Innovation, Education, Research and Reengineering

Updated and Edited 2022-12-23 New methods to finance research page 5.

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Content

What are Universities for?
Collini.

Mission of education:
"*Preparing students for active and effective participation in the pluralistic, often contentious society in which they will soon be adult members"*,
SCOTUS 1982.

"Humanly, the very best thing we can say about something that it must be reformed, because the implication is that it is indispensable and suitable for a new life",
Ortega y Gasset.

Tags: Education, Finance, Innovation, Research, Universities, Vocational Training

Prologue

Obviously, every student thinks her or his university education to be the only real scientific education. The other university courses are less or not scientific at all. Is that right, how do

you measure that and what does it mean? When does a university education change into vocational training? Does it matter?
Looking back. Some 1000 years ago the first university in Europe, Italy, was constituted in Bologna to support the Catholic Church. A dominant player in society. The curriculum: Theology, Notarial law, Canon law and Liberal arts. Well, vocational training. At the end of the day, it is all about vocational training. Leaving your college or university, graduated, you will go looking for a job. Isn't it? But where and how?
Well, let us follow the worldline geographically to the north and 600 years into the future. Leiden, Holland part of The Seven Provinces. It is about Simon Stevin, the University of Leiden and about 1600. Stevin from Bruges, Flanders, was adviser to the stadhouder prince Maurits. Maurits strongly felt the importance of vocational training. Vocational training alongside the scholarly training at the University of Leiden. The vocational training was for the service of the country and the advancement of those giving themselves to the exercise of engineering.
The training was in practical mathematics for people who had enough mathematics, but only as much is necessary for a general practical knowledge of engineering. So Maurits proposed a new school alongside the University of Leiden, denoted '*Duytsche Mathematique*'. The teaching was in Dutch and not in Latin (Pye, page 321).
Where did Universities come from and what are Universities for now?

1 Innovation, Education and Research.

The title of this section, "Innovation, Education and Research", displays a sequence of activities that are not common. The following string is the usual one: Education, Research, Visitation, Valorization, and Innovation. The transformation of this string into the string Innovation, Education and Research, is the subject matter of this section.
Is the string "Education, Research, Visitation, Valorization and Innovation" a kind of production chain? Or is there no coherence, is it not a production chain at all?
In "*Innovation and its Fallacies" (*www.leennoordzij.me*)* it is mentioned universities do produce good scientific results. However, the final step towards the market or rather the commercialization of knowledge is not or hardly realized (the innovation paradox).
The first question that arises is: should it be realized? The answer to this question is emphatically no! Even more pronounced: it cannot. The cases where research leads to innovation rests on mere coincidence. Innovation cannot be the argument for research at our universities. (N. N. Taleb, Antifragile: *How to Live in a World We Don't Understand*).
Kuhn also gave his opinion: "*Under normal conditions a research scientist is not an innovator. The scientist is a solver of puzzles, and the puzzles on which he/she concentrates are just those which he/she believes can be both stated and solved within the scientific tradition"*.
Davids et al (2013) explain in their book (2013) that the innovation paradox does not exist. Scientific research is not the essential prerequisite for innovation.
Innovation and, in any case, breakthrough innovation is mainly based on serendipity and

coincidence. Obviously, the spirit of entrepreneurship must be there.
Let's use a kind of "proof by contradiction" to explain scientific research is not the essential prerequisite for innovation: If research and innovation were to be related to the usual string(chain), then we have found the key to innovation. In this way, everyone has the key to innovation! Innovation can be organized. The Holy Grail is found. Consequently, innovation would not exist. Lucky us, innovation does not work this way.
It is not only a paradox, but also a vicious circle. When Universities consider stimulating entrepreneurship for the students to be their primary goal, then research becomes less important. This saps their policy research to be the primary source of innovation and they are no longer in the position to stimulate entrepreneurship. Even Mazzucato shows that there is not such a thing as a linear relation between research and innovation.
However, we can reverse the sequence of the usual string and allow innovation to stimulate research. If that is successful, results from research will have an impact on education. Hence, we are teaching (young) people the latest developments in technology, processes, etc. Also, innovation can lead to innovation of education: E-learning. (Christensen C. M., M. B. Horn and C. W. Johnson. *Disruptive Class. How disruptive innovation will change the way the world learns.*)
The misleading idea "scientific research just to be intellectual game playing" heard about in the so-called real world, has been a major drawback for scientific teaching and research. How come? Well, a lot of what are tools in today's real world begins its life in the ivory tower without the pressure of publish or perish.
No GPS without relativity theory. However, a time delay of more than half a century(Bartusiak). Matrix algebra invented in 1855. CAD depends strongly on matrix algebra(Stewart). A time delay of more than a century. It is pure serendipity that someone sees chaos theory has a practical application.
This time delay is the source for the expression "*scientific research just to be intellectual game playing*", to put it mildly.
This teaches us not to try to establish a relationship between research and social relevance. However, not with innovation. Breakthrough just happens with a lot of luck and by chance. By trying to force a relation between research and social relevance into a straitjacket, it only leads to a waste of time and to groupthink with little risky research programs as a result. The Dutch NSF(NOW) only makes sure that politicians think that university research funds are well spent. So, low risk research projects are honored.
The application of Einstein for a research grant on general relativity was in any case not honored by NWO.
Furthermore, the Director of STW (part of NWO) is not happy with the way things are going. In De Ingenieur (January 2015, Nr. 1): "*We assign the national research budget to proven technology, since we think we can manage the risks.....*". That is exactly what is happening in the NWO programs and in the top sectors: minimizing risks by taking familiar roads. A kind of groupthink in which the same subjects are in the focal point of interest. Therefore, breakthroughs will hardly occur. Well, the above statement looks like support from

unexpected angle for the abolition of intermediate layers such as NWO.
It is not just a problem in The Netherlands. In the field of particle physics, it is all about string theory and the resulting trouble with physics (Smolin).

The above sequence of education, research, visitation, valorization, and innovation has been mentioned a few times. We now know that the order of the sequence is the other way around: from innovation to education. But, how meaningful are all the elements of this series? Visitation and valorization have not yet been mentioned.
Visitation can be said to be a kind of quality control of education and research. What is quality in this regard? Apparently, it does not go beyond a sort of benchmarking. The major danger of this benchmarking is that it gives rise to "regression to the mean". All universities are equal. Can some be more equal? Can it be different? Is Visitation necessary? In any case, it must be clear what a technical university stands for. This is not the issue now.
Valorization has been introduced to determine whether the university research can give rise to market mature/innovative products. Considering what has been described above on innovation, valorization can be deleted immediately. No more National Committee Valorization. The ' Valorization Day ' can also be abolished. (J. Tolbeek, *The Spirit fairground).* A meaningful, refreshing austerity.
An opportunity for innovation at universities can be found in organizing of research. Anno 2013/2014, the research has been disclaimed by flawed verification of the research (the Economist, 19th October 2013). How to deal with this? Resources should be available for research replication. This will increase costs in first instance. The fruits can be picked up in time. A University can distinguish itself by a Chief replication Officer (CRO) with responsibility at the level of the Executive Board.
Moreover, a representative of the EU has said: ' No funds will be made available for replication '. What can be the role of the EU?
However, something is going on in The Netherlands. NWO, the Dutch organisation for redistribution of research budgets, started in 2016 a pilot programme on Replication studies (www.nwo.nl) . Well, this can have a huge positive effect on improving efficiency by reducing bureaucracy. The conclusion of such a programme could be no need for a CRO. Furthermore, and even more important NWO could redirect and limit their budget to support replication research. Consequently, the administrative burden on Universities is reduced in a considerable way by reallocating NOW's research budget for the Universities back to the Universities.
We still have a lot of doubts about replication research, not so much about the improving inefficiencies, but about changing the culture. There is some hope now, not through increasing budgets for replication research. No, it is through major journals which are willing "*…. to publish papers that were scooped less than six month ago. And in a clever bit of rebranding, they're abandoning the word "scooped" altogether in favour of calling these "complementary" papers….*" The Atlantic December/January 2018 issue.
For Universities: from valorization to replication or better Complementary Research! We

must also stick to the adage that results of research are premature. Aspirin(ascor) is still a source of research after 100 years.

Universities guess to be innovative by using a label like “Top University”. However, not all universities can be TOP universities. Vocational training should be more appreciated. A discussion about the definition could be of some help (Caplan). Utilitarian arguments hardly play a role. Let us just call it "Bildung" (H. L. Wesseling). We could also denote Bildung by liberal arts. What is in a name? Well, that is the question.
There is something in a name. See Fareed’s *In Defense of a liberal Education*. To begin with, tertiary education (vocational and/or liberal arts education) is only successful when there are motivated teachers (Roth).
Caplan and Collini painted a picture of the complete spectrum of education: from vocational training to liberal arts. Caplan is of the opinion university’s role is for the greater part a signaling role: students at top universities have shown their ambition. What they learn obviously does not matter. A recent example of signaling is given in The Economist (January 5th, 2019): signaling of labeling.
We must choose.
Tertiary education is sometimes denoted by ‘Ivory Tower’: “Get out of your ivory tower and live in the real world”, the message comes by television networks. Networks that would not exist without generations of scientists, engineers, and mathematicians(Stewart). What more to add? We could add something. Having educated our students, they will leave the Ivory Tower to the benefit of, e.g., the networks.

Now an example in The Netherlands of what hardly can be called innovative.
Certainly not innovative are moving scientists within the Netherlands. A motive for such an action was/is: 'Universities want to distinguish themselves more'. America is also included as an example. Well, a move from MIT to Stanford is like a move from Twente to Maastricht. Tongue in cheek. The Dutch taxpayer who can cough up € 500 million will not be convinced. The Universities do feel a lot of pressure. They must accommodate NOW (Noordzij, *Abolish 2.1*) and try to comply with the so-called Topsectoren leading to a misallocation of the taxpayers money.

It is wishful thinking NWO and/or Topsectoren redirecting the research agenda of universities. The moment they try to do it in a meaningful way politics will lose their interest. This simply results from the inertia to change at the universities. Let me make it clear: this is quite natural. It takes time to adjust education programs to new insights resulting from research. Alas, from time to time, efforts will be made by governments or their representatives of the presumed “needs of society” to redirect R&D in some favoured so-called practical direction.

Rethinking financing of research at the university is a step to improve research programs. In The Economist(October 29th 2022) various approaches to finance research are evaluated. The major issue here is to prevent groupthink and to stimulate academics to take chances.

Various methods to finance research are presented. The reasons to try these methods are discussed.

2. Re-engineering higher Education in Continental Europe.

To start with Steve Jobs(Isaacson,2): *"It's in Apple's DNA that technology is not enough-that's technology married with liberal arts, married with humanities that yields us the results that makes our hearts sing."*

The remark of Jobs reflects the dilemma we are facing in continental Europe: Vocational Training, Colleges/Liberal arts, and Universities. What to choose?

When we consider higher education in Europe and in particular the Netherlands, it is important to start with the framework within which this education functions:

- In Europe, Government/politics plays a decisive role. The education and research becomes mainly (> 90%) financed from general resources(taxes).
- Staff members of European universities are civil servants.
- Higher education can be participated by students in institutions for both education and research.

Which problems do we face in higher education?
Due to limited economic growth, the higher education budgets are under pressure. Not in the least due to massafication.
In the Netherlands, the distinction between university and college for vocational training slowly fades. The universities all have the ambition to be Research University. The colleges also have this ambition. Problem: Academic Drift or Mission creep. Consequently, there can be a lot of infighting/lobbying on political level. Politicians must make decisions about budgets. So, choices are most of the time not based on the needs of society but based on the costs of a type of education.
Let's investigate some numbers: In Europe there are around 3000 institutions of higher education, and they all want to be Research Universities. (See also the Appendix: The Crumbled University).
In America there are also around 3000 institutions of higher education and there are about 100 Research universities. The top 20 of the Shanghai Ranking has been formed by non-continental European universities for many years.
It is to praise we in Netherlands do have the ambition to be with all our Universities in the top of the Shanghai Ranking. However, some sense of reality could be helpful. One Dutch University in the top ranking would be nice. To arrive there, choices must be made. Are the politicians prepared to do just that?
As mentioned before, governmental budgets for higher education and research remain under pressure. Now, in 2019, there will be continuous pressure on under-grade education to reduce costs.

We in the Netherlands will have to make choices. We cannot all be Research Universities. Whether politics will stimulate these choices? This question is difficult to answer. But certainly when there are fewer dogs fighting for a leg there is also less manipulation.
Choices: Which ones? At least one asks for action. This one it has been called mission creep and academic drift. Mission creep and academic drift is hardly to prevent in the present situation. A situation indeed.
Making choices, we need to prevent unhealthy competition between Universities and Colleges for vocational training.
To start with, do not allow Colleges for vocational education to denote themselves Universities. Since when we allow this, we practically institutionalize academic drift and mission creep. Resulting into a sort of discrimination of vocational training(Caplan).
In addition, a major issue is the 90% of the cost of education being covered by tax's payers money. This is the situation all over continental Europe. So, is the Dutch biotope.
Therefore, we will have to find solutions with the increasing demand for higher education, despite demographic developments, from the market for vocational education. And to efficiently deal with the limited resources.
We must promote the cooperation between Universities and Colleges for vocational Training. The market (Industry, etc.) should convince the education industry it is about skills and not about signaling. This is at least of some help to prevent mission creep and academic drift.
The balancing of the various tasks are obvious:

- The colleges are focused on bachelors training/Liberal Arts and vocational education, with the possibility of continuing one's study at a universities,
- The universities focus on the Graduate School and PhD.

In this way Academic drift decreases and the possibility of creating research universities of a certain critical mass will increase. The industry is better served with the emphasis on vocational education/training.
Is the consequence of this allocation of tasks a merger of Colleges for Vocational Training and Universities? The need for differentiation is obtained through a merger (WRR-rapport 90)? May be. On the other hand, a merger could create additional bureaucratic layers. The major technological institutes like TNO, can play an intermediate role play between the universities and the business community.
It comes as no surprise to see a growing market for vocational education, The Economist March 19th, 2016. I do not know whether it is a shame that this disruption is initiated by the market: private education. It is in the air. Again, The Economist June 25th 2016: attention to higher education is given in the International section. The title is almost self-explanatory: A new crop of hands-on universities is transforming how students learn. It is not just about "how" but also about what. Employers strongly advise to pay attention to vocational training and to train the skills which the market longs for.

A necessary condition –obviously not sufficient – for admission to college and/or University is a challenging education being at high school. How to measure that? The teachers at prep. Colleges (VWO-The Netherlands) should not lower the bar for university entrance but make them higher. That's not what's going on in The Netherlands. Mathematics is a particular problem. In some Colleges mathematics has been split into Mathematics B and D. As you can imagine, D is a bit more difficult than B. Since pupils can choose(D is not obliged) you can guess, most of the students dropped D and consequently the success rate of these prep. colleges increases. With positive effects for the budgets of these prep. Colleges. Leaving universities with the problems of the lack of required basic knowledge of mathematics. For students in prep. Colleges, it is also frustrating to suddenly find out in your third year that there is no possibility of acquiring the Mathematics D knowledge. Even some prep. colleges, with a so-called Technasium(The Netherlands) dropped Mathematics D. In this way they needlessly created hurdles for young people who like to work in top level laboratories. In these laboratories there is a close relation between inventing and applying new instruments and research. Think of Kamerlingh Onnes, a Dutch Nobel Prize winner.
A cynical remark in this respect is that the prep colleges could improving their success rate even further. This obtained by a split Mathematics B with the expected result. That is the approach for managing your talented students in prep. Colleges. Government, wake up! May be this a call is on deaf ears. Can Universities do something about this? Well, I am not sure after reading "The Fall of the Faculty", a truly horror story.
The administrators and staff are busy with empire building instead of supporting Faculty by improving core processes: educating young people. The book is about the US. However, I think the situation differs not that much from the situation in Continental Europe. Indeed, it differs not that much. In 2016(sic) university administrators are thinking of implementing ideas from manufacturing: lean production. These administrators are playing with secondary issues not related to the core business(to use an expression) of Faculty. It is ironical to realise lean production concentrates on bringing responsibility back to where it belongs: the production worker. So, there is some hope. In the situation where administrators really understand lean production they learn to strengthen Faculty by returning responsibility to where it belongs. Do administrators realize doing their job well they creatively destroy their job? Did administrators really understand lean production? Did they read the book: *"The Machine that changed the World"*, written some 35 years ago?

Tertiary education has become a mass production system, leading to questioning quality of the delivered product: educated young people.
Well, again we can learn a thing or two from education in the US. Longitudinal research on education is reported by Arum and Roska. It does create much hope. Also, Caplan(2) in The Atlantic wonders *"What's college Good For?"* . The latter paper is rather cynical about students. However, it is society that makes them philistines.
What now? Push, usually a top-down process, does not help and only causes frustration and stagnation, resulting in a major failure. But what does it help?
Well, as mentioned before, innovation can be of great help. Carey describes the situation in

the US. The huge fees and the strong incentive for just doing research instead of teaching is a driver for creative destruction. Like Christensen, et al, Carey strongly believes that digital learning will save under-grate education. Re-engineering higher education gets special attention.

In The Netherlands, the discussion about accessibility of a particular educational program, be it vocational training, colleges, universities, is complicated by the claim of equal chances or opportunities. I think this to be nonsense: fortunately, we are not equal. It is about equal rights.

3 Creative destruction of Post-secondary Education; the University a Discussion

The university is among us for some 1000 years. What is the university for (Collini), what universities are we looking for?
I think, this question needs a lot of attention.
The ideas presented by Snow are also helpful. I am not saying this thinking Snow presented a solution. No, in his Rede Lecture he forced us to discuss the subject matter to find a workable climate where Universities can flourish to the benefit of society.
My copy of Snow's Lecture started with an Introduction by Collini.

- The Bologna style university (some 1000 years ago): students paying their professors and sometimes sacking their professors.
- The Humboldt Research university?
- The hybrid, research and education, university?
- The new Humboldt University(The Economist sept 2005)?
- University(Colleges) for vocational education?

Disruption, incremental or no change at all? The answer depends on which continent you are living. For example, MOOC's as a solution for democratization of Ivy League Universities? There are no Ivy League Universities or elite universities on continental Europe.
MOOC's as a solution for massafication? Well, may be the university of Rome is an example of massafication and some Universities in Germany. However, the law in Italy must be changed to make it work.

In the Netherlands we do not have a short-term problem with massafication of our universities. Staying with the Netherlands for a moment. Universities budgets are sponsored for 90% by the taxpayer and what are or will be the priorities? With soaring costs of healthcare and welfare the universities must be prepared for a major change in a negative sense of their budget. Not to mention demographic changes. Politicians must reconsider the redistribution of taxpayers money since taxpayers are not willing to bear the brunt. So, the change will be disruptive since there are on the short term no other sponsors for the budget.

Consequently, tuition fees must be increased, and faculty will be reduced. That is why MOOC's could be a helpful instrument. But caveat MOOC's. The critical remarks of Craig give insight into the do's and don'ts of MOOC's.

In addition, we must consider the market. I.e., demand for education by students, demand for vocational training by companies, demand for college education by companies, institutions and so on. Is there just a latent non-articulated market or is everything simply fine with respect to supply and demand?
However, there is still the question: What are universities for(Collini)?
In addition, it is worthwhile, to consider the analysis of Bloom(1987) about the same question. Reading both authors we could conclude, there are no universities at all. We created just training institutions.
Question to be answered indeed. Why do universities have tenure tracks? Why are young scientist forced to spend much of their research time on trying to be successful in gathering grants? In this way Universities are creating a kind of group thinking about en vogue research. Not a way to support revolutionary research (Smolin). It is almost a strait jacket. Not a way to educate young people. Not a way to become an attractive university. Freedom of inquiry must be renewed.

"No, nothing of importance is given for free; we have to build, to create, to construct; that's why homo faber is the most "fitting" title for our species" , Ortega y Gasset.

When reflecting on Research and Development I like to recall the statement of Vannevar Bush, the godfather of the National Science Foundation, who knew a thing or two about Research:
"The distinction between applied and pure research is not a hard and fast one, and industrial scientists may tackle specific problems from broad fundamental viewpoints. But it is important to emphasize a perverse law governing research: under pressure for immediate results, and unless deliberate policies are set up to guard against this, applied research invariably drives out pure.
This moral is clear: It is pure research which deserves and requires special protection and special assured support", Vannevar Bush. And Bush continued : *"The publicly and privately supported colleges, universities and research institutes are the centres of basic research. They are the wellsprings of knowledge…….. and their scientist are free to pursue the truth wherever it may lead, there will be a flow of new scientific knowledge".*
Lederman made the following statement: *"Most of the major advances in technology that have influenced the quality and quantity of life have come out of pure, abstract, curiosity-driven research. Amen".*
To conclude this section, I cite Isaacson's *Einstein His Life and Universe*:
"Had he been consigned instead to the job of an assistant professor, he might have felt compelled to churn out safe publications and be overly cautious in challenging accepted notions. As he later noted, originality and creativity were not prime assets for climbing

academic ladders, especially in the German-speaking world, and he would have felt pressure to conform to the prejudices of prevailing wisdom of his patrons. 'an academic career in which a person is forced to produce scientific writings in great amounts creates a danger of intellectual superficiality,' he said."
Well, this is about the beginning of the 20th century and Germany. Now it applies for the whole academic western world(Smolin).

4 Conclusions.

First and for all, the question "*What are Universities for?",* (Collini),needs to be answered.
My answer is simple: Universities and colleges are for Education of Young People. From this position I can work on a few other conclusions.
Obviously we should pay attention to history. Is it helpful?
The first university in Europe was there as a (re)source of educated people to support the almighty church of those days. This can be defined as Vocational Training.
Then, universities developed educational programs based on what is called Liberal Arts.
The curriculum of Liberal Arts can considered to be time dependent (Kronman). Kronman defined ante bellum and post bellum Liberal Arts.
Then came Bildung. Let us call it the Research University. Stimulated in Germany and from there on worldwide.
So, we could consider the College/University curriculum time dependent. Looking back, there is a sort of slowly varying part and a fast-varying part:

$$U(niversity) = U_0(slowly\ varying) + U_1(fast\ varying).$$

This formula is given here to underline the idea. We could also call the slowly varying part to be more cyclical. Think of vocational training.
Now, the major problem is nowadays, the focus on the Research Universities. This focus creates the situation academics no longer to be committed to teaching. This brings us back to the question: *What are Universities for?* (Collini).
Let us pay some attention to Research Universities and statistics.
In the Us there are about 4000 institutions for higher education, tertiary education. Furthermore, there are about 50 Research Universities of an acceptable and top-ranking level. So, it is about 1%. In the US, the thinking is 50 Research Universities are too much. The budgets are too thinly spread among these top institutions.
What about Europe? Well, let me just look at The Netherlands. In my country the thinking is all the universities should be top level universities. Well, I am of the opinion, this is wishful thinking with the statistics of the US in mind.
By the way, in Europe we have about the same number of institutions for higher education as the US has.
Still, there is nothing wrong to strive for top level institutions of higher education in Europe. It goes without saying, to realize this ambition, we need to cooperate within Continental

Europe. Exclusive Britain, with Brexit in mind.
Cooperation within Continental Europe is a rather difficult ball game. We cannot neglect culture differences within Europe. At European level, there is no law giving guidance for this cooperation. Can we do something about this? Maybe we can. Looking at what is going on in Universities with the ambition to be a top-level university can be helpful by making choices. These universities preaches education to be important. On the other hand, strong pressure is executed on faculty to focus on research. The dilemma is there: publish or perish.
Perish will happen when the focus is on educating young people.
In addition, research is without boundaries. So, academics are cooperating with academics of other universities and institutions. Consequently, commitment to teaching is dying or even non-existent. Academic research is not focussed on possible application. That is not the real problem. The real problem is the research to be focussed on the next research paper.
So, more R&D spending at Universities is directed to more research papers. Amplified by the wish of Universities to become a Research University. Obviously, something can be done to reduce the drive for the number of research papers[1]. However, the major problem here is the quality of educating young people. Hence, decouple the Research University from the University with focus on educating young people.
Instead of Research Universities create Research Institutions, which will be financed with private money and, at maximum up to, 50% with taxpayers money. So, decouple Research and University. Research University is an oxymoron.
Then, Colleges and Universities can focus again on educating young people.
In continental Europe you need to convince government for taxpayer's support.
Then, how difficult it may be, we must realize it is about quality. So, a numerus clausus should be introduced for these new Colleges/ Universities.
Education is focused on preparing for life after the University. Vocational training in a broad sense.
The business community need to be convinced of the importance of vocational training.
Can we prevent regression to the mean? Yes, we can. Since, when we go for quality there will be a regression to higher quality in tertiary education.
Oversight is needed to prevent in the strongest way, the institutions of vocational training to drift to research universities.
A definition of Liberal Arts:
"*It is the education that liberates men from the bondage of ignorance, prejudice, and provincialism. It enables us to see the whole world and to see ourselves in perspective ".*
Cited from a report by Hoerner. In that report, some other definitions can be found.

[1] Noordzij, L., *Abolish 2.1*, Updated 2021-06-20 www.leennoordzij.me 2016.

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Epilogue: The Crumbled/Fragmented University

In the second half of the 70th century I sat down, once a week, in the living room of my house with Prof. Dr. R. Timman on Friday afternoon and discussed, while eating a cup of soup, the Dutch University environment. It was very animated. Consequently, without noticing, he emptied his pipe under his chair. Prof. Timman was an advisor to the NSMB (now MARIN). NSMB is a testing and research organization of ship models and offshore constructions. I was the manager of the research department Ship Research.
One of the returning items on the subject matter, was the importance of making a choice to create in the Netherlands climate to constitute a top university. Choices depending of course on the quality of Dutch university education. Prof. Timman, as Doyen of the Faculty of Applied Mathematics at Delft University of Technology, was rather outspoken. He was in favor of limiting the number of universities in the Netherlands and appointing one of the universities as a top university. Since, those days Twente University (then denoted Twente Institute of Technology, THT) was about, 10 years in service, it was a university qualifying to develop into a top University.
In any case, we held the discussions at a time when a business administration degree was still a post graduate course at the University of Twente. Graduation means a bachelor's degree in liberal arts.

The university is one of the oldest institutions in the world. The first real university was founded in Bologna in the 11th century. Those in Paris and Oxford in the 12th century. The ancient institutions and thousands of followers grow and flourish in our century. The universities have changed but not much. Certainly not until the 19th century. Since then, there have been clear changes in relation to mass education and its funding from public funds. Private resources are also more often used, as Cambridge has done by setting up a computer science laboratory together with Microsoft. Another important change is, in addition to funding, the mass education. The growth to mass university covers the need for a university education as a passport for a good job.

The demand for a university education is certainly not the same as the demand for a scientific education. However, there is a correlation between the demand for a university education and the need for a university degree. There may already be a key here to answer the questions that had been asked.

The need for well-educated people is a given. We use concepts such as knowledge society and/or knowledge economy. Concepts coined by Peter Drucker in 1957. As a result, universities have become important assets of a country. Investing in knowledge has also attracted political interest. Whether this leads to relevant choices is a question that can be answered in the negative. No choices are made, especially in the Netherlands. A top university has not been realized. All universities are equally important and are for the greater

part financed with taxpayer's money. Nevertheless, universities are expected to act as incubators in the national innovation process. But how can the university fulfil this role if, in addition to its scientific role, it also has to meet the demand for mass university education? Student numbers will continue to grow. Does this growth mean that the quality of training will decrease? Asking the question is answering the question. The decrease in quality would not have been necessary if choices had been made in a timely manner. Obviously, choices have been made. And how! By not choosing, we in The Netherlands chose the polder university. We live in the Netherlands under the misconception of equal opportunities. Equal opportunities only exist if we are all equal. We have equal rights and obligations at most.

Everyone is going to college? Fine, but then we'll have to reinvent the university. That is, diversification in tertiary education. We already had that, so let's get back to it quickly: vocational training (HBO) and a scientific education(liberal arts). The business community honors both educational programs equally well. Does the business community see the importance of this? Will all this happen? What we're seeing now is academic drift. The university is forced to vocational training at HBO level and the HBO wanted to be a university. Both no longer deliver what is socially desired. This continues to create problems.

The crumbled university, what does it mean? I would like to clarify that mass education will allow the university to use every opportunity to specialize in courses of study. If only to cut of HBO's stride in its academic ambitions (academic drift). One can imagine that business administration (MBA) was a minor part of mechanical engineering 50 years ago. Now it's not. Where does this lead us?

Some 200 years ago the university education curriculum consisted of logic, rhetoric, geometry, arithmetic, astronomy and music. Seven main courses.
The more courses are becoming detailed(specialized), the more likely it is some courses remain scientific and some become less scientific. Nowadays, the curriculum consist of about 150 courses(Snow mentioned some 137), the impetus for "academic drift". This process reinforces the HBO's(Tertiary Vocational Training in The Netherlands) idea they are universities too and are going to manifest themselves as such. There is no need for this to happen. And yet it happens. How is that possible? There is a lack of political will to do something about this. The government (i.e. the taxpayer) pretends to set the course, but the government only pays. By and large, the institutions continue to go their separate ways. Franz Schnabel (1937) put it this way: "The university, which distributes knowledge fragments among rival faculties, where that knowledge is further dissected by specialized professors, who cloak themselves in deliberate darkness."

The university of today and tomorrow will move inescapably to the HBO level. There will be no more clear vocational training and no clear scientific training. Despite the earlier aspirations to take care of this differentiation. It is about quality. Choosing quality, regression to the mean can be prevented.

Unfortunately, how scientific the training has seemed to be, it will become less and less scientific. What to do? Encourage that the parts of the training that are much more part of vocational training are also accommodated there. This will prove to be a pointless act as tertiary vocational training shifts more and more towards university education "academic drift". The special of The Economist, *A Survey of Universities- The knowledge factory,* October 4th 1997 is still of current interest.

How to uphold the scientific standard?

1. Keep asking questions. Results of research are always premature. Otherwise, there is an invention.
2. The essential to be distinguished of the non-essential
3. To be unbiased facing of the new.
4. Integrity in the method of doing research and communicating of the results.
5. With the methodical approach to science (paradigm, theory, experiment review and a paradigm shift) in to move the horizon.

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