulates excellence and regional anchorage while compensating for the geographic distance of the structures**
- **The consolidation of links between sites and educational courses that have strong connections with economic players is a key factor in keeping the student and educated population in the region**

The region is characterised by an excellent success rate - the best in France- in the baccalauréat; however, its **rate of continued studies in higher education is lower than the national rate**. The lack of a higher education diploma can be a disadvantage in terms of professional integration in a context in which businesses are seeking increasingly qualified personnel.

The **doctoral courses** are based on successful structuring in 11 doctoral schools (as at 1st September 2015) and distinguished by **their very high level**: 92% of doctoral students are registered in A or A+ doctoral schools (AERES

KEY FIGURES

- 225,000 students registered in HER
- Registrations at the university have higher growth rate than national average: + 7.2% in Pays de la Loire, +2.9% in Bretagne compared with +3.2% nationally
- Internationalisation of Masters in Grandes Ecoles: 38% of French international Masters are at UBL standard (CDEFI survey 2012-2013)
- No. Masters graduates: 9,111 (2010)
- No. Ph.D.s: 900 (2010)

[9] Source MESR 2000-2008

assessment). The doctoral offering is attractive, with significant growth in the number of Ph.Ds. at site level.
The involvement of establishments in **several innovative educational course initiatives** (4 Idefi on the site) also contributes to improving the attractiveness of the on-site educational courses, with **increased cooperation between universities and Grandes Ecoles, and with business**: AVOSTTI, MAN-IMAL, REMIS, 2PLG, involvement in the French Institute of Open Distance Learning to support the creation of innovative SMEs-SMIs for Export (Idefi INNOVENT-E). The establishments are demonstrating their **capacity to adapt to the requirements of the socio-economic environment**, with the quality of educational courses offered as block-release, as apprenticeships and as ongoing lifelong education.

INTERNATIONALISATION

Essential points

- **The momentum to internationalise research is growing strongly, particularly in publications of certain disciplines of excellence: Chemistry and Engineering Sciences**
- **It relies upon a strong commitment from HER establishments and bodies in European projects. The partnerships put in place are a rich and solid base for setting up new collaborative projects within the framework of the Initiative**
- **However, scientific visibility at an international level still needs to be developed: the proportion of international and European co-publications is below the national average (21% vs 26%)**
- **The geographical site does not enjoy general international visibility**

KEY FIGURES

- 25 international Masters
- 650 jointly supervised theses
- A European network of 759 partners, involvement in 310 collaborative European projects and 25 European infrastructure projects
- 3rd national ranking IUF Nominations 2009-2013: 43 (behind PACA and Rhône-Alpes)
- Growth in number of foreign students greater than national average : +16% 2005-2009 (+8% nationally) in Pays de Loire
  2 UMI, 12 LIA and 5 GDRI (CNRS), supported by the establishments

For the past ten years or so, the whole site has continued **to develop and gain international visibility** in research thanks to established partnerships with major players in cutting-edge disciplines (e.g. collaboration in nuclear physics with CERN). This development is illustrated by the **growth in international co-publications.**
In terms of **education and training, a policy of internationalisation has begun** (Masters in English, including international Masters from the Grandes Ecoles), double degrees, Erasmus, summer schools). However, **the partnerships and co-diplomas with international openness remain very heterogeneous** and, according to AERES, too modest, with a European dimension that requires reinforcement.
Regarding collaborative research, the establishments and bodies present in the region are fully integrated into a network of partners and involved in the large European projects, particularly as a pilot for projects such as: TARCC[10] (€3M), and REBORNE[11] (€11m) coordinated by INSERM, or ITN - WALLTRAC[12] (€3.3m), FP7- FRUITBREEDOMICS[13] (€6M), and FP7 - DREAM[14] (€6M) coordinated by INRA, SUCCESS / Strategic Use of Competitiveness towards Consolidating the Economic Sustainability of the European Seafood sector (€5.2 M), coordinated by UBO. Several international research laboratories also provide strong international visibility (particularly the CNRS/Saint Gobain/Université Rennes1 "LINK" joint-research unit at the National Institute for Material Science in Tsukuba, Japan).
The **site's international visibility** also depends on its **scientific themes. Among the outstanding ones are:** ecology, marine biology (impact factor: 1.41), cancer research (1.69), biotechnology-genetics (1.59), ICT – electrical engineering and electronics (1.15), chemistry (1.21), agri-business (1.46) and geosciences (1.33)[15].

[10] Targeting alpha-particle emitting radionuclides to combat cancer (coordinated by INSERM)
[11] Regenerating Bone Defects using New biomedical Engineering approaches (coordinated by INSERM)
[12] The plant cell wall training consortium, (coordinated by INRA)
[13] Bridging the gap between genomics and fruit breeding (coordinated by INRA)
[14] Design and development of realistic food models with well characterized micro- and macro- structure and composition (coordinated by INRA)
[15] OST figures: impact factor expected at 2 years as a worldwide reference based on worktime and levelled out over the years

2. The goal of the Initiative

SUMMARY *Opportunities for the Initiative*

- **To focus our research and our educational courses on major societal challenges so as to guarantee an original university model, founded on complex areas of research, necessary international openness and strong regional anchorage**
- **To advance our pedagogical methods by incorporating a culture of interdisciplinarity**
- **To renew intra- or mono-disciplinary research by throwing light on the UBL+ Initiative at the frontiers of disciplines or on the interfaces**
- **To create an international knock-on effect through the strength of our targeted strategic partnerships**
- **Potentiate the economic impact (wealth and jobs) from research results**
- **To accelerate the transfer of innovation between academic research and socio-economic players**

❖ We have imagined a university model directed at major societal challenges

In our analysis, the winning universities of the 21st century will be global, with very strong international openness and a voluntary involvement in the research and educational programmes that tackle the major challenges facing the planet. The immediate consequence for the organisation of research, education and training, and innovation will be the development of transdisciplinary approaches, which alone are capable of dealing with the complexity linked to these challenges.

The UBL+ Initiative is based on the establishment of a federal university in Western France and Europe, *the Université Bretagne Loire*. This networked university, supported by six well-identified campuses, is on a territory comparable to that of Ireland, with which we share a number of characteristics (surface area, population, number of students and universities, presence of a federal university). This network promotes the emergence of diversity because of the distributed structure, and uses this same diversity thanks to connectivity. The symbolic university serving as our model to construct UBL+ is, for its federal organisation, the *University of California* (UC) and its ten campuses (237,000 students, of which 52,000 are post-graduates and 19,000 are teachers), which has successfully used the full power of its universities ("the power of ten") and its territory to develop its campuses and place 4 of its universities in the global top 20 (UC Berkeley, UCLA, UCSD, UCSF). UC is also a resolute player on its territory, thanks to programmes like Berkeley's CITRIS centre, dedicated to accelerating the process of creating start-ups, based on a research idea to address the major challenges facing the State of California.

The second University to have inspired us, through its positioning which is very close to our vision, is the *Arizona State University* (ASU), which also promotes diversity in hiring, the consideration of Humanity's major challenges and strong regional anchorage. It is a global model both for the large-scale development of transdisciplinarity and for its tools of commercial viability.
Our vision responds point-by-point to this analysis. Firstly, through the territorial space under consideration: neither the Pays de la Loire nor Bretagne has the sufficient research power to succeed at the global level. However, their complementarity in terms of scientific and economic leadership across a wide range of disciplines and inter- and transdisciplinary themes make the UBL a potential leading player in numerous fields: the ocean and the land-sea interface, interactions between humans and mechanical and digital systems, the food of the future, expertise in materials and in their implementation from molecule to structure, and the link between life sciences, technologies and health in a forward-looking vision of a sustainable implementation of public health. Next, we are convinced that the establishment of the UBL+ Initiative, organised around its teams and its themes of excellence, provides a unique opportunity to accelerate this process so as not to fall behind our global competitors, in particular the new universities of the BRICS countries, first and foremost China.

❖ We have defined what we consider to be the major societal challenges

An analysis of our strengths, as set out above, guided us towards five major challenges, which cover the stakes at the heart of H2020, and which we must face in the decades and centuries to come.

- **Transitions** concerning the often powerful and rapid changes taking place in our society, such as the arrival of digital in our daily lives, or even transitions with regard to climate, food or healthcare systems, which are often the source of wealth or fragility;
- **Natural resources**, whether these are the source of our food and our drinking water requirements, our capacities to generate sufficient quantities of "clean" energy, or simply raw materials in the production process, particularly industrial;
- **Anticipation**, in direct relation with the notions of risk, prediction and optimisation. As a key element of public policy, anticipation relies heavily on mathematic modelling and digital simulation as well as the study of complex systems comprising multiple interacting factors;
- **Diversity**, the indispensable wealth of our planet, whether it concerns biodiversity, social diversity, genetic approaches, personalised medicine, or the élite's awareness of the problems of discrimination;
- **Democracy**, in a globalized world, in which science and education fight against obscurantism and withdrawal, in which new technologies question our social relationships (the use of digital, big data, cybersecurity, etc.), and in which scientific progress may question the individual (genetic diagnostic and law, etc.).

❖ We have chosen perimeter of excellence that are original in two ways

The standards of excellence are based on a scientific approach situated **between, through** and **beyond** disciplines in order to attempt to provide responses to the analysis of the "infinitely complex" imposed by the **societal challenges**. The **Perimeter of Excellence (PE) cannot, therefore, be reduced to the juxtaposition of recognised themes.** So as to promote **research "in the limits"** of knowledge and technological and societal development, the standards of excellence will combine themes of excellence and disciplinary and sectorial interfaces.

Excellence is then a starting point as it is to be used as a base to transcend disciplines and favour risk taking and disruption. The standards of excellence do not thus rely purely on the research themes already assessed as falling under 'excellence' (PIA1 targets, ERC, etc.), but anticipate the excellence of the future by asking researchers to work together to design disruptive problems at the interfaces of their disciplines. It is in this way that the Initiative will bring together researchers from different disciplines so as to explore either what is at the frontier of each of their disciplines or what is beyond that frontier (other disciplines and society as a whole).

Transdisciplinarity, which is defined at the interfaces between our research themes and mixes research, economics and, more broadly speaking, society, is necessary in view of our choice to address major societal challenges. **This is the first originality**.

The **second originality** is based on the unique structuring of a region that enables it, first of all, to be an **exceptional demonstrator** in, for example, the major challenges linked to the land-sea continuum, questions of food and health, digital transition and culture, etc. This region is also **a connected one**, which has successfully taken advantage of locally produced diversity to create a dynamic leading to success with PIA1 and beyond, by imposing a **very present, networked operating model** (research laboratories, doctoral schools, educational courses, etc.). The operating mode will be an asset that will enable us to develop **strategies to implement a network on an international scale** (cooperative projects with the Université Laval in Québec, with Arizona State University, etc.), thus ultimately establishing an **extended region**.

These are the two original dimensions, which, together, make the Initiative an "augmented science" incubator.

Based on this concept, the themes of transdisciplinary research have been defined according to the following principles:

- A proven track record of excellence to support these scientific questions (important density of very high level PI[16], internationally recognised)
- A selection and a contribution to one or several of the five society challenges
- Regional anchorage identified by the involvement, for example, of PIA1 excellence targets (Obex) or technological partnerships
- A problem set at the frontiers of the disciplines or at the interfaces

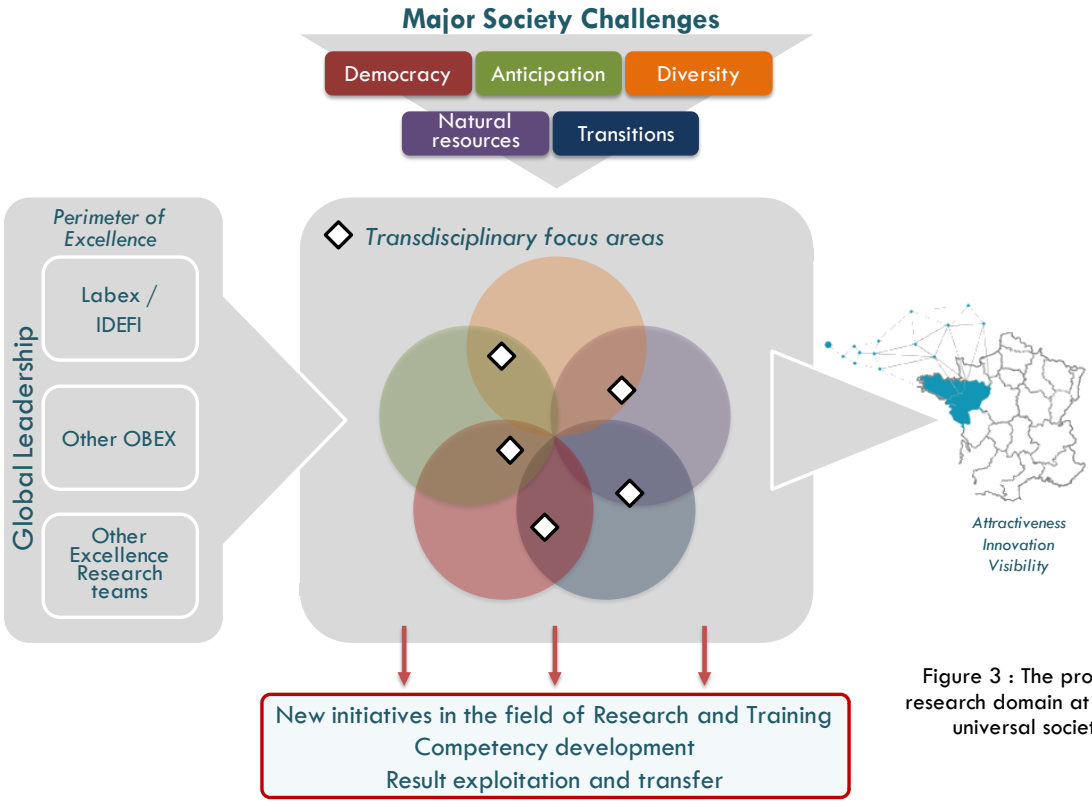


Figure 3 : The project's position: a research domain at the interface with universal society challenges

❖ We have taken the decision to develop the entirety of the Initiative on the basis of this transdisciplinarity

Transdisciplinarity will be the common theme to the development of the Initiative, beyond the original and innovative research inspired by this approach:

- In terms of education and training: to prepare for cross-fertilisation of competenciesexpected for the fields of the future and to learn to develop networked work,
- In terms of result exploitation and transfer, to further increase the density of the relationships between higher education and research establishments and the socio-economic world so as to strengthen companies' innovation and competitiveness,
- In terms of social responsibility: to train women and men capable of comprehending the major challenges facing the planet,
- In terms of regional anchorage: to participate in the re-industrialisation of France and Europe in the processes of wealth and job creation.

  The UBL+ Initiative is therefore an accelerator of this vision, by decompartmentalising the institutional interplay between universities, Grandes Ecoles, and bodies, and beyond, into a process of very successful co-construction with our partners in the socio-economic world and local authorities. This requires an organisation that is more open, reactive and forward-looking.

  Through this integrated vision, the UBL+ Initiative is a demonstrator that prefigures the University of the future.

[16] PI: Principal Investigator

❖ We are aiming for great achievement with our partners in order to benefit from the internationalisation of HER

The goal of the UBL+ Initiative is to **accelerate international openness and positioning**, by drawing, on the one hand, from **the dynamic of partnerships developed** within the framework of the Labex, Idefi and other PIA1 and, on the other hand, by **fostering new partnerships**, and by increasing international attractiveness thanks to the standards of excellence projects. The site's internationalisation has developed considerably and been reinforced over the past five years with an increase in the number of foreign students welcomed to the site, and an increase in international and European co-publications. Moreover, the *Jules Verne* and *b<>com IRT* now bring a visible international dimension, with new tools such as the IET ICT Labs collocation facility in Rennes, the Doctoral School IET ICT Labs and a Doctoral Training Centre on the themes of Medias, interaction, networks, and cloud computing. Finally, there was recent success obtaining the first projects in the framework of H2020 on *Factory of the future*, and a partnership with Fraunhofer enabling the installation of the 1st team in France in Nantes.
So as to strengthen the site's visibility and contribute to achieving the goal set by UBL+, international synergies will be established within four years with the different target institutions, selected either for their exemplary character in relation to the Initiative (University of California, Arizona State University), or for the density of relationships deserving to be transformed into strategic partnerships (including Université Laval).
The UBL+ Initiative is indeed anchored to a very rich network of international collaborations. Over the duration of the FP7 European programme, there are over 300 collaborative projects, 25 European infrastructure projects and 25 ITN-type educational networks, involving almost 700 institutions in Europe. The value of international partnerships is behind almost 700 jointly supervised theses every year.
The objective of the UBL+ Initiative will therefore be to focus collaborations onto a restricted number of high-level international partners, by specifically targeting the themes of the standards of excellence. These partners have been identified on the basis of the following criteria: exemplarity of the model that inspires the Initiative, multiplicity of European contracts in common with UBL establishments; numerous Erasmus projects and jointly supervised theses; existing institutional partnerships (communal teams, LIA, etc.); common interests for the strategic areas of the standards of excellence; shared strategy for the future (participation in large international programmes, co-development of a European strategy).

The priority partners are the following:

- **University of California** (QS rankings: UCLA 5; UC Berkeley 27; UC San Diego 59; UC Santa Cruz 265). Its model particularly inspired UBL+ for its federal organisation and commercial viability.
- **Arizona State University** (QS ranking 88), whose model particularly inspired UBL+ for its focus on transdisciplinarity.
- **Université Laval, Québec** (2014 QS ranking 298), in view of the great number of existing collaborations, in particular in Health, Digital, Oceans and Land/Sea Interfaces, with strong humanities and social science involvement. Its model particularly inspired UBL+ for pedagogical innovation and transfer towards business.

Taking the themes of the standards of excellence and existing links into account, the following establishments will also be concerned: **Shanghai Jiao Tong University** (QS ranking 104), Materials (engineering) and Oceans and Land/Sea Interfaces (environment); **Technical University of Denmark** (QSR 123), Oceans and Land/Sea Interfaces; **Université Louvain** (QSR 154), Health and Digital, strong element of humanities and social science; **KTH Royal Institute of Technology Stockholm** (QSR 110), Materials (engineering), Oceans, Land/Sea Interfaces (environment), Digital; **Université de Gent** (QSR 129), Materials (engineering), Oceans, Land/Sea Interfaces, Food-processing, Digital; **Wageningen University & Research** (QSR 151), Food-processing with SHS; **University of Edinburgh** (QSR17), Oceans and Land/Sea Interfaces, Food, Digital; National Institute for Materials Science (NIMS) in Tsukuba : UMI LINK.

The majority of the actions described in the following sections will be focused on target institutions such as these, taking into account the priorities of th UBL+ scientific focus areas. The aim is, in fact, to move from team-level collaborations to solid and powerful institutional partnerships.

3. The deployment of the project

3.1. Strategic focus areas

❖ An integrated transdisciplinary approach to research, education and innovation

The UBL+ Initiative positions itself over **five major societal challenges** (cf. § 2 The goal of the Initiative) and **five major transdisciplinary focus areas,** in complementarity with the region's other wins in the PIA 1, in order to lead research, propose educational courses addressing the major societal challenges, and thus contribute to the region's economic development. The 5 transdisciplinary focus areas are as follows (abbreviations in parenthesis):

- Oceans, land-sea interfaces and societies in transition (Oceanland)
- Humans at the heart of digital society (Digital society)
- Future therapies and quality of life (Therapies)
- Sustainably constructing the food of the future (Food)
- The birth and life of materials and structures (Materials)

These focus areas refer to research problems on the interfaces, related to health and food, the impact of digital technologies to society, the ocean and the coast, etc. They are constructed as collective research projects, intended to go beyond the frontiers of the disciplines and thus offer a double opportunity: reinforcing the current standards and preparing those of the future. By making this choice, UBL+ is aiming to drive the development of original and innovative research, by opening up to the best scientific teams (**34% of the region's scientific capacity**) and equipping the process to involve other researchers (cf. § 3.2 - Actions).

The Initiative's standing and attractiveness will be developed through specific funding of the focus areas and symbolic and structuring actions aiming at developing transdisciplinarity in research and education, necessary for the development of the project as a response to the societal challenges we have identified (cf. § 3.2 - Actions).

As a matter of fact, the whole project relies on the consistent and effective linkage between social challenges, transdisciplinary focus areas and territorial development, whose priorities are expressed in the smart specialization strategies (S3).

Focus areas will contribute to the reflection on the challenges and will leverage research into successful innovation, especially in the industrial key sectors of our territory. For example, the "transitions" challenge will get lots of inputs from the focus areas on food transition, energetic transition, digital transition, public health transition, climate transitions. Concerning the local economy, the reflection on the re-industrialization of the territory will get a number of crossed inputs from Digital Society and Materials, while the marine renewable energy sector will take advantage of common research carried out at the interface of Oceanland and Materials. In these last cases cooperation between UBL+, the IRTs Jules Verne and B<>com and the ITE France Energies Marines will be a must.

The five focus areas are described below.

Oceans, land-sea interfaces and societies in transition

Transdisciplinary focus area

Marine Research has international visibility in Bretagne and Pays de la Loire with many PIA1successes; now an integrated continent-ocean vision needs to be constructed, by focusing more particularly on certain **socio-ecosystem interfaces** – such as coastal areas and the coastline, an interface between the ocean and the continent which concentrates problems of usage and risks – and certain **resources** – some of which are vulnerable, such as water, biodiversity or soil whose sustainability must be ensured, and others that have significant potential, such as renewable marine energy, substances coming from the biodiversity of both oceans and continents, or deep mining resources. A fragile coastline, strong marine socio-economy and catchment areas subjected to high-impact agriculture place the region in the centre of strategic choices between risks and opportunities.
In the face of these challenges, research in Bretagne-Pays de Loire has strong potential for the observation, comprehension and modelling of systems functioning, and the evolution of uses. Cross-fertilization of scientific disciplines (modelling, natural sciences, economics, law and engineering sciences) combined with strong social and economic demand will enable within UBL excellent research dedicated to environmental questions.
The project is deeply thought out in connection with the need to **anticipate** the planet's future in a context of **transition** and depletion of **natural resources**. In particular, it is based on a new approach to the **diversity** of resources and their use, taking into account the need for a more **democratic** appropriation of these new relationships between humans and nature.

Legitimacy of the region

The project relies on the oceanic sciences which concentrate 60% of national strength in the Bretagne and Pays de Loire regions (including the national dedicated institute, Ifremer), federated by Europôle Mer. Environmental sciences, with strong focus on geosciences, ecology, agro-ecosystems and space are federated within the 4 OSU. A community of excellence in Humanities and Social Sciences puts a unique transdisciplinary ambition within reach. It is in this context that the ERC saw the day, such as IOWAGA, which offers the most precise wave model in the world, and HUMAN SEA, which studies the impact if law on the development of new activities at sea. There are also exceptional pioneering talents in landscape ecology and hydrology, recognised by several CNRS medals, working here - at the human-nature interface. Due to its natural and human character (strong maritime tradition and connected activities – 100,000 jobs – environmental problems on water), this region is an exceptional research and innovation laboratory.

Overview of players linked to focus area

PIA 1	Industrial partners and clusters	National and international strategic partners
Labex: MER Equipex: CRITEX, NAOS, IAOOS IRT Jules Verne and ITE FEM Biotechs-resources: OCEANOMICS, IDEALG, SATT Ouest Valorisation	Mer Bretagne-Atlantique competitiveness cluster gathering 200 companies in the sea sector Total, Veolia, Petrobras (Brazil), DCNS, Thales, STX, Altran, ANTEA Group, Silixa Ltd,Itasca, SKB (Swedish Nuclear Fuel and Waste Management Company ..)	WHOI/MIT (Woods Hole Oceanographic Institution and Massachussets Institute of Technology), University Of California (San Diego, LA), KDM (German Marine Research Consortium), NOC (National Oceanographic Center, UK) JAMSTEC (Japan Agency for Marine Earth Science and Technology), UOC (Ocean University of China, Qingdao), etc

The interface issues

1. Beyond the transversalities specific to each field: developing a Land-Sea integrated vision.
2. Sustainability and new usage require powerful reinforcement of transversalities towards geography, legal sciences, anthropology and history.
3. Use of ICT is fundamental for programmes on systems observation and modelling.
4. Galvanise the scientific fabric linking engineering schools and universities on questions of materials engineering and Eco technology for the sea (EMR, Eco construction, Deep sea)
5. In connection with the food of the future challenge, how do we minimise the environmental impact, particularly in coastal areas, of agriculture via the development of research in agro ecology?
6. In connection with health and also nutrition, development of shared projects on marine substances.

Examples of programmes

- The global ocean in transitions: cross natural sciences with economy and signal processing to observe and model past and future oceans. Specialists of remote sensing and deep-sea exploration will work together with economists and modellers to anticipate the transitions and their consequences for society.
- Marine and continental socio-ecological systems and landscape sustainability: understanding the key processes at the heart of ecosystems, and in particular physical, chemical and biological flow between the continent and the oceans, and their impact on the goods and services enjoyed by societies. Developing observation and ecosystem modelling tools and policies in order to enrich decision-making aids to manage resources and developments.
- Natural resources for the future: Blue and Safe Energy (renewable marine energies); new substances from algae and micro-algae; water, soil and biodiversity in the critical zone, the tiny interface between geosphere and atmosphere, where human activities (focus on agronomy) impact biogeological cycles and hence resource quality and quantity.

Experts

Pilot PI:	Philippe Davy	Fabrice Ardhuin	Patrick Chaumette
Publications:	115	153	130 (83 in reading committes and 47 books)
H-index:	37	22 (M = 1.4)	NA (SHS)
Prizes:	Aymé Poirson Grand Prize French Academy of Sciences (2001) City of Rennes medal (1997) Barrabé Prize, Geological Society of France (1995) CNRS Bronze medal (1993)	ERC IOWAGA Role of waves in the dynamic with Ocean interfaces	ERC Human Sea Evolution in Sea Law and Maritime Law

Scientific quality of associated teams:

- **623 A/A+ team researchers**
- **57 (8,9%) h-index>20 researchers**
- **26 (4%) h-index>30 researchers**
- **4 ERC**
- **5 IUF**
- **5 CNRS silver medals**
- **7 CNRS bronze medals**
- **27 patents**
- **15 European projects** coordinated

Humans at the heart of digital society

Transdisciplinary focus area

The digital revolution is transforming all our activities and systems of representations. In most fields of activity (Industry, Health, Agriculture, Education, Environment, Culture, etc.), there is an impact on learning methods, transfer of knowledge, and professional hierarchies, and we are seeing new skills and new jobs arriving on the labour market. The exponential increase in digital data and the interconnection of devices potentially represent a factor in improving human performances, usage, decisions and recommendation, placing the individual and organisations at the heart of a real infosphere. Finally, with the development of cobotics and immersive interfaces, we are seeing the emergence of new forms of cooperation between humans and digital artefacts. While developing information and communication sciences and technologies, how do we design a professional, intellectual and economic environment that renews societal frameworks and places the individual at the heart of a real digital humanism?

Legitimacy of the region

Research laboratories in the Maths-ICT field at the highest international level, all A or A+ rated, used to collaborating with each other and with the other disciplines. One Labex on the themes of the Internet of the future and one in mathematics, two TRI (communications and images, and future factories). KIC IET ICT Labs. Strong industrial R&D fabric (Images et réseaux cluster, West electronique network), CEAtech, cluster of excellence in cybersecurity/cyber defence including numerous players under the leadership of DGA-MI.

Overview of players linked to focus area

PIA 1	Industrial partners and clusters	National and international strategic partners
CominLabs and Lebesgue Labex, b<>com and IRT Jules Verne Europe: KIC ICT-Labs SATT Ouest Valorisation	Orange, TDF, Thales, Alcatel Lucent, Technicolor, Airbus, STX, Alstom, PSA, Renault, + many SMEs and IET.	Stanford, UC Berkeley, CSU Chinese academy of Sciences, NII, U. Laval

The interface issues

1. **The augmented human in the infosphere**: how to create, connect and use connected devices and masses of data? How can their deployment in fields such as smart cities, construction, transport, energy and raw materials, education, science, health, art and culture, and leisure, lead to new algorithms, new applications and new means of consumption and use? Will they create jobs or not?
2. **The augmented work environment of the future**: which new electronic, communication, simulation and interaction technologies (between people, digital systems and the physical world)? How will that change our manner of creating, innovating and working? What do these technologies transform agriculture, industries (manufacturing, cultural and creative) and services into? What role is there for the digital factory?
3. **Cybersecurity**: how to increase trust in digital system? How to become organised in the face of vulnerable systems (data, critical systems) and cope with omniscient and indiscreet systems? How to identify and compare the technical, organisational, economic and legal challenges?

Examples of programmes

- Cybersecurity: controlling the entire chain from the physical (material attacks), to humanities and social sciences (economic and legal aspects), and mathematic (cryptography), networks (intrusion detection) and IT (detection of vulnerabilities, counter-measures).
- Human-digital artefact interaction: analyzing the societal challenges caused by the growing development of human-digital artefact interactions and fostering innovative production in the UBL's specialized fields (in particular, artistic creation, health, new businesses, cybersecurity, etc.)

Experts

Pilot PI	AM. Kermarrec	Claude Berrou	John Tolan
Publications:	220 (14950 cit)	260 (17467 cit)	126 (512 cit)
H-index:	41	30	9
Prizes:	ERC A. Europaea	ERC, Academician Prix Marconi	ERC A. Europaea
Patents:		11	

Scientific results of associated teams:

- **467 A+ team researchers**
- **43 h-inex >20 researchers**
- **15 h-index>30 researchers**
- **9 ERC**
- **10 IUF**
- **1 CNRS bronze medal**
- **80 patents**
- **7 European projects coordinated**

Future therapies and quality of life

Transdisciplinary focus area

Innovations and discoveries: even if biology and health remain intimately linked, the health of the future will also be built thanks to technological and digital innovations to develop new diagnostic, prognostic or surgical tools. In the specific fields of immunotransplantation, cancer research or chronic illnesses, the discovery of new targets and new therapeutic agents, which will need to be perfectly assessed from a medico-economic perspective, will depend on coordinated progress in disciplines such as biology, IT, chemistry and physics.
Society: investment in childhood and youth is a challenge for developed societies. The new generations' well-being measure and international comparisons in this field show that France is badly positioned. The improvement of these well-being conditions, from childhood onwards, requires connections between biomedical sciences, public health and social sciences.

Legitimacy of the region

The 'Grand Ouest' (Bretagne and Pays de Loire regions) is a very active contributor to medical research: 0.7% of global Top 10 publications in the field, or 4th place in France, but above all the highest growth in France (>90%) between 2003 and 2013 (OST, September 2014). The project relies on the 2 regions' strongest and most differentiated points in recognised fields of immunotransplantation (Ectis UHI, IGO Labex), cancer research and nuclear medicine (EquipEx ArronaxPlus, IRON Labex), health technology (the CominLabs and CAMI Labex, EquipEx TRI BCom), bio-IT, genetics and public health. This interdisciplinarity is strengthened by R&D and translational platforms structured within the Biogenouest network.

Overview of players linked to focus area

PIA 1	Industrial partners and clusters	National and international strategic partners
Labex: IGO, IRON + CAMI, CominLabs Equipex: ARRONAX IHU CESTI and IRT b<>com SATT Ouest Valorisation	Atlanpole Biotherapies Biofortis	CASyM: international network for systemic medicine; French network of excellence in imaging; European network for tolerance and kidney transplantation; US NCI-PO1 myeloma genetics; Fondation RTRS Centaure; European and national programmes: DREES, CNSA, IRESP, ANSES

The interface issues

1. Adapting and coordinating progress in fundamental biology, mathematics, digital, chemistry and engineering so as to personalise care in the fields of immunotransplantation, cancer research and complex illnesses.
2. Decompartmentalising scientific disciplines for multi-scale modelling, from the atom to the patient, for the development of new treatments through internal and external radiotherapy for cancer care, and their assessment via new imaging techniques.
3. Assessing the link between the difficulties encountered by young people in professional integration and health risks in such a manner as to develop public policies to promote access to autonomy.

Examples of programmes

- Can we model radiation/matter interactions on different scales in order to prepare new therapeutic modalities using ionising radiation?
- Can we bring together common tools and platforms for therapeutic strategies in immuno-transplantation and cancer research?
- Which public policies seem best to be able to support and cope with the ongoing generational transitions, from childhood to the loss of autonomy?

Experts

Pilot PI:	Claude Fered	Philippe Moreau	Claude Prigent
Publications:	571	314	110
H-index:	51	59	34
Prizes:			
Citations:	10089	11306	

Scientific results of associated teams:
- **588 A/A+ researchers**
- **65 h-index>30 researchers (11%)**
- **5 ERC**
- **9 IUF**
- **3 CNRS Bronze medals**
- **12 European projects coord.**

Sustainably constructing the food of the future

Transdisciplinary focus area

The sustainable construction of the foods of the future must jointly treated at all levels of the food chain, and must enable the management of **(global food, climatic and demographic) transitions**, while optimising agro-resource management while anticipating and controlling the impact on human health and the environment.
In the field of agri-business, it is a matter of characterising and modelling, at increasingly specific scales, the elementary elements of food matrices, in particular those coming from new sourcings (land or marine), as well as their evolution during the use of industrial processes (including fermentation), or during their deconstruction in the digestive tract.
Upstream, this requires better prediction, in order to construct it, of the operation of dense and sustainable production systems, in particular with regard to the health of plants and animal populations, and zoonotic risks.
Downstream, it is a matter of evaluating the nutritional and health impacts (at hepatic-gastric, adiposal, endocrinal levels, etc.) of new sources and food matrices and of xenobiotics by integrating the psychosocial determinants and neurophysiological circuits of human food behaviour.

Legitimacy of the region

The Grand Ouest is the 1st agricultural and agri-business area in France and No. 3 in Europe. It has the highest French concentration of students in food sciences, animal and plant sciences (around 5,100) and a pool of over 600 scientists. The regional ecosystem is reflected in longstanding alliances between research teams (TGU, pooled experimental and technological platforms, etc.), co-authorised interregional Masters, and multiple partnerships with socio-economic players (collaborative projects such as FUI, RMT, UMT, GIS, 5 business chairs).

Overview of players linked to focus area

PIA 1

Labex: IRON, SERENADE
Equipex: ARRONAX+, SeaFood
Biotech-Bioresources: AKER, BREEDWHEAT, GENIUS, PEAMUST, RAPSODYN (coord)
Bio-IT: MIHMES (coord)
Infrastructures: BioBanques, Cohorte CONSTANCES, CRB-Anim, F-CRIN, PEPITE, PHENOME, Q-Collect.
Idefi: ECOTROPHELIA, MANIMAL (coord)
ITE: IFMAS
European infrastructures: BBMRI, ECRIN, MIRRI
DHU: DHU2020, COMPARE, Oncogreffe
Carnot: ICSA, QUALIMENT
SATT Ouest Valorisation

Industrial partners and clusters:

Private groups: Bayer, Bel, BioMérieux, Bongrain, Biogema, Cesbron, Clause, Danone, Diana-SPF, Lactalis, Limagrain, MSD, Pfizzer, Promosol, Roullier, Syngenta, Sanofi, Servier.
SMEs: Agrauxine, BioFortis, Biopredic, Bioprox, Biotrial, CEP Innovation, Diafir, GIE Colza, Locmaria, Novadi, Nutrialys, Pasquier, Standa, Xenoblis.
Competitiveness clusters: Atlanpole, Végépolys, Valorial.
Sector group: Ania, Bba, Breizpack/Ligépack, Cap Aliment, ID2-Santé, Gds.
Institutes/Technical centres: Actalia, Adria, Adro-Ouest, Cbb, Cetiom, Cnc, Cniel, Idele, Ifip, Itavi, Itc, Pôle Cristal, Sysaaf, Zoopole.
UMT: Caseolis, InnoPlant, Pisum, Santé des troupeaux bovins.
Public-interest initiator: ANSES, DG-AL, DG-CCRF, DG-TRADE, DG-SANCO, EFSA, GEVES.

National and international strategic partners:

Wageningen University Netherland (all areas)
Université de Gand, Belgique (animal, food)
Iowa State University USA (animal, food)
Max Planck Campus in Tübingen Germany (vegetal)

The interface issues

1) How to model food transitions by integrating different levels of approach (structural dynamics, pheno-/chemo-typing and evolution under duress, microbial biodiversity) for targeted functionalities (organoleptic qualities, nutritional value and human health) in food products, processed or not?
2) How to take into account the impact of epigenetic regulations during the mutual adaptation of plants and their pests to the environment so as to predict the sustainability of resistance levels, limit inputs and ensure the quality of vegetable crops in rural and urban contexts?
3) How to follow and model the risks linked to biological dangers in animal populations in high-density production areas and assess their possible impacts on human health and on the economy in order to anticipate the emergence of new risks?
4) What are the food, environmental, behavioural and metabolic determinants that influence health and chronic human illnesses, in particular obesity, hepatic-gastric pathologies and their vascular components?

Examples of programmes

- Combining detailed knowledge of raw materials, microbial biodiversity and mastery of procedures for an optimized, diversified and eco-designed food offering.
- Establishing the causal link between exposure to the chemical dangers of food and human chronic pathologies in relation with endocrine disruption.

Experts

Pilot PI:	Bucher Etienne (39 years old)	Le Bizec Bruno	Léonil Joëlle
Publications:	16 (Nature, Nature genetic…)	217	101 (DR1 Inra, STLO-Group leader)
H-index:	15 (1600 citations)	35 (3659 citations)	29 (2291 citations)
Prizes:		1 award Euroresidue	
Patents:		1	3

Scientific quality of associated teams:
- **405 A/A+ researchers**
- **63 (15,5%) h-index>20 researchers**
- **26 (4%) h-index>30 researchers**
- **4 ERC**
- **5 IUF**
- **5 CNRS silver medals**
- **7 CNRS bronze medals**
- **27 patents**
- **15 European projects coordinated**

The birth and life of materials and structures

Transdisciplinary focus area

At the crossroads of chemistry, physics, mechanics and biology, the theme is applied to a continuum progressing from the material through to the structure, with particular attention paid to sustainability.
The creation of the molecules and functional materials of the future is part of a framework of rational natural resource management: "fully organic" polymer materials, coming from bio-resources, able to be integrated into eco-composites; organic photovoltaic cells and materials for (opto-) electronics. Vitreous materials are also included in this project.
With the Jules Verne TRI, the passage from material to structure will rely on advanced *manufacturing* (additive and direct composite manufacturing, integrated product-process design, smart and flexible production systems). With the France Energies Marines IET and the "Oceans and continents in transition" focus area 1, materials and structure components will be developed for the production and storage of renewable marine energy.
The sustainability of materials and structures will be studied either through the means of production or degradation, the type of materials (for bone tissues, for electricity storage) or the type of environmental burdens (effect of lighting, electric cycling). It will be studied with strong interaction between material and structure, through the design of materials and original composites, forming of complex parts, physico-chemical reactivity vis-à-vis the environment, ageing and recycling. Model validation will be done via precise damage characterisation techniques (opto-acoustic, non-linear methods).

Legitimacy of the region

The presence of the Jules Verne TRI enables effective partnerial research with businesses on *advanced manufacturing* as well as the acquisition of leading test platforms. The Rennes glass cluster (synthesis, forming, operating performance, ageing, damage, etc.) is a leading player on the international scene.

Overview of players linked to focus area

PIA 1	Industrial partners and clusters	National and international strategic partners
IRT Jules Verne ITE France Energies Marines Labex SERENAD SATT Ouest valorisation	Graftys, Safran, CEA, Total, EDF, Alstom, Saint-Gobain, SAGEM, Thales, Umicore, Schott, NEG, Airbus-EADS, Corning …	Leibniz Institut für Katalyse of Rostock, Universities of Durham, Zhengzhou, Wroclaw, Tohoku Sendai, Tucson

The interface issues

1. How, and from what, will molecules and materials be made in the future? How to promote the use of raw materials coming from bio-resources and to integrate them into functional and structure materials?
2. How to improve the sustainability of materials and structures, for example, those used in the production and storage of electricity, particularly via renewable marine energy.
3. How to promote renewable energy, particularly via the development of 3rd-generation photovoltaic materials and low-energy OLED materials?
4. How to design materials and structures in glass with unique functional and mechanical properties, by having chemists, physicists and mechanical engineers work on a material together?
5. Which certifications for bio-sourced materials, which are sounder, less expensive and /or locally produced?

Examples of programmes

- Bio-resources, catalysis and sustainable polymer materials interfaces: identification of bio-resources available long term and of production variabilities; rational deconstruction by biological and/or chemical catalysis; transformation of building blocks and development of bio-sourced materials with controlled functional properties: dispersed systems (emulsions, foams, etc.) and composites with optimised mechanical properties.
- New approaches for efficient bio-mimetic materials: reproduction of living processes: healing processes (substitute materials transformed *in vivo* into bone tissue), conversion of light energy into electric or chemical energy (artificial photosynthesis) and photoluminescence.
- New ways to strengthen glass and increase its sustainability: innovative materials and structures (glass-ceramising, particulate or fibrous composite materials, forming and surface treatment processes), aiming to generate reinforcement, adaptation, and original healing mechanisms.

Experts

Pilot PI:	JF Carpentier	D. Jacquemin	N. Moes	T. Rouxel
Publications:	246	310	48	119
H-index:	45	40	25	27
Prizes:	IUF junior, CNRS bronze and silver argent, Prix Acad. Sci.	ERC Consol., IUF Junior, Dirac medal	ERC Adv., CNRS silver, IUF Junior, www.highlycited.com	ERC Adv., , bronze, IUF Junior, Prix Otto Schott, Grand Prix Acad. Sci.…
Patents:	43	2	0	2

Scientific quality of associated teams:
- **376 A /A+ researchers**
- **41 h-index>30 researchers**
- **81 h-index>20 researchers**
- **3 ERC**
- **12 IUF**
- **11 CNRS silver and bronze medals**
- **139 patents**

❖ The renewal of Labex and Idefi thanks to transdisciplinary research

The Labex supported by the site are an integral part of the standards of excellence and there are many interactions between the Labex, the societal challenges and the transdisciplinary focus areas. The Labex will be involved in

- **Reinforcing** the focus areas with active contributions from the Labex
- **Transferring** Labex disciplinary research results to feed the focus areas
- **Prefiguring** new projects topics and future focus areas with inter-Labex cooperation
- **Mobilising** Labex into the governance of the Transdisciplinary Institute for Complex Systems, the school of transdisciplinary studies and the Instiutute for Open Innovation.
- **Creating** Labex/focus areas *consortia* to reinforce international networks, submit H2020 projects, establish Erasmus+ curricula,
- **Provisionning** the *International Centre for Analysis and Synthesis* with projects and focus areas with scientific questions related to the societal challenges,
- **Participating** in all innovation, transfer and economic actions, with SATT as a reference operator, in scientific operations with our strategic partners, in conjunction with the IRT, ITE, IHU and French Tech ecosystems.

More specifically, the **Comin Labs** Labex will contribute very significantly to *Digital society Oceansland* (modelling, big data), *Materials* (digital factory of the future) and *Therapies* (imaging, bioinformatics, connected devices). The **IGO and IRON** Labex and the **MAN-IMAL** Idefi will contribute to *Therapies*, in terms of research, education and training. Links with *Oceansland,* in the context of algae-sourced molecules for therapeutic purposes have been identified. The **Lebesgue** Labex (Mathematics) supports the Mathematics Agency (cf. § 3.2) project, which should be mobilised by all focus areas for modelling purposes and will interact significantly with the Transdisciplinary Institute for Complex System (TICs) (cf. § 3.2). The **Mer** Labex, directly in connection with *Oceansland* will participate in the work on Food. The Idefi **AVOSTTI**, within Polytech network will contribute to setting up footbridges between different educations courses at the crossroads of disciplines.

❖ Acceleration of transfer towards the economy and strengthening links in the region

Being in a fertile environment for co-constructing research results with industrial partners and transferring them to the economy (cf. § 1.3), we aim at **maximizing the commercial viability of research transfer and the contribution of UBL+ to local economic development.** This will be done by aiding the launch or development of businesses and by supporting the professional integration of doctoral students.

Strategically, we will participate in the economical development at three key levels: **assistance for spin-offs and start-ups** in relation with public and private incubators and accelerators, **technology transfer towards mid sized businesses** to participate in their growing and internalization and finaly **strong research relations with international groups**.

Doctoral education will also be a key vector for strengthening links with businesses, on the one hand, by creating a doctorate-business continuum allowing the link between Ph.D *alumni* and their original academic teams to be reinforced and, on the other hand, by *creating* an environment that encourages researchers and professors to gain business experience. In all cases, for UBL+, this involves positioning Ph.Ds. as a vector of innovation, by promoting their professional integration and their participation, particularly in starting new businesses and in the increased innovation of SMEs.

The strategic territorial issues, as expressed in the *smart specialization strategies (S3) will be addressed by the transdisiplinarity focus areas for ocean,* materials and advanced manufacturing, health and agrofood.

❖ The systematic internationalisation of our transdisciplinary approach

Science is now **totally global**, and competition is getting increasingly tough in terms of attracting, retaining or reintegrationg the best students and scientists. On the other hand, scientific and social

challenges, particularly those we have chosen as the signature of UBL+ are also essentially global. Finally the economy is global, which means two things: universities economical models are bound to evolve and economical models for research and technology transfer are also bound to evolve.

In this context, we consider that our main leverages are based on three major aspects of our project: **transdisciplinarity, excellence and alliances**. Our goal is then to make UBL+ a decompartmentalised and outward-looking university of excellence.

Whereas transdisciplinarity and excellence have been already detailed, the question of alliances needs some development. The alliances we need to construct and stengthen are twofold.

At the local level, as mentioned, alliances between universities, engineering schools and national institutes were concretized by the creation of University of Bretagne Loire and partnerships with local companies and local branches of global companies are established, in particular through competitiveness clusters and IRT/IHU/ITE.

Based on this large consortium, our goal is then to establish long term, wide spectrum, global partnerships with half a dozen universities in the world with which we share common interests and strategic reflections. Among our current contacts, Université Laval, UC and ASU are obvious options that we hope to concretize during UBL+ first two years.

❖ Developing the "UBL+ spirit" within society

The UBL+ Initiative will be widely open to civil Society. By playing this card it will simultaneously enrich research fields building on usage, experience, the human element (experimental approach), and disseminate acquired knowledge, promote the developed innovations, and, through a virtuous spiral, reinforce the site's attractiveness.

In order to achieve this objective, we wish to activate 5 distinct levers:

- By **very specifically appealing to the student public**, in the aim of opening the minds of the new generation to the major societal challenges, and help them adjust to the transdisciplinary approach proposed by the Initiative.
- By **developing our exchanges with our international partners** in a manner adapted to the dissemination of knowledge to students and more widely to society: access to remote documentary resources, to databases, teleconference courses and debates
- By developing through the ISC an **experimental approach** that can merge the scientific approach with the experiences of citizens and economic players.
- By creating **spaces for sharing and reflection open to civil society and the political world**. This is a matter of putting in place (within the ISC), international forums (NGOs, etc.) that are open, in the form of workshops, to civil society and the political world.
- By relying on **Scientific and Technical culture tools** from PIA 1: "Maison de la Science de Bretagne", Parcours, MERITE

3.2. Actions

3.2.1. Structuring, Integration and governance

Our goal is to create the conditions for the deployment of the UBL+ Initiative's actions. For each field, a symbolic action will guarantee the implementation of strategic choices and be developed within 10 years. This is firstly a matter of coordinating, then pooling and finally integrating the region's resources and skills. The organisation and governance of UBL+ support this vision. However, it is also a matter of developing new practices in an international context to extend the region and expand UBL's influence. These actions will be adapted according to the change of the law concerning competences of the Regions (MAPAM law and government bill NOTRe).

Contextual elements and benchmarks: the UBL+ Initiative has developed an ambitious organisational framework, whose organisation is inspired by the University of California, to deploy actions across the standards of excellence. However, within 10 years, these structures will constitute both the base for the deployment of new practices within all HER establishments and the entry points for strategic international partnerships. But tomorrow has already arrived: the structuring actions aim to initialise this framework and to realise the UBL+ Initiative's ambition for the region as soon as possible.

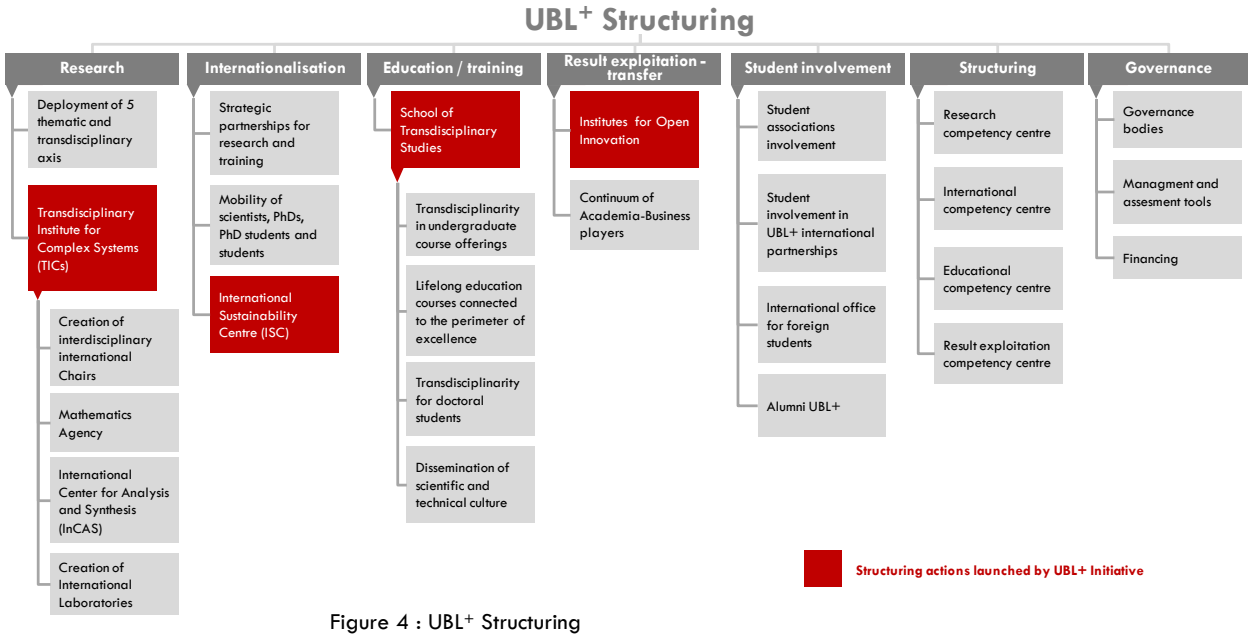


Figure 4 : UBL+ Structuring

3.2.2. *Research*

Our ambition is to profoundly transform our research practices by addressing the societal challenges that we have identified. To achieve this, we will develop tools which will enable us to simultaneously respond to this need to develop transdisciplinarity and to reinforce our international attractiveness. They will constitute a global offering led by the TICs within UBL+.

Contextual elements and benchmarks: The UBL+ Initiative results from the working group's willingness to focus the region's excellence centres on major societal challenges: to address these challenges, actions aim to integrate and shorten the innovation chain and to promote transdisciplinarity. To achieve this, the UBL+ Initiative aims to create a dynamic in which we can break away from an approach that often remains excessively disciplinary. Led by the TICs, the deployment of research actions aims to develop an integrated offering: funding the scientific projects of the standards of excellence, establishing chairs, position papers… The TICs will thus be the vector of new research practices and contribute to reinforcing the site's internationalisation. In terms of a benchmark, the Helmoltz association draws on disruptive projects within research focus areas and also transdisciplinary projects at the interfaces of the focus areas. In other words, the TICs will be composed of a service offering resulting from the deployment of the following actions.

STRUCTURING: RESEARCH COMPETENCY CENTRE

UBL+ provides for the implementation of a research competency centre playing a role of chairing and coordination between the transdisciplinary focus areas of the standards of excellence, each managed by three principal Investigators (PIs), the Mathematics Agency, the InCAS and international laboratories. The Assistant Director of *Research* runs the *research* competency centre and directs the TICs, and is a member of the Executive Committee. He (she) will be responsible for building a roadmap for research programmes and their evolution with the progress of work carried out in transdisciplinary research. The principal localisation of TICs will be that of the Assistant Director.

Results 2 years out	Results 4 years out	Results 10 years out
▪ Implementation of the UBL+ Initiative's research management tools: roadmap, project framework, relationships with members and partners ▪ TICs prefiguration report ▪ INCAS implementation ▪ Financial allocation of ressources on each scientific theme	▪ Establishment of TICs with standards of excellence key partners ▪ 2 new International Laboratories creates ▪ 1 new trandisciplinary laboratory (Labex size) created	▪ Institutionalisation of TICs at UBL level to lead international and transdisciplinary research programmes ▪ 4 new trandisciplinary laboratories (Labex size) created ▪ 5 new International Laboratories creates

ACTION 1: DEPLOYMENT OF THEMATIC TRANSDISCIPLINARY FOCUS AREAS OF THE STANDARD OF EXCELLENCE

Each theme will be coordinated by 3 PIs (complementary in their disciplines and chosen for their international reputation) whose mission will be to coordinate the collective scientific project and to ensure its potential, so as to maintain the emergence of projects on the interfaces. This work will be undertaken in interaction with an office comprising around ten of the main lead research scientists in the focus area under consideration and scientists from foreign partner establishments. Each of the five focus areas will be endowed with an annual budget, assessed yearly by the AIC, enabling the PIs to implement the project. This funding will be accompanied by funding for open transdisciplinary projects on research questions not directly related to the focus areas or implying research at the interface of the focus areas, thus enabling us to pursue and diversify our response to the major selectd societal challenges. The objective is to adopt a functioning emulating that put in place by the Institutes of the Helmholtz association for which funding is allocated to projects. For UBL+, this means that each theme will have to implement the necessary strategy for its completion by defining the medium- and long-term actions – which will respond to the general goals and, in particular, to those of research at the interfaces and transdisciplinarity. An assessment procedure, involving the *AIC,* will be set up to guarantee compliance with the criteria.

Results 2 years out	Results 4 years out	Results 10 years out
▪ 60% multi-disciplinary projects ▪ 30% interdisciplinary projects ▪ 10% transdisciplinary projects	▪ 40% multi-disciplinary projects ▪ 40% interdisciplinary projects ▪ 20% transdisciplinary projects ▪ Publication of transdisciplinary articles and works (5%) ▪ Hiring of researchers for transdisciplinary projects (5% of hiring)	▪ 20% multi-disciplinary projects ▪ 40% interdisciplinary projects ▪ 40% transdisciplinary projects ▪ Establishment of new community of researchers ▪ Publication of transdisciplinary articles and works (20%) ▪ Hiring of researchers for transdisciplinary projects (20% of hiring)

ACTION 2: CREATION OF INTERNATIONAL AND INTERDISCIPLINARY CHAIRS

Modelled on the FIAS (Frankfurt Institute for Advanced Studies) or the Beckman Institute for Advanced Science and Technology at the University of Illinois, the TICs will aim to lead fundamental and theoretical research oriented towards the societal challenges targeted by UBL+. The TICs will thus support Chairs in an international centre of theoretical research oriented towards complex natural, technical and social systems, enabling the establishment of closer links between science, society and our environment and the creation over time of a solid base for more applied research and a competitive advantage for innovation. It will offer a network of scientists, for the hosting of common seminars or other major events in particular. Research will be conducted especially with the IEA (Nantes, Labex RF-IEA) in a logic of strong complementarity. The expected impact of this process on the region will be embodied through:

- The establishment of around ten international chairs, co-funded by UBL+ and industrial patronage, which will welcome internationally renowned researchers for 3 to 5 years. Assessment by the AIC (cf. part 4 – governance)
- Attracting internationally renowned researchers (H index > 50, to adjust depending on the disciplines) to the region: theoreticians and modellers from physics, chemistry, biology, medicine, earth sciences, mathematic, IT, etc
- A monthly meeting for common seminars, so as to develop their work as much with each other as with the rest of the local, interregional, national and international scientific community

Results 2 years out	Results 4 years out	Results 10 years out
▪ 2 operational chairs ▪ 3 manufacturers co-funding chairs over 5 years	▪ 4 operational chairs ▪ 6 manufacturers co-funding chairs over 5 years.	▪ 12 operational chairs ▪ 100 publications/year in leading international vectors ▪ €100k of annual contractual income per chair (regional contracts, ANR, H2020). ▪ 10 manufacturers co-funding chairs over 5 years

ACTION 3: THE MATHEMATICS AGENCY

By relying on the Lebesgue Labex, the Mathematics Agency is intended to reinforce existing interfaces and create new ones between, on the one hand, mathematics and other sciences, and, on the other hand, mathematics and the industrial world. The aim is establish a simple structure, which promotes interdisciplinary research with high mathematical content. This Agency is one of the innovative elements of the augmented science at the heart of our project and the development of transdisciplinarity, with:

- the organisation of meeting days to initiate dialogues when a promising subject emerges and could benefit from the contribution of mathematic
- projects identified at the above interfaces: research engineers will implement jointly designed calculation codes. Under a system of delegated authority, researchers will be encouraged to throw themselves into these management centres

Results 2 years out	Results 4 years out	Results 10 years out
▪ 5 of projects initiated /year	▪ 15 of projects initiated /year	▪ 25 of projects initiated /year

ACTION 4: INTERNATIONAL CENTRE FOR ANALYSIS AND SYNTHESIS (INCAS)

The InCAS, based on the NCEAS (US) model, can provide groups of experts with the means and infrastructures necessary (work spaces, access to bibliography, means of calculation and analysis, accommodation, etc.) to pool data sets and/or lead in-depth discussions around the new concepts related to one of the transdisciplinary focus areas of the current standards of excellence and more widely of the more global project standards of our Initiative. Such a centre thus provides the possibility to set up targeted prospective and to publish position papers. New subjects of transdisciplinary research could also be produced by these projects. This centre will enable us to develop and assert the leadership of the UBL+ teams on the international scene, to put international groups in synergy and to develop a shared strategy with U. Laval, or any other academic partners. The projects will be validated by the AIC.

Results 2 years out	Results 4 years out	Results 10 years out
▪ 4 operational projects (2 per years) and one in collaboration with U. Laval	▪ 6 operational projects and 2 in collaboration with U. Laval and 2 with ASU ▪ 4 completed projects ▪ First publications (4/ project)	▪ 20 completed projects ▪ 80 position papers ▪ 10 operational projects

ACTION 5: CREATION OF INTERNATIONAL LABORATORIES

These laboratories enable us to develop, reinforce and embody targeted collaborations with a laboratory or a university. They also constitute an excellent tool to attract the interest of manufacturers in terms of international collaborations. The set-up of such laboratories leads to exchanges between researchers from the Initiative and the foreign establishment concerned. Such a dynamic will benefit from our existing and claimed aptitude for networked work. They will also aim to respond to InCAS calls for projects and to cross-overs for doctoral students and researchers. The Initiative will thus strengthen its research internationalisation strategy and facilitate the implementation of our transdisciplinary projects. The project aims to put these laboratories in place in partnership with national research bodies.

Results 2 years out	Results 4 years out	Results 10 years out
▪ Choice of partner and projects to establish international laboratories	▪ 1 international laboratory established	▪ 5 international laboratories established

3.2.3. International

Our ambition is to profoundly transform our education, research and innovation practices by supporting international collaborations with a small number of public and private institutions around the world that share our values and our ambitions and to thus produce the collective intelligence necessary to rise to the major global challenges addressed by the standards of excellence. We also contemplate strong international commitment, by linking the Initiative's scientific programming to the knowledge dissemination challenge for the action undertaken through the International Sustainability Centre.

Contextual elements and benchmarks: we want to open the international knowledge systems (see EFS frontiers of science initiative RESCUE [2011]) to a real transition towards sustainability. Inspired by the

Julie Ann Wrigley Global Institute of Sustainability of Arizona State University and the Global Sustainability Institute of Anglia Ruskin University, we wish to establish a centre for international meetings, exchange, research and education in the field of the Ocean/Land/Food/Human focus areas in connection with health and digital technologies and with the intention of creating a knock-on effect for the Initiative and for UBL.

STRUCTURING: INTERNATIONAL COMPETENCY CENTRE

Member of the Executive Committee, the Assistant Director of *International* chairs the *International* competency centre and directs the ISC. Relying on the grouped engineering competenciesof the UBL European projects, the centre will accelerate the internationalisation of themed transdisciplinary programmes, both for research and education: strategic positioning with regard to international calls for projects, network choices, development of strategic alliances, assistance in the drafting and setting up of projects, or even the implementation of coaching and sponsoring notably in order to have young researchers supervised by an expert and to support scientific projects (project proofing, preparation for ERC oral exams, etc.). The UBL+ *Mobility Pack* is, through a quality process for international welcome, an accessible tool on a dedicated portal, including services enabling a step to be taken towards international attractiveness, with the deployment of *International Mobility Centres* across the six major UBL sites. It will have to deal with participation in a new KIC, obtaining European research and education funding, Erasmus+ common Masters, the HR Excellence in Research logo obtained for the Initiative's establishments, the number of internationally co-authored publications, etc. The principal localisation of ISC will be that of the Assistant Director.

Results 2 years out	Results 4 years out	Results 10 years out
▪ Implementation of schemes aimed at communities ▪ The Initiative assumes responsibility for internationally focused operations on behalf of its member ▪ Hiring of 5 consulting engineers ▪ Group of experts set up and operational for coaching ▪ Implementation of the Mobility Pack with dedicated accompanying ▪ Cycles of international workshops held on sustainability	▪ Assesment of the 4 hubs created ▪ Participation in at least one new KIC (Food and/or Raw Materials) ▪ Cycles of international workshops organised and position papers	▪ 8 international development hubs created ▪ Participation in at least one new KIC (or equivalent project in future European framework). ▪ Cycles of international workshops organised and position papers

ACTION 1: CONSTRUCT AND ENHANCE STRATEGIC RESEARCH AND EDUCATION PARTNERSHIPS TO CONNECT THE STANDARDS OF EXCELLENCE TO THE WORLD

The objective is to construct international exchange hubs in connection with strategic partners chosen so as to build solid and powerful institutional partnerships by relying on the density of existing collaborations between the UBL+ Initiative teams. Composed of several people, this presence constitutes intervention units established for a preferably short period. Their vocation is to showcase and promote, on behalf of the Initiative's establishments, in the aim of establishing new international scientific consortiums, facilitating the construction of joint research programmes, accessing new funding windows, putting in place and deploying common education projects, intensifying the cross-over schemes (sabbaticals, jointly supervised theses, mutual welcome of post-doctoral students, etc.). The actions will be adjusted depending on the strengths and requirements of the different focus areas of the standards of excellence.

Results 2 years out	Results 4 years out	Results 10 years out
▪ Validation of definitive list of partners from initial base ▪ Deployment of 1st hub	▪ Deployment of 3 new hubs ▪ Assessment of hub implementation on education, research and commercial viability activities ▪ +20% European funding for research projects (including +30% ERC grants/+20% RIA, IA, CSA, ITN-H2020 project coordination / +20% participation in INFRA-H2020 projects) ▪ +20% European funding for collaborative projects in education sector (including 1 Knowledge Alliances coordination and 2 Erasmus+ common Masters) ▪ (for comparison: the standards of excellence today include 273 FP7collaborative projects + 25 infrastructure projects)	▪ 8 hubs established ▪ 50% increase in number of internationally co-authored publications ▪ +50% European funding for research projects (including +60% ERC grants / +40% RIA, IA, CSA, ITN-H2020 project coordination/ 40% participation in INFRA-H2020 projects) ▪ + 50% European funding for collaborative projects in education sector (including 3 Knowledge Alliances coordination and 6 Erasmus+ common Masters).

ACTION 2: IMPROVING CROSS-OVER MOBILITY FOR RESEARCHERS, POST-DOCS, DOCTORAL STUDENTS AND UNDERGRADUATE STUDENTS

This action aims to propose significant co-funding in favour of the mobility of staff and students, with the emphasis being voluntarily put on outgoing cross-overs for staff and doctoral students. This action aims

to consolidate and extend the Initiative's network of partner international institutions in all areas: education and training, research and innovation. The objective of this action is also to play the attractiveness hand by strengthening the cross-over service offering on the region's 6 sites and by guaranteeing a welcome service for foreign researchers and students that is of a high quality and homogeneous on each of the sites. Coordination work will notably be undertaken in view of a commitment to a quality process and this work will be a direct part of the continuity of actions coordinated by the ComUE UBL and already integrated into the Euraxess France network.

Results 2 years out	Results 4 years out	Results 10 years out
▪ Implementation of incentive funding scheme for 4 target establishments Funding over first two years: ▪ Staff: 10 outgoing cross-overs ▪ Doctoral students: 20 two-way cross-overs ▪ Masters students: 30 two-way cross-overs	Funding for cross-overs in years 3 and 4: ▪ Staff: 10 outgoing cross-overs /year ▪ Doctoral students: 15 two-way cross-overs/year ▪ Masters students: 20 two-way cross-overs/year ▪ Incoming UBL+ Mobility Pack set up ▪ Outgoing UBL+ Mobility Pack set up for 3 target countries ▪ Programme of language support in place for outgoing cross-overs	Funding for cross-overs in years 5 to 10 : ▪ Staff: 20 outgoing cross-overs /year ▪ Doctoral students: 25 two-way cross-overs/year ▪ Masters students: 30 two-way cross-overs/year ▪ Outgoing UBL + Mobility Pack set up for the 10 countries with which UBL+ has developed the most international connections

ACTION 3: ESTABLISH THE FIRST INTERNATIONAL SUSTAINABILITY CENTRE (ISC) IN FRANCE

The ISC is a long-term project that aims to forge the distinctive identity of the UBL+ Initiative by transforming an ideal to focus on a new type of university that is more universal, more interdisciplinary, more international, and more socially responsible.

The goal is to bank on partnerships already in existence and propose new international partnerships (ASU, the University of Colorado, Anglia Ruskin University, and French HER overseas (the University of Guyana, etc.)). The idea behind the ISC is to offer a space "without walls" for the reorganisation of research and education that seeks to answer the crucial question: "How can we transform human systems to preserve natural systems?" For UBL+, the "Future Earth" programme is a prime example, with contributions by civil society, including NGO, ("co-production of knowledge") to the research process (participative investigations) concerning issues that have a major impact on society (eg integrated management of a coastal zone or water). The ISC will support initiatives already under way (cross-cutting "science and society" networks) and contribute to international projects such as ARTISTICC (Adaptation Research - a Transdisciplinary Community and Policy Centred Approach). Above all, it will be a base for initiating new international research and education projects for activities directed toward civil society and political authorities. This centre will comprise:

- A multi-year programme of experimental workshops that implement systemic approaches for the region, open to international collaboration (see Action 1) and contribution to, or the initiation of, major national or international demonstration projects (workshop zones, etc.)
- A programme of international workshops, open to civil society and political leaders, focusing on major topics (eg : Actions to deal with climate change, Global resources, Waste and risks, food and sustainability…). A topic devoted to education has also been included in order to share our experiences, to propose original and inventive programmes, and to thus enable us to enhance the set of educational courses offered by the UBL+ *School of Transdisciplinary Studies*

Results 2 years out	Results 4 years out	Results 10 years out
▪ Scheduling of workshops in cycles, held every 2 years, on the 4 topics selected ▪ Choice of the first experimental workshop with ASU ▪ Connection to the "Future Earth" programme	▪ 1 experimental workshop done ▪ Cycles of workshops held on two topics that result in the publication of position papers ▪ Development of a funding mechanism for projects (businesses, community authorities, Europe) linked to international research and cooperation (Belmont Forums Calls) ▪ Common degree with ASU	▪ Creation of continuing education modules ▪ 200 students with Master's degrees ▪ 10 Ph.D. candidates per year trained in sustainability ▪ 3 experimental workshops held every 2 years ▪ 8 cycles of workshops held ▪ 50% increase in international projects on the topics selected

3.2.4. Education and Training

What we seek to do is develop a culture and practice of transdisciplinary exchanges at all levels of higher education, both undergraduate and continuing, combined with highly innovative teaching methods. Our objective is to add lessons learned from transdisciplinary research projects to the interfaces developed under UBL+'s standards of excellence and promote the establishment of globally transdisciplinary degrees at the Master's and doctoral levels. A few exemples of transdisciplinary Masters : Master of Life and Environmental Sciences with courses in natural sciences, ethics, policy…, Master of Public Policy in Sustainable Territories with policy markers form our Territories (Régions, Cities),

Master of food sciences, with medicine, life science, food security, nutritional issues, food supplements (algae..), Master in Sustainability (Life Science, Environmental Science, Sociology, Law and Economics)… Our establishment of the **School of Transdisciplinary Studies** will form the base for all pertinent activities in undergraduate, continuing and doctoral courses of study in this respect.

Contextual elements and benchmarks: ASU has made the deliberate, forceful decision to establish transdisciplinary courses of study based on areas of focus (renewable energy, border security, etc.). Likewise, Université Laval decided to undertake innovations in educational methods that have transformed its course offerings by diversifying and broadening them, especially involving various types of distance learning. Our goal is to resolutely and boldly open our course offerings up to new pedagogical methods and to transdisciplinarity by combining the research excellence of our staff with the pedagogical excellence of regional IDEFI's, specifically the MAN-IMAL (international degree courses based on the concept "One World, One Health"), which aims to develop a new set of course offerings that include food research, new types of foods, human and animal health, and REMIS - which is developing an interactive learning infrastructure (MOOC's, serious games) and in this sense brings into the networks educational experts and researchers on the proposed pedagogical methods.

STRUCTURING: EDUCATION-STUDENT INVOLVEMENT COMPETENCY CENTRE

The competency centre will prefigure the *School of Transdisciplinary Studies*. The Assistant Director of *Education* will chair the *Education* competency centre and direct the STS, and is a member of the Executive Committee. At the start-up of the Initiative, the competency centre will provide the pedagogical engineering necessary for the implementation of undergraduate and continuing educational courses in connection with the establishments. He (she) will draw up and deploy the Initiative's education roadmap and the control panel enabling the UBL+ performance indicators to be monitored. The competency centre will define the specifications of the transdisciplinary educational courses and participate in funding and implementation within the UBL's establishments: awarding grants, developing new pedagogical tools, events, monitoring agreements with different partners.

Results 2 years out	Results 4 years out	Results 10 years out
▪ Engineering of transdisciplinary educational courses: specifications, agreements between partners… ▪ Creation of a specific UBL+ Ph.D ▪ Creation of Ph.D – MBA ▪ + 2 one-stop entry points for foreign students	▪ Deployment of education actions and the establishment of the School of Transdisciplinary Studies' ▪ All 6 sites have one-stop entry point ▪ 1 "Campus Life"main action each year linking UBL+ with its international strategic partners	▪ School of Transdisciplinary Studies international reference in education ▪ Naming of at least 20 transdisciplinary Maters's courses throughout UBL, with at least 10 in English ▪ 1 "Campus Life"main action each year linking UBL+ with its international strategic partners

ACTION 1: DEVELOPING TRANSDISCIPLINARITY IN UNDERGRADUATE COURSE OFFERINGS

- Establishing a structure for course offerings where the transdisciplinary aspect is common to all the institutions:
  - Implementation of UBL+ "star" curricula at the 3rd-year B.A./B.S. (B-3) and 1st and 2nd-year Master's (M-1, M-2) levels, based on the following criteria: a transdisciplinary approach, in English or several languages, tracked internships in laboratories (B-3 and M-1) that include international partnerships, standards of quality assessment for students and teachers, and use of the digital campus
  - "UBL+ thesis research" scholarships for the best Master's students at UBL
  - Transdisciplinary educational modules set up based on the PE that are part of, and accredited in, undergraduate courses of study, specifically to promote professional experience at the B.A./B.S. level (see IDEFI 2PLG)
  - Competitive entry for UBL+ doctoral courses: recruit the best students (motivation, aptitudes for communication and entrepreneurship)
  - Awarding of UBL+ doctoral contracts proposed based on the standards of excellence and in collaboration with doctoral institutions
- For all students at UBL, mandatory familiarity with one educational module on transdisciplinarity, research on the crux issues and major changes facing the world (UBL+'s philosophy) and on the link between transdisciplinary studies and employment prospects (participation in entrepreneurial undertakings, enhanced skills)
- Organisation of discussions, experimental sessions and deployments of innovative and interdisciplinary learning/teaching methods: innovation in terms of focus area (instruction on the topics

in the standards of excellence), of methodology (methods of teaching transdisciplinarity, social learning, etc.), and of objectives (instruction on the link between transdisciplinarity, sustainability and enhanced employment opportunities)

- Establishment of an International Master's in Sustainability Science (ISS) within the Life Science, Environmental science, humanities, law and economics fields

Results 2 years out	Results 4 years out	Results 10 years out
▪ 3 UBL+ Master's courses established or branded ▪ 10 M-1 scholarships ▪ 20 M-2 scholarships implemented ▪ 20% of the awardees of M-2 scholarships pass the UBL+ doctoral entry competition ▪ 10 experimental modules developed and implemented	▪ Establishment of the International Master's in Sustainability Science (ISS). ▪ 5 UBL+ Master's courses established or branded (250 students in M-1) ▪ 50 M-1 scholarships ▪ 100 M-2 scholarships ▪ 20% of the awardees of M-2 scholarships pass the UBL+ doctoral entry competition ▪ 10 new modules	▪ Naming of at least 20 transdisciplinary Master's (1 and 2) courses throughout UBL, with at least 10 in English ▪ 100 M-1 scholarships (with outside co-financing) ▪ 150 M-2 scholarships (with outside co-financing) ▪ 20% of the awardees of M-2 scholarships pass the UBL+ doctoral entry competition ▪ On-line catalogue of the "modules"

ACTION 2: ESTABLISHMENT OF A PROGRAMME OF "LIFELONG EDUCATION COURSES" CONNECTED TO THE PERIMETER OF EXCELLENCE (CONTINUING EDUCATION, PERMANENT UNIVERSITY)

- The creation of "training labs" for continuing education, based directly on the results of research, linked to industrial partnerships and the IRT-ITE-IHUp. The purpose of these training labs will be to perform "proofs of concept" (ex: reducing human footprint, innovative tools of cybersecurity, HACCP procedure, introducing algae in food, Information and Communication Sciences and Technologies …)
- The creation of a transdisciplinary course of study linked to the interfaces of the standards of excellence and the ISC, to be offered in lifelong educational programmes at UBL institutions
- Interactif MOOC "Innovation and Entrepreneurship" enabling UBL+ to capitalise the initiative lauched in 2015 by SATT *Ouest Valorisation*
- The holding of "open innovation days", meetings between researchers and business leaders and/or the general public to brainstorm new projects

Results 2 years out	Results 4 years out	Results 10 years out
▪ Statement of specifications for the training labs and open days ▪ Naming for 4 years of 5 training labs by RFP ▪ Holding 5 open days per year	▪ Offering of an international continuing education course in English on the topics of excellence ▪ Naming of 5 training labs each year by RFP ▪ Evaluation of the training labs and open days	▪ New schedule of continuing education and permanent education courses including transdisciplinary courses ▪ 100 businesses and organisations have taken part in at least 50 training labs

ACTION 3: INSERTION OF THE SCHOOL OF TRANSDISCIPLINARY STUDIES' NEW CURRICULA INTO THE DOCTORAL COURSES AND TRANSDISCIPLINARY ADVISING FOR DOCTORAL STUDENTS

- Special *UBL+ doctorate*, characterised by the establishment of a break of several months, in advance of the doctorate, working in a laboratory or company that is a strategic partner outside of UBL+, followed by a transdisciplinary thesis within the standards of excellence. This thesis will be internationally based, either through a co-sponsorship with a foreign partner, or based on a "sandwich thesis" model, with one of the three years of doctoral studies spent working for a partner abroad
- Financial support for *CIFRE-PME- UBL+* theses that, unrelated to the UBL+ doctorate, cover a research topic within the standards of excellence
- *Ph.D. + MBA* double doctoral degree, accessible to selectioned UBL doctoral students: 3 years in partnership with the **3 Business Administration Institutes** (IAE) from UBO, UR1 and UN, and schools of management
- 30-hour *UBL+ transdisciplinary educational module* and 30 hours managing a research project as part of the 100 hours of doctoral studies
- Annual *compared epistemology meeting* with members of the Nantes Institute for Advanced Study (180 researchers from 42 countries in 2014), for young instructors-researchers newly recruited from member institutions and UBL+ doctoral students

Results 2 years out	Results 4 years out	Results 10 years out
▪ Annual international "summer school" on a topic from the standards of excellence ▪ Creation of an annual UBL+ educational module and a research management module ▪ Annual IEA and TICs meetings	▪ Proposal to each UBL+ doctoral student of a 6-month internship ▪ 20 CIFRE allocations for a business-based thesis within the UBL+ charter ▪ 30% Ph.D. - business ▪ 10% MBA-doctoral candidates	▪ 20 CIFRE allocations for a business-based thesis within the UBL+ charter ▪ Annual international "summer school" on each topic from the UBL+ charter ▪ 30% Ph.D. - business ▪ 20% MBA-doctoral candidates

	▪ Annual IEA and TICs meetings	▪ Annual IEA and TICs meetings

ACTION 4: PROMOTE AN INTEREST AMONG YOUNGER STUDENTS IN THE HARD AND SOFT SCIENCES

- The Initiative will undertake an ambitious plan to promote awareness of the scientific (hard and soft sciences), technical and industrial realms in the school system so as to develop an interest in science on the part of school children, in link with the two academies (primary, middle, secondary schools), as well as in the foundations of new technology and technical know-how, drawing heavily on the investigational approach.
- Providing young people with the keys to the world around them through training in problem solving and research questions, along with an adequate mastery of the procedures and basic transformations, will enable future generations to establish a baseline of theoretical knowledge and practical competenciesthat are critical to facing our society's challenges. The UBL+ Initiative will link up three *Investissement d'Avenir* (Investment in the Future) programmes currently under way in the region (*Parcours, Maison pour la science de Bretagne, MERITE*) by contributing a double added-value: setting up networking between the various programmes and publishing the results of these programmes throughout the UBL site.

Results 2 years out	Results 4 years out	Results 10 years out
▪ Linking of the 3 CSTI projects of PIA 1 ▪ Sharing and dissemination of information about existing initiatives and instruments ▪ Organisation of professional discussion areas for the various participants	▪ Offering of professional development training for primary and secondary level teachers, and experimentation ▪ Creation of instruments and measures to supplement the current offering	▪ Implementation of the instruments and measures throughout the UBL site ▪ Implementation of the professional development offering throughout the UBL site

3.2.5. Result exploitation / transfer and socio-economic partnerships

The purpose of the Initiative is to closely link excellence in research with commercial viability in order to contribute to the development of our industrial sector, both domestically and internationally, to enhancing exportation and to the creation of sustainable employment in the region. To supplement the measures set up at the existing tools, the Initiative's added value will be to promote a voluntary policy of open innovation. Our objectives are to: (1) Make the Initiative a major player in open innovation within the economic, cultural and social ecosystems of the region; (2) Intensify collaboration between academic players and companies; (3) Strongly promote the creation and acceleration of start-ups; and (5) Optimise the collaboration between agents involved in result exploitation.

Contextual elements: The region comprised in the Initiative is specifically structured to make research applicable in economic, social and cultural terms. This results in highly active ecosystems and great successes in PIA1 (Jules Verne IRT for advanced manufacturing, b<>com IRT for agile networks and hypermedia content, France Energies Marines (FEM) ITE focuses on renewable maritime energy sources, IHU CESTI on immunotherapy and transplants) and PIA2 (French Tech) calls for tenders. The SATT Ouest Valorisation contributes to technical and economic expertise and benefits from more than 5 million euros per year investment capacity (on its own ressources, without the leverage effect) to ensure the success and sustainability of new business activities derived from research. Today, the SATT has become the commercial viability operator for 23 institutions within Bretagne and Pays de la Loire. The 9 Carnot institutes take part in numerous collaborative undertakings by academics and industrialists. One must add to those 2 French Tech "labels" in Nantes and in Rennes out of the nine awarded nationally, which serve to recognise the dynamism of the digital ecosystems in the two cities and throughout the region. A network of technology centres and incubators, 9 competitiveness clusters, all interconnected, complements that structure. This organisation has the potential to create a substantial number of jobs based on added value for areas of excellence linked to a concentrated effort by the players and to productive links with research laboratories.

STRUCTURING: INNOVATION AND TRANSFER COMPETENCY CENTRE

The Result exploitation-Transfer competency centre will prefigure the establishment of the Institute for Open Innovation and anticipate the implementation of its main mission: (1) the management of a

network of Innovation Centres (2) growing socio-economic partnerships negociated by the SATT or other UBL+ partners, thanks to the management of a communication unit for the economic world and any other actions in the area of patronage (3) the establishment and leading of a network of innovation, formed of incubators, accelerators and start-ups which will be able to rely upon the Initiative's education and research competenciesto develop or support their activities and finally (4) the establishment of a Think Tank dedicated to Innovation and the acceleration of transfer.
A member of the Executive Committee, the Assistant Director of Innovation-Transfer competency centre and directs the IOI. At the project start-up, he (she) will be responsible for launching the centre's actions and in particular setting the roadmaps for the Innovation Centres and the Think Tank and leading the partnerships. He (she) is thus also responsible for a socio-economic partnerships unit, which will promote the Initiative vis-à-vis businesses and SMEs in order to help develop industrial chairs and other actions in the area of patronage. Among the notable schemes are the establishment of a think tank, composed of academic experts and the socio-economic world, which will be a place for reflections and proposals related to the acceleration of transfer and the re-industrialisation of the territories.

Results 2 years out	Results 4 years out	Results 10 years out
▪ Establishment of the IOI ▪ Establishment of the Think Tank ▪ Establishment of communication and partnerships unit ▪ Launch of Innovation Centres linked to IRT	▪ Deployment of 5 Innovation Centres linked to focus areas ▪ Organisation of an international conference on Open innovation	▪ Results and Outlook Report following 10 years of the Think tank

ACTION 1: ESTABLISH AN INSTITUTE FOR OPEN INNOVATION (IOI)

Based on our five societal challenges and our five transdisciplinary focus areas, and drawing on models such as the CITRIS at UC Berkeley or Sky Song at Arizona State University, we will set up an Institute for Open Innovation and a network of Innovation Centres that bring together academics and businesses. In partnership with the above-mentioned network for technology research and application, this institute will bring together transdisciplinary teams of researchers and engineers, academics and industrial producers to jointly develop innovation projects that may result in the creation of start-ups. The Innovation centres will include technological platforms (e.g. "Technocampuses"), co-working spaces and fab labs, associated with accelerators as needed (the hatching of future winners will be encouraged by an agreement with private accelerators: intensive programs, coaching, and education. The IOI will attract researchers and companies from the region and from the world at large. These participants will have the benefit of mentoring and training activities, research teams and resources from the Initiative to develop their projects. This institute will be networked with the TICs (see above) to create a formidable undertaking for the production of knowledge, innovations and value. Within the institute, we will set up a think tank comprised of experts on science and technology drawn from academia and businesses. This think tank will provide a forum for discussions and proposals concerning innovative practices within the Initiative and, more generally, on open innovation and the reindustrialisation of regions. Based on the work of this think tank, and with assistance from a "community manager" who will run a web site devoted to open innovation accessible to the general public, the Initiative will stand out as an opinion leader on these key subjects for France and as an effective lobbying agent with national and European government administrators.

Results 2 years out	Results 4 years out	Results 10 years out
▪ 50 start up created	▪ Deployment of 5 Innovation Centres linked to the focus areas ▪ Doubling up the amount of start-ups arised from academic laboratories : 110 ▪ Signing of research contracts with 5 accelerators for 10 start-up projects ▪ Attraction of 2 industrialists	▪ Creation and deployment of the "Social Innovation" innovation centre ▪ 335 start up created ▪ Signing of research contracts with 15 accelerators for 40 start-up projects ▪ Attraction of 10 industrialists, including 2 internationally ▪ 5 start-ups reaching the ETI level on the territory ▪ 5 national and international large groups on the territory through start-up buy out

ACTION 2: ESTABLISH A CONTINUUM OF ACADEMIA-BUSINESS PLAYERS

This action by the Initiative will combine 2 different dimensions:

- **Establishment of a doctorate-business continuum** that will provide for acceleration of the two-way, laboratory-business transfer through advising during the six years of doctoral and post-doctoral work D-3/D+3. This will be done by strengthening the link between any Ph.D. hired by a company and their institution of study (continuing education, joint studies on a technological platform under preferential conditions, access to seminars, etc.); by setting up double Ph.D./MBA profiles in

partnership with schools of management; by deploying a "business creation" profile in the Masters and Doctoral courses of the Initiative combined with educational modules on commercial applications and the start up of businesses (project PEPITE)

- **Establish the conditions for a "mobility" professional career path** by promoting the embedding of researchers and teacher-researchers in companies, which serves to diminish the obstacles to cross-overs found in the conditions required to move to the business sector and return to higher education and research institutions. The goal is for researchers to be able to contribute their expertise as directly as possible to companies in the region and still return to the academic realm under favourable terms (sabbatical year, doctoral or post-doctoral scholarship, etc.) and thus accelerate the process of knowledge intake/output. By thus reducing the obstacles, we can develop a positive attitude toward commercial application of research ("take a chance" rather than "take a risk").

Results 2 years out	Results 4 years out	Results 10 years out
▪ "Business creation" profile modules set up under UBL+ and open to doctoral students. ▪ 10 two-way cross-overs funded between companies and research labs	▪ A continuing education offering and support for the link with Ph.D.'s are both operational. 25% of Ph.D.'s involved in "continuum" actions ▪ Double Ph.D./MBA course of study is operational and involves 5-10 doctoral students. ▪ 20 two-way cross-overs funded between companies and research labs ▪ Sustained involvement of 20 instructors-researchers or researchers in regional businesses.	▪ 50% of Ph.D.'s involved in "continuum" actions ▪ Double Ph.D./MBA course of study involves 15-20 doctoral students.

3.2.6. Student involvement

Goal: The Initiative plans to draw on its level of interest to work with associations on the major world challenges. In addition, by means of a MOOC, all UBL students will be made aware of these challenges as part of their course of study in order to open their minds early on to neighbouring disciplines. This mind-set has to provide the link to our international partners. Lastly, the centre will also have to be attractive in terms of the simplicity of its administrative processes in order to achieve successful integration.

Contextual elements and benchmarks: A lifestyle including community involvement by the students will be specifically developed and diversified in HER [higher education & research] institutions in the western region of France (2012-2013 FSDIE MESR report). Each student's commitment is also a means of personal growth, as well as a pathway to employment: an understanding of major societal issues is thus critical in this context. Lastly, attractiveness is currently also measured by the supportive measures offered to foreign students: the one-stop process is a laudable step offered by the Ministry of Foreign Affairs and its expansion to all campuses would be a visible plus for our site.

ACTION 1: CENTRAL THEME OF TRANSDISCIPLINARITY TO BE BORNE BY STUDENT ASSOCIATIONS

This action aims to make the most of the special nature of the region, marked by a highly developed level of community involvement. Community associations serve to reach all students, all levels of study and all courses of education. We will thus offer:

- Each year: a topic related to the major societal problems underlying the transdisciplinarity of the Initiative: democracy, our natural resources, transition, what lies ahead, and diversity. For example, the topic chosen for 2015 will be "our natural resources".
- Material and financial assistance for associations that hold events, symposiums, cultural activities and presentations on the topic of the year.
- Continuation on to other topics (e.g. CSR - Corporate social responsibility) or a focus on transdisciplinary areas of the UBL+ Initiative (e.g. food supplies in the future).
- An award for the best initiative.

Results 2 years out	Results 4 years out	Results 10 years out
▪ € 25,000 for the associations ▪ 2,400 students involved	▪ € 60,000 for the associations (+ funding from businesses) ▪ 4800 students involved	▪ € 100,000 for the associations (+ funding from businesses) ▪ 7,200 students involved

ACTION 2: STUDENT INVOLVEMENT WITH INSTITUTIONS WHO ARE STRATEGIC PARTNERS OF THE INITIATIVE

- The strategic partnerships UBL+ has with *Arizona State University, Université Laval*, etc. will also grow in terms of student involvement, through a consistent effort to share information and distance learning courses: remote access to document collections and data bases, distance learning courses for students wanting to come to UBL (prerequisite courses, French as a foreign language, etc.), the granting of living stipend scholarships, etc.
- The holding of reciprocal cultural events with international universities who are strategic partners: University X Week, etc.
- The holding of debates between students by teleconference on major world issues, moderated by a person of international renown.

Results 2 years out	Results 4 years out	Results 10 years out
▪ 1 cultural event per partner institution ▪ 1 major debate per partner institution ▪ 20 living stipend scholarships	▪ 1 cultural event per partner institution ▪ 1 major debate per partner institution ▪ 20 living stipend scholarships	▪ 1 cultural event per partner institution ▪ 1 major debate per partner institution ▪ 20 living stipend scholarships

ACTION 3: INTERNATIONAL OFFICE FOR FOREIGN STUDENTS, IN ORDER TO BUILD A STRONG INTERNATIONAL IDENTITY INCLUDING OPENESS AND INVESTMENTS IN THE QUALITY OF STUDENT LIFE

In structural terms, the size of the site will require the establishment of shared processes to enhance students' access to the resources offered and facilitate the reception of foreigners in line with the site's visibility on the international level. The following measures will thus be proposed:

- Physical welcoming of foreign students, upon first arrival, with upgraded measures to help them settle in and successfully become part of the community: assistance with administrative procedures (presence of staff from the Prefecture), residence card, registration for courses, lodging, insurance, healthcare, involvement in associations and cultural activities, travel arrangements (August/September and January).
- Trilingual advisors on hand in the university residences during times when foreign students are arriving (August/September and January).
- Assistance and replies to questions as quickly as possible, handling of emergencies, monitoring of changes in French immigration regulations (all year round).

Results 2 years out	Results 4 years out	Results 10 years out
▪ 10,000 students involved	▪ 20,000 students involved	▪ All 6 sites have one-stop entry points ▪ 40,000 students involved

ACTION 4: UBL+ ALUMNI NETWORK

- UBL+ alumni will comprise the graduates, doctoral students and personnel working at UBL+ who benefited from research and educational activities under the Initiative.
- This purpose of this action is to set up and manage a network of UBL+ alumni internationally, maintaining periodic communication with them and requesting that they serve as resource points to help our businesses get a foothold or grow on the international level.
- The UBL+ alumni network will offer opportunities to take advantage of a number of services: become a mentor/sponsor for a student or another alumnus/alumna, have access to an on-line directory and find old schoolmates in French and internationally, contact specialists in numerous fields and businesspersons in any economic sector, take part in UBL events, and make presentations during seminars and conferences.

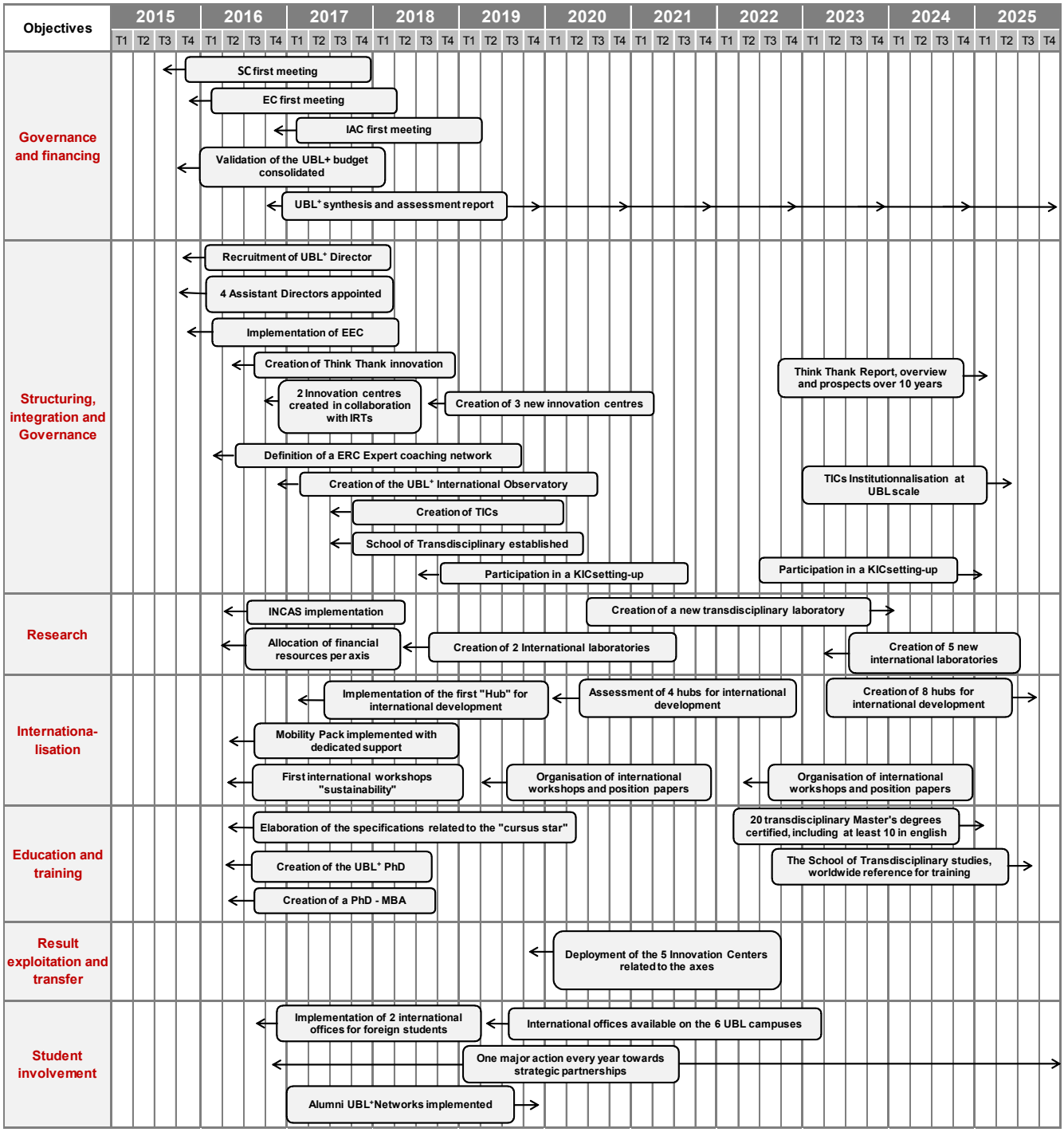
Results 2 years out	Results 4 years out	Results 10 years out
▪ Statement of specifications written for the services offered to alumni ▪ Develop the network before degrees are awarded (communication)	▪ Network set up ▪ Requests to first alumni (group activities)	▪ Network is active internationally ▪ 30 companies receiving assistance from the alumni network

3.3. Trajectory

In order to successfully achieve the goals of the UBL+ Initiative, the working group has identified key milestones to be met in order to fulfil our commitments 2, 4 and 10 years out (see § 3.6). Particular attention is paid to the first two years, which will enable us to build the structural framework to meet our 4-year objectives. Our achievements will be assessed using performance indicators, which will also allow us to discern the transformative effects of the UBL+ Initiative. For research, our analysis of the portfolio of programmes funded, highlighting multi-disciplinary, interdisciplinary and transdisciplinary projects, will be one instance of this.

The following master plan sets forth the key Initiative milestones at 2, 4 and 10 years out:

Implementation plan



3.4. Resources

The Initiative's LABEX area all essential to its development and it is vital to be able to continue to fund the scientific work on the themes that they are developing.

A gradual reorganisation of the focus areas and the Labex could thus enable the two systems to merge so as to arrive at a system of focus areas which would focus both on transdisciplinarity and the challenges, with teams ensuring the necessary resourcing to maintain disciplinary excellence. The development of inter-focus area research would then become the real reactor core of the Initiative by magnifying the transdisciplinary concerns in order to tackle the societal challenges in depth.

A target from the first phase of UBL+, four years, will therefore be to manage the evolution of the Labex towards a reorganisation within the focus areas by adapting the governance and funding of the focus areas accordingly.

The total budget of the UBL+ Initiative, amounts to 250 M€ over the first four years.

The UBL+ Initiative grant (69.9 M€) must be considered as a starter input, allowing to insure the sustainability of the ambitions of the Initiative over the future four years.
This amount is completed by several contributions, stemming from partners of the project:

- The contribution of Institutions of higher education (Universities and Grandes Ecoles), in proportion to their specific shares, for a total amount of 18 M€.
- The contribution of inter-regional Community of Universities and Establishments (ComUE), for a total of 1 M€.
- The contribution of the institutional organizations (regions, city…), which strongly support the Higher Education and Research on this territory. These Institutions provide a global amount of 28.6 M€ for the HER.
- The participation of economic partners, especially in the action of innovation, for a total amount of 8.5 M€.
- The contributions of Research bodies (CNRS, INRA, Inria, INSERM, Ifremer), who support very strongly this Initiative project, strengthen the global strategy (123.3 M€).

These various mobilized resources (except of LABEX actions) by the partners are ventilated on various axes as follows:

- Governance & strategy : 31.6 M€
- Research : 101.2 M€
- Education & training : 42 M€
- Result exploitation and socio-economic partnerships : 25.5 M€
- International : 39.3 M€
- Students involvement : 10.4 M€

Each axe is organized in several actions, which are described in appendices of this file.
The project, managed by the ComUE UBL, allows all the partners to benefit from the technical support of the latter; but also to develop the dynamics and the collaborations between Universities, Grandes Ecoles and Research bodies.

As soon as the UBL+ Initiative will start, the financial projections will be check to insure the sustainability of the actions beyond the initial duration of the Initiative. This strategy will be supervised by the Steering Committee (SC), with help of the Advisory International Committee.

Overall Cost of the Action Plan and financing plan

	Average annual cost		Total* 2016-2019	Financing resources *total 2016-2019*					
					IdEX funds	COMUE	EES groupmt	OR groupmt	Part. Publics	Part. Privés
Total (k€)		**62 493**	**249 972**	**%**	**69 889**	**990**	**17 960**	**124 000**	**28 600**	**8 533**
%	**%**									
Structuring and governance	***13%***	**7 899**	**31 596**	*13%*	**9 217**	**-**	**13 378**	**9 000**	**-**	**-**
Action 1 : Competency centre for Research		3 568	14 274	*5%*	3 512	-	1 762	9 000	-	-
Action 2 : Competency centre for International Relations		1 693	6 774	*4%*	2 902	-	3 872	-	-	-
Action 3 : Competency centre for Education & Training - Student life		1 318	5 274	*2%*	1 402	-	3 872	-	-	-
Action 4 : Competency centre for Result Exploitation - Transfer		1 318	5 274	*2%*	1 402	-	3 872	-	-	-
Research	***40%***	**25 291**	**101 163**	*37%*	**25 630**	**-**	**2 966**	**55 000**	**10 000**	**7 567**
Action 1 : Deployment of thematic and transdisciplinary axes of the perimeter of excellence		8 500	29 000	*21%*	15 000	-	-	10 000	4 000	-
Action 2 : Creation of international and interdisciplinary chairs		7 547	27 761	*8%*	5 568	-	-	15 000	-	7 193
Action 3 : Mathematics Agency		4 983	11 680	*2%*	1 050	-	630	10 000		-
Action 4 : InCAS : International Center for Anlysis and Synthesis		5 557	13 904	*4%*	3 064	-	840	10 000		-
Action 5 : Creation of international laboratories		5 955	18 818	*1%*	948	-	1 496	10 000	6 000	374
Education & Training	***17%***	**10 496**	**41 985**	*7%*	**4 763**	**-**	**590**	**30 000**	**6 000**	**633**
Action 1 : Development of transdisciplinarity as part of the initial training offer		5 250	21 000	*3%*	2 200	-	550	15 000	3 250	-
Action 2 : Creation of a "life-long training" programme linked to the perimeter of excellence (ongoing training)		1 919	7 675	*1%*	513	-	-	5 000	1 650	513
Action 3 : Integration of innovative trainings from the School of Transdisciplinary Studies as part of the PhD training and the cross-disciplinary support for PhDs		1 690	6 760	*1%*	540	-	-	5 000	1 100	120
Action 4 : Develop competencies in hard and subtle sciences and technology basics for younster		1 638	6 550		1 510	-	40	5 000	-	-
Result exploitation and socio-economic partnerships	***10%***	**6 374**	**25 497**	*29%*	**20 330**	**-**	**333**	**-**	**4 500**	**333**
Action 1. Creation of an Institute for Open Innovation (IOI)		4 500	20 247	*25%*	17 330	-	333	-	2 250	333
Action 2: Creation of a continuum for Academic players - companies		750	5 250	*4%*	3 000	-	-	-	2 250	-
International dimension	***16%***	**9 830**	**39 320**	*7%*	**4 986**	**990**	**244**	**25 000**	**8 100**	**-**
Action 1 : Build and enhance strategic partnerships for Research and education & training to connect the perimeter of excellence to the world (hubs)		3 048	12 190	*1%*	1 036	-	84	10 000	1 070	-
Action 2 : Improve the mobility of scientists, PhDs, PhD students and other students		2 855	15 920	*6%*	3 950	990	-	5 000	5 980	-
Action 3 : Create the first International Centre for Sustainability (CIS) in France		2 803	11 210	*0%*	-	-	160	10 000	1 050	-
Student involvement	***4%***	**2 603**	**10 412**	*7%*	**4 963**	**-**	**449**	**5 000**	**-**	**-**
Action 1 : Transdisciplinarity model followed by student associations		420	1 681	*2%*	1 545	-	136	-	-	-
Action 2: Student life with UBL+ strategic partners		501	2 005	*3%*	1 804	-	201	-	-	-
Action 3 : International office for foreign students, to achieve a strong identity on the world stage		1 669	6 676	*2%*	1 575	-	102	5 000	-	-
Action 4 : Develop an Alumni UBL+ Network		13	50		40	-	10	-	-	-
Total (€k)		**62 493**	**249 972**		**69 889**	**990**	**17 960**	**124 000**	**28 600**	**8 533**
Annual average (€k)			62 493		17 472	247	4 490	31 000	7 150	2 133

**Excluding the costs related to Labex, Idefi and other PIA projects carried out by IdeX*

3.5. Human resources

UBL+ HR management and recruitment policy will be structured around 3 levels of actions: 1) Recruiting of labor forces to drive and realize UBL+ actions. The site attractiveness will be improved by attracting the best talents for the excellence perimeter and experts to implement UBL+ core actions. 2) Pooling and enhancing existing forces, within higher education institutions, or within "University Bretagne Loire", the core of the Initiative. The main target will be to constantly optimize human resources. 3) Setting up skill development policy, allowing an evolution of the support staff within the initiative perimeter and more globally, within UBL.

❖ Rigorous and high level recruitment process, vector of the site attractiveness

- Internationally: in support of the initiative ambitions by developing international cooperation. The Initiative will emphasize an attractive recruitment offer for researchers, managers and international students at 3 different recruitment level :
- International pluridisciplinary chairs: the recruitment process will be based on a tight schedule for junior or senior scientific. They will be positioned beside a competency centre and they will work for a scientific theme of the Initiative to galvanize UBL+ transdisciplinary axis and bring out new concepts and new projects. Up to 5 years within the framework of TICs.
- International mobility: Welcome packages for researchers and international students will be set up either as temporary invitations or as doctoral or post-doctoral scholarships. From 1 month to 1 year.
- Executive managers' recruitment: Management positions will be hold (at least for some of them) by candidates with long experience abroad. Any supervisory position which won't be fit out thanks to a pool of human resources will be open at an international level.

Office for Mobility, within the International competency centre will be in charge of helping incoming foreign students or staff and particularly foreign researchers with any impediment: housing, administrative paperwork, spouse/ husband recruitment, children education in international schools…The competency centre will seek support from the regions, urban conglomerations and Prefectures to build up the best offer.

- At a local level : UBL will be in charge of recruiting talents, essential for reaching UBL+ objectives: top-level researchers, experienced engineers, experienced support staff (education, project engineering, digital, international policy…). The Initiative will finance directly these positions. However, a pooling with the ComUE and higher education institutions will be systematically sought. These polling effects will enable UBL+ to rationalise costs and favor knock-on effect.
- Hiring process: The Search Committee will be composed of PIs and/or vice-presidents and external experts. UBL+ President will always take the final decision.
- Contracts: 1 to 3 years fixed term contracts, renewable within a limit of a 5 years contract. An annual review and an assessment after the first three years will be conducted by the direct manager. After this assessment, the contract might be transformed into a permanent position and implemented by UBL or one of its members.

A salary grid will be created to stabilize compensation levels. The objective will be to devise incentive but also fair and consistent compensation policy. This policy will allow UBL to devise multiannual consistent budget forecasts and to handle payroll mobilized on scientific projects. Attractiveness is not systematically linked with remuneration and then, every particular case will be discussed and alternatives might be offered.

❖ Pooling and emphasizing human resources called up on the project

Beyond recruitment, the pooling effect of existing resources is one of the main important levers of the Initiative.

- Creation of UBL+ shared platforms : as an answer to the originality of the site distributed system, communication functions, international policy functions, educational innovation tools and European projects engineering services will be shared
- An inter-institution mobility policy will be set up to ease exchanges and synergies: any measure which would facilitate mobility within the different institutions of the perimeter will be considered.

Provisions will be privileged for temporary mobility of any people towards the Initiative or any researchers towards partner companies. Permanent mobility will become possible among the Initiative different partners, either by transfer (employment grant) or by provisional assignment. The whole plan will be designed to uphold shared actions in research and education.

- Rallying the best talents of the perimeter on UBL+ actions and transdisciplinary themes : UBL+ HR policy will be highly selective and will aim at rallying the more relevant talents on a given action or project (ERC, IUF, CNRS medalist …)

❖ Enriching professional careers

UBL+ HR team will also be in charge of analyzing changing jobs, identify relevant competences to be acquired by the different actors, and support them in this necessary evolution.

- Pooling a specific offer of trainings, using the one set up by ComUE, for recently recruited staff
- Creating a management school focusing more specifically on managers called up on the Initiative to emphasize common values and objectives. For the knock-on effect, this school will be opened to any personnel within the Initiative partners.
- Pooling researchers coaching to allow them to defend international projects and ERC applications for example.
- Setting up "mobility action plan" to ease careers development (external mobility, promotions, internal Challenges …)
- Creating a support pole for non-permanent staff focusing on assessment organization and individual measures to facilitate occupational integration at the end of their contract. A specific charter will be taken on in this subject.

3.6. Main commitments

The UBL+ Initiative is an ambitious undertaking where the research and educational courses are designed to deal with major societal challenges that often require multi- and interdisciplinary approaches within the topic areas selected (ocean-coastal areas, human-digital, new therapies and quality of life, future food supplies, the discovery and life cycle of materials and structures), and transdisciplinary approaches to the interfaces between topics, that involve cross-fertilisation between academic institutions, businesses and society.

To achieve this, the members of the working group are committed to implement all of the actions described previously, which will serve to provide a new type of university, founded on complex research objectives with mandatory international outreach and strong roots in the region. Table 1, below, summarises the main indicators for implementation and results 2 and 4 years out that outline the mechanism for assessment of the Initiative to be set up based on a proposal by the Executive Committee.

We expect that, within the first 2 years, structural actions will be taken to quickly root the Initiative in the landscape of the HER and to provide a leverage effect for the results to be achieved 4 years out, as defined below.

		2 years out	4 years out
Structuring, Integration & Governance	Establishment of the Research competency centre	▪ Installation of the competency centre	▪ The principal localisation of TICs will be that of the Assistant Director
	Establishment of the International Competency centre	▪ Installation of the competency centre	▪ + 20% European funding for research projects (incl. +30% ERC scholarships/+20% coordination of RIA, IA, CSA, ITN-H2020 projects/+20% participation in INFRA-H2020 projects). ▪ +20% European funding for collaborative projects in the educational sector (incl. 1 coordination of the *Alliance de la Connaissance* and 2 Erasmus+ shared Master's degrees) ▪ *(for comparison: the standards of excellence currently includes 273 FP7 collaborative projects and 25 infrastructure projects)*
	Establishment of the Educational Competency centre	▪ Installation of the competency centre	▪ The principal localisation of STS will be that of the Assistant Director
	Establishment of the results exploitation and transfer Competency centre	▪ Installation of the competency centre ▪ Creation of a proprietary Web site	▪ Location of Innovation Centres in Angers, Brest, Nantes and Rennes
Research	Deployment of the 5 transdisciplinary focus areas	▪ 60% multi-disciplinary projects ▪ 30% interdisciplinary projects ▪ 10% transdisciplinary projects	▪ 40% multi-disciplinary projects ▪ 40% interdisciplinary projects ▪ 20% transdisciplinary projects ▪ Publication of transdisciplinary articles and studies (5%) ▪ Recruitment of researchers for transdisciplinary projects (5%)
	Establishment of interdisciplinary international chairs	▪ 2 operational chairs ▪ 3 industrials co-financing chairs for 5 years	▪ 4 operational chairs ▪ 6 industrials co-financing chairs for 5 years
	Establishment of the Mathematics Agency	▪ Implementation of math content in UBL+ projects every year	▪ Implementation of math content in UBL+ projects every year
	Establishment of the InCAS	▪ 4 projects operational (2 per year)	▪ 6 projects operational ▪ 4 projects done ▪ Initial publications (4/project)
	Establishment of International Laboratories		▪ 2 international laboratory established
International	Enhance strategic partnerships related to the PE		▪ Deployment of 3 new international development hubs
	Improving cross-over mobility for researchers, post-docs, doctoral students and undergraduate students	▪ Staff: 10 outgoing cross-overs ▪ Doctoral students: 20 two-way cross-overs ▪ Master's students: 30 two-way cross-overs	▪ Staff: 10 outgoing cross-overs/year ▪ Doctoral students: 15 two-way cross-overs/year ▪ Master's students: 20 two-way cross-overs/year
	Establish the first ISC		▪ 1 experimental workshop done

		2 years out	4 years out
Education and Training	Development of transdisciplinarity in the course offerings for undergraduate education	▪ Creation of 3 UBL+ Master's degrees ▪ 10 M-1 scholarships ▪ 20 M-2 scholarships ▪ 20% of M-2 scholarships for UBL+ doctoral students ▪ 10 transdisciplinary educational modules linked to the PE implemented in education curricula, specifically L	▪ Creation of 5 UBL+ Master's degrees ▪ Creation of an International Sustainability Master's (link to ISC) ▪ 50 M-1 scholarships ▪ 100 M-2 scholarships ▪ 20% of M-2 scholarships for UBL+ doctoral students ▪ 10 new transdisciplinary educational modules
	Programme of lifelong educational courses linked to the PE	▪ 5 training labs created, derived from research results	▪ 5 training labs created each year, derived from research results
	Insertion of the School of Transdisciplinary Studies' new curricula into doctoral courses	▪ Annual international "summer school" on a topic from the standards of excellence	▪ Number of Ph.D.'s with UBL+ /UBL doctoral degrees: 100/1100 ▪ Number of Ph.D.'s with MBA doctorate: 20
	Promote an interest among younger students in the hard and soft sciences, and in the bases of technology		▪ Creation of instruments and measures to supplement the current offering
Result exploitation / transfer and socio-economic partnerships	Establishment of the Institute for Open Innovation	▪ 50 start ups created	▪ 110 start ups created ▪ Signing of research contracts with 5 accelerators for 10 start-up projects ▪ Attraction of 2 industrialists
	Establish a continuum of Academia-Business players	▪ 10 two-way cross-overs funded between companies and research labs	▪ 200 doctoral students supported by continuum activities ▪ 20 two-way cross-overs funded between companies and research labs ▪ 10 Double PH.D/MBA tenure holder
Student involvement	Central theme of transdisciplinarity to be borne by student associations	▪ 2400 students involved	▪ 4800 students involved
	Student involvement with Institutions who are strategic partners of UBL+	▪ 4 student involvement actions implemented	▪ 8 student involvement actions implemented
	One-stop entry point for international students	▪ 10,000 foreign students involved	▪ 20,000 foreign students involved
	UBL+ Alumni Network		▪ Requests to first UBL+ alumni

4. Governance, organisation, management and commitments

This section describes the organisational framework that will serve to get Initiative stakeholders involved and to fulfil our commitments for deployment of the entire programme of activities. This organisation also concerns promoting within UBL+ those best practices developed through contact with our various partners.

Given the approach taken with establishment of the ComUE (Community of Universities and Establishments) combining research strengths and regional skill bases, managing the Initiative will involve setting up a strategic and operational "cockpit" that has strong leadership to mobilise all of the members and carry out ambitious, transformative actions for the site.

The organisational framework proposed comprises governance that will facilitate decision making and implementation for a simple structure that places responsibility in the hands of experienced directors, as well a key processes to provide the Initiative with a basic set of competenciesthat allow us to meet the requirements demanded by implementing innovative and emblematic actions for the site itself and internationally.

The UBL+ Initiative is one component of the *Université Bretagne Loire* EPSCP ComUE and thus may benefit from the services and operations of the ComUE while still retaining autonomy in terms of management and business planning. Territorial actors (local authorities, companies…) will be associated with implementation the operational of Initiative UBL+.

4.1. Organisational structure of the UBL+ Initiative

UBL+'s structure combines the competenciesrequired to deploy the Initiative. It is based on three approaches: the creation of excellence ecosystems, a chain of command that ensures actions are implemented by sector in line with the stakeholders in question, and the deployment of networks, tools and infrastructure such as the Mathematics Institute.

- **Excellence ecosystems:** These groups brings together the best research teams to focus on research problems at the interfaces, with each transdisciplinary focus area coordinated by three PI's who are responsible for developing a roadmap that serves to launch and direct the research projects and educational courses, as well as to promote commercial viability by calling in institutional players and the socio-economic sector.
- **Fields:** Actions will be implemented based on several field-specific competency centres, i.e. Research, International, Education and Commercial Applications-Technology Transfer, each supervised by an assistant director.
- **Tools, networks and infrastructure:** some actions are highly representative of the Initiative's goals for the regional and spread of a knowledge-based economy. In addition to operational launching of projects, competency centres will provide supervision and development of structural actions or "future entities", directed by the assistant director (AD) in question: the TICs (AD for research), the ISC (AD for international affairs), the STS (AD for Education), and the IOI (AD for Commercial Application-Technology Transfer).

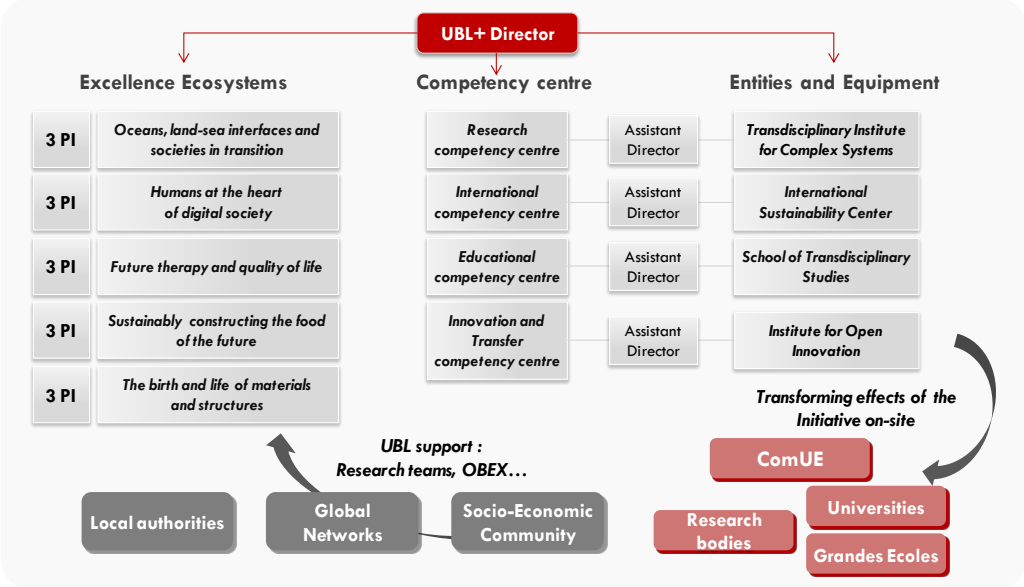


Figure 5 : UBL+ governance

The proposed structure will serve to create a framework devoted to launching and supervising the actions and thus to develop new practices. The Initiative will use its own human resources distributed within the competency centres (research, international, education, commercial applications-technology transfer) that include one assistant director and one chargé de mission per centre.

4.2. The UBL+ Initiative model of governance

The UBL+ Initiative is one component of the Université Bretagne Loire EPSCP ComUE. As with the other components, the UBL Board of Directors will deliberate annually on the major areas (operations, investments, employment ceiling) and approve the Initiative's annual report.
The UB UBL+ Initiative system of governance proposed is intended to make and implement strategic decisions related to the standard of excellence and the various fields (research, international, education, commercial application-technology transfer), to provide for consultations with and mobilisation of the stakeholders, and to provide management and assessment of our actions.

- **Steering Committee (SC):** The SC will define the Initiative's broad strategic outlines for the year and state its position on emblematic and transformative projects. It will name the UBL+ director, a researcher or teacher-researcher with high international visibility and proven management skills. It will also name the assistant directors based on recommendations from the director.
  - **Membership:** 13 members, comprised of:
    - The chairman of the Steering Committee, a person from outside UBL who is elected by the UBL members by absolute majority
    - Three university presidents (or their representatives), two "Grande École" directors (or their representatives), and five research entity presidents (or their representatives).
    - The director of the Initiative
    - The president of the UBL
  - **Operations and meetings:** The Steering Committee will meet every two months.

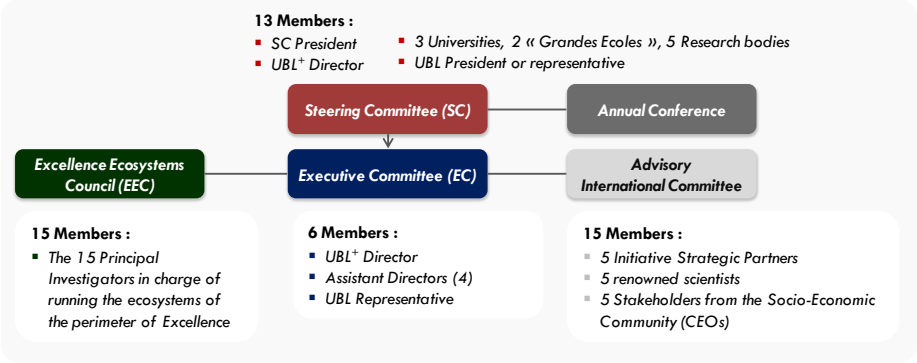


Figure 6 : UBL+ entities

- **Executive Committee (EC):** The Executive Committee's job is to ensure the implementation and operational supervision of our actions in cooperation with all of the stakeholders.
  - **Membership:** 6 members - UBL+ director, assistant directors (research, international, education, commercial application-technology transfer) and the UBL president or his/her representative.
  - **Operations and meetings:** It shall meet weekly and at minimum assess the progress of our various actions, the requests from excellence ecosystems coordinators and the needs of stakeholders. In order to have the resources to implement actions as part of the complex framework of the Initiative (dispersed competenciesbase, diversity of research problems, innovations in content and practices, etc.), the Executive Committee will have the benefit of a number of instruments and methodological approaches:
    - *Outlining of roadmaps and development plan:* For each sector (research, etc.), the Executive Committee will draw up a roadmap in cooperation with the excellence ecosystems, UBL departments and the various institutions and partners.
    - *Project mode supervision:* The Executive Committee will interact with the various stakeholders in project mode to coordinate the players and mobilise the resources and competenciesrequired to implement the actions: UBL+ educational curriculum, student involvements, research project on interfaces, etc.
    - *Performance monitoring:* The Executive Committee will review the UBL+ tables of supervisory performance indicators: operational indicators (mobilisation of resources) and indicators of

results at 2 years and 4 years out, and the implementation of action plans to ensure that the Initiative stays on track in terms of its development plan.

- **Excellence Ecosystems Council (EEC):** The EEC will coordinate the progress of the various transdisciplinary topic-based programmes and have a major role in the sharing and standardisation of practices.
  - **Membership:** 15 members: The principal investigators (PI) in charge of running the ecosystems of the Initiative's standard of excellence.
  - **Operations and meeting:** It shall meet once a month with the Executive Committee to ensure overall consistency of the project. The EEC will consolidate information into a table that specifically includes indicators related to evaluation of the focus areas and their state of progress, the research excellence of the works undertaken, their participation in educational actions, in commercial application actions, etc. Each focus area shall be supervised by an office staffed by the 3 PI's and the main researchers working in the ecosystem. Each office will meet at intervals to be defined by the director in order to check the progress of the actions within each focus area in question and to assess and approve use of the budget to implement the project (doctoral contracts, credits for operations or equipment, etc.). It will also assess the value of responding to RFP's (ERC, etc.).

- **Advisory International Committee (AIC):** This body will make recommendations on the Initiative's strategic guidelines and development. It selects the programmes financed by the focus areas and proposes the breakdown of funding between the focus areas and between the programmes within the focus areas. It will also serve to perform progress reviews of each strategic partnership.
  - **Membership**: 15 members.
    - 5 Initiative strategic partners who promote the international visibility and growth of the site.
    - 5 major international figures in research
    - 5 international CEO's
  - **Operations and meetings:** It will meet every year under the authority of the AIC president, to be chosen within the entity.

A conference shall be held every year with all Initiative stakeholders.

4.3. UBL+ Initiative procedures and operations management

A number of cross-cutting practices will be set up and supervised to deploy the actions and operations of the Initiative.

- *Strategic management*: The process of strategic management is designed to identify the Initiative's strategic guidelines for each year. It will involve a number of governance entities, serve to define the UBL+ Initiative's strategic guidelines, and develop the annual roadmaps for each topic and each sector.
- *Allocation of resources*: In order to manage the substantial staffing and mobilisation of its members and partners, the UBL+ Initiative will use a number of processes to allocate resources (RFP's, etc.) and carry out operations by objectives (budget for each action, seconding of staff, loaning of equipment, etc.).
- *Development*: The Initiative will use several types of procedures to mobilise members and partners, whether through the establishment of strategic partnerships or relationships in the region with stakeholders (players from commercial applications, the economic sector, local authorities, etc.) or through intellectual property management.
- *Supervision and assessment tables*: The process of supervising the UBL+ Initiative will incorporate assessment tables by sector. These will account for the milestones and registered commitments in order to monitor our actions and propose corrective measures. Under the responsability of the Executive Committee, the UBL+ Initiative also proposes to organise its system of supervision and assessment based on **5 major groups of key performance indicators** that will be used both as an input to the EEC and the Advisory International Board and as guidelines for decision making. These indicators are:
  - The **alignment** of R&D expenditures with the strategic objectives decided on by the SC. It will be measured by the ratio between Research and Training spending concentrated on the 5 UBL+ scientific topics and total spending. As the project goes along, spending dedicated to the 5 axes will be reinforced.
  - Establishing a **knowledge base** specific to UBL+: we are interested here in accumulating the various sources of knowledge that comprise it: the main entities established and the

competenties of the associated staff (TICs, School, Institute for Open Innovation, ICS) and the existing system used to exploit that knowledge (data bases, standards, trademark, partnerships developed, etc.).

- The production of **deliverables** that allow one to measure the Initiative's management effectiveness in achieving the various milestones, with a quarterly evaluation, so as to allow managers to intervene as much in advance as possible.
- Our **impact**, by thus measuring our leverage effect on partnerships, on the establishment of material and immaterial assets, measured on an annual basis: our ability to attract foreign researchers and students, placements of Ph.D.'s, the creation of international chairs, leverage effect on private sector funding, etc.
- The level of **continuous breakthroughs**: this means verifying the allocation of resources for the financing of projects that produce real breakthroughs (ex: creation of international laboratories, start-ups creation, international hubs development, increase in the ERC numbers...) foreseen for each transdisciplinary focus area: the share of breakthrough project expenditures in overall expenditures (%).

Those indicators are expected to grow regularly as UBL+ goes along. The following board summarizes the key performance indicators and 2, 4 and 10 years objectives which will be clarified shortly after the first months of UBL+ existence.

O = Objectives R = Realisations	Synthetic board of the key performance indicators						
	2 years		4 years		10 years		TOTAL
	O	R	O	R	O	R	
Alignment							
Research expenditures dedicated to the 5 scientific themes (%)	**60%**		**70%**		**80%**		
Continuous breakthroughs							
Financing of projects that produce real breakthroughs (%)	35%		20%		15%		
Knowledge base							
Ratio of inter and transdisciplinary projects	**40%**		**60%**		**80%**		
Researchers hired for transdisciplinary projects on site	**20%**		**40%**		**70%**		
Creation of the new transdisciplinary laboratory (size Labex)	**0**		**1**		**4**		**4**
Number of international hubs developed	**1**		**3**		**4**		**4**
Number of position papers	**2**		**6**		**20**		**20**
Ratio of publication of inter/transdisciplinary articles			**5%**		**20%**		
UBL+ internationalisation observatory			**1**		**1**		**1**
Deliverables							
Achieving milestones (%)	**80%**		**70%**		**70%**		
Resource allocation by focus area	**60%**		80%		100 %		
Impact							
Number of international chairs	**7**		**14**		**20**		**20**
Number of foreign students	**20**		**50**		**140**		**140**
Number of students in transdisciplinary masters	**480**		**960**		**2400**		**2400**
Leverage effect on partnerships (% private funding)	**10%**		**20%**		**35%**		
Number of start-ups created	**50**		**110**		**335**		**335**
Doctors' integration within companies (%)	**50%**		**50%**		**50%**		
Doctorate – MBA tenure holder			**10**		**20**		**20**
UBL+ Doctorate tenure holder			**100**		**200**		**200**

This UBL+ monitoring and assessment mechanism aims at:

- **Carrying out and steering the whole project**
- **Reviewing the outcomes of UBL+ actions**
- **Ensuring the financial follow-up**
- **Gathering key elements for communication and promotion of the project**

A dashboard will be designed to prepare the meetings of the governing body. It will be synthetic and user-friendly so that each member of the governing body could be able to use and understand it. It will be used for reporting: **The situation for UBL+ different jobs and for transversal actions, highlighting the different risks ; The recommendations and decisions to be made.**

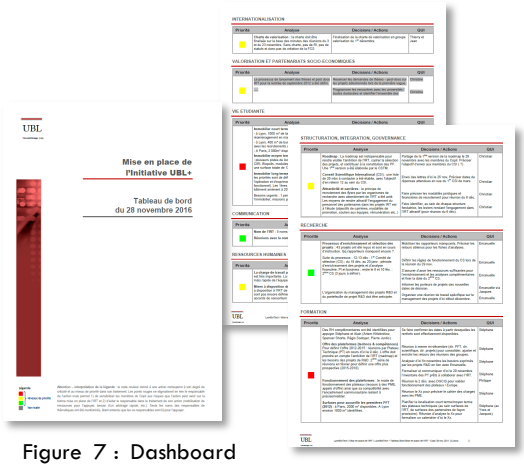


Figure 7 : Dashboard UBL+ example

5. Key data and financial schedule

Table 1.1	
Number of instructors-researchers and permanent researchers benefiting from Initiative excellence actions (excl. Labex and IDEFI)	2 459
Number of instructors-researchers and permanent researchers present throughout the working group	7 238 (source MENESR-DGESIP, janvier 2015)
Ratio	34%

Table 1.2	
Number of students benefiting from Initiative educational actions, regardless of level[1]	66 963
Number of students present in all of the working group	233 978 (source MENESR-DGESIP, janvier 2015)
Ratio	29%

Table 2.a	
Capital funding requested	700
Annual baseline amount of interest earned on funding (based on a rate of 2.496%)	17.5

[1] The Initiative's educational actions are those presented in paragraph 3.3 of the project proposal

Table 2.b		
Labex name	DNC in millions of €	Annual amount of interest earned, in thousands of € (rate = 3.413%)
LEBESGUE	7.0	0.24
COMIN LABS	14.0	0.48
MER	11.0	0.38
IGO	5.5	0.19
IRON	4.5	0.15
Totals	42.0	1.4

Table 2.c		
IDEFI name	DNC in millions of €	Annual amount of interest earned, in thousands of € (rate = 3.413%)
Man-IMAL		0.18
2 PLG		0.08
REMIS		0.18
AVOSTII		0.31
Totals		0.7

Table 2.d	
Total DNC	764
Total interest	19.7