

## **Risk, Trust and Cutting Edge Technologies: A Study of Australian Attitudes**

Karen Farquharson is a Lecturer in Sociology at Swinburne University of Technology

Christine Critchley is a Lecturer in Psychology at Swinburne University of Technology

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### **Abstract**

This study examines the relationship between trust and public attitudes towards new technologies in Australia. Using data from the 2003 and 2004 Swinburne National Technology and Society Monitors, we ask: does the trustworthiness of the key institutions and people behind new technologies have an impact on how comfortable people are with new technologies?

Our analysis shows that, for the majority of Australians, levels of trust in science are predictive of levels of comfort with new technologies, and the relationship is particularly strong for biological technologies, including stem cell research. We also found a positive relationship for the majority of respondents between trust in government, business and media and comfort with technologies. We expected that Australians would be more trusting of public than private institutions, and that their levels of trust in institutions might vary across different demographic groups, in particular gender, religiosity, and occupational category. We found evidence to support these expectations.

**Key words:** trust, risk, public perceptions, technology, biotechnology

## Introduction

We are in the midst of an information revolution. Amazing new technologies are being developed that affect our ways of living and the essence of our very being: from instant global communication to designer babies. Many new technologies are being developed and implemented quietly, with little public debate. At times, as with the case of genetically modified food in Europe, this has backfired and there has been a public outcry against the new technology (Winston, 2002). At other times, new technologies, such as mobile phones, the Internet, and DNA paternity testing, have been more or less smoothly incorporated into our social fabric.

There are arguably many factors that impact on the public's acceptance of new technologies. One of these is trust. Trust was an important factor in the debates over genetically modified food in Europe: there was not enough public trust in the new technology for it to be accepted. However this is not the case in the United States, where genetically modified foods are sold and seemingly accepted. Clearly, then, it is important to consider local contexts when examining trust in relation to new technologies.

This study examines the relationship between trust and public attitudes towards new technologies in Australia. Using data from the 2003 and 2004 Swinburne National Technology and Society Monitors, we ask: does the trustworthiness of the key institutions and people behind new technologies have an impact on how comfortable people are with different new technologies? We first consider what it means to trust in an institution. We then review the risk society thesis, and relate it to the research on trust. We argue, along with Sztompka (1999), that trust is logically related to risk, and that without risk there is no need for trust. We then report our results. Our key finding is that most Australians have high levels of trust in science, and that this trust is highly correlated with the levels of comfort people have with different new technologies. In other words, the more trusting Australians are of science, the more comfortable they are with new technologies.

## Trust

The social science literature on trust is largely focused on interpersonal trust rather than institutional trust. In fact, there are lively debates between those who argue that the concept of trust is most relevant at an interpersonal level (for example, Hardin, 2002) and those who advocate for a broader definition, including institutional trust (for example, Levi, 1998, Sztompka, 1999). In this section we will briefly review both perspectives, arguing that institutional trust is a relevant concept and is logically related to public attitudes towards new technologies.

Political philosopher Russell Hardin, one of the most prominent theorists in the area of trust, argues for an encapsulated interest model of trust: "That is, *my trust of you is encapsulated in your interest in fulfilling the trust*" (Hardin, 2001b: 3, italics in original). In this view, it is in an individual's interests to be trustworthy if they wish to maintain a relationship with the person who is trusting them. Your trust in someone is based on how trustworthy you deem them to be. Because of this, trust is a type of knowledge or belief, not an action. You can act on trust (your belief that someone is or is not likely to do something based on your knowledge of them and the context surrounding the desired action), but the act, the entrusting, is separate from the trust, the knowledge, itself (Hardin, 2001b).

Hardin further argues that when we speak about trust, the concept we are really trying to explain is trustworthiness. How trustworthy we believe somebody to be is related to our prior interactions with them, and our expectations about how they will behave in the future. Hardin argues that "...[T]rustworthiness is *not* a commodity, even though perceived trustworthiness (that is, reputation) is" (Hardin, 2001a: 22, italics in original). Although Hardin is referring to trustworthiness at an individual level, it is not difficult to imagine that institutions might also develop reputations for being trustworthy. In fact, Sztompka argues that it is very important for businesses to develop such reputations, and that, further, it might take an entity a long period of time to develop a reputation for trustworthiness, and this reputation could be undermined in an instant (Sztompka, 1999).

Other social scientists have taken a different approach to understanding interpersonal trust, locating it as a key component of social capital. For example, Robert Putnam (2000) and Francis Fukuyama (1995) argue that interpersonal trust is critical for societies. Fukuyama defines trust as follows: "Trust is the expectation that arises within a community of regular, honest, and cooperative behavior, based on commonly shared norms, on the part of other members of that community" (Fukuyama, 1995: 26). In this view, in societies that have high levels of trust, high levels of social capital are also present, enabling the society to be more economically productive. In a similar vein, Putnam examines trust as it pertains to social capital, arguing that levels of social capital in a community have an important impact on the quality of life for that community (Putnam, 2000). Hardin notes that these types of study linking trust and social capital do not clearly define what it means to trust and be trusted (Hardin, 2001b). Because of this, he argues, it is unclear what the relationship between social capital and trust actually is.

For the most part, researchers studying social capital have focused on trust at the interpersonal level. When institutional trust has been examined it is often with the intention of understanding its impact on individual social capital. For example, Stone and Hughes look at the impact of ties individuals have with institutions on how much they trust (expressed as confidence in institutions) the institutions, finding that the level of confidence an individual has in an institution is not dependent on whether or not they have personal ties with that institution (Stone and Hughes, 2002). Although this type of research does look at social capital in the context of institutions, it still remains analytically at the interpersonal level.

A different approach to understanding trust looks at generalised trust, or how much trust people have in the world in general. Unlike Hardin's encapsulated trust model which argues that trust is strategic, this research focuses on the moralistic side of trust and argues that trust is not always strategic: it is possible and meaningful to research general levels of trust in society (Uslaner, 2002). This research argues that some people are more trusting than others and it examines which factors are related to being a trusting person (for example, Uslaner, 2002, Sztompka, 1999). It has found that generalised levels of trust have declined in recent decades and seeks to explain why this has occurred (Uslaner, 2002). This research is concerned with institutional trust, mainly as it relates to generalised trust.

What does it mean to trust an institution? Political scientist Margaret Levi and sociologist Piotr Sztompka provide us with some insights into this issue. In contrast with Hardin, who argues that it is not accurate to say that people trust in institutions because trust requires knowing people and it is not possible to know enough people in a given institution for it to inspire trust (Hardin, 1998), Sztompka and Levi argue the opposite: that trusting an institution means trusting the people behind it (Levi, 1998, Sztompka, 1999). According to Levi, an institution becomes trustworthy when the processes that are in place to select its agents are geared to select people who "... are competent, credible, and likely to act in the interests of

those being asked to trust the institution" (Levi, 1998: 80). Similarly, Sztompka argues that when we say we trust an institution, we are really saying that we trust the people behind the institution.

[I]ntuitively we feel that trust must be vested in people, rather than natural objects or events. Even if we seemingly conferred trust on objects, such as saying 'I trust Japanese cars,' or 'I trust Swiss watches,' or 'I trust French rapid trains,' we in fact refer to humanly created systems and indirectly we trust the designers, producers, and operators whose ingenuity and labour are somehow encrypted in the objects. (Sztompka, 1999: 20)

Although trust in institutions obviously has an interpersonal aspect, it is different from interpersonal trust in the encapsulated sense that Hardin discusses it. Rather, trust in an institution involves a belief in the trustworthiness of the institution based on its reputation. This type of trust suggests that an institution has processes in place to ensure that the people it relies on will do what the institution expects of them. It is a trust that an institution, because of its associated checks and balances and quality controls, will perform its tasks in a particular, predictable way (see Levi, 1998).

According to Sztompka, trust and risk are intrinsically associated; without risk, there is no need to trust (Sztompka, 1999). In this view, entrusting an entity to do something is an active way of dealing with uncertainty. The notion of risk is also implicit in Uslaner's research, where he argues that "Americans have...become less trusting because they worry about the future. Expectations for the future and the belief that you can control it are the most important factors shaping trust" (Uslaner, 2000-01: 587). Sztompka's definition of trust reflects the relationship between trust and risk: "trust is a bet about the future contingent actions of others" (Sztompka, 1999: 25). The others might be individuals, or they might be other social actors, like governments, or other institutions. Defining trust in this way makes it possible to understand how people might trust institutions as well as individuals. It also provides a means for us to understand the link between the concept of trust and living in a risk society.

## **Risk Society**

An alternative way we might attempt to understand the public's comfort with new technologies is through the risk society thesis. Research on the risk society, led by Giddens (1990) and Beck (1992), argues that modern societies encounter many more risks than previous ones. Traditional societies encountered risks from natural sources, such as floods and lightning. Because of technological advances, modern society has many more risks in addition to these natural ones. For example, we now must worry about global warming, nuclear winter, and the degradation of our environment. The risks that modern societies encounter are manufactured: they are caused by the activities of humans. Because of the manufactured nature of modern risks, and because we have never encountered these risks before, we do not even know what the risks are until they eventuate, and they have the ever-present potential to be devastating.

With the notable exception of Sztompka, trust theorists, who are mainly American, for the most part do not discuss the more European risk society research and its implications for trust and entrusting. Yet in considering trust in science, new technologies and scientific institutions, a consideration of the riskiness of the work that scientists do is essential. When scientists are altering the human genome or developing genetically modified food for us to

consume, our perceptions of their levels of trustworthiness to not harm society are worth considering.

Giddens argues that in previous eras the public respected scientific authority, but in current times we approach the findings of science with scepticism (Giddens, 2002). Similarly, Yearley notes that most of the time when the public receive scientific information it is in a particular context. For example, scientists we see in the media are often trying to sell us something, like washing powder, and we take that kind of scientific information with a certain degree of doubt, because we know that the aim of the information is to convince us to buy the product (Yearley, 2000). We no longer unquestioningly trust the information we receive from scientists, we place it in its context and make our judgment about it based on that contextual information, rather than on the authority of science itself. Scientists are often in disagreement with one another, and these debates no longer take place behind closed doors, but rather in the public domain (Giddens, 2002, Beck, 1992). If this scepticism does, in fact, lead to a decrease in trust for science and scientists amongst the public, we would expect to find this reflected in our surveys.

As society develops technologically, individuals need to deal with the effects of these new technologies on our daily lives. For example, although we have to trust farmers who we do not personally know to grow our food, we might develop strategies to ensure that the farmers are in fact growing our food in a careful manner. We might choose to only purchase organic food because we believe the organic food industry is carefully regulated to ensure that only organic growing methods are used, so our food would not be subject to excess of use of pesticides, hormones or antibiotics. These regulations might encourage us to trust organic farmers to produce food that will be healthier and safer than that produced by 'traditional farmers.' However this strategy means that instead of placing our trust in the farmers themselves, we are placing our trust in government and regulatory bodies to carefully ensure that organic farmers actually do use organic farming methods. This type of trust relies on regulatory processes, on checks and balances, to ensure favourable outcomes. It is a trust that the regulatory processes will be carried out, and that the processes in place to select the people who implement these regulations are sound.

Central to the risk society thesis is the idea that while lay people express a distrust of science and scientists, they also rely on scientific institutions (Kerr and Cunningham-Burley, 2000). This suggests that the relationship between lay publics and science is one of ambivalence. In our risk society we have more knowledge about the work that scientists do and the debates that they engage in. We have different expectations about the possibilities of science and the validity of scientific findings, and we understand that knowledge changes as science progresses. 'As industries develop so do hazards, and the associated industries of risk management proliferate, seeking to ameliorate these effects' (Kerr and Cunningham-Burley, 2000: 294). We attempt to manage the manufactured risks associated with new scientific developments by regulating them. This places the public's trust in regulatory bodies at the centre of concerns about attitudes towards new technologies.

The risk society thesis, then, is closely related to issues surrounding trust. As Sztompka argues, the concept of trust is only useful in the context of risk: if there is no risk, there is no need to trust. For our purposes, we can expect the Australians' levels of comfort with new, potentially risky/dangerous new technologies would be closely connected with the amount they trust the people and institutions behind those technologies.

The risk society literature provides important insights into our current situation: we live in an age rife with manufactured risks. Because these risks have never been encountered before, we cannot accurately gauge what they are or how dangerous they are. One way of coping

with these risks is to regulate them, to ensure that the people who are acting in potentially risky ways are doing so carefully and morally. In other words, ideally we would regulate science and scientists to minimize the risk of new scientific developments to society as a whole. In practice, the extent of this regulation is questionable. Therefore it is reasonable to expect that the public would be less trusting of research done in less regulated environments, such as private institutions. This is because private institutions are arguably not subject to the same scrutiny that publicly funded institutions are; we expect that private institutions will be guided by the profit motive.

The individuals and institutions behind new technologies include scientists, government, universities, private research organisations, politicians and political parties, and interest groups. Scientists are an obvious group to include: scientists are the ones who are actually developing new technologies. Government is also important. We expect government to provide regulation so that science and scientists do not harm society as a whole. Research is conducted in publicly funded institutions such as universities and public hospitals, as well as in privately funded institutions, so it is reasonable to expect that trust in these groups might have an impact on how comfortable we feel with various new technologies. Politicians and political parties and interest groups are also relevant because we might expect that they would have an impact on the likelihood of new scientific developments being regulated.

Because of the riskiness of many cutting-edge technologies, we expect that respondents would value government regulation over industry self-regulation. Industries are motivated to make profits, and the types of self-regulation they would pursue would reflect this. Governments may be expected to be more cautious in their regulatory approaches to risky areas.

In the following sections we report our results on the levels of trust Australians have in these individuals and groups that they do not know personally. Like Sztompka, we define trust as the likelihood of taking a risk on some sort of action. If we trust scientists, that means that we can entrust them with the responsibility of new technological developments. It means that we are fairly confident that they will do the morally right thing by us.

## **Expectations**

We will examine the levels of trust Australians have towards various social institutions and then investigate the link between trust and new technologies. First, we expected that the Australian public will be more trusting of public compared to private institutions and that this level of trust may vary across different demographic groups. It was expected that levels of trust may differ across individuals with varying needs, values, perspectives and personal risk invested in new technologies (for example, gender and religiosity). An investigation into which groups are significantly more trusting was therefore conducted. Second, we expected to find that the change in trust will be stable over a one year time period. Between the years in which the survey was conducted there has been no catastrophic event directly relating to new technologies that may force individuals to reconsider and readjust their notions of trust. Thus trust in unknown others conducting and regulating new technologies were not expected to change. Finally, in line with the ideas of Sztompka and Levi, we also expected that trust in science should demonstrate a strong relationship with comfort with new technologies.

## Method

### Participants and Procedure

The data for this research was obtained from the Swinburne National Technology and Society Monitor (ACETS, 2004, ACETS, 2003). The NTSM survey was conducted twice over two years occurring in April of 2003 and May, 2004 to gauge public attitudes towards emerging and established technologies. The aim of the surveys is to describe and understand public understandings of emerging technologies, as well as to document any changes in opinion from year to year. Data from both surveys was included in the present research to examine change in trust from 2003 to 2004, and to increase the validity of the results by reproducing the findings across both years. The surveys involve random samples of Australians, and are conducted through the Australian Centre for Emerging Technologies and Society (ACETS) Computer-Assisted Telephone Interviewing (CATI) facility. A total of 1044 respondents participated in the 2003 Monitor, with 1013 in 2004. While the 2003 survey was under represented in terms of males (38.0% were male) and younger participants, (21.5% were born before the 1940's), both surveys were representative of the Australian population in terms of State and territories, occupational status, income, education, and marital status. The 2004 survey was representative in terms of gender (50.0% were male) and age (15.3% were born before the 1940's) (see ACETS, 2003 for a description of the 2003 sample and, Critchley and Turney, 2004 for a description of the 2004 sample).

## Measures

### Trust

Participants were asked at both times to rate their level of trust (using a five-point scale where 0 = don't trust at all, and 5 = trust a very great deal) in a variety of institutions and other groups that could be expected to have some impact on the development of new technologies. Using principle components analysis with an oblique rotation, the 13 questions in the 2003 survey were found to represent three underlying dimensions of trust (Gilding and Critchley, 2003). These were: trust in oppositional organisations (that is, the environmental and trade union movements), trust in government, business and media (that is, the media, the public service, major Australian companies, the federal government, state governments, small business, the churches) and trust in science (that is, the CSIRO, universities, scientists, hospitals).

A multigroup analysis using EQS for Windows (Bentler, 1995) found that the 3-factor structure was reproduced in the 2004 data. None of the equality constraints placed upon the 13 factor loadings were significantly different at  $p < .01$  (Lee and Bentler, 1980), and the 3-factor model was a good fit with the data across both the 2003 and 2004 samples ( $\chi^2(135) = 584.42$ , Comparative Fit index = .93 (Bentler, 1988), Incremental Fit index = .93 (Bollen, 1989), Standardised Root Mean Residual = .05 (Sörbom and Jöreskog, 1982). Thus the 13 trust questions demonstrated good validity and reliability (Bollen, 1989).

Given the consistency of the factor structure over time, three total scores were computed to represent the three dimensions of trust. Each item was multiplied by its factor score regression weight (FRW), and then proportionally summed to obtain an overall indicator of each trust dimension<sup>1</sup> (see Fleishman and Benson, 1987, Jöreskog, 1971, Werts et al., 1978 for a description of this procedure). Since trust in oppositional organisations only consisted

of two questions<sup>2</sup>, the total was obtained by averaging the scores on both. Total scores ranged between 0 = low trust to 5 = high trust. Descriptive statistics for each of the total scores and the individual items are shown in Table 1.

### **Comfort with Technology**

Participants in both surveys were asked to rate their level of comfort with 11 new technologies on a 10-point scale (0 = not at all comfortable, and 10= very comfortable). The technologies were designed to cover four different areas: communication technologies (that is, mobile phones, the Internet), pharmaceutical technologies (that is, drugs for enhancing male sexual function, such as Viagra, and drugs for enhancing female sexual function, drugs for reducing social anxiety), biological engineering technologies (that is, genetically engineered plants for food, genetically engineered animals for food, cloning human babies, using animals to grow human organs for transplant) and stem cell technologies (that is, stem cell research using left-over IVF embryos, stem cell research using tissue from adults).

Using principle components analysis with an oblique rotation, the 11 questions in the 2003 survey were found to clearly represent the four expected dimensions (Gilding and Critchley, 2003). A multigroup analysis using EQS for Windows (Bentler, 1995) found that the 4-factor structure was reproduced in the 2004 data. None of the equality constraints placed upon the 11 factor loadings were significantly different at  $p < .01$  (Lee and Bentler, 1980), and the 4-factor model was a good fit with the data across both the 2003 and 2004 samples ( $\chi^2(85) = 264.98$ , CFI = .97, IFI = .97, SRMR = .05). Thus the comfort with technologies measures demonstrated good validity and reliability (Bollen, 1989).

Given the consistency of the factor structure over time, four total scores were computed to represent the level of comfort reported for each of the four types of technologies. Each item was multiplied by its FRW, and then proportionally summed to obtain an overall indicator of each technology type in a procedure identical to that used for the trust questions. Since communication technologies and stem cell technologies only consisted of two questions, the two were averaged to obtain total scores. Total scores ranged between 0 = low comfort to 10 = high comfort. Descriptive statistics for each of the total scores and the individual items are shown in Table 2.

## **Results**

### **Trust in the Institutions behind New Technologies**

Our first expectation was that Australians would trust public institutions more than private ones. As expected, we found that was in fact that case: Australians reported higher levels of trust in the public developers of new technologies than in private organisations. Table 1 shows the mean trust scores for the different institutions and groups. It shows that Australians reported the highest levels of trust in scientists, hospitals, CSIRO, and universities, all of which are publicly funded institutions. On the other end of the spectrum, Australians expressed the least trust in the media, with trade unions and governments not far behind. Supporting the expectation that trust would remain stable, the results show that overall trust in the three areas of science; government, business and media; and oppositional organisations did not significantly change over time. There was however, a slight increase in trust in 2004 for the environmental movement, and trust in hospitals was slightly reduced in 2004 when compared to 2003. A repeated measured ANCOVA (which compared mean trust scores across the three trust types, controlling for the effects of age, gender and church attendance<sup>3</sup>) found that trust in science was significantly higher than trust in oppositional

organisations, which were in turn more trusted than government, business and media ( $F_{\text{TRUST TYPE}(2, 3116)} = 147.78, p < .001, \eta^2 = .09$ ). However, as Figure 1 shows, this pattern was only found in the 2004 sample. A significant year by trust type interaction was found, suggesting that in 2003, Australians did not trust oppositional organisations any more than government, business and media ( $F_{\text{YEAR} \times \text{TRUST TYPE}(2, 3116)} = 7.50, p < .001, \eta^2 = .01$ ). Thus in 2004, the difference between trust across these two sources became slightly larger, indicating a small trend towards trusting oppositional organisations more and government, business and media less.

Table 1 Descriptive statistics for trust questions.

	Mean		Standard error of mean		Standard deviation		n	
	2003	2004	2003	2004	2003	2004	2003	2004
<b>Oppositional organisations</b>								
The environmental movement	2.80	2.99*	0.05	0.04	1.46	1.28	725	990
Trade unions	2.05	2.12	0.05	0.04	1.37	1.30	718	986
Total	2.44	2.54	0.04	0.04	1.20	1.11	743	1002
<b>Government, business and media</b>								
The media	1.62	1.58	0.05	0.04	1.30	1.14	741	1001
Federal government	2.39	2.31	0.05	0.04	1.41	1.34	742	996
State government	2.36	2.30	0.05	0.04	1.37	1.25	742	1001
Major Australian companies	2.32	2.41	0.05	0.04	1.32	1.22	722	997
Small business	3.16	3.14	0.05	0.04	1.26	1.19	729	991
The churches	2.55	2.51	0.05	0.04	1.48	1.45	728	989
The public service	2.50	2.54	0.05	0.04	1.32	1.22	738	993
Total	2.35	2.34	0.03	0.03	0.93	0.89	680	962
<b>Science</b>								
Scientists	3.38	3.36	0.04	0.03	1.11	1.04	725	985
Universities	3.66	3.66	0.04	0.03	1.05	0.98	729	989
CSIRO	3.78	3.68	0.04	0.03	1.06	1.06	712	972
Hospitals	3.64	3.50	0.04*	0.04	1.12	1.09	739	997
<b>Total</b>	<b>3.59</b>	<b>3.56</b>	<b>0.03</b>	<b>0.03</b>	<b>0.82</b>	<b>0.80</b>	<b>681</b>	<b>951</b>

Note: Means were adjusted for gender, age and church attendance. There were significantly (at  $p < .001$ ) more males, younger participants and less frequent church attendees in 2004 than in 2003. Missing values represent 'Don't know' responses. Missing values were substituted for means in the total scores. \* = Difference in means was significant at  $p < .01$ . The range for the trust questions was 0 = don't trust at all to 5 = trust a very great deal.

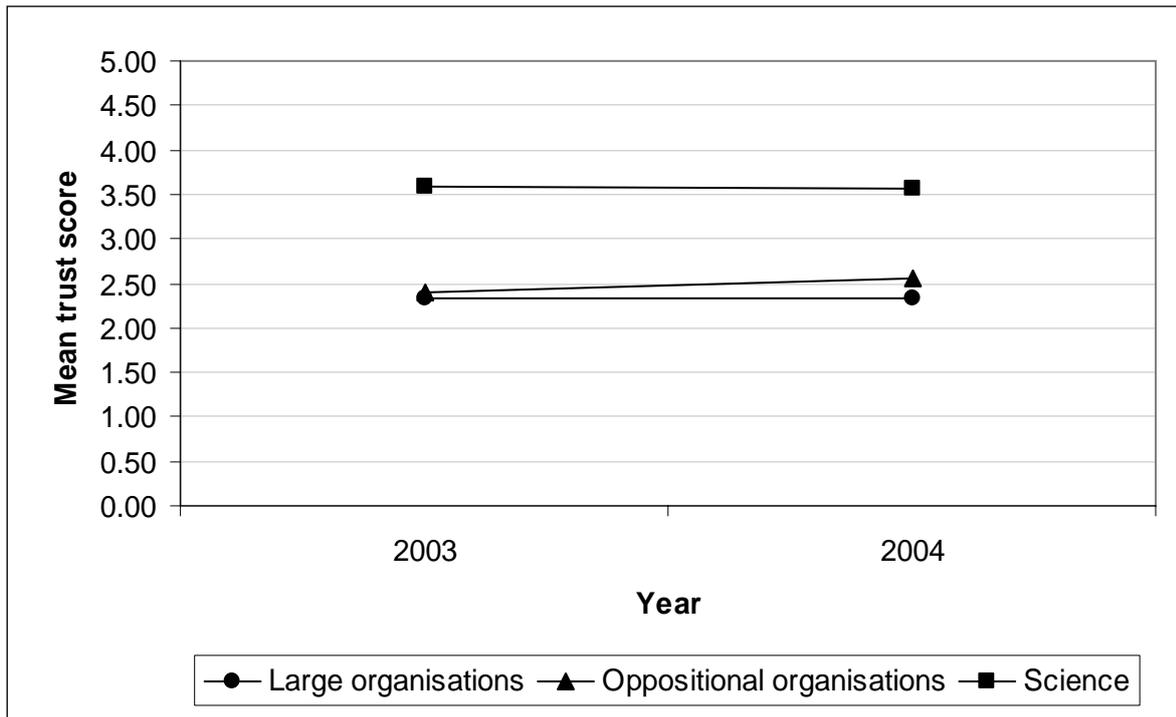


Figure 1. Mean total trust scores across time and trust dimension.

Note: Means were adjusted for gender, age and church attendance.

## Gender

Thus far, our discussion has concerned overall trust rates. However, we expected that trust levels within the Australian population may also vary across different groups. Wajcman argues that there is "...a mutually shaping relationship between gender and technology, in which technology is both a source and a consequence of gender relations" (Wajcman, 2004: 7). In this view, men and women have different relationships with technology. If this is that case, then it is likely that men and women will also have different approaches to understanding new technologies, and to trusting the institutions behind them. Because of the different social locations of men and women with respect to new technologies have, we expected to find that men and women would demonstrate different levels of trust in institutions in the context of new technologies.

Three 2 (Gender) x 2 (Year) ANCOVAs were computed to assess gender differences in the three trust scores over time. The covariates in all analyses were age and church attendance. The means, adjusted for the covariates are shown in Figure 2. As Figure 2 shows, males ( $M = 3.63$ ,  $SD = .82$ ) were significantly more trusting of science than females ( $M = 3.52$ ,  $SD = .79$ ) ( $F_{\text{GENDER}}(1, 1626) = 7.20$ ,  $p < .01$ ,  $\eta^2 = .004$ ). A significant interaction between year and gender however, suggested that males increased their trust in science from 2003 to 2004, while females' trust decreased ( $F_{\text{GENDER} \times \text{YEAR}}(1, 1626) = 5.44$ ,  $p < .05$ ,  $\eta^2 = .003$ ).

Women ( $M = 2.56$ ,  $SD = 1.12$ ) were slightly more trusting of oppositional organisations than men ( $M = 2.42$ ,  $SD = 1.19$ ) ( $F_{\text{GENDER}}(1, 1739) = 6.08$ ,  $p < .05$ ,  $\eta^2 = .003$ ) and this difference was reproduced across time ( $F_{\text{GENDER} \times \text{YEAR}}(1, 1739) = .01$ ,  $p > .05$ ,  $\eta^2 = .000$ ). While there was no significant difference in trust in government, business and media across gender, males tended to increase their trust in government, business and media in 2004, whereas

trust levels among women declined from 2003 to 2004 ( $F_{\text{GENDER} \times \text{YEAR}} (1, 1636) = 5.04, p < .05, \eta^2 = .003$ ). Thus, as expected, trust did significantly vary across gender, though it should be pointed out that the differences tended to be small, (that is  $< 0.25$  on the scale of 0-5).

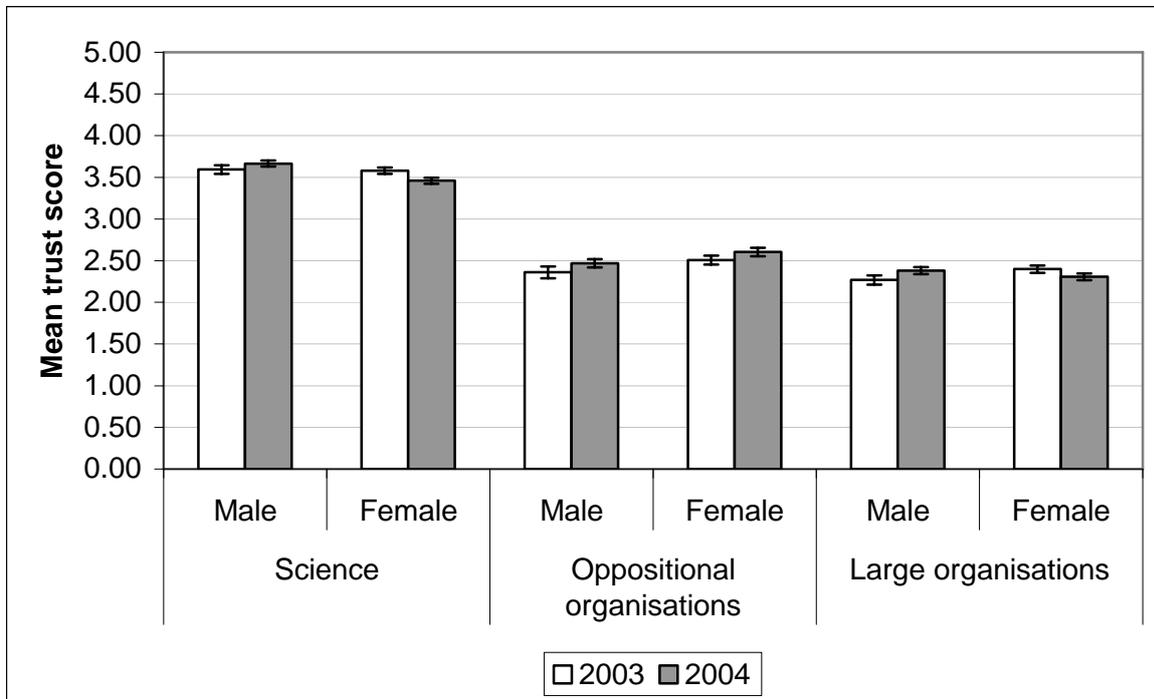


Figure 2. Mean total trust scores across time and gender.

Note: Means were adjusted for age and church attendance. Bars represent standard error of the mean.

### Religion

It was expected that high levels of religiosity might have an impact on Australians' trust in institutions. Given that religious values have long been shown to be in conflict with those encapsulated by science, religious people may be less trusting of scientific work in general than those who are not religious (Fulljames, 1996).

To examine the relationship between religiosity and trust, an overall indicator of religiosity was obtained utilising measures of religion type, frequency of religious attendance and the level of trust in the churches. Including the category 'no religion', there were 23 different religions stated by respondents in 2003 and 21 in 2004. Each of the categories was classified into one of the following groups: no religion, non-Catholic Christian, Catholic, Non-Christian and other. Religious groups that fell into the other category were self defined as other or 'new age'. Religious frequency was obtained by asking respondents how often they attend church or religious functions apart from baptisms, weddings and funerals. Scores ranged from 1 = never to 5 = at least one a week. Trust in the church was obtained by asking respondents on a five-point scale (where 0 = don't trust at all and 5 = trust a very great deal) how much they trusted the churches.

To obtain an overall indicator of a respondent's religiosity, frequency of church attendance, religious type and trust in the churches were subjected to two latent class cluster analyses<sup>4</sup> (Goodman, 1974) using LatentGold Version 3.0.1 (Vermunt and Magidson, 2000). The results suggested two clear clusters of respondents in both samples (2003: 2-cluster solution: BIC = 6214.65,  $L^2 = 145.27$ ,  $p > .05$ ,  $df = 129$ , classification error = .11; 3-cluster solution: BIC = 6235.69,  $L^2 = 120.17$ ,  $p > .05$ ,  $df = 122$ , classification error = .11; 2004: 2-cluster solution: BIC = 8327.82,  $L^2 = 215.69$ ,  $p < .001$ ,  $df = 129$ , classification error = .09; 3-cluster solution: BIC = 8333.36,  $L^2 = 173.04$ ,  $p < .003$ ,  $df = 122$ , classification error = .17). In both analyses, all religious groups apart from 'no religion' were significantly more likely to be in cluster one, while those with no religion were more likely to be classified in cluster two. Those who attended church more frequently and who placed higher trust in the church were also more likely to be classified into cluster one, the high religiosity cluster, and less likely to be in cluster two, the low religiosity cluster. Cluster one was therefore strongly representative of religious individuals at both times.

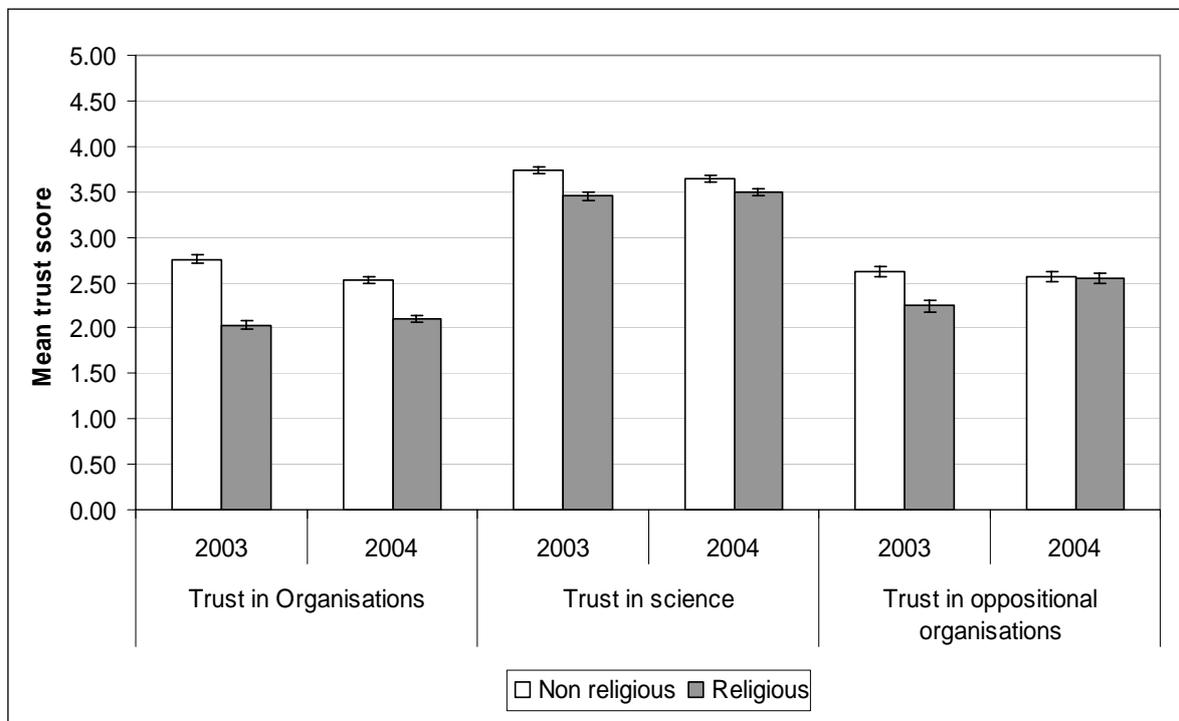


Figure 3. Mean trust scores across religious groups and time.

Note: Means were adjusted for gender, and age. Bars represent standard error of the mean.

Three 2 (Religion) x 2 (Year) ANCOVAs were computed to examine differences in the three trust scores over time and the religious groups. The covariates in all analyses were gender and age. The means in Figure 3 show that the religious cluster were less trusting with respect to all trust groups than the nonreligious cluster, confirming our expectations. Religious Australians were much less trusting of government, business and media than the non religious groups ( $F_{RELIGION} (1, 1623) = 176.51$ ,  $p < .001$ ,  $\eta^2 = .10$ ). However, this difference was significantly reduced in 2004 compared to 2003 due to the non religious group demonstrating a decrease in their level of trust in government, business and media over time ( $F_{RELIGION \times TIME} (1, 1623) = 11.89$ ,  $p < .005$ ,  $\eta^2 = .01$ ). The religious group were also slightly less likely to trust scientific organisations than the non religious ( $F_{RELIGION} (1, 1591) = 28.15$ ,

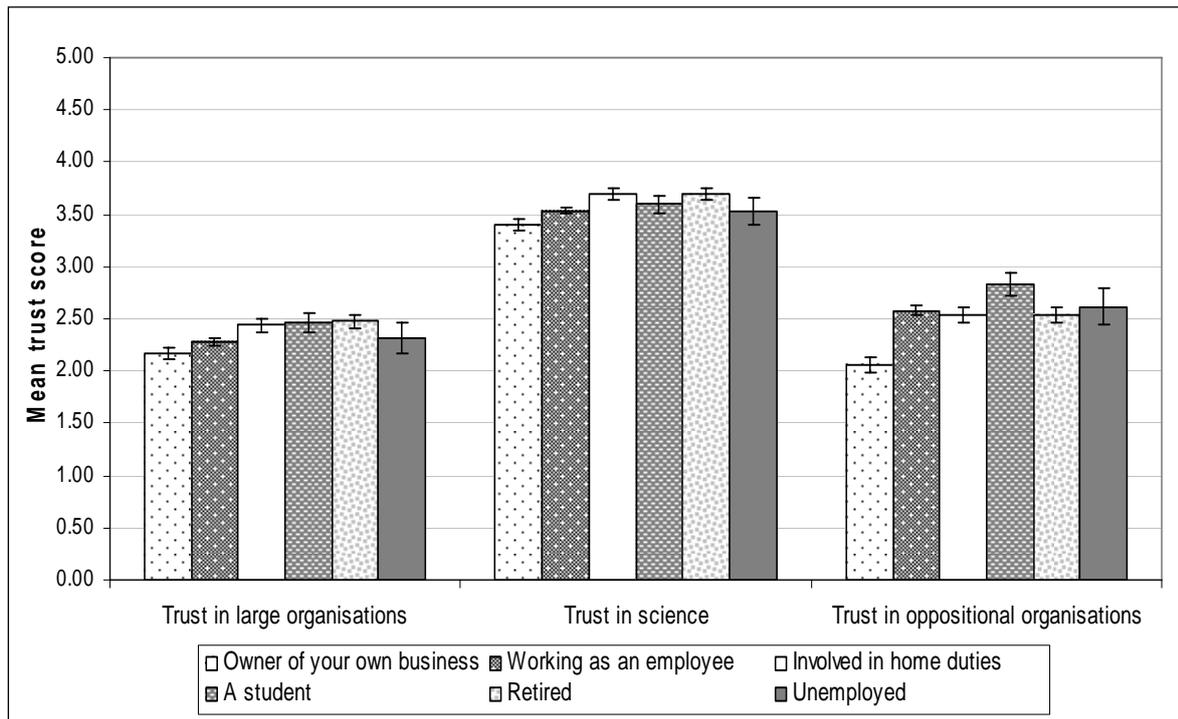
$p < .001$ ,  $\eta^2 = .02$ ), and this difference remained stable over both years ( $F_{\text{RELIGION} \times \text{TIME}} (1, 1591) = 2.90$ ,  $p > .05$ ,  $\eta^2 = .002$ ). Finally, religious respondents were also less likely to trust oppositional organisations, but only in 2003 ( $F_{\text{RELIGION}} (1, 1692) = 12.66$ ,  $p < .001$ ,  $\eta^2 = .01$ ). In 2004 there was no significant difference between the two groups due to a significant increase in trust amongst the non religious group over time ( $F_{\text{RELIGION} \times \text{TIME}} (1, 1692) = 10.73$ ,  $p < .001$ ,  $\eta^2 = .01$ ).

### **Employment Type**

The type of work a person does might have an influence on the levels of trust in society's institutions. We might expect that, for example, people who work for themselves would have different levels of trust in government than people who are unemployed because of their different social locations with respect to the government. Three 6 (Occupation) x 2 (Year) ANCOVA's were computed to assess occupational differences in the three trust scores over time. The covariates in all analyses were gender, age and church attendance. The six occupational groups were owners of own business (2003: 12.4%, 2004: 18.4%), working as an employee (2003: 34.7%, 2004: 43.0%), involved in home duties (2003: 18.3%, 2004: 9.0%), student (2003: 8.4%, 2004: 7.1%), retired (2003: 23.8%, 2004: 19.7%), and unemployed (2003: 2.4%, 2004: 2.7%). The results showed that there were significant differences across occupational categories for all three aspects of trust, and that these differences remained stable across the two years (that is, none of the occupation x year interaction effects were significant).

The means (averaged over the two years) shown in Figure 4 reveal that those who owned their own business reported the least amount of trust in all three trust groups. Post hoc comparisons showed that people who owned their own business, employees and the unemployed were significantly less likely to trust government, business and media than all other occupational groups ( $F(5, 1604) = 4.37$ ,  $p < .005$ ,  $\eta^2 = .01$ ). Figure 4 also shows that those who were retired and who were involved in home duties were more likely to trust science than all other occupational groups,  $F(5, 1596) = 4.39$ ,  $p < .005$ ,  $\eta^2 = .01$ . Also, post hoc comparisons across groups revealed that those who owned their own business trusted science less than all other occupations. Trust in oppositional organisations was significantly lower amongst those who owned their own business compared to all other categories, and highest amongst students compared to all other categories,  $F(5, 1706) = 10.09$ ,  $p < .001$ ,  $\eta^2 = .03$ . These findings confirm that occupational category has a significant impact on trust levels.

Figure 4. Mean trust scores across occupational type.



Note: Means were adjusted for gender, age and church attendance. Bars represent standard error of the mean.

### Trust and Comfort with Different Technologies

Our third expectation was that trust in science is strongly associated with comfort with new technologies. That is, we expected to find that people who had high levels of trust in science would report higher levels of comfort with new technologies than those who trusted science less. Our reasoning was that people who find science to be trustworthy will feel confident that scientific outputs, in the forms of new technologies, are also trustworthy and therefore something they would feel comfortable with.

Two canonical correlations were utilised to assess the relationship between the set of the three trust and the set of the four comfort variables (Hair et al., 1998). This technique determines the number of dimensions, or canonical variates, which maximize the relationship between a set of independent and dependent variables. Thus the communality or shared variance between the three trust types (that is, government, business and media, science and oppositional organisations) was used to predict the shared variance between the four comfort scores (that is, communication, pharmaceutical, biological engineering and stem cell). Two independent analyses for each year were computed.

Table 2 Descriptive statistics for comfort with technology questions.

	Mean		Standard error of mean		Standard deviation		n	
	2003	2004	2003	2004	2003	2004	2003	2004
<b>Communication technologies</b>								
Mobile phones	7.40	7.53	0.09	0.08	2.66	2.52	746	1003
The Internet	7.69	7.73	0.09	0.08	2.61	2.49	733	991
Total	7.54	7.62	0.08	0.07	2.27	2.18	749	1004
<b>Biological engineering technologies</b>								
Genetically engineered plants for food	3.99	3.67	0.11	0.10	3.10	3.07	727	979
Genetically engineered animals for food	2.79	2.63	0.10	0.09	2.80	2.71	724	975
Cloning human babies	1.02	1.16	0.07	0.06	1.97	2.06	740	993
Using animals to grow human organs for transplant	4.41	4.57	0.12	0.10	3.18	3.06	731	978
Total	3.03	2.89	0.09	0.08	2.43	2.39	692	939
<b>Stem cell technologies</b>								
Stem cell research using left-over IVF embryos	5.55	5.56	0.12	0.11	3.54	3.19	714	969
Stem cell research using tissue from adults	6.75	6.49	0.11	0.10	2.88	2.87	705	911
Total	6.14	6.00	0.10	0.09	2.84	2.69	734	986
<b>Pharmaceutical technologies</b>								
Drugs for enhancing male sexual function, such as Viagra	5.36	5.20	0.11	0.09	2.98	2.86	712	975
Drugs for enhancing female sexual function	5.41	4.98	0.11	0.09	3.05	2.91	715	954
Drugs for reducing social anxiety	5.03	5.31*	0.10	0.09	2.85	2.70	712	952
<b>Total</b>	<b>5.38</b>	<b>5.13</b>	<b>0.10</b>	<b>0.09</b>	<b>2.84</b>	<b>2.64</b>	<b>675</b>	<b>903</b>

Note:.. Means were adjusted for gender, age and church attendance. Missing values represent 'Don't know' responses. Missing values were substituted for means in the total scores. \* = Difference in means was significant at  $p < .01$ . The range of scores for the comfort variables was 0 = not at all comfortable to 10= very comfortable.

The results for 2003 suggested that the set of trust variables was significantly associated with the set of comfort variables ( $F(12, 2259) = 9.78, p < .001, \eta^2 = .05$ ). Overall high levels of trust were associated with higher comfort in technology. The variables were significantly linked by two canonical variates (variate 1: Canonical  $r = .30, p < .001$ ; variate 2: Canonical  $r = .22, p < .001$ ), meaning trust and comfort were associated in two distinct ways. As the canonical loadings in Table 3 show, the first variate suggests that for the majority of participants, higher comfort in all four technologies, and particularly biological engineering and stem cell technologies, was associated with higher levels of trust in government, business and media (which includes governments as well as business) and especially with trust in science. This is interesting because of all the comfort groups, Australians were least comfortable with the biological technologies. This finding suggests that if we want to increase Australians' comfort with more controversial new technologies, such as bio-engineering products, then we need to develop strategies to increase trust in science and government, business and media. Trust in oppositional organisations was not significantly associated with comfort with all four types of technology for this variate.

Table 3. Canonical loadings for trust and comfort variables for 2003 and 2004

Independent variables	2003		2004		
	Variate 1	Variate 2	Variate 1	Variate 2	Variate 3
Trust in government, business and media	<b>0.71</b>	<b>0.42</b>	<b>0.57</b>	<b>-0.71</b>	<b>0.40</b>
Trust in science	<b>0.96</b>	-0.28	<b>0.93</b>	0.17	<b>0.33</b>
Trust in oppositional organisations	0.27	<b>-0.54</b>	0.00	0.05	<b>0.99</b>
Dependent variables					
Communication	<b>0.47</b>	-0.04	<b>0.49</b>	<b>-0.33</b>	<b>0.70</b>
Pharmaceutical	<b>0.47</b>	<b>-0.43</b>	<b>0.36</b>	0.12	<b>0.57</b>
Biological engineering	<b>0.89</b>	<b>0.42</b>	<b>0.73</b>	<b>-0.52</b>	-0.24
Stem cell	<b>0.71</b>	<b>-0.63</b>	<b>0.79</b>	<b>0.62</b>	-0.02

Note: Bolded canonical loadings are significant at  $p < .05$  (Hair et al., 1998).

The second variate suggests that for some respondents, high levels of trust in government, business and media combined with low levels of trust in oppositional organisations was associated with higher support for biological engineering technologies and lower support for pharmaceutical and stem cell technologies. This variate shows a different mechanism relating trust and comfort with new technologies from the first variate. For some respondents in 2003, then, trust in science is not the key to their comfort levels with new technologies. Therefore, for 2003, our expectation that trust in science and government, business and media would be strongly associated with comfort with new technologies was confirmed for the majority of participants.

The results for 2004 again suggested that the set of trust variables was significantly associated with the set of comfort variables ( $F(12, 2415) = 12.24, p < .001, \eta^2 = .06$ ). Overall high levels of trust were associated with higher comfort with new technology. The variables were significantly linked by three canonical variates (variate 1: Canonical  $r = .33, p < .001$ ; variate 2: Canonical  $r = .21, p < .001$ ; variate 3: Canonical  $r = .14, p < .001$ ), meaning trust and comfort were associated in three distinct ways. As the canonical loadings in Table 3 show, the first variate suggests that for most of the sample, higher comfort in all four technologies, and particularly biological engineering and stem cell technologies, was associated with higher levels of trust in government, business and media and especially with trust in science as it was in 2003. Trust in oppositional organisations was again not significantly associated with comfort with all four types of technology for this variate. As with 2003, our expectation about the relationship between trust in science and government, business and media and comfort with new technologies was confirmed.

In 2004 the second variate was both similar and different to the second variate found in 2003. The second variate in both 2003 and 2004 suggests that for some individuals, high levels of trust in government, business and media was associated with higher support for biological engineering technologies and with lower support for stem cell technologies. Thus it appears that trusting government, business and media was particularly important in increasing the level of comfort with technologies that alter the biological foundation of animals and food, but in decreasing comfort with technologies that are more related to modifying human beings. Some respondents were therefore comfortable with genetically modified plants and animals and using animals to grow human organs, but only if they trusted government, business and media. Interestingly this did not extend to the use of human embryos or even adult stem cells for research purposes. Instead some people who trusted government, business and media generally did not feel comfortable with stem cell research. Perhaps this pattern in both 2003 and 2004 can be explained by an underlying concern for the moral issues related to stem cell research.

Research has shown that increased religiosity is associated with lower support for stem cell research (for example, Critchley & Turney, 2004) and that conservative individuals are more likely to have faith in established authorities. Religious individuals who are more likely to trust the churches and possibly other larger mainstream authorities such as big business and governments may therefore display high levels of trust in larger organisations combined with lower support for stem cell research. Since modifying plant and animal biology does not violate religious or conservative beliefs, religious and/or conservative individuals will be comfortable with these practices if the organisations that are responsible for regulating them are trustworthy. This would also help to explain why in 2003 the second variate also includes a significant loading for trust in oppositional organisations. It could be expected that conservative or religious individuals would be less likely to trust oppositional organisations as well as being more likely to trust established organisations. In 2004 trust in oppositional organisations was not significantly associated with the second variate, which may be the result of a significantly lower number of religious respondents in the 2004 compared to 2003 sample.

The other difference with the results of the second variate across the two sample is with trust in pharmaceutical and communication technologies. Trust in government, business and media was associated with lower comfort with pharmaceuticals in 2003 but not in 2004, and with higher trust in communication technologies in 2004 but not in 2003. Why these difference would occur across the samples is probably beyond the scope of this paper, but may have been due to the differences in age or gender found across the samples. What

these results do show however, is that the relationship between trust and comfort with emerging technologies is complex, and that trust in government, business and media seems to have a unique influence on comfort with particular technologies. Moreover this complexity seems to be heightened in that the unique relationship between trust in government, business and media and comfort with technology could differ across different groups of Australians. Indeed the complexity could also be due to methodological reasons such as the heterogeneous nature of the government, business and media category. Future work should thus assess the complex relationship between trust in government, business and media and support for different technologies by examining separating each individual organisation's influence on comfort with technology. This should also be done across different groups of individuals, particularly those that differ in terms of religiosity, age and gender.

We also found a third variate in 2004 but not in 2003, which suggests that for some participants, high levels of trust in all organisations and especially oppositional organisations was associated with higher comfort in communication and pharmaceutical technologies, but not with biological or stem cell technologies. Thus for some individuals in 2004, trust in all organisations was associated only with comfort with some technologies and not others. For these individuals, support for stem cell and biological technologies was not associated with trust in any of the organisations assessed here. Possibly the absence of this result in the 2003 data may be due to the differences in age, gender and religion across the samples. In the older, more female and more religious 2003 sample, trust may be more important in determining how comfortable one is with biological and stem cell technologies, than for younger male and less religious people who would arguably be more concerned with at least communication technologies. For the latter group who may not be aware or concerned with stem cell or biological technologies, factors other than trust may be more important in determining their comfort. This third variate may therefore represent the relationship between trust and comfort for those who are not concerned with or are unaware of biological and stem cell technologies, but who are in relation to communication and pharmaceutical technologies. Further research is thus needed to further examine the nature of these relationships, especially considering that this third variate only accounted for a small percentage of the variance in the relationship between trust and comfort. It should therefore be treated with caution.

## Discussion

Trust in an institution involves a belief that the institution has in place processes to ensure that its people are competent and can be expected to act in a predictable, or trustworthy, manner. Our trust in institutions, then, is fundamentally a belief that their people are trustworthy. In our survey we asked whether people trusted scientists, a group of individuals, as well as scientific institutions. We found that they did, and that trust in scientists and trust in scientific institutions were highly correlated and could be clustered together to form a group, which we called science.

Australians were, for the most part, very trusting of science. This is interesting, and counter to the lack of trust in science predicted by the risk society thesis. Rather than there being a lack of trust in science, of all the institutions we asked about, trust was highest for scientists and scientific institutions. We may trust science because we believe scientists are strongly bound by ethics. Although we live in a risk society, our level of trust in science is nevertheless high. Not surprisingly, Australians who said they trusted science were more likely to be comfortable with new technologies than Australians who did not trust science.

Trust in the producers of new technologies suggests a belief that they will be responsible for the technologies they choose to pursue. According to Sztompka (1999), trust also has a moral side. Part of trusting an institution is trusting it to do the right thing, the moral thing. When we say we trust scientists and scientific institutions, part of that trust, at least in the context of the more controversial technologies, must be in trusting that they will develop technologies that are moral, ethical, and not harmful.

Australians reported middling levels of trust in government, business and media and in oppositional organisations. Trust in government, business and media, like trust in science, was associated with comfort with new technologies for the majority of respondents, but trust in oppositional organisations was only slightly associated with comfort in certain technologies. This finding may reflect that oppositional organisations, for the most part, have had little to do with the production of new technologies in Australia. However, several of the institutions in the government, business and media category (in particular federal and state governments, but also business) do strongly influence the development of new technologies. For some businesses, such as pharmaceutical companies, this relationship is direct: they conduct research that produces the technologies. As with science, if we trust these groups, it is logical that we would be comfortable with the products of their labours.

Trust in government might have a different impact on comfort levels than trust in business. Governments are responsible for making sure that there is appropriate regulation of scientific activity. Trusting government, in this context, means trusting that it is paying attention to the ethical and quality control issues regarding scientific research that is being conducted. Even if we say we have low levels of trust in government generally, we are not necessarily saying that we do not trust its regulatory processes with respect to cutting-edge scientific research. In our risk society we rely on government to place a check on potentially dangerous new types of research. It is possible to report low levels of trust in government, as many of our respondents did, while still trusting it to adequately regulate scientific research.

A limitation of our data is its lack of information indicating why Australians trusted the various institutions, information that is more qualitative in nature. Thus, future research could further explore the mechanisms by which governments are viewed to be trustworthy within the context of developing new technologies. It should also examine our trust in science in greater detail, focusing particularly on differences and similarities between trusting science conducted by public and private institutions. Qualitative data would be particularly useful in helping to develop our understanding of these issues.

According to our findings, Australians reported the highest levels of comfort with the technologies with the highest penetration in Australian society: the communications technologies. It is not surprising that we are most comfortable with mobile phones and the Internet -- most of us use them, many of us on a daily basis. Comfort with pharmaceutical technologies was however middling. These technologies, that are aimed at improving sexual function and to reduce social anxiety, are on the border between medicine for physical problems and medicine for social problems. This makes them potentially controversial, yet our mean comfort levels with them were on the side of more comfortable, rather than less. Perhaps this is because these types of drugs are quite well known. Viagra, for instance, has been extensively discussed in the media, and it is not unlikely that we may have some personal knowledge of it and that it is useful. Indeed Gilding and Critchley (2003) found that older Australians who may be more likely to use such drugs were significantly more comfortable with pharmaceutical technologies than younger people.

Interestingly, Australians also reported middling levels of comfort with stem cell research using left over IVF embryos, and high levels of comfort with stem cell research using adult

stem cells. Most of us would have little personal experience with this type of research. Focus group research recently conducted on attitudes toward stem cell research suggests that Australians do not consider research using adult stem cells to be controversial because it is expected that donors would be able to provide their consent (Critchley and Turney, 2004). The use of left over IVF embryos was more controversial, but still mainly acceptable amongst focus group participants (Critchley and Turney, 2004); this is reflected in the middling comfort levels reported by our sample. See Critchley and Turney (2004) for a more thorough discussion of Australian attitudes toward stem cell research.

Our findings showed that Australians were least comfortable with bioengineering technologies, all of which had mean comfort levels of <5 on the 0-10 scale. Of all the technologies we asked about, these are perhaps the most controversial as they involve changing the nature of living things. Consequently, it is not surprising that we are least comfortable these types of technologies. In the case of some types of biotechnology, such as genetically modified food, the consequences could cause profound and permanent changes to the ecosystem. Perhaps it is in this sphere that the riskiness of the research is most pressing and has the greatest impact on our comfort levels.

People who reported high levels of trust in government, business and media and in science were most likely to be comfortable with these technologies, perhaps reflecting the moral dimension of trust: that we trust people not to create technologies that are unreasonably risky. These technologies could represent some of the most unknown manufactured risks around. We, as a society and as individuals, do not and cannot know what the consequences of these technologies are for us until they are implemented, but by then it will be too late if there are negative consequences.

It is in the moral dimension of trust that the divide between public and private research becomes important. As Table 1 showed, Australians had high levels of trust in public research organizations, and much lower levels in private businesses. This is possibly because we expect private businesses to develop technologies to make profits, while public institutions are expected to do research that is value neutral and for the public good. If profit is your motive, it is in your interest to get your product to market as quickly as possible, even if it might require that you cut some corners in order to get there. As Yearley argues, the public look at the sources of scientific information before they decide on their validity (Yearley, 2000). We expect that private businesses will report research findings that show their products to be good, and safe, because it is in their interest to get their products onto the market. Our expectations for publicly produced research are likely to be different, in that we expect them to be reliable, safe, ethical and accessible to those in need.

It is curious that Australians trust the media least of all the groups we asked about. Information about new technologies is often obtained through the media (for example, Turney et al., 2003), yet on a scale of 0-5, the level of trust in the media was approximately 1.5 for both years. Despite this, it is likely that most Australians would have received most of their information about biotechnologies, pharmaceutical technologies and stem cell research via the media. It may be, as Yearley (2000) argues, that media consumers critically examine what the media reports, looking at the interests behind scientific reports before making assessments about their validity. If the source of the information is deemed trustworthy, then perhaps the information is more likely to be believed. Also personal contact with new technologies may increase trust independent from the information about them received via the media. Future research should therefore examine the impact of the media on trust in new technologies for those who have had personal contact with new technologies and those who have not.

This process provides an explanation for how Australians can report low levels of trust in the media, but high levels of comfort with technologies that they may not have personal experience of. When the research reported is conducted by trusted groups, such as scientists working for publicly funded organisations, consumers might be more likely to take it as fact, and feel comfortable with it. For example, in our surveys, people who reported high levels of trust in science also had high levels of comfort with stem cell research, a potentially risky type of new technology. It would seem that we trust science to conduct research in potentially risky areas.

## Conclusion

We theorised that institutional trust involves a belief that trustworthy institutions have processes in place to make their actions predictable and reliable, and, because we live in a risk society, these checks and balances are particularly important for the institutions behind new technologies. We expected that Australians would be more trusting of public than private institutions, and that their levels of trust in institutions might vary across different demographic groups, in particular gender, religiosity, and occupational category. We found evidence to support these expectations and we also found support that levels of trust remained stable over the two years.

Our analysis shows that, for the majority of Australians, levels of trust in science are predictive of levels of comfort with new technologies, and the relationship is particularly strong for biological technologies, including stem cell research. We also found a positive relationship for the majority of respondents between trust in government, business and media and comfort with technologies, similar to the relationship between trust in science and comfort levels.

Trust in the institutions behind new technologies therefore seems important for people living in a risk society like ours. For people to be comfortable with new, cutting edge technologies, trust in these institutions is an important precursor. If governments and/or private businesses want people to be comfortable with their technologies, arranging their development through trustworthy groups (such as public science) and transparent processes would be a promising strategy.

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<sup>1</sup> Factor score regression weights were calculated using LISREL 8.54 (Jöreskog & Sörbom, 2003). One confirmatory congeneric measurement model was calculated for each of the three trust factors using a scaled covariation matrix of the polychoric correlations, with the method of Weighted Least Squares (Jöreskog & Sörbom, 2003).

<sup>2</sup> Factor score regression weights are not obtainable from 1-factor congeneric models with only two indicators (Jöreskog & Sörbom, 2003).

<sup>3</sup> These variables were controlled for given that there were significantly (at  $p < .001$ ) more males, younger participants and less frequent church attendees in 2004 than in 2003.

<sup>4</sup> Two separate analyses were computed for each year. Both frequency of religious attendance and trust in the churches were treated as ordinal variables in both analyses.

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