Towards an operational eco-systemic approach of research misconduct

Caroline Gans-Combe – INSEEC

OUR PEREQUISITS: GETTING STATISTICS AND NUMBERS

AN (ALMOST EXCLUSIVE) FOCUS ON COST ANALYSIS

RM = RESEARCH FRAUD AT THE WORKPLACE, AS SUCH IT CAN BE CONSIDERED AS OCCUPATIONAL FRAUD

WE WORKED ON CASES FOR WHICH THE SHARED CONVENTIONAL MAINSTREAM (SOCIETY AS A WHOLE:/ACADEMIA/INDUSTRY) ACCEPTS A LEGAL TREATMENT THIS BEING THROUGH COURTS, MEDIATION OR LEGAL SETTLEMENT...

CASES NOT ADRESSED BY THE LEGAL SYSTEM (QPR...) ARE FOR NOW NOT COVERED BY THE PRESENT ANALYSIS...DIFFICULT TO CAPTURE THEM STATISTICALLY.

WE ARE VERY WELL AWARE THAT SOME ELEMENTS OF RM ARE OUTSIDE OF THE PERIMETER OF THE PRESENT ANALYSIS?

RESPONSIBLE RESEARCH : A MULTI-LEVEL CONCEPT

Responsible R&D may be defined and understood at several levels (cf., Barré 2011):

(a) the "macro" or institutional level of the societal debates and the long term visions of elaboration of rules and codes of conduct;

(b) the "meso" level of funding agencies in charge of scientific priorities and "modalities" (methods) for carrying out research activities, and for their assessment;

(c) the "micro" level of the researcher in his/her laboratory, with associated questions of responsibility, ethics, and transparency.

RESEARCH MISCONDUCT: WHAT IS IT?

R&D may be carried out *with integrity,* or be *"misconducted",* or even *"not-conducted".* In the DEFORM Project, we use indifferently the terms <u>research fraud</u> and <u>misconduct,</u> as they both imply *intentionality.*

Many typologies of RM now exist. We exploit a double classification.

Steps of Research	PROPOSING	PERFORMING	REVIEWING	REPORTING
MAIN TYPES of RM				
Mistreatment				
Fabrication *(3)*				
Falsification *(5)*				
Piracy *(8 variants)*				
Plagiarism				
QRP				

THE TENSION BETWEEN BENEFIT EXPECTATIONS & FULFILMENT OF PROMISES : PROMISEOMICS

Expectations about R& D outcomes are present at multiple levels in all R&D business models.

Stakeholders at each level have their corresponding expectations : the societal creation of value (health, safety, security, economic growth, etc.); return on investment, product value; salary, rewards, reputation….
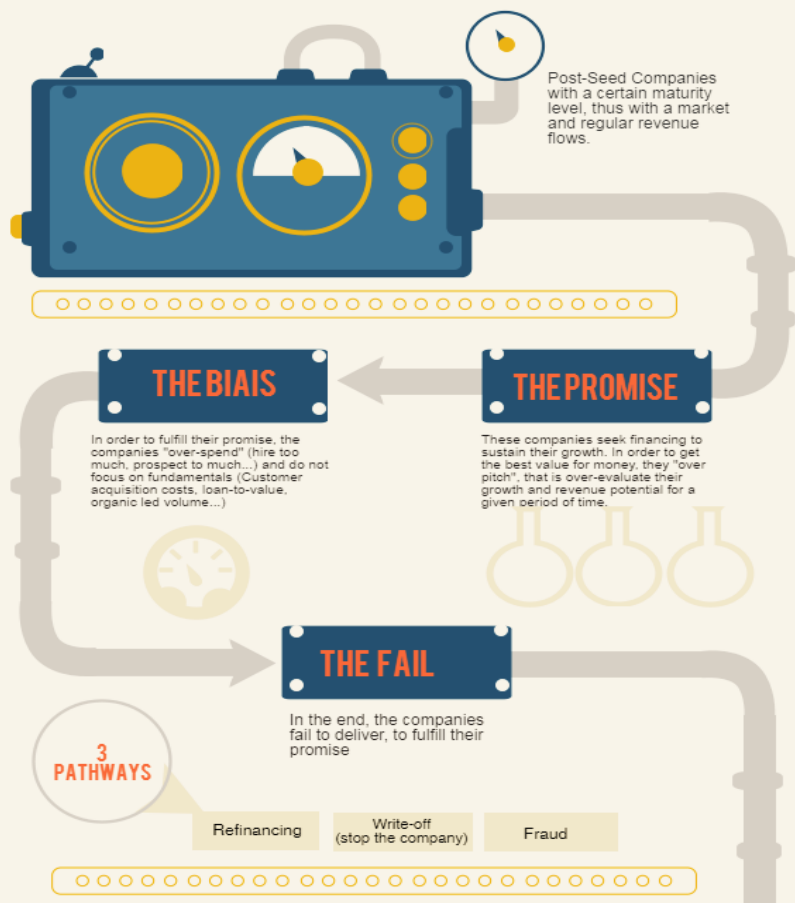
R&D activities are undertaken in response to these expectations.

But, there is a tension between what we can call the research results "promise" _exante_, and the ability to reach this outcome _expost_.

The greater the difficulty in delivering, the greater the "incentive" to misconduct. SEE FIGURE: THE VALUE TRAP.
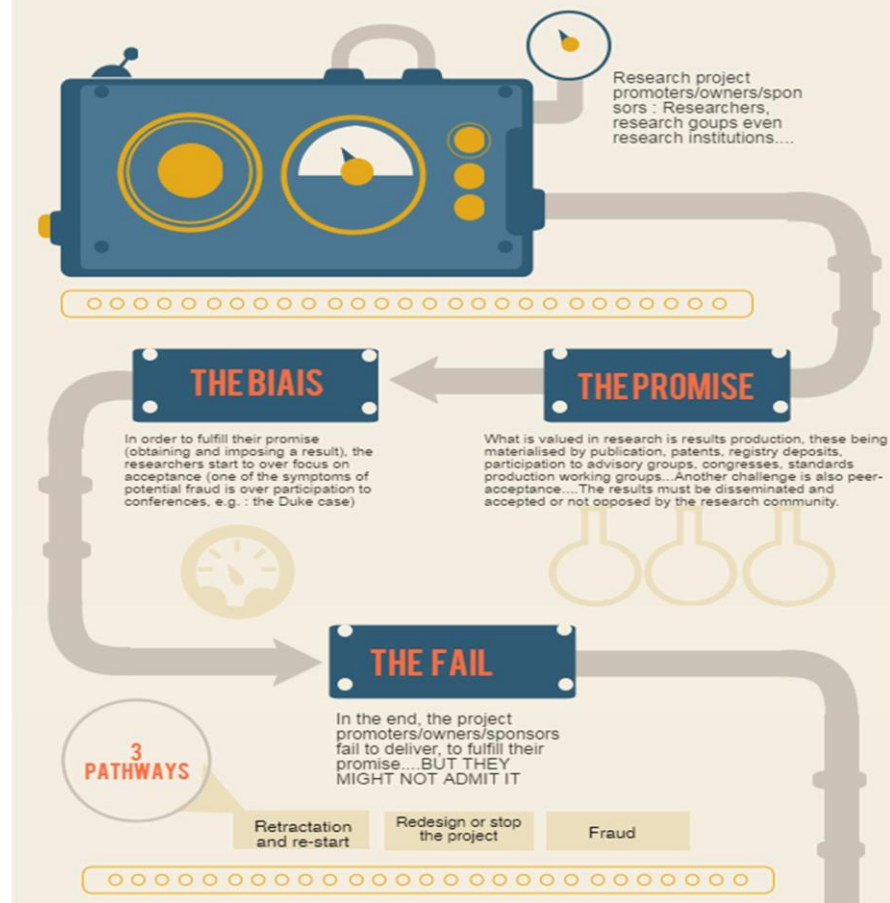
FOR BUSINESSES

THE VALUE TRAP

Post-Seed Companies with a certain maturity level, thus with a market and regular revenue flows.

THE BIAIS

In order to fulfill their promise, the companies "over-spend" (hire too much, prospect to much...) and do not focus on fundamentals (Customer acquisition costs, loan-to-value, organic led volume...)

THE PROMISE

These companies seek financing to sustain their growth. In order to get the best value for money, they "over pitch", that is over-evaluate their growth and revenue potential for a given period of time.

THE FAIL

In the end, the companies fail to deliver, to fulfill their promise

3 PATHWAYS

| Refinancing | Write-off (stop the company) | Fraud |

FOR RESEARCH

THE VALUE TRAP
For Research projects

Research project promoters/owners/spon sors : Researchers, research goups even research institutions....

THE BIAIS

In order to fulfill their promise (obtaining and imposing a result), the researchers start to over focus on acceptance (one of the symptoms of potential fraud is over participation to conferences, e.g. : the Duke case)

THE PROMISE

What is valued in research is results production, these being materialised by publication, patents, registry deposits, participation to advisory groups, congresses, standards production working groups....Another challenge is also peer-acceptance....The results must be disseminated and accepted or not opposed by the research community.

THE FAIL

In the end, the project promoters/owners/sponsors fail to deliver, to fulfill their promise....BUT THEY MIGHT NOT ADMIT IT

3 PATHWAYS

| Retractation and re-start | Redesign or stop the project | Fraud |

Stakeholders of the R&D Business Model and their expectations conditioning the promises.

Actors of the R&D process	Interests & Expectations	Direct recipients	Expectations	The indirect beneficiaries or damaged actors	Expectations
Researcher	Scientific challenge Recognition Reputation Wages	**Beneficiaries/ Customers**	Value extracted from the innovated product /service	**Individuals**	Health No toxicity No harm
Research team	Scientific challenge Recognition Notoriety/reputation Budgets	**Funders**	Return on investment, short, middle or long term	**Politics/ Public institutions/ Territories**	Economic Growth Global Health Wellness Security/Safety
Research Institution (public or private)	Notoriety/reputation Budgets	**Other members of the institution**	Sustainability of their institution	**Other Firms Economic sector**	New markets No loss of markets
Collaborative Research Institution	Scientific challenge Recognition Notoriety/reputation Budgets	**Providers**	Revenues Image/reputation	**Research communities** **-Sub-discipline** **-Global**	Recognition/ legitimacy, Knowledge & power Scientific progress Shared knowledge Science legitimacy

WHO ARE THE ACTORS IN RESEARCH MISCONDUCT?

The interdependence between individuals' actions and their institutional and wider socio-economic environment, has important consequences for notions of responsibility in research.

> It is important to avoid researchers' individual stigmatization, in situations where there is significant institutional responsibility.

In the identification of the "Fraud Pathway" (viz., the identification of the research "value gap" between promise ex ante and results ex post), each category of stakeholder, at each institutional scale, may potentially be/become a ROGUE ACTOR.

These "rogue" actors may act as insiders, individually or collectively, or they may act outside the research organization

See the typology THE GRAMMAR OF FRAUD (as proposed by Power 2013).

The Grammar of Fraud *(Source: Michael Power, 2013)*

RISK SOURCE	INSIDE	LEADERSHIP	ORGANIZATION	OUTSIDER
RISKY SUBJECT	Rogue trader	Rogue leaders	Rogue organization	Rogue organizations and states, cyber-criminals, hackers
FRAUD TYPE	Insider theft, operational and trading loss	Organization used by leaders as perpetrator of crime	Organization defrauds customers, stakeholders	Organization as vehicle for crime (e.g. money laundering) or victim (e.g. data theft)
MECHANISMS	Manipulation of records, deceit	False accounting or reporting	Deviant norms of practice	Breach of systems security
COUNTER-PRACTICE	Internal control; segregation of duties, oversight	Corporate governance, independent directors, oversight and disclosure	Regulatory censure; cultural change	Security systems and resilience
FACT PRODUCTION	Control facts	Governance facts	Cultural facts	Security facts

WHAT ARE THE COSTS ASSOCIATED WITH RM?

Each stakeholder, as a function of their decision and action perimeter,

    USES RESOURCES (expenses, period costs and part of assets),

    MAY LOSE OPPORTUNITIES, and

    MAY SUFFER DAMAGES — whose estimation may be based on legal procedures or agreements (litigation) or may be analysed as reputation or image costs.

Major cost categories include human resources (wages), direct operating expenditures, and capital expenditures dedicated to the research project.

There are also costs in relation to the prior training of the researchers (their capacities, know-how or embedded assets), which has been "wasted".

THE DEFORM APPROACHES TO RM COST ESTIMATION.

The DEFORM work focuses on two complementary approaches to cost estimations:

<u>First</u>, the evaluation of the aggregate direct costs of RM from the point of view of research funders, that is, the part of the research budget that is not put to good use;

<u>Second</u>, the evaluation of the full spectrum of direct and indirect costs of one specific fraud, namely, the analysis of what is now known as "the Volkswagen emissions scandal".

To link up these two approaches, we also need to consider available data about the incidence of different forms of RM.

THE INCIDENCE OF FRAUD IN RESEARCH

Type of Research Misconduct	Counts	Source(s) - 2013
IP violation (plagiarism, patents infringements):	478	BJS, COPE
IP violation (piracy)	328	Advisen, CDEW
Fabrication frauds (false data usage)	3140	BJS, Advisen, CDEW
Fraud Against Institutions (business, research, govt…)	1303	ACFE, CDEW, BJS
Falsification Fraud (reporting)	527	ACFE, CDEW, BJS, Interstats, Trac
Mistreatment (Privacy infringement excl. ID theft)	467	Advisen, CDEW, Interstats
Questionable research practices		*(no consolidated data)*
Other	6729	All sources
Total potential cases	**12 972**	**All sources**

NOTE: 2013 being the last full year for which all datasets are fully available, we have chosen to build our first cycle of calculations using information provided for this year.

THE RM DISCOVERY RATE, BY PROJECT

The frequency with which RM wrongdoers' actions become known, can be estimated as:

[Frequency of fraud occurrences] x [Elucidation rate in relevant fraud cases]

Assuming a probabilistic framework, the **[frequency of fraud occurrences]** can be formalised as the

[Freq. fraud occurrences] = [No. research projects] x [fraud occurrence ratio]

According to our data and models, the <u>occurrence ratio</u> for RM is about 0.6 %. That is, the probability of some form of RM happening on a given project/set of projects, is 0.6 %.

So, if an institution finances 25,000 projects during a set time-period, the estimated number of projects tainted with misconduct is 0,6% of 25,000 = 150.

We take the elucidation rate in fraud cases in Europe to be about: 6.1 %.

<u>Note</u>: This is the rate for Fraud cases in brought to courts in 2013 in 15 Member States, according to Ministries of justice statistics. See: http://www.justice.gouv.fr/budget-et-statistiques-10054/donnees-statistiques-10302/les-condamnations-27130.html

So the % of projects for which RM is revealed, is :

0.6 % x 6.1 %. = 0.04 %

THE DISCOVERY RATE OF RM, BY PROJECT

Putting this another way, the frequency of RM wrongdoers' being brought to court, is estimated as:

[No. research projects] x   [Freq. fraud occurrences] x   [Elucidation rate]

= No. research projects x (0.04%)

Insum:

If an institution (such as the EU) finances 25,000 projects,
in which an estimated 150 are tainted by some sort of misconduct,
the number of cases that will be discovered is limited to about 10.

THE VISIBILITY RATE OF RM, BY PROJECT

The visibility rate's aim is to compute the odds for a wrongdoer of becoming visible, which in the end could enhance sanctions, and thus interest for best practices.

Using the "K factor" (virality) we computed the propagation level of the fraud information (perimeter and duration of such visibility).

K = 4

A wrongdoer in the digital age is 4 times more visible than previously

THE DIRECT COST OF RESEARCH MISCONDUCT IN EUROPE

At a "macro" level:

About **$US 375 billion** spent in <u>Europe</u> in 2015 on R&D.   About **$US 2.25 billion** were engaged in plausibly fraudulent or misconduct-tainted projects.

For the USA, the estimated lost budget is about **$US 2.75 billion.**

Improved fraud and misconduct identification could bring significant budget savings, or significantly improved "value for money" in research funding.

At a "meso level", we can estimate the cost of RM fraud in research for Europe during the last framework program (2007-2013).

The total invested amount in research for the period was about   **56,000 million €.**

If 0.6 % of financed projects are <u>wholly or partly</u> fraudulent, up to **330 million €** might have been (wholly or partially) wasted during these seven years.

These are only "orders of magnitude" estimations for RM costs. Although very primitive, they give an idea of the scale of the phenomenon in economic and public finance terms.

THE COST OF RESEARCH MISCONDUCT: THE 'BOTTOM-UP' APPROACH

At the micro level, the costs and risks (whether for institutions or individuals) seem quite evident.

Perpetrators of RM frauds at this level, when clearly identified (or just publically accused), are vulnerable to reprisals, which may have lasting consequences, both individually and in society.

The DEFORM Project is engaged in several "micro" analyses aiming
[i] to improve knowledge of the incidence of RM, and
[ii] to improve estimations for the different categories of costs.

This is the "bottom-up" approach that we intend to demonstrate through the study of the recent Volkswagen (VW) R&D fraud, whose consequences may be much more costly than those deduced from R&D budgets alone.

The direct recipients	Relevant fraud costs for the actor
Customers	*Damage –loss of value - litigation*
Funders (Public, Private, Banks …)	*Loss of previous funds, grants (wasted funds)* *Loss of opportunity in funding better projects* *Global Fraud cost in research*
Other members of the institution	*Litigation costs – loss of future markets*
Providers	*Image cost- loss of future supplies*

The indirect recipients	Relevant fraud costs for the actor
Individuals	*Health, Wellness costs*
Politics/ Public institutions national or international/ Territories	*Environmental, Health, loss of productivity of workers, regulatory costs for Public institutions, repair and remediation costs, avoidance costs – litigation costs*
Other Firms Economic sector	*False markets game costs* *Misdirected research costs*
Research communities: Sub-disciplines / Global / Private-Public	*Reputation costs* *Governance-control costs*

COSTS OF A SPECIFIC FRAUD CASE — THE VW CASE STUDY

Actors in R&D process	Relevant fraud costs for the actor
Researchers	*Reputation – litigation – loss of future Research budgets – loss of future wages* *Research control –professional costs*
Research teams	*Reputation –loss of future budgets* *Research control –professional costs (reviews, reporting …)*
Research Institutions (Research centre, Firm…)	*Image – Reputation – loss of future budgets* *Loss of previous budgets (rogue wages – rogue training)* *Research control –professional costs (reviews, reporting ….)* *Loss of opportunity in better projects*
Collaborative Research Institutions	*Image – Reputation – loss of future budgets* *Research control –professional costs*

THE COST OF RESEARCH MISCONDUCT:
THE 'MICRO' APPROACH

Introduce a first model at companies' level of full costs including both individual and institutional costs

Hypothesis for each event : **Individual costs(X)** researcher embedded assets (training/reputational costs) (η), project costs(ι) and restitution costs (ϕ), (money repaid to project financers because of the Fraud), & **Institutional costs (x')** image and communication costs (ι), firing, hiring, turnover costs (η), litigation and fines costs (both globally and at project level) (ϕ), financing loss (these being of one financing cycle, that is 3 years – which imply that the institution must be in a position to cover by debts or other means the loss of opportunity (ϕ) – research "unproductivity costs", which consist in the raise of researcher time taken away by administrative burden (8% of FTE – Rockwell, 2009) which tends to reduce the productivity of the funds invested in research projects (η).

3 main natures of cost typologies :

Human resources (η - Eta), Financial (ϕ - Phi) and Immediate (ι - Iota)

Human resources (η)	Financial (ϕ)	Immediate (ι)
Researcher embedded assets	Restitution	Project costs
F&H, turnover	Loss of financing opportunities	Image costs
Unproductivity costs	Litigation and fines	

THE COST OF RESEARCH MISCONDUCT:
THE 'MICRO' APPROACH

THE RELATIVE WEIGHT OF IMMEDIATE COSTS IS FAR INFERIOR THAN THE SUM OF MID AND LONGER TERM COSTS

$$Y = \sum X + \sum x' = 3\eta + 3\phi + 2\iota = 3(\eta + \phi) + 2\iota = n(\eta + \phi) + (n-1)\iota$$

The n Factors counterbalance the issues of costs granularity : taking into consideration the different counts /weights.

CONCLUDING REMARKS

Indicators based on incidence of RM, relative to direct R&D budget costs, are useful, but insufficient for estimating full social costs of RM.

Our aim is to cover not only direct costs but also opportunity costs and consequences (commercial, financial, operational losses).

In DEFORM we have not yet started to work on the full life cycle of the "responsible R&D process", that is, from the researcher to the citizen, the human being and their social and ecological environment.

Both DEFORM approaches (AGGREGATE DIRECT COSTS; and TOTAL COSTS OF ONE FRAUD) may provide stakeholders – including researchers themselves – with reasons to imagine and support new forms of governance, not only to create control activities, soft and hard laws, but to reduce future control costs by reducing frauds.

THANK YOU