RW Blears

Capital

Extract from a preliminary report to the ATTRACT Consortium - 7 September 2016

Proposal for a private investors' workshop and a commissioned report on ATTRACT and private investment. CERN Purchase order ref: CA6436854: 'Young Genius Funding' and First Loss Guarantee Funding - 'Sundance Innovation Funds'.

We were commissioned to write a report for CERN describing two ways in which more private finance could be raised to develop commercial applications of the intellectual property rights created [1] by scientists and innovators working at members of the ATTRACT consortium of universities and public sector research institutions: rights that could lead to breakthrough scientific and technological advancements capable of revolutionising the way we lead our lives and of driving prosperity and societal well-being. This paper is an extract from our preliminary report delivered to CERN on 7 September 2016.

The key members of ATTRACT include some of Europe's top research infrastructure:

CERN,

European XFEL,

[1] within the context of the goals set out by Mr Moedas, Commissioner for Research, Science and Innovation see "Open Innovation, Open Science, Open to the World – a vision for Europe" published in 2016 at http://bookshop.europa.eu/en/open-innovation-open-science-open-to-the-world-pbKI0416263/

Institut Laue-Langevin,

European Molecular Biology Laboratory,

European Synchrotron Radiation Facility, and

European Southern Observatory.

Collectively they have a track record of high-impact industrial spinout – core technologies of the World Wide Web, hospital scanners, touch screens and computer interfaces, Big Data and new medicines.

They are joined by two leading entrepreneurship educators, ESADE Business School and Aalto University, and the European Industrial Research Management Association representing more than 100 R&D performing multinationals. More about ATTRACT can be found here www.attract-eu.org).

The ATTRACT vision

We understand the ATTRACT vision to be an open and inclusive initiative which aims at creating the next generation of detector and imaging technologies for non-military purposes, with applications in the fields of medicine, manufacturing industry, aerospace, ICT, engineering and beyond. It will bring together the existing innovation potential, know-how and expertise of national and pan-European Research Infrastructures, industry (large corporations and in particular SMEs) and innovation and business organisations.

The development of future detection and imaging technologies is key since they constitute a driver enabling fundamental research and industrial competitive advantage.

This increased industrial competitiveness ultimately translates into jobs. These technologies are also enablers for addressing the societal challenges that Europe will face in the coming decades (i.e. better and more inclusive health care, e-society, greener transport, connected cities, sustainable production processes, reduction of CO_2 footprint, etc.).

Frost & Sullivan estimate[2] the following global market revenues for the top 10 technologies in sensors:

Technology	**CAGR between 2014 – 2020 %**	**Revenue forecast 2020 ≥ USD Billions**
Drones – Eyes in the Sky	28	31
Smart Sensors	13	24
Biosensors	13	24
Energy Harvestings	25	5
M2M Communications	16	100
Sensor Fusion	37	8
Touchless sensing	31	21
Printed Sensors	5	8
Optoelectronic Sensors	13	23
3D Imaging Sensors	22	3
		≥ 247 USD Billions

ATTRACT aims to deploy both public and private funds in the identification and development of a wide range of technology break through opportunities towards industrial scalability and some with a purely social impact. It is proposed to launch "Mini" ATTRACT in 2017/18, phase 1 of which requires EC funding of 20 million Euros through the Instrument of a Research and Innovation Action under Horizon 2020

[2] 2015 Top Technologies in Sensors & Control (Technical Insights) – May 2015 D675-TI Frost & Sullivan, see www.marketresearch.com/product/sample-8995122.pdf

with a phase 2 requirement in 2019 of 30-60 million Euros of EC funding. It is anticipated that "Maxi" ATTRACT will be launched in 2020 with a budget of 1 billion Euros.

Executive summary of our private finance proposals

Funding model 1 - Young Genius Funding

Our first proposal, 'Young Genius Funding,' is designed to make early stage pathfinder projects more attractive for private investment. It employs two strategies. First, that any young scientist or innovator must be mentored by someone with private sector expertise and experience in businesses operating in the same field of action; and second, that investor risk should be mitigated by the prospect of an investment return through 'tithe' payments if the young scientist or innovator achieves some measure of success in his or her career, regardless of whether this is attributable to their success in creating valuable intellectual property rights.

Funding model 2- First Loss Guarantee Funding –'Sundance Innovation Funds'

The second model employs a different strategy for mitigating investor risk, though it could also be combined with Young Genius Funding: that the purchasing power of public money currently allocated for investment in research and development might be multiplied many times over if it were to be deployed in underwriting a minimum return on private money business-led investment in early stage technology rather than being deployed in the form grants. We believe this second funding model might greatly multiply the purchasing power of available EC funding.

An ATTRACT' workshop to discuss the preliminary report

Our preliminary report will also support a workshop where different funding models will be explored and discussed. The workshop will be held at Founders' Hall, Cloth Fair, London on 10th November 2016 under the chairmanship of Professor Wood, the chairman of ATTRACT with registration and breakfast starting at 8:30 am.

A final report will be prepared following the workshop to collate its findings.

We are delighted to have been commissioned to prepare this substantive report and to provide assistance in the organisation of the workshop.

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Part 2 - Model 1 - Young Genius Funding

Investing in the person not the project

The object is to support and fund the creation, development, marketing and sale of relevant intellectual property at a very early stage by providing mentoring and financial support to scientists and innovators (each "**a Young Genius**") by reference to their chosen field of action for intellectual property creation rather than any specific project.

The business of providing this support and funding should be carried on by an independent company, an innovation company, staffed by those with private sector experience of commercialising intellectual property with a focus on a specific field of action ("**an Innovation Company**"). Specialist Innovation Companies should work alongside universities and public sector research institutions with relevant expertise.

The Innovation Company would select as provisionally suitable those candidates who hold a qualification which is at level 7 of the European Qualifications Framework and who are selected by their host ATTRACT university or research institution.

In the same way that decisions about the allocation of grant support for research funding are best taken by researchers themselves and their peers rather than by government ministers or civil servants, it is imperative that each potential Young Genius should be supported by someone with relevant private sector expertise and experience in businesses who can, initially, help the Innovation Company decide which projects are likely, within 10 years, to lead to a commercial application of the intellectual property rights being developed or to the creation of a new business based on those rights; and who is also able to provide ongoing mentoring services to Young Genius (**"a Mentor").** It is recommended that an experienced director and executive network (**"EDEN")** should be established around all ATTRACT universities and research institutions.

The substantive day-to-day business of an Innovation Company would consist of identifying worthy science from which valuable intellectual property rights might be created, encouraging the relevant scientists to consider the development of business led applications of their work and in seeking out a suitable Mentor. By working with multiple Mentors an Innovation Company would hope to select and provide mentoring and financial support to many scientists and entrepreneurs, not just the few that might be mentored by the Innovation Company alone.

On a day-to-day basis an Innovation Company would:

- review and evaluate nominations received from ATTRACT research institutions of potential candidates they deem worthy of support;

- decide which proposals are suitable;

- identify a suitable EDEN member as a Mentor;

- seek to match a potential Young Genius with the nominated Mentor; and

- seek to agree a funding and mentoring programme for the creation of intellectual property rights in the chosen field of action with the potential Young Genius, his or her host institution and the nominated mentor (**a "Pathfinder Programme").**

Key issues in setting up a Pathfinder programme are likely to be:

- What could be the applications of discoveries in the chosen field of action? Would they be products or services?

- What are the existing competing solutions? In which industry?

- Is the relevant industry concentrated around a few key players, or is it fragmented?

- Would the new discoveries provide an incremental improvement to existing solutions or would it be a clear game changer?

- What would be the costs associated with the development of applications?

- Which route is most likely to be successful: licensing or setting up a commercial new venture?

- What is the cost of building a prototype?

- Would this be done in collaboration with existing industry players?

- Which complementary skills (such as design, sales, marketing, operation) would likely need to be brought up into the management team if a spin off company were to be the outcome of the Pathfinder programme?

- What is the potential market?

    - What is the size the potential market(s)?
    - What is the timescale to build a working prototype?

The host institution of a Young Genius will need to be a party to the Pathfinder Programme so that there is a clear agreement between all relevant parties relating to the sharing of intellectual property rights which are created, the expenditure which the Innovation Company should finance and what the host institution will pay for. Local laws of the jurisdiction where the work will be done and/or where the host institution is based will need to be checked as they may also regulate ownership of intellectual property rights. The involvement of the host institution will also be important as regards the subsequent tracking of the Young Genius so that an Innovation Company can maintain contact with those to whom it provides Young Genius Funding.

Funding of intellectual property creation – "Young Genius Funding"

It is unlikely that a Pathfinder Programme will be specific about the nature of its outcome; that is for the Young Genius to discover. So, of necessity, the investment must be made in the person of the Young Genius rather than in a project which is only capable of being ill-defined too widely or too narrowly. Accordingly, funding for a Young Genius should be provided by an issue of promissory notes by the Innovation Company **("Notes")** pursuant to which the Innovation Company will promise to pay amounts to the order of the Young Genius and/or his or her host institution (and with the approval of the relevant Mentor) to fund the mechanics of creating relevant intellectual property rights.

The average value of Notes to be issued to a Pioneer is anticipated to be +/- €100,000. If cashed, all monies paid out by an Innovation Company on its Notes must be employed in developing a piece of technology and the costs of protecting intellectual property. None must be spent on paying accountants or business consultants to write business plans or to provide generic business advice. None must be spent on paying fees to the relevant Mentor who will be expected to provide their mentoring services in the hope of either negotiating a slice of the intellectual property rights which are created or of becoming the chairman and acquiring shares in any spin out company which is formed to commercialise the output of the relevant Pathfinder Programme.

If cashed by the Young Genius and/or his host institution, Notes will then be convertible at the election of the Innovation Company on a 'pick and mix' basis into a share of those slices of the intellectual property rights which are created and regarded as suitable for being commercialised, with an entitlement to a corresponding share of royalties or, alternatively, into a share of the equity acquired by the Young Genius in one or more spin off companies formed to exploit those rights.

Conversion value of Notes

The extent of the ownership rights to be acquired on conversion of Notes will be a matter for negotiation with the Young Genius and probably also with his or her host institution but it is intended that there should be a minimum conversion value equal to the face value of the Notes which are cashed plus a notional per annum profit uplift; probably a higher per annum notional profit uplift in the early years of a Pathfinder Programme, commensurate with normal venture capital rates of return, and a lower 'run off' per annum profit uplift thereafter ("**Conversion Value**"). The parties may also wish to

negotiate an absolute limit on the Conversion Value so that the Innovation Company can never acquire more than a given percentage of any slice of intellectual property rights and/or shares in a spin out company so that there is always sufficient rights or shares remaining to motivate the Young Genius.

If an Innovation Company elects to convert cashed Notes, then its investment return on that cash will be derived solely from the royalties flowing from the share of intellectual property rights or the income and capital profits attributable to shares in spin off companies which it acquires.

If an Innovation Company elects not to convert cashed Notes, because the outcome of the Pathfinder Programme does not result in the creation of valuable intellectual property rights, the investment made under those Notes would be written off.

Payment for mentoring services by way of deferred 'tithe' payments

If a Young Genius does not create any valuable intellectual property rights but goes on to find success in other ways,–for example if the Young Genius becomes a successful investment banker, venture capitalist, accountant or captain of industry – then, in return for the Innovation Company arranging for the provision of services by his Mentor, the Young Genius would be required, for a period of, say, 15 years, to make payments to the Innovation Company equal to 10% of his or her earnings above an agreed earnings threshold falling within a range of, say, £21,000 to £45,000 per annum plus 50% of the profits he or she makes from any capital gains, excluding gains in respect of a Young Genius's primary residence or benefits payable on retirement ("**tithe payments**").

Young Genius Funding should not allow an Innovation Company to double dip on its prospective returns from a Pathfinder Programme investment by the receipt of tithe payments as well as by acquiring a share of intellectual property rights or equity in spin out companies, and so the Innovation Company would agree an overall cap on its entitlement to receive tithe payments up to a limit equal to the Conversion Value of cashed Notes which have not been converted.

Revenues, use of monies and growth and development of Innovation Companies

Accordingly, an Innovation Company would expect its revenues to comprise:

- royalties and licensing fees received in respect of its share of intellectual property rights created by each Young Genius which it elects to acquire; and/or

- the income and capital profits derived from equity shares in spin off companies which it elects

to acquire from each Young Genius; and/or

- tithe payments received from each Young Genius if they are otherwise successful.

A financial model for an Innovation Company is attached. The model is inherently highly speculative but absolutely focused on growth and development. An Innovation Company would spend its capital: in paying the legal and other expenses incurred in issuing shares and raising finance; and in applying the balance in issuing Notes alongside agreed Pathfinder Programmes and the running costs of the Innovation Company. Due to the cost intensive and long term nature of its business plan virtually all of its capital will be employed within the business before any revenues are generated. The ideal scenario for investors in an Innovation Company would be that it becomes sufficiently profitable from its first intellectual property rights portfolio (see '*High Scenario'* in the financial model) and is in a position to support further Pathfinders Programmes and able to continue growing its intellectual property rights portfolio. The ideal exit for investors in an Innovation Company would be the floatation of the Innovation Company.

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Part 3 - Model 2 – First Loss Guarantee Funding – 'Sundance Innovation Funds'

This model proposes that the purchasing power of public money allocated for investment in research and development might be multiplied many times over if it were to be deployed in underwriting a minimum investment return on private money business-led investment in early stage technology rather than being deployed in the form of grants. We believe this second funding model might greatly multiply the purchasing power of available EC funding.

How can private money be incentivised to invest at an earlier stage?

Anything worth doing takes time to show up in tangible results. In that lag, the authors of change funded by public money may be supplanted by private money which reaps all the glory and profits.

If private capital traditionally waits for public money to do the hard work of identifying and developing worthy intellectual property rights before it invests, taking only the cream, how can private money be incentivised to invest at an earlier stage alongside or replacing public money in order to increase and/or simply ramp up the prospects of more breakthrough scientific and technological advancements being discovered which are capable of revolutionising the way we lead our lives and of driving prosperity and societal well-being?

Rainbow Seed Fund

A stage-gated public-private funding model, managed by an experienced, but not a 'big name' fund manager, who was over seen by a strong supervisory board – has been tested and proven successful in the UK with the Rainbow Seed Fund, a collaboration between the major UK public sector research institutions **("Rainbow").** The original director of CCLRC[3], the lead institution in the formation of Rainbow, Professor John Wood, is the chairman of ATTRACT.

The Rainbow supervisory board enjoyed the effective ability to veto investment proposals it didn't like. This ensured a high level of disclosure and scrutiny regarding the day to day activities of the fund manager but also that only those prospects which really did constitute worthy science were pursued. The potential ability for the public sector research institutions to skew investments in their favour was avoided by dint of two representatives from the private sector being appointed to the supervisory board for every one public sector representative. The fund was set up as an evergreen fund and so there is no short termism in its management compared to a more conventional limited life fund.

But the private funds invested in Rainbow ventures were not pooled with the public sector money. So although from an initial capital of £4 million, Rainbow has leveraged over £190 million of private investment in its portfolio companies representing a ratio of over £20 for every £1 invested by Rainbow, the private money came later on only once the cream rose to the surface.

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[3] Now the Science and Technology Facilities Council (STFC)

How might a future fund modelled on Rainbow be established in which private money is put to work at an earlier and riskier stage? (each a "Sundance Innovation Fund").

Investment risk with earlier stage investments is the increased lack of certainty as to whether a pro fit or loss is made. If the risk of loss with earlier stage investments were mitigated would private money invest at an earlier stage?

There would be no reason not to do so.

Public money to stand surety for the prospect of a minimum return

What if the initial capital of a Sundance Innovation Fund were wholly funded by private money? – but on the basis that public money stands surety for the prospect of a minimum target return being earned over the long term on that private money. If the actual return were less than the target then the public money would be paid out under a first loss guarantee to private investors to compensate them for their investment loss, both as to capital and as to any agreed minimum return on their investment ("**First Loss Guarantee**").

Competitive bidding for First Loss Guarantees in Dutch Auctions

The size of a First Loss Guarantee would be determined by a Dutch auction process. The opening bid for a First Loss Guarantee to support a Sundance Innovation Fund might be announced by a relevant public body at €1 for every €1 of private money committed to a Sundance Innovation Fund.

Private money would then bid for a First Loss Guarantee on a reducing basis; so that a Sundance Innovation Fund bidder which seeks the lowest level of First Loss Guarantee would win the auction; the ratio of surety cover to the amount of private money raised being referred to as the surety ratio ("**Surety Ratio**").

For example, if there were only one private money bid then the level of surety provided by a First Loss Guarantee may simply be €1 of public money for every €1 of private money; a surety ratio of 100%.

If there were competitive bids then the level of surety underpinning might be significantly less; for example, €0.70 of public money for every €1 of private money; a surety ratio of 70%.

Once a winning bid to establish a Sundance Innovation Fund has been identified the relevant public body would issue a First Loss Guarantee to cover the agreed capital at risk (and any agreed minimum return) on the winning Sundance Innovation Fund bid.

The risk for the private money if the level of surety cover is less than 100% is that a First Loss Guarantee may pay out less than what is needed to meet a significant shortfall in the overall investment return from a Sundance Innovation Fund.

The level of risk which private money is willing to take will vary across different markets, different years and different research institutions. The best institutions might be expected to attract private money willing to take greater risk.

In some years, for some host research institutions, private money may be more adventurous and Sundance Innovation Funds might be established with a surety ratio of 50%

In some years, more cautious years, if the financial markets are down, a Sundance Innovation Fund might only be established with a surety ratio of 70%.

A relevant public body would have no liability to pay out under a First Loss Guarantee for ten years. It might future fund its contingent liability under a First Loss Guarantee as it monitors progress with the Sundance Innovation Fund and can assess the likelihood of calls being made under its guarantee. Alternatively, a public body might decide to set money to one side at the outset so that its liability under a First Loss Guarantee is covered from the outset. If the relevant public body were relatively small compared to the size of the Sundance Innovation Fund in question, then private investors might require such a provision fund in any event.

Social Impact Undertakings

In return for its First Loss Guarantee a relevant public body might invite private sector bidders to propose that a proportion of the private money raised will be deployed in investments with a primary societal rather than a commercial benefit; such investments to be excluded from First Loss Guarantee.

Overall benefit of Sundance Innovation funds

The intended benefit is that EC public money, ordinarily made available in the form of grants, should leverage a much greater amount of private money into earlier stage 'business-led' investments if it is used to support the issue of First Loss Guarantees for Sundance Innovation Funds.

If €1 of public money, which might otherwise be deployed as grant funding and written off, were instead set aside to provide a First Loss Guarantee which leverages €1.1 of private money in a Sundance Innovation Fund – an initial surety ratio of 91% - then the First Loss Guarantee will have increased the amount of private money available for early stage business-led research by €0.1. The leverage could be much greater.

The spreadsheet which accompanies this model illustrates how First Loss Guarantee Funding might work for three Sundance Innovation Funds with very different performance outcomes. In fact, all three funds perform badly, but the net effect is that public money, otherwise deployed in grant funding, leverages in a much greater amount of private money. In the examples given €60 million of First Loss Guarantees attract €75 million of private money. At the end of ten years there are calls under the First Loss Guarantees of approximately £32 million to fund shortfalls, the present value of which is €28.97 million.

But if these shortfall payments had been deployed in the form of grants they would have been written off in any event. By deploying them in underwriting private money business-led investment returns each €1 of public money written off has attracted €2.59 of private money. In a world of austerity, a structure which multiplies the purchasing power of public money ought to be very attractive to all EU and other public authorities.

The upside prospect for the private money is that a Sundance Innovation Fund develops something which changes the world.

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We invite you to support the ATTRACT vision, hope very much that our proposals are of interest and look forward together with Professor Wood to welcoming you at the ATTRACT workshop on 10th November at Founders' Hall, Cloth Fair, London with registration and breakfast starting at 8:30 am.

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