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Experiments for Web Science: Examining the Effect of the Internet on Collective Action

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The shift of much of political life on to the Internet and WWW has implications for understanding of political behaviour, particularly people's willingness to undertake collective action and organise around public goods. Web-based experiments are an under-used methodology to identify and investigate these Internet effects. This paper reports on two such experiments, one in the laboratory and the other in the field, which explored how one particular characteristic of the Internet – the ability to feed real-time information about the behaviour of others back to an individual user – can affect people's incentives to act collectively. The results suggest that information about high numbers of other participants positively affect an individual's willingness to participate, while information about low numbers of other participants can have a negative effect, suggesting that a revision of the 'logic' of collective action may be necessary for the Internet age.

Collective action has been a key puzzle of political science since the 1960s. In *The Logic of Collective Action*, Mancur Olson (1965) put forward a thesis about when individuals can be incentivized to act collectively. He argued that, when organising around collective goods, 'small groups are more efficient and viable than large ones' and that if they are not, they need to be able to coerce their members or provide selective incentives to contributors. Generations of social scientists have worried over the implications of Olson's argument, which skews the influence of interest groups, limiting the ability of large groups to represent their interests. More recently, a number of studies have suggested that larger groups may actually find it easier to form, as their size makes it more likely they will be able to attain a 'critical mass' of activists who organise around public goods (Marwell and Oliver, 1993), and that the costs of collective action around many public goods vary little with group size, due to 'jointness of supply'. In these cases free-riding is unlikely to be problematic, larger groups are just as likely to exhibit collective action as smaller ones, and indeed under some conditions more likely, as they are more likely to be able to assemble a 'critical mass' of activists. This argument supported by claims for the so-called 'bandwagon effect', which causes people to sign up to a party or cause with large numbers of supporters because they feel that they are 'on a roll' (see Marsh, 1984).

Various claims have been made for the effect of the Internet on the 'logic' of collective action (e.g. Lupia and Sin, 2003), but empirical evidence is scarce. This paper reports two experiments aimed at testing empirically how key aspects of Internet-based communication affect collective action decisions. Specifically, it examines the effect of providing internet users with real-time information about other people's participatory actions on people's incentives to act collectively and to organise around public goods. . In fact, although many theories of collective action are based on the assumption that potential participants know the level of participation of others, in the pre-Internet era this was most usually not the case. The Internet therefore, provides us with the opportunity to test these theories for the first time as well as investigating the effect of the Internet itself.

Our hypothesis is that information about how many other people have undertaken a participatory activity (such as donating money to a cause or signing a petition) will affect people's decisions about whether to incur costs themselves in the pursuit of collective action. That is, if people know (for example) how many other people have signed a petition, we hypothesise that it will affect their willingness to sign or to incur other costs in the pursuit of the issue petitioned for. We also hypothesise that information about different levels of other signatories will have differential effects, building on the work of both Olson and Marwell and Oliver. That is, where very low numbers of people have signed a petition, the information could have a negative impact on one individual's propensity to sign, as they will consider it a hopeless cause – or it could have a positive effect, as any one individual will feel that their action will make a significant difference. Where very high numbers of people have signed, the information could have a positive impact, generating excitement, social pressure and a feeling that they can be part of change – or it could act negatively, making people feel that so many other people are acting that their contribution would be insignificant.

Experimental Design

The experiments tested these hypotheses by exploring the effect of information on the mobilisation of others on any one individual subject's willingness to incur costs in supporting a collective issue. In the first lab-based experiment, around forty people were invited to participate from OxLab's pool of subjects (which includes both students and non-students from the city of Oxford). Both groups were provided with a list of six petitions currently active and asked first, whether they agreed with the issues being petitioned for, second, to spend ten minutes finding out about the issue on whatever web sites they chose and third, whether they (a) would sign the petition on the issue (or against the petition if they wouldn't) and (b) whether they would give a small proportion of their participation fee towards supporting the issue. They were divided into two groups: one (the treatment group) received information about how many people had signed the petition (some of the petitions had high numbers of signatures, some low) and the other (the control group) received no such information. The No.10 Downing street web site was blocked during the experiment, to prevent those in the second treatment finding this information. Subjects completed a post-experiment questionnaire asking for some demographic and attitudinal information, perceptions of the experiment and levels of internet skills. Subjects were incentivized to participate by a payment of between £12 and £15, depending upon the amount they chose to donate to supporting the issues with which they were presented. All subject information was fully anonymized.

Participants were asked to consider six petitions, addressing the following issues (the number of signatories provided to the treatment group is shown in brackets):

1. To introduce a tax on plastic carrier bags (665,768)
2. To exert pressure on the Japanese government to halt its programme of whaling (9)
3. To create a new public holiday, the National Day of Remembrance (369,492)
4. To provide free prescriptions for asthma sufferers, unrelated to income (11)
5. To employ a policy of an opt out system instead of the current opt in system for organ donation (1,234,117)
6. To scrap the introduction of compulsory identity cards (6)

Deception was avoided in the experiment by presenting subjects with actual petitions and numbers. Subjects did not actually sign the petitions in the experiment, but when they had completed the experiment including the post-experiment questionnaire, they were provided with the screen which gave the opportunity to do so.

In the larger quasi field experiment, we tested more fully the hypothesis, using a larger subject pool and four treatments. We used 668 subjects, contacted from OxLab's subject database who participated in the experiment remotely, using their own internet connection. They were presented with a screen which asked them to examine a number of issues and then asked to (a) express their willingness to sign a petition supporting the issue and (b) donate a small amount of their participation fee to supporting the issue. Subjects were randomly allocated across a control group (of 173) and a treatment group (of 495). In the control group, participants received no information about other people signing. In the treatment group, subjects were randomly assigned across three sub-treatment groups in each of which participants received six petitions, two in each of the following categories:

- Subjects were told that very large numbers of people (> 1 million) had signed the petition
- Subjects were told that medium numbers of people (>100, < 1 million) had signed
- Subjects were told that very low numbers of people (< 100) had signed

The sub-treatment groups were as follows:

- Group B (164) received two 'low-numbered' petitions, two 'high' and two 'middle'
- Group C (171) received two 'middle-numbered' petitions, two 'low' and two 'high'
- Group D (160) received two 'high-numbered' petitions, two 'middle' and two 'low'

Subjects were incentivized via a small payment (£6-£8), again depending on the amount they chose to donate, which was paid using Amazon vouchers which were automatically generated when the subject had satisfactorily completed the task. There was a pre-experiment questionnaire as before. All subject information was fully anonymised and no addresses were collected. The petitions used were as follows (with the high, medium and low numbers provided shown in brackets):

1. *National governments should put pressure on the Chinese leadership to show restraint and respect for human rights in response to protests in Tibet (*High: 1,682,242, Medium: 1,189, Low: 76).
2. *National governments should negotiate and adopt a treaty to ban the use of cluster bombs* (High: 1,200,000, Medium: 330,000, Low: 7)
3. *Governments should lobby the Japanese government to stop commercial whaling of the Humpback whale* (High: 1,082,808, Medium: 57,299, Low: 98)
4. *Governments should support a stronger multinational force to protect the people of the Darfur region of Sudan* (High: 1,000,000, Medium: 5,978, Low: 15)
5. *World leaders should negotiate a global deal on climate change* (High: 2,600,000, Medium: 575,000, Low: 53)
6. *Governments should work to negotiate new trade rules, fair rules to make a real difference in the fight against poverty* (High: 17,800,000; Medium: 22,777, Low, 25).

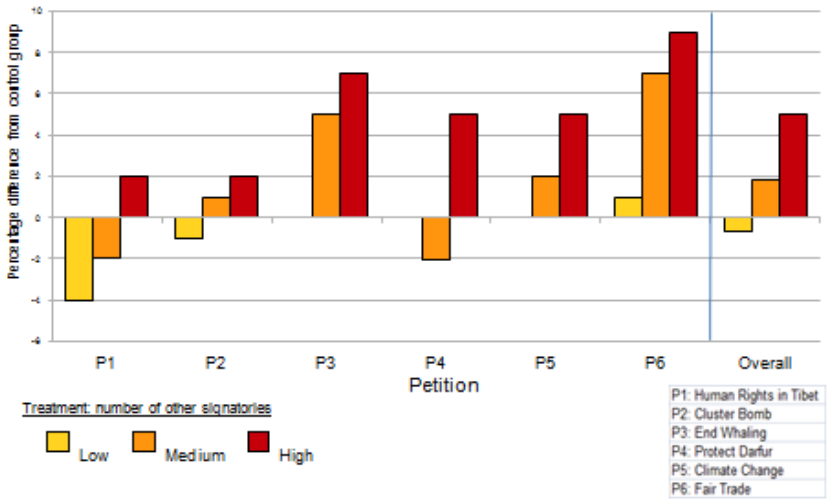
There was no deception in this experiment. Subjects were provided with generic petitions and we trawled the WWW to find actual on-line petitions that had been created on these issues with different numbers of signatories, so the numbers of signatories provided were all actual numbers that had signed a similar petition on this issue. The issues were all selected to be of international significance and were drawn from across different geographical spaces and points in time, although all during the last three years.

Experimental Results

As there were six petitions in both laboratory and field, we stacked the data so as to examine the variation according to the numbers that subjects could see signing, which yielded a total of 282 person-petitions for the laboratory and 4008 for the field. In the initial lab-based experiment, we found that 58 per cent of petitions were signed overall; 46 per cent in the control group and 54 per cent of the treatment group (those who received information about other people signing). We identified one issue (out of six) where subjects were significantly more likely to sign a petition if they received information that many other people had signed than if they received no information. This petition was the one supporting an opt out system for kidney donation, the only one for which the number of signatures was over a million (1,234,117), leading to a possible hypothesis that 'critical mass' where the information makes a difference could be one million. Across the six petitions there was a positive correlation with the number of other people signing (when numbers were high) and the likelihood of an individual signing. The numbers of subjects were too small to come to firm conclusions about the distribution of effects on people's likelihood to participate. But the identification of a distinct effect for 'high' numbers on propensity to sign and a weaker effect of 'medium' numbers on propensity to donate (see below) fed into the design of the larger quasi-field experiment.

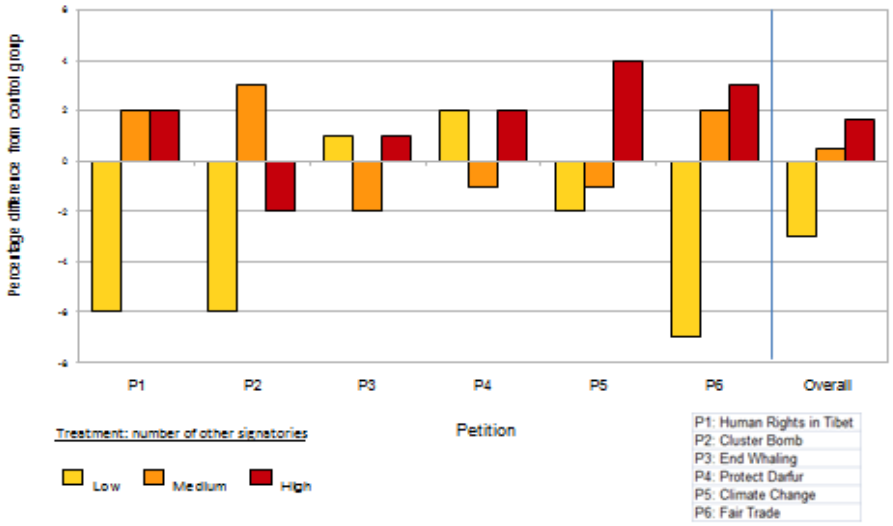
For the larger experiment, 62.5 per cent of the petitions presented to the control group were signed. Of the petitions presented with low numbers, slightly less (-1.9 per cent) were signed and for those presented with medium numbers, slightly more (+1.9 per cent) were signed. For those presented with high numbers, 66.7 per cent were signed (that is, 4.2% more than in the control group) and this result is significant (p=0.015). The percentage of participants signing each petition are shown in Figure 1 below, compared with the proportion of people signing in the control group (shown as the base line). The figure shows clearly that for all petitions, 'high' numbers had an effect, although it was not always significant. This effect was strongest for the petition on fair trade, which also had by far the highest number of signatories in this category (17.8 million), leading to a possible hypothesis that the effect of high numbers varied according to the magnitude of the number of other signatures. But when we tested this hypothesis by using the log of the number of signatures in a regression, we found no statistical significance.

Figure 1. Subjects Signing Petitions (by number of other signatories)



Turning to people's propensity to donate, overall, two-thirds of those who signed a petition went on to make a donation. Interestingly, an as yet unexplained feature of the patterns of donation is that for every petition in the larger experiment, almost exactly two-thirds of those who signed went on to donate, suggesting some kind of universal effect. Even with the rather different experimental set-up and much smaller numbers in the laboratory experiment, a similar effect could be observed. Across the six petitions, a similar graph to Figure 1 above for signing is shown in Figure 2 for donations. Here the effect of the numbers is less clear, but low numbers have a negative effect in all but one case (the petition on Darfur) and high numbers have a small positive effect in all but one (the petition on cluster bombs). The difference between signing and donations is interesting, possibly due to the fact that less people donate than sign (63 per cent versus 43 per cent).

Figure 2. Subjects Donating to Petitions (by number of other signatories)



It seems that this group have a higher threshold for donating and are consequently less influenced by high numbers and more easily discouraged from doing so by low numbers of other signatories.

Looking at the results across the two experiments for signing, we ran probit regressions for both experiments with 'signing' as the dependent variable and using our 'high', 'medium', 'low' terms as independent variables, shown in Table 1 below. Clearly, we would expect the likelihood of an individual signing to also be affected by the extent to which they agreed with the issue under consideration, so we also used a variable ('agree with issue') based on responses to the pre-experiment questionnaire, where subjects were asked whether they agreed or disagreed with the issue of the petition – unsurprisingly, we found high significance for this variable across models.

Table 1. Probit Models for Signing Petitions

	Laboratory			Field Experiment		
	M1	M2	M3	M4	M5	M6
	ß (s.e.)	ß (s.e.)	ß (s.e.)	ß (s.e.)	ß (s.e.)	ß (s.e.)
Agree with Issue	0.88 (0.21)***	0.68 (0.19)***	0.82 (0.19)***	1.11 (0.08)***	1.12 (0.08)***	1.10 (0.08)***
Signatures						
High Numbers	0.89 (0.35)**			0.15 (0.06)*		
Middle Numbers		0.0 (0.22)			0.05 (0.06)	
Low Numbers			0.16 (0.20)			-0.03 (0.06)
Constant	-0.35 (0.17)*	-.23 (0.16)	-0.31 (0.16)*	-0.59 (0.08)***	-0.60 (0.08)***	0.58 (0.08)***
Number of Obs	161	183	207	1973	1970	1969
Log Likelihood	-95.57	-118.53	-127.6	-1166.9	-1186.5	-1205.7

†: p<0.1, *: p<0.05, **: p<0.01, ***: p<0.001

We did not look for any overall treatment effect, as knowing the numbers of other signatories has been hypothesised to both increase and decrease participation depending on the numbers and these effects could cancel each other out. So we were more interested in the effect of the 'high numbers' treatment (shown in M1 and M4), which was significant at p<0.05 (a two tailed test) across both experiments. We found no significance for 'middle' (M2, M5) or 'low' (M3, M6) numbers across the two experiments.

For donation, shown in Table 2, in contrast we did not find the 'high numbers' treatment to have any effect.

Table 2. Probit Models for Donating to Petitions

	Laboratory			Field Experiment		
	M1	M2	M3	M3	M4	M5
	ß (s.e.)	ß (s.e.)		ß (s.e.)	ß (s.e.)	
Agree with Issue	0.55 (0.22)*	0.50 (0.21)*	0.60 (0.21)**	0.95 (0.09)***	1.05 (0.1)***	1.02 (0.1)***
Signatures						
High Numbers	0.24 (0.29)			0.04 (0.06)		
Middle Numbers		-0.54 (0.26)*			0.01 (0.06)	
Low Numbers			-0.22 (0.20)			-0.09 (0.06)
Constant	-0.86 (0.19) ***	-0.82 (0.18)***	-0.89 (0.18)***	-1.04 (0.09)***	-1.14 (0.1)***	-1.11 (0.1)***
Number of Obs	161	183	207	1973	1970	1969
Log Likelihood	-96.68	-99.35	-118.24	-1282.1	-1267.5	-1258.3

†: p<0.1, *: p<0.05, **: p<0.01, ***: p<0.001

For the laboratory experiment, the 'middle numbers' treatment had a modest negative significance at the $p<0.1$ level, meaning that participants were less likely to sign when provided with the information that more than a hundred but less than one million other people had signed (actually, given the actual numbers used, middle numbers ranged from 300,000 to 600,000). In the quasi-field experiment, we found a similar effect for the 'low-numbers' treatment, that is that participants were less likely to sign when they saw that < 100 other people had signed, in comparison with no information, but 'middle' numbers were not significant.

Conclusions

The experiments reported here provide some insight into a key dimension of political behaviour, the propensity of people to act collectively, and the effect of the Internet on that propensity. Across the two experiments, we found support for our hypothesis that people's willingness to take part in collective action will be affected by information about the number of other people who have also taken part. When it comes to signing petitions, people are positively affected by the information that there are one million or more other signatories and this effect was observable across our two experimental designs. For donating money, these high numbers do not 'pull' participants towards this more costly form of participation, but there is evidence that numbers below this level can have a negative effect on people's willingness to donate, found in the laboratory experiment. Overall, the results lend support to Marwell and Oliver's claims for a 'critical mass' effect and suggest a revision of Olson's logic of collective action for the Internet age. These results also provide some support for the 'bandwagon effect'. Nadeau et al (1993) have found evidence for the bandwagon effect outside the electoral context on opinion formation, which might be seen as the first stage of the effect. This research has identified a possible second stage - the extent to which it persuades people to make some participatory move towards supporting the issue, putting their money (or at least their signature) where their mouth (or mind) is, on which previous research is largely silent.

These findings could have practical implications. Most voluntary organisations campaigning on issues now run on-line petitions and offer other opportunities for internet users to support their campaigns. Some of these applications provide feedback evidence on how much support has already been received; others do not. The findings of our research suggest that up to a certain point, indication of existing support could have a negative effect on people's willingness to participate, particularly when it comes to 'stronger' participatory acts like donation and it might be efficacious to suppress such numbers. Once numbers have surpassed one million, providing them makes sense because they are likely to have a positive effect, at least for weaker participatory acts such as signing petitions.

The findings of this experiment provide a methodological pointer for the study of the societal implications of the Internet within Web Science. While Internet research abounds with claims of how the Internet enhances political participation, empirical evidence is scarce. Experiments of this kind could prove to be a fruitful way to establish specific internet effects, as they have in the field of public administration where members of the same research team have investigated how the changed information environment provided by the internet affects citizen-government interactions (see Petricek et al, 2005; Escher et al, 2006; Dunleavy et al, 2007). The WWW itself provides fertile ground for 'natural' versions of these experiments (see Salganik and Dodds, 2006, for an experimental analysis of cultural markets) to further examine the phenomena discussed here, as well as other aspects of political behaviour on-line.

References

Dunleavy, P. Margetts, H. Bastow, S. Pearce, O. and Tinkler, J. (2007) *Government on the Internet: progress in delivering information and services online,* Value for Money Study by the UK National Audit Office (London: The Stationary Office) HC 529 13 July.

Escher, T., Margetts, H., Petricek, V. & Cox, I. (2006) 'Governing from the centre? Comparing the nodality of digital governments' Presented at the 2006 Annual Meeting of the American Political Science Association, 31 Aug-4 Sept.

Lupia, A. and Sin, G. (2003), 'Which public goods are endangered?: How evolving communication technologies affect the logic of collective action, *Public Choice*, 117: 315-331.

Marsh, C. (1984) 'Back on the Bandwagon: The Effect of Opinion Polls on Public Opinion', *British Journal of Political Science*, 15: 51-74

Marwell, G. and Oliver, P. (1993), *The Critical Mass in Collective Action* Cambridge: Cambridge University Press.

Nadeau, R. Cloutier, E. and Guay, J-H. 'New Evidence About the Existence of a Bandwagon Effect in the Opinion Formation Process', *International Political Science Review* 1993; 14; 203

Oliver, P. Marwell, G. Teixeira, R. (1985), 'A theory of the critical mass. I: Interdependence, group heterogeneity, and the production of collective action', *The American Journal of Sociology*, Vol. 91, No. 3. (Nov., 1985), pp. 522-556.

Oliver, P. & Marwell, G. (1988), 'The paradox of group size in collective action: A theory of the critical mass II',*American Sociological Review*, 53.

Olson, M. (1965), *The Logic of Collective Action* Cambridge: Harvard University Press.

Petricek, V., T. Escher, et al. (2006). 'The Web Structure of E-Government - Developing a Methodology for Quantitative Evaluation'. *Proceedings of the World Wide Web Conference* 2006, Edinburgh.

Salganik, M. J., P. S. Dodds, et al. (2006). "Experimental Study of Inequality and Unpredictability in an Artificial Cultural Market." *Science* 311(5762): 854-856.