What happened to applied research? Do we need to resuscitate it?

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UiO : Faculty of Social Sciences
University of Oslo

OSIRIS
OSLO INSTITUTE FOR RESEARCH ON THE IMPACT OF SCIENCE

Starting points 1

- Traditional/statistical distinction between basic research, applied research and development
- Lots of attention to “basic research” – ever since Richard Nelson’s classic essay (1959)
- A continuing need to defend this activity – but basic research also has a large number of champions in academia, policy and industry
- Innovation has also entered the science policy discourse and in various forms become a requirement for many types of research, often quite close-to-market and to the D in R&D
- What about applied research in this landscape?

Starting points 2

Research that leads to major societal benefits can often be described as “applied” in various ways

Applied research: based on intention (Frascati) or other characteristics (uncertainty, degree of theory)

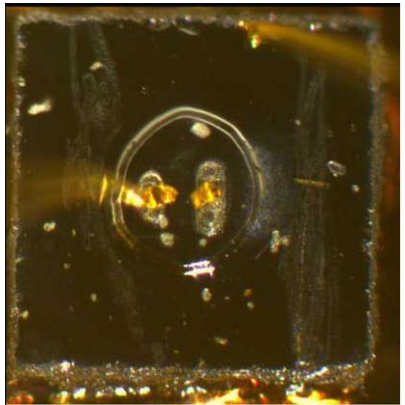
Daniel Sarewitz' messages

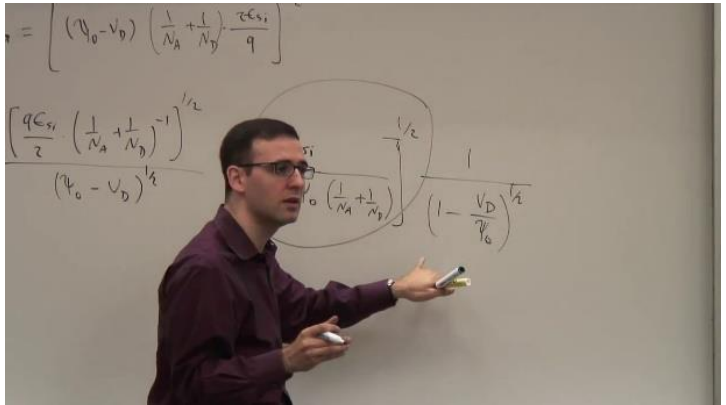
1. *Excellence/quality comes from solving problems:* "Scientific knowledge advances most rapidly (…) when it is steered to solve problems — especially those related to technological innovation"
2. *Unrestricted research has many challenges:* "When science is not steered to solve such problems, it tends to go off half-cocked in ways that can be highly detrimental to science itself"
3. *Good research is integrated in society:* "Science will be made more reliable and more valuable for society today not by being protected from societal influences but instead by being brought, **carefully and appropriately**, into a direct, open, and intimate relationship with those influences"

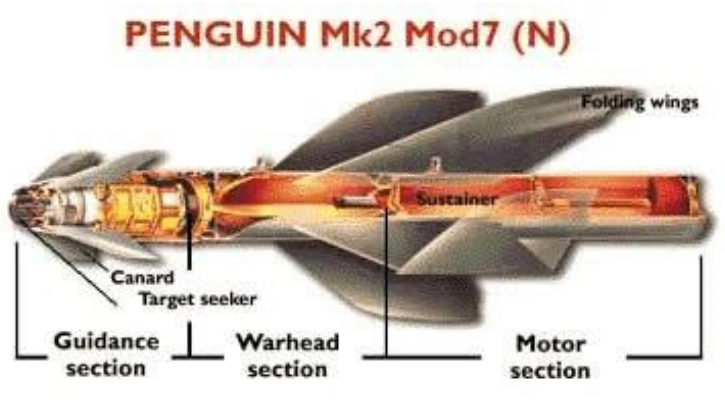
In other words, **utility value is a precondition for excellence** rather than the other way around

Basic research useful through applied research

- Fundamental research with no practical application in mind (for the scientists carrying it out) crucial to technological breakthroughs e.g. within electronics and computing
- But this research primarily becomes useful through larger networks working on concrete problems/challenges
- Electronics industry, defence and solid state physics good example







Same message: M. Mazzucato

What Makes the iPhone so Smart?

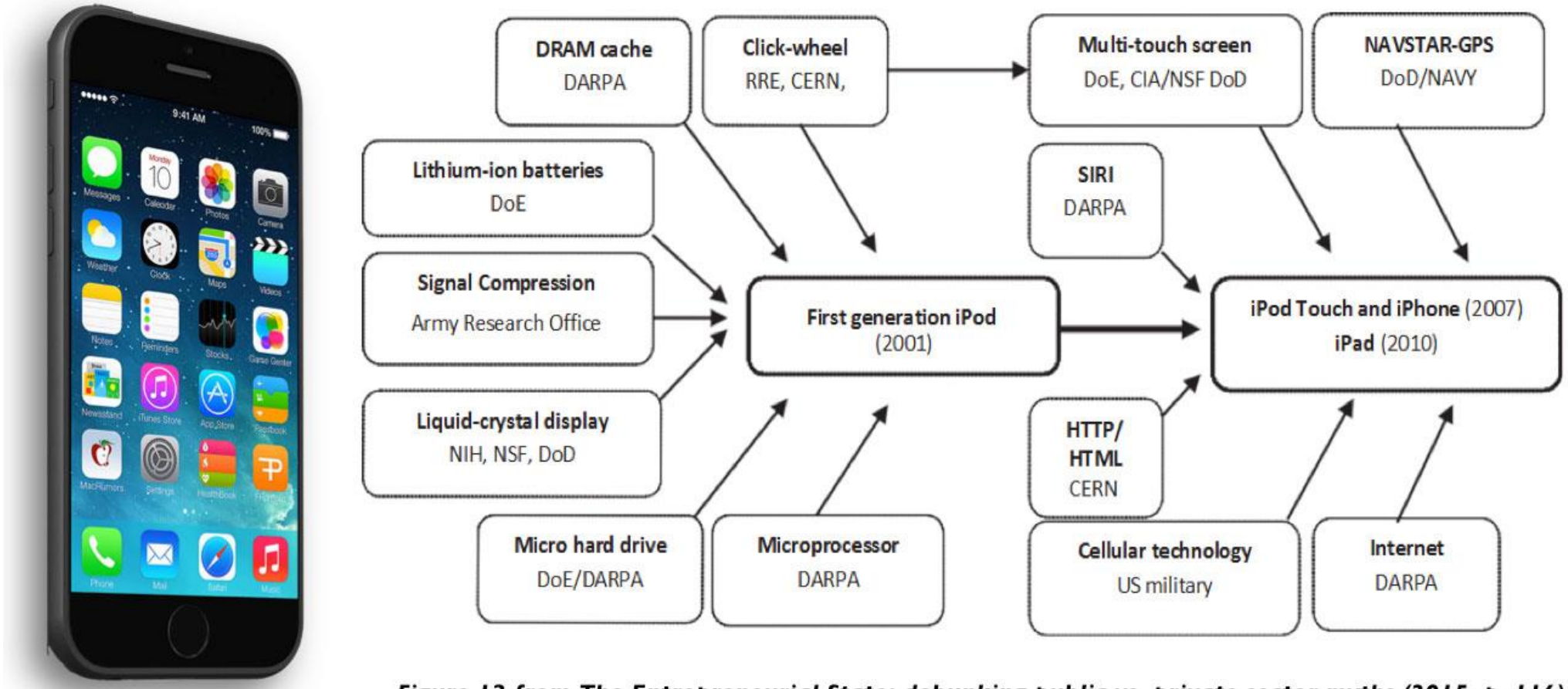


Figure 13 from The Entrepreneurial State: debunking public vs. private sector myths (2015, p. 116)

Not a US phenomenon, the same is seen in Norway

The GSM system for telecommunication

- Technology developed at the Telecom Research Institute and SINTEF (our largest technological research institute, an RTO or PRO)
- All-digital system well adapted to Norwegian geography which posed complex challenges
- Global utility, especially in neighbouring countries!

Aftenposten A-magasinet Osloby Sport Meninger Magnus Meny

Skapte revolusjon innen mobiltelefoni

GUNHILD M. HAUGNES

OPPDATERT: 30.OKT.2012 11:09 | PUBLISERT: 22.OKT.2012 12:02

Torleiv Maseng regnes for å være GSM-nettets far. Han ledet den lille forskergruppen som ved SINTEF på 80-tallet utviklet det som ble den europeiske standarden for radiodelen på det med tiden globale digitale mobilnettet GSM. Her er han fotografert hos Forsvarets Forskningsinstitutt i 2004, hvor han de siste årene har vært forskningssjef.

FOTO: Ihman, Rolf

De nordiske landene opparbeidet seg høy mobilkompetanse på feltet gjennom utviklingen av det analoge systemet NMT (nordisk

Aftenposten A-magasinet Osloby Sport Meninger Magnus Meny

Rørene gjorde oljeeventyret mulig

GRO STRØMSHEIM | GUNHILD M. HAUGNES

OPPDATERT: 29.OKT.2012 11:49 | PUBLISERT: 29.OKT.2012 07:45

Laboratoriet på Tiller utenfor Trondheim er enormt. Rørene er laget i samme størrelse som de som blir brukt på havbunnen ved oljeplattformene, for å sikre at resultatene av forsøkene stemmer med virkeligheten.

FOTO: SINTEF

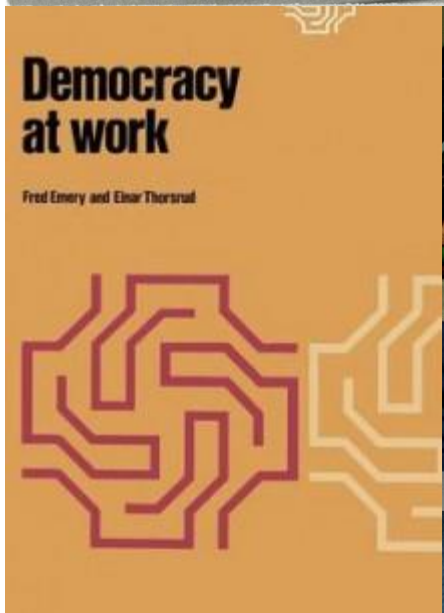
Flerfaseteknologien har gjort det mulig å bygge ut flere og mindre felt enn det ellers ville vært mulig.

Multiphase flow

- A panel of scientists placed this as the most important research-based innovation in Norway the last 50 years
- R&D at the Institute for Energy Technology and SINTEF and related research and education at several universities
- Crucial technology for the Norwegian oil and gas industry based on huge practical challenges in the North Sea
- Benefits estimated at “hundreds of billions of NOK”

Democracy in the workplace

- The “collaboration experiments” between unions and business associations, led by social psychology professor and work researcher Einar Thorsrud, have probably had large effects since the start in 1962
- Related to the “Nordic Model” of “flat” organisational structures, high degrees of collaboration etc.
- New legislation, the “Basic Agreement”, employee rights to influence adaption of new technology
- R&D normative and based on challenges of bureaucracy, alienation and routinisation



Many other examples

- Central industrial technologies, important innovations for patients and the environment, the country's most significant high technology firms as well as central scientific contributions **often came from researchers and research units that work with applied R&D**

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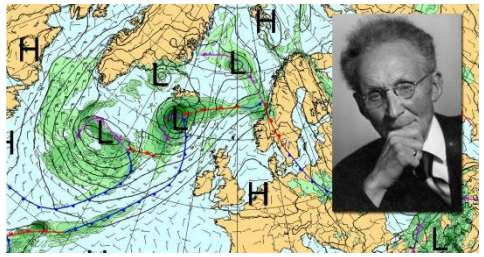


Characteristics of this research

- Tied to a concrete societal challenge or problem – interaction with users in industry, healthcare and society in a wide sense
- Long-term and with significant “core funding” and most of the time a relatively high degree of autonomy
- Curiosity, high ambitions and often carried out in a combination of non-academic research organisations and universities in Norway and abroad
- Protected from short-term political priorities and the logic of the market – and often with other application areas than the original one (e.g. nuclear R&D in oil and gas)

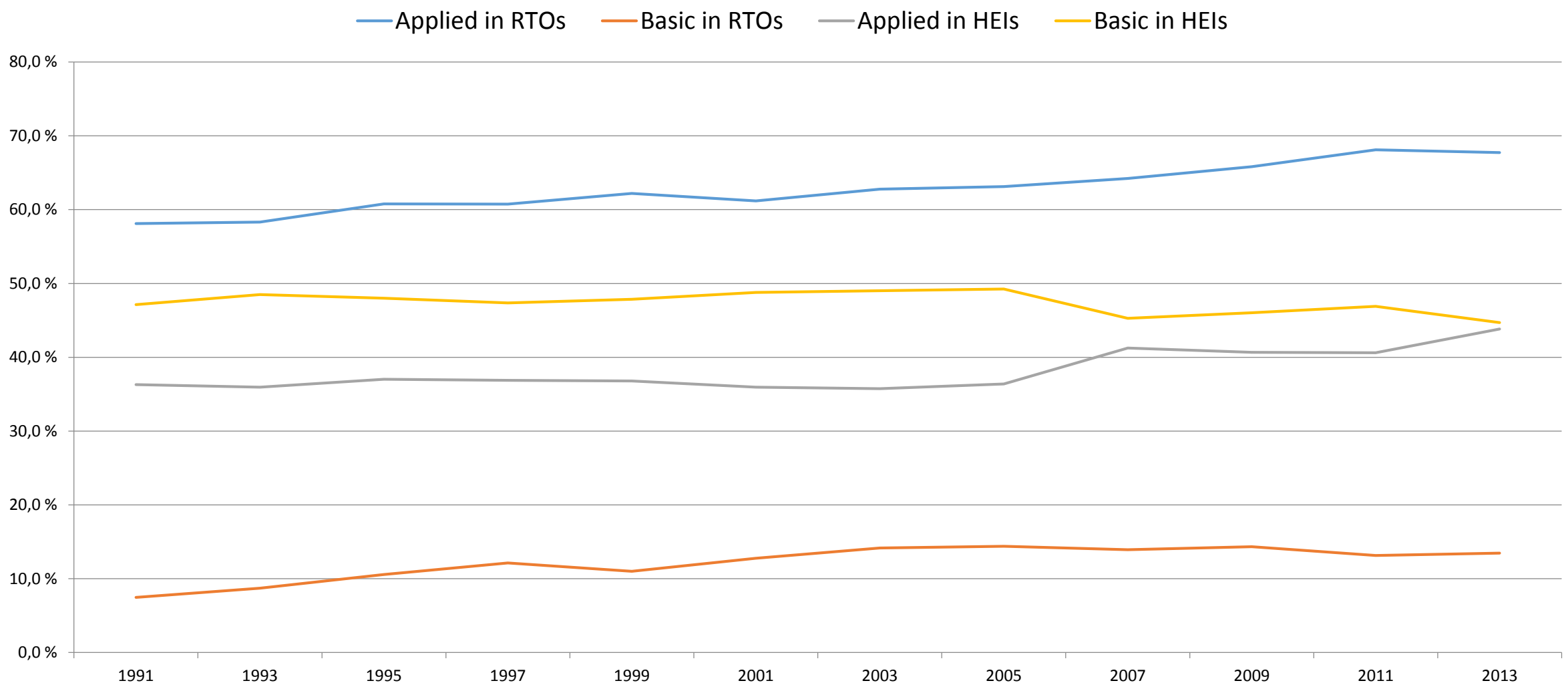
- It is not relevant to see applied research as a contrast to basic research – these activities are complementary

Is this research "good"?

- Meaningless to denote research that gives societal benefits for "bad" or even "mediocre" (we may or may not like its impacts, but that is not the topic here)
- But: most of my examples probably would not be able to acquire "excellence"-oriented funding (ERC, Norwegian centre schemes and more) – this research has other qualities that may be termed "fitness to purpose"

- Can we develop perspectives on research quality that to a greater extent incorporate "fitness to purpose" rather than (only) excellence?

Applied research is a major activity



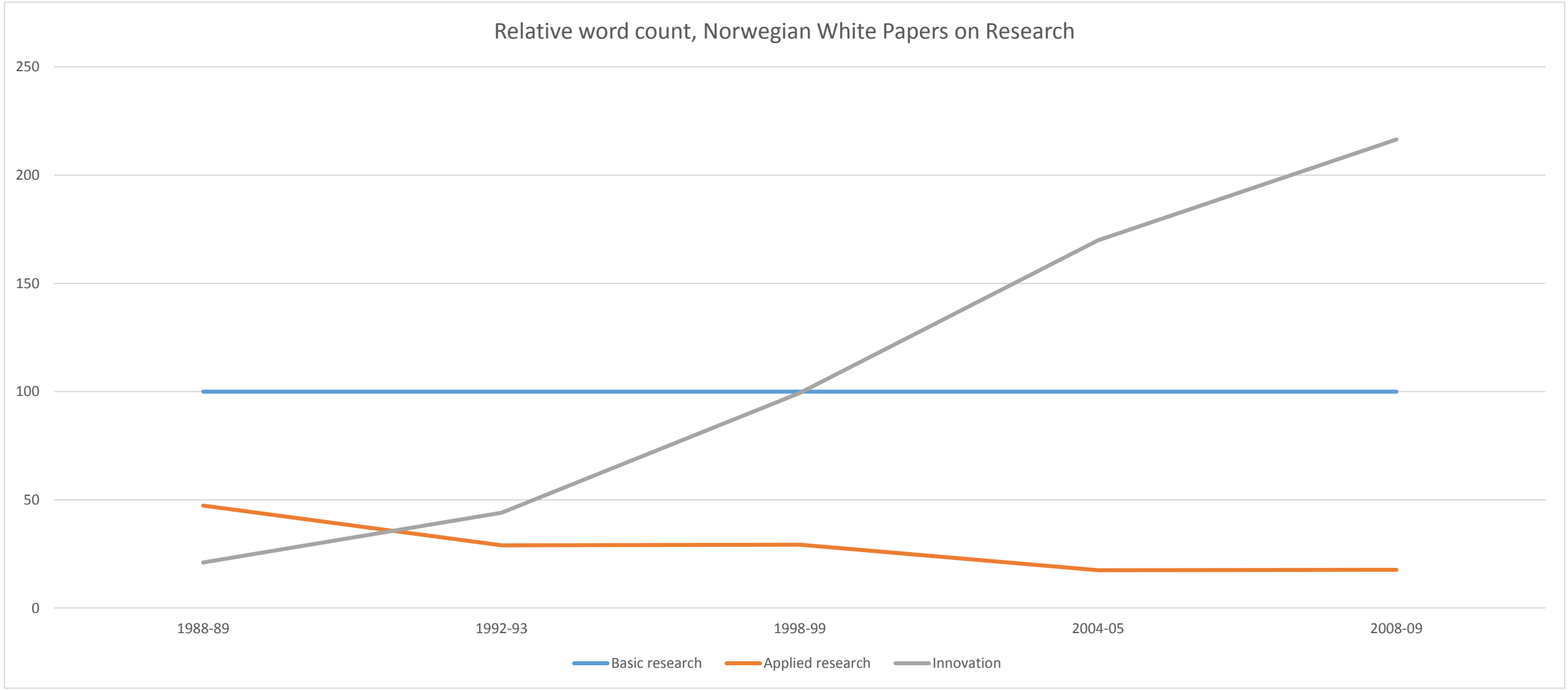
Source: Norwegian R&D statistics

In various combinations

- More than 80 per cent of tenured personnel in Norwegian higher education institutions report that they are involved in applied research – but only 4 per cent *exclusively* in applied research
- A similar pattern found in other countries, but the relative emphasis on applied work varies
- Although basic and applied research are often combined (and slightly more academics are engaged in the latter), the categories themselves are meaningful for the academics as labels for their research activities

- *Sources: Gulbrandsen & Kyvik (2010); Bentley et al. (2015)*

But “applied” seems to be gone from policy



New strategies highlight excellence only

Regjeringen.no

Tema Dokument Aktuelt Departement R

Du er her: Forsiden • Dokument • NOU-er • NOU 2016: 3

NOU 2016: 3

Ved et vendepunkt: Fra ressursøkonomi til kunnskapsøkonomi — Produktivitetskommisjonens andre rapport

Utredning fra et utvalg oppnevnt av Regjeringen Solberg 7. februar 2014.

The Norwegian “Productivity commission” and the plan for reorganising the research council are heavily influenced by neoclassical economists who argue that (more or less) only research that confines to “elite” criteria should be funded

Områdegjennomgang av Forskningsrådet

Ekspertgruppa har hatt mandat til å anbefale tiltak som kan gi økt kvalitet i forskinga og redusert ressursbruk i Forskingsrådet. Leiar Siri Hatlen vil legge fram gruppa sine anbefalingar.

A dichotomy in science policy

- Science policy and the funding mechanisms seem polarised (or in some cases “everything at the same time”)
- The “good applied research” described earlier may fall between two stools – although it may be still argued that this activity is less threatened than undirected basic research

Groundbreaking
Excellent
Elite journals
Standard metrics

Applied research

Innovation oriented
User-controlled
Contract based
Co-produced

Resuscitating applied research?

- To what extent do our concepts support the problematic dichotomy (e.g. the frequently suggested sharp distinction between knowledge as a public good and knowledge as private property)?
- Is it always useful to propose a continuous stream of (good) new concepts: Mode 2, Pasteur's Quadrant, Post-Academic/Normal Science, Transformative STI Policy, Cycles of Discovery/Invention and many more?
- Would it be possible to resurrect the "old" concepts of applied and basic research – since academics themselves still seem to find them meaningful for their own activities and because we may learn from the history of applied research (beyond missions, sectors) in this way?

Challenges with applied research

- What does it mean that applied research should be brought “carefully and appropriately” in touch with users?
- What about the many applied research failures and the problems of the “reverse linear model”?
- How do you handle openness and legitimacy in applied research?
- What is the role and status of non-academic and non-industry research organisations?
- How do you organise for directionality and serendipity?

Main message

- Applied research is the central activity at the intersection between society's needs and the research community
- Applied research is often long-term and curiosity-driven but with an overall practical end goal and in interaction with non-academics
- Many researchers are engaged in this form of research
- Challenge: applied research may suffer under a dichotomous or polarised science policy that either supports an introspective notion of excellence or short-term practical benefits
- Benefit from resuscitating applied research: a familiar concept, used in the research community, highlights the combination of long-term R&D and societal engagement

More information

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Pictures from Wikipedia, SINTEF, BT, Aftenposten, NRK