



TRUE COSTS OF RESEARCH MISCONDUCT

2012 iThenticate Report

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1.0 *Introduction*

Misconduct in research is a growing problem, yet the true costs of research misconduct are challenging to quantify. The misconduct of a single individual researcher can have an expansive and costly impact on organizations and the public—ranging from a damaged reputation to a lost career to even harmful treatment of patients.

Withdrawing articles from publication, known as ‘retractions’, increased ten-fold^[1] in the last few decades. Some retractions are due to irreproducible results or accidental data errors, but a high percentage of retractions are due to instances of purposeful research misconduct.

The growing pressure to publish, especially in notable journals, exacerbates these problems. Falsified research, fraudulent data, paraphrasing, duplication and blatant plagiarism are all examples of misconduct that have increased over the past several years, with many of these instances appearing from prestigious journals and formerly revered researchers.

This report explores the four categories of costs that misconduct cases cause—individual, brand, capital and human. To put the extent of these costs into perspective, the report will examine the rising trend of research misconduct; the reasons for the increase; and current or potential preventative measures that publishers are establishing.

2.0 *A Growing Industry, A Growing Problem*

Increases in the number of researchers, the growth of research dollars, and the number of publications, over the past decade, has put pressure on the academic research community to publish scholarly work.

- Currently over 7.1 million researchers in the world today (a significant change from the 5.7 million that existed in 2002) compete to have their research published in over 25,000 scientific, technical and medical journals.^[2]
- The U.S. spent one trillion dollars last year on research and development—a 45 percent increase from 2002.^[2]
- The number of scientific publications internationally has grown rapidly, with an increase in the number of publications from 1.09 million in 2002 to 1.58 million in 2007 to 1.94 million in 2010.^[2] This represents a 77 percent increase in the number of research manuscripts that have been published since 2002.

Dr. David Everett, researcher at the University of Otago in New Zealand, and editor at the International Dairy Journal, makes note of these changes:

“Our publication numbers have increased; we are getting more and more submissions every year, but we are accepting a smaller and smaller fraction of them. And I think the submissions are far lesser quality than they were years ago, so we are still only accepting the best quality ones.”

In this environment, journals—particularly top-tier ones—are faced with mounting submissions, which taxes the standard journal screening processes. This leads to a rise in ‘bad research’ allowed through the doors to publication.

For Example, PloS ONE published a research article highlighting the prevalence of misconduct amongst scientists and doctors. Findings revealed that two percent admitted to falsifying research, and 34 percent admitted questionable research practices:

A pooled weighted average of 1.97% (N = 7, 95%CI: 0.86–4.45) of scientists admitted to have fabricated, falsified or modified data or results at least once –a serious form of misconduct by any standard– and up to 33.7% admitted other questionable research practices. In surveys asking about the behaviour of colleagues, admission rates were 14.12% (N = 12, 95% CI: 9.91–19.72) for falsification, and up to 72% for other questionable research practices.^[3]

A January 2012 report based on 2,700 researchers surveyed by the British Medical Journal shows 1 in 7 UK-based scientist/doctors have witnessed colleagues intentionally alter or fabricate research data for purpose of publication.^[4]

1 in 7 UK scientists and doctors have witnessed intentional misconduct^[4]

In addition to falsified research misconduct, in 2010 Nature Publishing Group surveyed nine scientific journals and discovered an alarming level of plagiarism within them. In its findings, one of the journals under publisher Taylor & Francis was rejecting a 23 percent of all submitted content because of plagiarism.^[5]

In recent years, Eric Kissel at the University Corporation of Atmospheric Research (UCAR) has seen a substantial portion of submissions that contain plagiarism:

“It varies wildly within our chapters anywhere from as low as 5% of submissions, but I have seen as high as 30%. So much of what we see varies between some text that is inadequately cited—where the citation is there, but it isn’t properly cited. Then there are obviously the other cases that are overtly plagiarism.”^[6]

iThenticate, a leading plagiarism detection and prevention service for researchers and research organizations, released a report in 2011 that addresses how the pressure to publish, as a result of globalization and technology, is increasing misconduct in scholarly research.^[7]

iThenticate saw twice the number of new customers in 2011 from the previous year, with more than 3,000 organizations and researchers or authors seeking plagiarism checker software to screen manuscripts before publication. In addition, the number of publisher members in CrossCheck, a user community of publishers established by CrossRef and iThenticate, grew to 283 publishers, representing tens of thousands of journals (from 20 in 2008). In 2011, iThenticate processed over 2.3 million manuscripts.

Whether researchers are taking more ethical risks or misconduct is a byproduct of the increased pressure to publish, misconduct is certainly on the rise.

3.0 Rising Retractions

One clear indicator of the surge in misconduct is the rising rate of retraction. Nature Publishing Group published a comprehensive study in 2011 that examined a large quantity of retraction data from 1977 to 2010. The study surveyed high-impact factor journals such as *Nature*, *Cell*, *Science*, *Proceedings of the National Academy of Science USA* and *J. Immunology Findings*. The survey indicated that, within these journals, on average, “the number of retraction notices has shot up 10-fold.”^[1] Of these total retractions, 44 percent of the retracted materials were flagged due to research misconduct, with the majority of the misconduct occurring within the last five years.

In 2010, the Journal of Medical Ethics published a study that examined nearly 800 retracted papers, which yielded alarming results both in terms of the rising rate of retraction as well as misconduct. From the Journal of Medical Ethics:

“Total papers retracted per year have increased sharply over the decade ($r=0.96$; $p<0.001$), as have retractions specifically for fraud ($r=0.89$; $p<0.001$).”^[8]

In the past, journals have relied on retraction as a “fail-safe” protection against misconduct. By retraction, a journal indicates that an article is unfit for publication. In addition, the act of retraction notifies other researchers that the problematic material should not be used as the basis for building additional research.

Retraction Watch, a web site that covers news of retractions and research misconduct, reported an upsurge in stories related to retractions across a span of 12 months between 2010-2011. Analysts from Retraction Watch found “posts [that] cover something like 200 retractions... That is unusually high activity for a 12-month period; the annual average for the previous 10 years was about 80.” A year later, in its 2011 recap, Retraction Watch wrote that it heard of nearly 400 retractions for the year, double the number from the previous year.^[9] Retractions are on the rise at an alarming rate. But, the increase does not seem to be a deterrent to the continued submission of faulty, falsified, or plagiarized work.

Another problem with retractions is the disparate way journals and institutions handle them. A “retraction” can range from a journal acknowledging the problem to their concealing a scandal. Without a standardized response to retractions, the majority of misconduct cases may not receive the necessary attention or due consequences they warrant.

Sometimes retractions can be a case of a “too little, too late.” Although a paper may eventually be deemed inaccurate in some way (when the research misconduct is finally exposed and the paper retracted), damage may already have been incurred.

4.0 *Costs of Misconduct*

A case of research misconduct rarely results in only one single cost; in most cases, misconduct creates a ‘ripple effect’ of damages that touch a number of individuals and organizations. Some of the most common types of damages that a case of misconduct can produce include:

- Individual costs
- Brand costs
- Capital costs
- Human costs

4.1 Individual Costs

The cost for an individual researcher who engages in misconduct can range from the loss of their professional career or reputation, lawsuits, revoked awards, designations, titles and academic degrees.

A quick survey of news headlines over the past few years yields a number of infamous cases of misconduct and the cost of that conduct to the individual.

In 2011, two examples of cases that were highly publicized were those of Karl-Theodor Zu Guttenberg and Johann Hari.



Individual Costs

- Loss of job
- Revoked PhD
- Revoked awards
- Lawsuits
- Questioned integrity

The case of former German Defense Minister Karl-Theodor Zu Guttenberg underscores how even the mighty can fall in the wake of research misconduct. Guttenberg was at the height of his political popularity, even considered as the next Chancellor of Germany by some, when a plagiarism scandal broke in relation to his doctoral dissertation. When it was discovered that Guttenberg had indeed copied large parts of his paper, he was forced to resign.^[10] Even now, removed from a professional career in politics, Guttenberg faces continued repercussions in the form of potential legal prosecution due to copyright infringement.

Former columnist and interviewer for Britain’s The Independent Johann Hari was not only forced to resign due to claiming other words as his own; he was stripped of prestigious awards including the George Orwell prize.^[11]

Often, the individual’s cost of misconduct is not his alone; other individuals in the periphery are also typically impacted. In the Guttenberg case, some of his associates, including current German Chancellor Angela Merkel, were impacted by the scandal.

4.2 Brand Costs

One of the most damaging long-term costs associated with misconduct is brand damage. Universities, publications and journals all have “brands.” All of these entities have invested in and work to foster their reputation, whether towards attracting more students, selling more subscriptions or increasing overall funding from federal agencies.

In an interview with iThenticate, Dr. Benson Honig, a professor at McMaster University, DeGroote School of Business, as well as an editor of the business publication, Entrepreneurship Theory and Practice, has seen firsthand how important reputation can be to universities and publications:

“In social science journals in particular, reputation is based on who decides to submit. If a journal were to be discovered publishing erroneous material, people might think twice about the reputation of that journal. University interests are similar: when something embarrassing happens, don’t make it public. I am well aware of universities that have found scandalous things; for example a professor taking student work and publishing it as their own... And they kept a lid on this for a very clear reason.”

Because an individual researcher is an employee and as such a representative of an organization, a very public case of misconduct involving that researcher has the potential to significantly harm the institution’s brand.

The *New York Quarterly Magazine’s* editor-in-chief, Raymond Hammond, describes how their last incident of plagiarism caused multiple, lasting damages:

“We had to rush to pull the affected issue of the magazine from sale, we subsequently lost money from not being able to sell that issue for a while, I had to meet with lawyers on a daily basis for at least a week to research our reaction to this act and to plan a course of action that would salvage the remainder of the issue and allow us to sell it again.”^[12]



Duke University is undergoing a case of alleged misconduct by cancer researcher, Dr. Anil Potti. For five years Duke backed Potti’s research and medical treatments for over a hundred cancer patients. Potti’s research was published in the most prestigious medical journals, including *Nature Medicine*, *The Lancet Oncology*, *Blood* and *PLoS ONE*. After investigation in 2010, Potti was accused of falsifying his research data and committing fraud. The story has received news coverage on the internet, on television, most notably on a recent *60-minutes* CBS News segment. Although Potti is no longer practicing

his research at Duke, the university may be faced with the challenge of recovering from a damaged reputation amongst the medical community, publications and patients worldwide.^[13]

4.3 Capital Costs

A number of costs associated with research misconduct aren’t often made public. A case of misconduct can set off a chain reaction of capital loss to a publication or academic institution, including losses incurred while financing deceptive research, money spent to investigate the case itself, as well as costs associated with repairing the damage caused by the incident. Most organizations keep such information private, given the embarrassing and sensitive nature of misconduct.

In 2010, The Public Library of Science journal, *PLoS Medicine*, published a study, titled ‘The Costs and Underappreciated Consequences of Research Misconduct: a Case Study,’ which quantified the costs of misconduct. Utilizing a “data-based modeling approach” and applying it to a real example of scientific fraud, PLoS researchers were able to calculate actual dollar amounts for the damages incurred. In the end, they determined that their experimental case directly cost the university involved \$525,000.^[14] This amount included costs for case deliberation, an inquiry panel, as well as the use of an investigation committee, comprised of eight individuals. However, this calculation may be conservative because it does not include several other indirect costs.

Taking their statistical model one step further, while also employing external sources to determine the national extent of institutional misconduct, the PLoS group calculated that “the direct costs would exceed \$110 million” for the United States in 2010 alone.^[14] Given the data for increased misconduct over the past few years, this number will likely be significantly higher in 2012.



Capital Costs

- **Lawsuits**
- **Legal costs**
- **Investigation costs**
- **Loss of grant money**

A Fall 2011 survey conducted by iThenticate, which sampled nearly 200 of its customers across five industry types (government, non-profit, publishing, research, and scientific, technical and medical (STM)), found that 60 percent of respondents who dealt with an incident reported the total value of capital losses for the organization to cost up to \$10,000. Ten percent reporting damages up to \$50,000.

Tight budgets over the past few years have forced government granting agencies to be even more discriminating on who receives funding. This has increased the pressure for researchers and governmental or intergovernmental departments to publish quality work.

4.4 Human Costs

Another cost of misconduct that often escapes public view is the human cost. Although papers containing misconduct are being retracted at a greater rate than ever before, that does not necessarily mean that the retracted materials have not influenced ongoing research and even medical treatment in a negative way.

The Journal of Medical Ethics published a study in 2011 that examined 180 retracted papers which contained research linked to 28,000 patients. The study found that 6,573 of those patients were treated utilizing the data and research from the retracted papers.^[15]

Another prominent case of misconduct involved anesthesiologist Dr. Scott Reuben, who was exposed in 2009 for having fabricated at least 21 papers. The prominent medical journal *Anesthesia & Analgesia* had published 10 of Reuben's papers, and even though the materials were later retracted, the damage was already done. The editor-in-chief of *Anesthesia & Analgesia* highlighted the cost of misconduct in this case:



Human Costs

- **Misdiagnosis**
- **Research costs**
- **Lost time**

"We are talking about millions of patients worldwide, where postoperative pain management has been affected by the research findings of Dr. Reuben."^[16]

Beyond directly affecting the health outcomes for the general public, misconduct also works to turn back the clock on progress within the research community. Time spent on research based on fraudulent work is wasted effort.

Moreover, fraudulent or falsified research can be passed on and used by other researchers, even post-retraction. John Budd, working out of the School of Education at the University of Missouri in Columbia, examined 235 retracted journals during 1966-96 to evaluate the effect of older retracted articles on newer research. As reported by *Nature*:

"He found that they were cited in total more than 2,000 times after their withdrawal, with fewer than 8% of the citations acknowledging the retraction. And the rates haven't improved much in the age of electronic publication: in a preliminary analysis of 1,112 retracted papers during 1997-2009, Budd finds them cited just as often, with the retraction mentioned in only about 4% of the citations."^[17]

5.0 Preventing Misconduct

The standard post-misconduct path of retraction is a good start. But the rise in retractions, coupled with the high-stakes environment of research, underscore how this approach is not as effective as previously thought. Not only do the standards for retractions vary widely between publications, but fallible research causes damage even post-retraction.

Another potential solution might be to bolster awareness of proper research methods, data collection, citations and plagiarism for students, researchers, and publications. Yet, in spite of the effort to build awareness, there are still individuals who are willing to commit fraud and plagiarism if the risks warrant it. Dr. Everett of the University of Otago told iThenticate of his experience with this transformation firsthand:

“Teaching students about misconduct, fraud and plagiarism is something that I engage in, but once they get to the cut-throat funding environment as researchers, they may forget that knowledge fairly quickly.”

A proven path to reduce the cost of misconduct is by preventing the publication of ‘questionable’ materials altogether. Thoroughly screening submissions prior to publication can potentially catch cases of misconduct before they go public and cause damage to an individual or institution. This includes carefully vetting content for errors, fraudulent data, lack of citations and plagiarism.

However, this screening process has been a challenge as of late. Submissions to prominent journals have jumped to record levels over the past several years (as we’ve seen), giving editors and peer reviewers a difficult assignment in preventing harmful content from slipping through. This is where technology can significantly assist.

iThenticate is cutting-edge plagiarism detection software that provides researchers, publications and institutions with the technology to efficiently prevent research misconduct. The software scans a massive database of scholarly text, as well as billions of web content, in order to highlight instances of duplicate content. This enables a publisher to pull suspicious material prior to publication in order to prevent potential damage.

Elizabeth Wager is the chair of the Committee on Publication Ethics (COPE) and an authority on providing advice to editors and publications on how to prevent and handle cases of research misconduct. COPE encourages the use of plagiarism detection software. Wager told iThenticate the following:

“We certainly see iThenticate and the CrossCheck database as a really important tool and we encourage our editors to think about using that sort of thing. Either routinely as they seem to be increasingly doing, or in cases where there is a suspicion of either redundant publication or plagiarism.”

Sharon Martini, who is the Assistant Editor at the Journal of Chemical Physics for the American Institute of Physics (AIP), described the reason why she thinks publishers would join the CrossCheck initiative:

“Our journal sees cases of potential ethical misconduct each month. It would be so helpful if all publishers would contribute to iThenticate so that we could rest assured that we are not missing other cases of plagiarism by not being able to scan a complete set of journals for matches.”

Many iThenticate customers screen all manuscripts before publication to avoid misconduct upfront. An additional step some customers take is to place the iThenticate logo on their websites to send a message to authors that they do not tolerate plagiarism. Karen Tingle, CEO of Writers Research Group told iThenticate:

“We tell clients that we are using the iThenticate plagiarism checker service for all of our articles prior to submission—this is a big value-add for our writing services in the eyes of any potential clients. Legal defense is another big value-add. iThenticate is a low-cost solution that makes sure we aren't going to be sued.”^[18]

6.0 *Conclusion*

Organizations and individuals who have been involved in cases of research misconduct are all too familiar with the associated costs. Careers, capital, research development and grant funding are a few of the losses that append cases of misconduct. Although journals can fall back on retraction as a solution, the reality is that the best approach to avoid the hazards of misconduct is through a combination of pre- and post-emptive measures.



To learn more about iThenticate, please visit www.ithenticate.com.



To learn more about CrossCheck, please visit www.crossref.org/crosscheck.

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