

Summary of Alternative Models of Higher Education Seminar
9 October 2017
DCU

In attendance:

Name	Affiliation	Email
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Both Tom Boland and Joe Ryan sent messages of support in the evening stating how interesting the event was for them.

Tony Donohoe from the employers advocacy group IBEC was clearly interested in some of the ideas presented and the sympathy for business.

Tom Collins and Joe Ryan are actively designing the proposal by which Dublin Institute of Technology, with Blanchardstown Institute of Technology and Institute of Technology Tallaght will apply under the yet to be passed *Technological Universities Bill 2015* for status as a Technological University for Dublin, headquartered at Grangegorman, a redesigned and repurposed former mental hospital and army barracks.

Charles Larkin has been commissioned to provide the basic rationale for the creation of a Technological University for Dublin, draft part of the application and subsequently be involved in the drafting of a new strategic plan for the unified institution.

Short Summary

Alternative Models for Higher Education A Proposal for Experimental Colleges

Ireland has a long-standing tradition as a focal point for academic scholarship. It's location at the periphery of Europe has been part of its success and difficulty. As a small open economy, Ireland has been one of the most consistent supporters of globalisation and the digital economy that enabled it to flourish since the late 1990s. Work by Microsoft and Boeing have highlighted that an effective 85-hour higher education training course will be able to be produced for around 2.5m USD and delivered at a cost of approximately \$13.75 per hour per student. The disruption of the higher education system is coming soon and it is in conjunction with the disruption of the wider labour market, with 40% of the current US labour force facing obsolescence within the next decade. The excessive costs of higher education have begun to draw political attention, being considered a decisive factor in the failed Tory election of 2017 and a growing political consideration in the United States, most recently highlighted in a cover article by Matt Taibbi of [Rolling Stone](#).

A reconciliation between academic and vocational education is required to ensure the continued operation of the postsecondary education sector. Looking directly at the design of a liberal education, it is clear that engineering and technological studies clearly contribute. Basic higher education should be likened to a spring board for specialist study while at the same time providing the key skill of transfer. But that depends on the "combination" of learning across subjects. A general education that consists of subjects taught separately without reference to each other is not a liberal education. Similarly, an education that does not overtly pay attention to the skill of learning (learning-how-to-learn) is not liberal. The "combination" gives equal importance, to the person, society and the economy. The truth or falsity of the theoretical is to be found solely in its reference to the practical." All our activities begin with the practical. Finding out how to do what we want to do leads to our theories. We are our own agents. So it is with learning, we learn that which we do. Therefore, the first stage of this curriculum should necessarily be problem or project based in which the problems or projects are arranged to ensure that the need for the other dimensions of knowledge and behaviour become apparent, and worthy of exploration. In this way skill in non-cognate transfer should be developed.

The mathematician philosopher Alfred North Whitehead provides a theory of how this stage of education should be regarded. The stages of Whitehead's theory of rhythm in education are summarised in Box 1. The first stage of romance is necessarily one of transdisciplinarity because it is a stage of exploration, a stage of discovery. So too is the final stage of generalization (synthesis). The curriculum described above is a stage of romance at the beginning of higher education. If as some argue the school curriculum needs to be extended then it would be a stage of generalization.

Box 1. Whitehead's theory of rhythm in the educational process. The stages of mental growth and the nature of education. A summary of pp 27 – 30 of the essay on *The Rhythm of Education*.

Stage 1: Romance:

The stage of first apprehension (a stage of ferment). Education must essentially be a setting in order of a ferment already stirring in the mind: you cannot educate the mind *in vacuo*. In our conception of education we tend to confine it to the second stage of the cycle, namely precision [] In this stage knowledge is not dominated by systematic procedure [] Romantic emotion is essentially the excitement consequent on the transition from bare facts to first realisations of the import of their unexplored relationships.

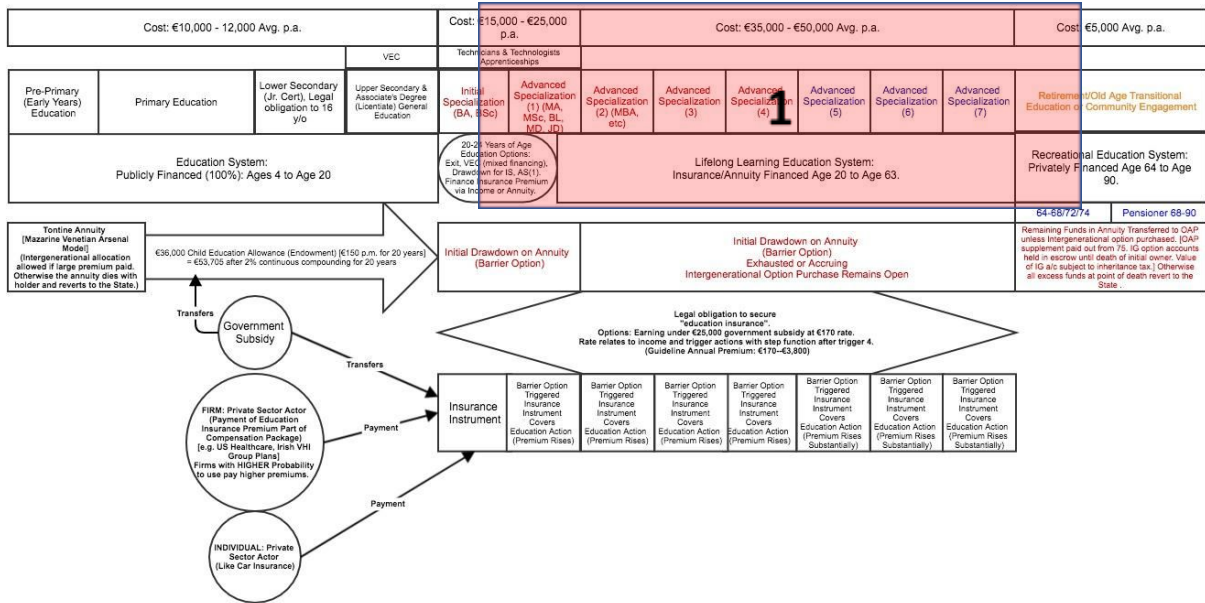
Stage 2: Precision:

The stage of romance-width of relationship is subordinated to exactness of formulation. It is the stage of grammar, the grammar of language and the grammar of science. It proceeds by forcing on the students' acceptance a given way of analysing the facts, bit by bit. New facts are added but they are the facts which fit into the analysis.

Stage 3: Generalisation:

Hegel's stage of synthesis. A return to romanticism with the added advantage of classified ideas and relevant technique.

Figure 1: Proposed Life-long Learning Education System



In Figure 1, we attempt to source the availability of eight trigger points that can be utilised by an Irish student within the Irish (or other national) education system.

The process of education is designed to work between the state providing primary and secondary education and the first two years of higher education. The subsequent specialisations are to be supported by an insurance instrument. The education endowment is a lump sum of income allocated to every citizen. Funding for this endowment is provided by means of ring-fenced taxation or a tax expenditure. It is aimed to be sufficient to provide support for most students completing higher education to EU Bologna Process Cycle 1, or what is commonly referred to as the Bachelor's Degree. This entire structure for the insurance model of higher education would be underwritten by a large issue of perpetual bonds, that would have a low yield and be a useful part of an institutional investor portfolio to provide low risk Tier 1 Capital.

After the completion of upper secondary and leaving certificate education, the student will enter into the third-level system, either through a degree, diploma or certificate programme, or indeed a technician and technologies apprenticeship. Apprenticeships constitute a different track since they are connected to a shared cost of education, with part of the education cost being borne by the endowment and the wage payment to the apprentice being provided by the employer that the student is apprenticed to during the apprenticeship process. As apprenticeships are typically more expensive to provide compared to a normal BA degree, it would be likely that the student's endowment would be heavily drawn down and would need to begin topping-up insurance payment early in their career as a tradesman. Again, this can be partly or completely addressed via wage supplementing insurance prerequisites.

This initial phase will ideally be reshaped to direct students from upper secondary to a 2-year associate's degree programme, all of which will remain under public payment. "Senior" university for BA studies will be part of the initial specialisation supported by the education endowment. This will then lead to an advanced specialisation, which is proposed to cost between €10,000 and €25,000 per student per annum dependent upon the student's choice of specialism. It is then expected that the student will enter the workplace and enter the second stage of the Lifelong Learning Education System (LLES). This structure can be modified to take into

account the student that enters the education system later in life. The main requirement is that there is an endowment that is then drawn down to directly fund education or the insurance instrument.

Following the first two years, the specialisms and programmes are selected based upon the necessitated skill and talent deficiencies of both the company and the student/employee. Therefore, the design of this system can add a multitude of added benefits including flexibility and specialisation of talent, which will provide a sought niche for prospective companies and companies that are already based in Ireland. Further, our young talent will benefit from the co-existence of work-experience and education simultaneously as programmes can be re-designed to facilitate part-time learning. There will be three proposed sources of financing towards the upskilling of each student: 1) a government subsidy that exists similar to that found in the Irish education system; 2) the private sector company (Government Sponsored Entity or GSE) that has employed the student and is deemed responsible for their development; and 3) the private sector insurance-style (GSE) payment that has been paid both on behalf of and by the student throughout their life to the point in which they are seeking to add further educational development. It is expected within our proposed model that the majority of strike-points would be utilised before the age of 30, therefore our selected methodology must represent this fact.

One of the key proposed financial products that can be used to represent the nature of our model is that of barrier options. At each strike point in area 1 above, it is envisaged that this would be similar to the strike point being met. Once the next phase of education is over, the student then returns to full-time employment and continues to pay an education insurance premium. The premium will continue to be paid during education, just as health insurance is still paid while sick and will apply from the age of 20, drawing initially on the endowment and subsequently on alternative sources.

This will be paid until it reaches such a value that the hypothetical option 'strikes' and the next stage of education is available. At the initial stages of 1 and 2 these will be very low option strikes. Strikes become progressively higher, reflecting the need for higher return on investment to recuperate the sunk costs of human capital investment. Should an employee pay into the system at a minimum level and be unable to accumulate the necessary funding for their barrier option to strike, they could seek aid from their employer, SOLAS/Social Protection or increase their premium payment, either continuously or with a lump sum, which could be provided in a third-party deal contingent on academic performance and the proposed salary benefits that may be available due to added education. Specialised education will reflect the premium levels of the students. Advanced and specialised Level 9 or 10 work will reflect very high premium payments. Level 6, 7 and 8 will reflect lower payments. For example, a classics graduate in small firm employment that is paying their premium at a low level either personally or via endowment can take a simple level 7 accounting course via the accounting technicians body.

A medical doctor pursuing an MBA would have had to have paid a high premium, either directly out-of-pocket or via the remuneration contract with the hospital to avail of this expensive human capital investment and will be subject to a higher premium in the future due to multiple triggers.

How does this work?

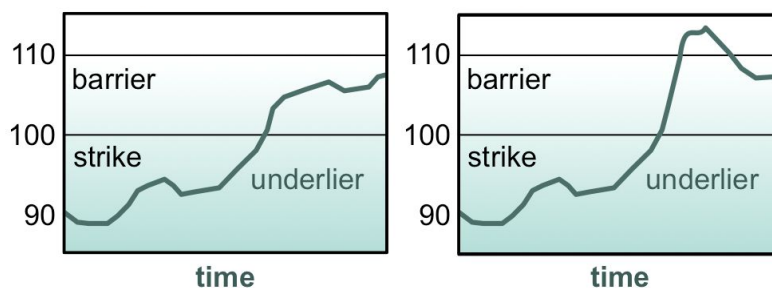
To put it in engineering terms, think of a earning individual as a Pratt & Whitney J58 and the design of the air intake. As the aircraft accelerates from Mach 0 to Mach 3.2 the cone will improve supersonic performance by allowing more bleed. As a student's investment hits a certain value (velocity) the option is actioned and student enters study, in the same way that Mach 3 force incudes forward and aft bypass. The student is observed to be purchasing the barrier option to be utilised when the value of their investment has reached a certain threshold, whether it be through their own investment, the aid of a third-party or indeed direct provision of capital through an employer. The funding system is said to be writing the barrier option. It is important to stress that the payments will be same for all participants. Students entering professions with substantially higher levels of

salary will be expected to contribute more through the provision of higher university fees within an accepted regulatory framework focused on cost restraint.

The proposed education financing system would mirror that of an “up-and-in barrier option”. The lifelong learning financing system is said to be writing the option, or providing the up-and-out put (sell) option. This payment system would be taken from that described in Figures 2 and 3 mirroring that of the proposed education financing system.

In Figure 2, we present a hypothetical system in which the barrier on a stock price underlier is breached. On the LHS, the underlier is not breached, therefore, there is no payoff, no education purchased, have not passed Mach 1 to use our engineering metaphor. However, on the RHS, the barrier is breached, therefore there is a payoff, education purchased, have passed Mach 1. It is proposed that the total unit funding for each student should be considered in the same manner to the below underlier (i.e. underlying asset, which will be the insurance instrument), and should it breach a pre-selected barrier level (e.g. time, return on investment, earning potential), the student would have the ability to enter the education system while the insurance-style payment system covers their costs.

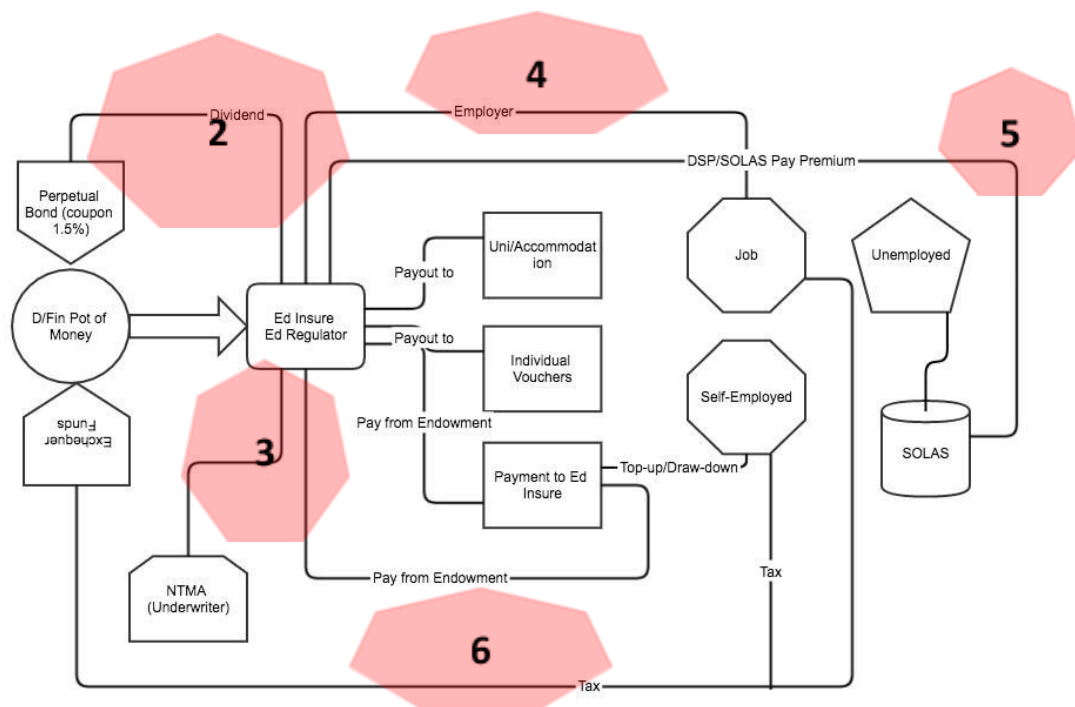
Figure 2: An example of a barrier option being breached



While we review the relationships between the proposed financing system, we can however obtain guidance from the existing relationships between barrier options and underlying financial market products. There are closed-form solutions for pricing European-style barrier options.

When clarifying the loop of financing throughout our proposed financing model, we have attempted to use the lowest possible risk financial market products while leveraging upon the existence of agencies that already exist in Ireland. While simplistic in nature, there are five further key areas of risk that are prevalent within the proposed system. To facilitate the available capital to allow students to “strike”, the education insurance system must underwrite a large government-supported bond (with the government acting as a guarantor). This is represented in area 2. While long-term bonds are preferable, in this system, and proposed time to expiry will create a “pinch-point” with the capacity to expose the system to collapse at the point of repayment. Should the system become self-sufficient at any point in the future, it would be proposed that the outstanding debt of this bond would be reduced as a priority. It would be recommended that the system be underwritten through the use of a perpetual bond.

Figure 3: Potential Financing Structure for the Proposed Life-long Learning Education System



Since perpetual bond payments are similar to stock dividend payments, as they both offer some sort of return for an indefinite period of time, it is logical that they would be priced the same way. The price of a perpetual bond is therefore the fixed interest payment, or coupon amount, divided by some constant discount rate, which represents the speed at which money loses value over time (partly due to inflation). The discount rate denominator reduces the real value of the nominally fixed coupon amounts over time, eventually making this value equal zero. As such, perpetual bonds, even though they pay interest forever, can be assigned a finite value, which in turn represents their price. The formula for the present value of a perpetual bond is simply:

$$\text{Present value} = D / r;$$

where D represents the periodic coupon payment of the bond and r represents the discount rate applied to the bond.

Area 3 represents the presence of an underwriting government agency that shall be remunerated for their services and expertise in the provision of the insurance-style products. The National Treasury Management Agency (NTMA, Irish government finance body but any government underwriter/reinsurer is sufficient) would be observed as a key proposed partner in this regard. The rationale for this proposition is simple, the NTMA have a wealth of experience raising large amounts of capital through bond issues, they possess a substantial portfolio of assets and government wealth that may be useful in the underwriting requirements for any financial produce designed to aid the creation of this education model and finally, they are deemed to be an acceptable financial vehicle under European and international financial rules and regulations albeit that their use is denoted as to provide stabilisation of the banking sector.

This structure would place the Treasury in a key role to determine the management to a late post-industrial economy and further economic stabilisation. Therefore there will be a large component of political economy.

Next Steps

(CL = Charles Larkin, JH = John Heywood, AC = Alan Cheville, MR = Mike Richey, KM = Krishna Madhavan)

- Complete *Economic and Pedagogical Analysis of an Alternative Model of Engineering Education* paper for the ASEE Conference, 24-27 June 2018 in Salt Lake City. [Paper must be completed by 5 February 2018. Max 20 pages.]
- ★ **FOR M. RICHEY**
 - Alan Cheville arranged introduction with Shaen Corbet and Charles Larkin
 - Mike Richey, Boeing Associate Technical Fellow (Guiding instructional design and development strategies. This includes the challenge of developing critical personalized learning for our design centers and global partners)
 - **Need to find ways of signing data NDA. - Coordination with Research Office of DCU and TCD or by individual signatures.**
 - DCU Blackboard Data Exhaust - SC organizing access to full DCU data exhaust for analysis.
 - Arrange introductions with
 - Charles Camarda, a NASA astronaut and senior advisor for engineering development at NASA Langley Research Center
 - Krishna Madhavan, Lead Learning and Data Scientist at Microsoft
- ★ John Heywood and Alan Cheville to engage with David Drew and Larry Bucciarelli on developing their models further.
- ★ Academic paper progress:
 - **Sam Vigne of *Research in International Business & Finance* to accept a consolidated paper from JH, AC, SC/CL, MR, KM (size is not an issue).**
<https://www.journals.elsevier.com/research-in-international-business-and-finance>
 - John Heywood paper/small book to be completed following revisions recommended by Alan Cheville.
 - The Skill of Navigation (*The Lost Art of Finding Our Way* (2013))
 - Alan Cheville and the recursive, redundant and cyclical change model. Systems understanding of institutional change.
 - Aim to produce approximately 4 papers from this project.
 - Need to obtain a copy of this report cited by MR:
<https://www.forrester.com/report/The+Future+Of+Jobs+2025+Working+Side+By+Side+With+Robots/-/E-RES119861>
 - Corbet/Larkin paper to be revised:
 - Re-frame assumptions
 - Re-inforce global mega trends and income-employment issues.
 - Separate out from Income Contingent Loan Debate
 - Re-orientate endowment from ring-fenced corporate tax receipts.
 - Outline structure and test framework for operation within a firm and within a US state (e.g. Microsoft/Boeing, Washington State).
- ★ Policy conference in the US (Bucknell University, Lewisburg, PA?)

- Alan Cheville to investigate NSF funding to link JH, SC and CL to meetings where principles from the engineering profession, industry and the policymaking community all meet.
- CL easiest to attend as compliant with Hatch Act.
- Connection to Brookings Institution, Washington, D.C..

- ★ White Paper on the Alternative University (Heywood U. model)
 - Further support from the Irish Business and Employers Confederation
 - Arrange meetings with Minister for Enterprise Frances Fitzgerald (Deputy Prime Minister):
 - Mike Richey, Boeing Associate Technical Fellow (Guiding instructional design and development strategies. This includes the challenge of developing critical personalized learning for our design centers and global partners)
 - Charles Camarda, a NASA astronaut and senior advisor for engineering development at NASA Langley Research Center
 - Krishna Madhavan, Lead Learning and Data Scientist at Microsoft
 - Cathriona Hallahan, MD, Microsoft Ireland
 - Ron Olsef, Iron Range
 - AC, JH, CL, SC
 - Aim to operate two trial colleges in Ireland: One out of the soon to be vacated DIT facilities in City Centre Dublin and for TCD, possibly via Marino Institute of Education, which is an associated body with the TCD School of Education. Aim would be to look at two natural experiments of a wide profile of students against a top decile group.

- ★ Operational Aspects of the Alternative University Experimental College Proposal
 - Present alternative models in operation:
 - Deep Springs: <https://www.deepsprings.edu/>
 - Quest University Canada: <https://questu.ca/>
 - Minnesota State University at Mesabi Range College (Mountain Iron, Iron Range Engineering): <http://www.mesabirange.edu/>
<http://www.ire.mnscu.edu/>
 - Franklin W. Olin College, Boston: <http://www.olin.edu/>
 - Alverno College, Milwaukee, WI: <https://www.alverno.edu/>
 - Charles Sturt University, Australia: <http://www.csu.edu.au/>
 - Design working business model for HU model
 - 2 year
 - 12 Month, year-round
 - Max 2,000 students
 - Build Space with co-sponsorship (Georgia Tech capstone project co-sponsor model)
 - Lifelong Learning via CPD driven by Blended Learning, MOOCs and SPOCs.
 - Present academic/educational rationale
 - Course structure and modules
 - Present financial structure with different student populations
 - State Income
 - Private Fee Income
 - Endowment Income
 - Model P&L sheets
 - The TCD Dimension

- Design as an experimental college of the University of Dublin
 - Legal problems
 - Quality and Qualifications Ireland issues
 - Design
 - Private, non-HEA
 - Funding via ring-fenced endowment via Apple Tax bill (€13bn when collected)
 - Trinity Research Seminar
 - Bootstrap alumni network, most especially those returning in 2020 for 250th anniversary of the College Historical Society.
- ★ The Initial “Ask”
 - White Paper Investigation Funding: Time buyout 9 months for SC; Postdoc contract 12 months, CL; funding for travel and meetings: €120,000-150,000 depending on overhead estimate (approximately).
 - Set-up of an experimental college (Marino Institute of Education (?)) with approximately 500 to 1000 students with all data flows being monitored by Microsoft and Boeing.