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The art and science of impact assessment: results of a survey of IAIA members

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Results from a questionnaire survey of International Association for Impact Assessment (IAIA) members' on the art and science of impact assessment (IA) are reported. Over 325 respondents provided their views and ideas on what this relationship means and how it contributes to effective assessment practice. The importance of a strong scientific basis of rigorous, verifiable and objective information was endorsed by nearly everyone. As policy art, the integration of values and community concerns into assessments and the effective communication of information and findings to the public and decision-makers were also highly regarded. Political influences on IA outcomes were acknowledged but viewed with some suspicion. Overall, the results suggest that IA good practice is recognised by many IAIA members as an amalgam of sound science and policy art, with space and need for both rational, technical and fact-based analysis and contextual, participative and value-responsive actions to deliver sustainable outcomes.

Keywords: impact assessment, science, policy, decision-making, effectiveness, politics, art

THE THEME OF THE 28TH ANNUAL MEETING of the International Association for Impact Assessment (IAIA), held in Perth, Australia, 4–10 May 2008, was 'The Art and Science of Impact Assessment'[1] (hereafter 'IAIA08'). Much of the discourse at the conference centred on or around this theme.[2] In addition, we distributed a questionnaire survey to probe delegates' understanding of and perspectives on the relationship of art and science in impact assessment (IA), focusing on aspects that are considered to be important and their linkage to process and practice effectiveness. Subsequently, the survey was posted online and all members of IAIA were invited to respond. In this article, we report on the results of this survey and their implications for gaining a better understanding of the dynamics of IA.

The questionnaire used in the survey is reproduced in Box 1. It includes both (i) open or free choice and (ii) closed or defined choice questions, which respectively yielded qualitative and quantitative data sets. The first set, derived from written responses, is content rich but presents difficulties of classification and our analysis here is selective and generalised. The second set, derived from scoring response scales, is content-simple but structured and readily analysed as to frequency and distribution of views. In light of the considerable volume of results generated, we only provide a summary of key observations here.

In this context, the results can be read as a preliminary scan of the coordinates of IA as art and science, including pointers on their interplay in practice, imprint on performance and possible directions for further work. Specifically, it is intended that a discussion/working document/state of theory and practice report, drawing on the proceedings of IAIA08, will be part of the activities undertaken in support of the IAIA

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Box 1. Survey questions

Note: the numbering below indicates the original sequence of the survey questions. The three headings were not included in the survey.

Closed or quantitative structured questions
Respondents were asked to rate each of the statements below according to the supplied response scale (strongly agree, agree, partly agree, partly disagree, disagree, strongly disagree, unable to judge). They were asked to respond on the basis of their own experience of impact assessment practice.

1. In my experience of IA practice:
   a. Politics plays too influential a role.
   b. Community perceptions play too influential a role.
   c. Scientific analysis plays too influential a role.
   d. Proponents play too influential a role.
   e. Government agencies play too influential a role.
2. In reaching a decision:
   a. Political aspects are more important than scientific aspects.
   b. Value judgements are more important than scientific aspects.
   c. Political aspects are more important than value judgements.
3. There is a high level of *policy art* in current IA practice.
4. There is a high level of sound *science* in current IA practice.
5. An effective IA process must result in:
   a. Preparation of a scientifically credible report.
   b. Significant input from the affected community.
   c. The identification of the best practicable alternative.
   d. An expedient approval decision.
   e. An outcome that represents the most sustainable form of development.
6. Effective IA practice must:
   a. Be adapted to the political realities of proposals.
   b. Explicitly address the need or justification for change.
   c. Accommodate public values and concerns.
   d. Explicitly address the trade-offs at stake.
   e. Propose creative solutions to problems.
7. Effective IA practice must be based on:
   a. Objective knowledge from appropriate disciplines.
   b. Verifiable data and information.
   c. Expert analysis by qualified specialists.
   d. A report of findings of significant impact.
   e. Technical input to decision-makers that does not take a particular position.

Open or free-choice questions (qualitative data)

8. In one *sentence* what is your definition of the 'science of impact assessment'.
9. In one *sentence* what is your definition of the 'art of impact assessment'.
10. In one *sentence* describe how 'art and science' should be married in (effective) impact assessment practice.
16. Any other comments regarding the art and science of impact assessment...

Demographic questions

11. Approximately how much of your working time do you spend directly on IA-related activities (choose 1 only)
    None / Up to 25% / Between 25 and 50% / Between 50 and 75% / Between 75 and 100% / 100%
12. How many years have you worked in the IA field (choose 1 only)
    Up to 5 years / 5 to 10 years / 10 to 15 years / More than 15 years
13. What best describes your role in IA (choose 1 only)
    Academic research / Consultant / NGO / Government agency / Proponent / International aid or lending organisation
14. What is your main area of IA specialisation or interest (choose 1 only)
    EIA / SIA / EMS / SEA / HIA / Other (please specify)
15. Which region do you work in or on (choose 1 only)
    Europe / Asia / Africa / South America / North America / Australia/NZ / Other (please specify)

update of the environmental assessment effectiveness review. This would be undertaken by the authors in collaboration with others.

Demographic characteristics of respondents

Although we address them first, the demographic survey questions were positioned towards the end of the survey instrument (Questions 11–15 in Box 1). The survey was returned by 344 participants (which represents around 13% of IAIA's total membership base). While not necessarily a representative sample of IAIA members, volunteered responses can be argued to reflect a level of interest in the topic and come from a professionally engaged constituency. Not all respondents answered each question (ranged from 331 to 344 for the demographic and quantitative questions and 260 to 276 for the qualitative questions). The survey was conducted in English and addresses a potentially complex and multi-dimensional concept. Consequently it is not surprising that the highest numbers of responses were received for the demographic and quantitative questions (i.e. in which the participant's response option could be chosen from a list with a click of a computer mouse), and that fewer provided written answers to the qualitative questions.

Results from the five demographic questions revealed the following key characteristics:

- Almost all participants spend some of their working time on IA-related activities, with some 39% overall spending more than 75% on these.
- Generally speaking the survey was completed by more experienced IA practitioners; the highest response category correlates to the greatest number of years worked in the field (>15 years – 33%).
- With respect to role in IA, most respondents were consultants (40%), government employees (28%) and academics (20%); representation from proponents, NGOs and international aid or lending organisations was much lower (3–6% each).
- EIA was the dominant area of specialisation (56%), with SEA the next highest category (21%). This implies that project based assessments continue to dominate practice world-wide.
- In their work locations, respondents were drawn from all regions of the world in approximately equal proportions (i.e. 14–20%) with the exception of South America (3%), a geographic imbalance that appears to be characteristic of IAIA membership distribution overall. Many respondents in the 'other' category (8%) indicated that their work is international in scope.

A profile of impact assessment as art and science

This section outlines the profile derived from the seven defined-choice questions of the survey, which

asked respondents to rate statements on art and science dimensions of IA on a six-point Likert scale (from strongly agree to strongly disagree). Most of the questions had several components making a total of 25 individual statements. The original survey question numbering is indicated (as per Box 1) and the percentage of 'total agreement' is recorded (meaning the combined percentage of partly agree, agree and strongly agree responses); this provides a simple overall gauge of support for statements of the individual results which are unpacked below.

Question 1: Influence of key agents in impact assessment

Respondents were asked to judge whether politics, community perceptions, scientific analysis, proponents and government agencies respectively play 'too influential a role' in IA practice. 'Politics' was most commonly identified as being too influential' (87% total agreement), ahead of proponents (82%) and government agencies (70%). By contrast, community perceptions (56%) and science (49%) were considered to have less influential roles. These results point to the differential influence of major agencies on IA practice and suggest there is a perceived imbalance and particular concern about the role of politics and what might be called power holders (proponents and government agencies).

Question 2: Relative influence of politics and values in decision-making

With respect to the relative influence of politics and values in decision-making, respondents confirmed that they believed 'political aspects' (72%) and 'value judgements' (68%) play a more important role in reaching a decision in the IA process than scientific aspects. It is interesting to note that these total agreement figures, although a clear majority, are somewhat lower than the responses for the previous question regarding the role of politics and tended to fall more frequently in the 'partly agree' category. This suggests a less definitive viewpoint.

When asked to indicate whether political aspects are more important than value judgements in reaching a decision, once again respondents agreed overall (60%) but this time not so strongly. Relative to all previous statements, the proportion of 'unable to judge' responses was high, in effect reflecting the value basis of politics as a process of bargaining and adjudication of different interests or interpretations.

Questions 3 and 4: Levels of policy art and sound science in IA practice

In a pair of survey questions, respondents were asked to rate the level of 'policy art' (73%) and 'sound science' (72%) in current IA practice. Although the scores were nearly identical, there is more ambivalence in the rating of sound science indicated by the relatively high percentage of 'partly agree' responses. Overall, these ratings suggest that the state of IA practice on both counts is judged positively and also that 'sound science' does not necessarily translate into influence on IA practice or decision-making (as indicated by previous responses). This finding supports a common intuition among practitioners. So far as we know, there is no comparable intuition with respect to 'policy art', which is possibly a less familiar concept than sound science if the different proportion of 'unable to judge' responses is a guide.

Question 5: Results of an effective IA process

Almost every respondent indicated that an effective IA process must include a scientifically credible report (99%) and also significant input from the affected community (99%). There were no 'strongly disagree' or 'unable to judge' responses for either of these statements. Similarly there was very high total agreement that an effective IA process must result in identification of the best practicable alternative (95%) and an outcome that represents the most sustainable form of development (96%). While there was also strong support for an expedient approval decision (81%), some respondents clearly disagreed with this statement and the proportion of 'strongly agree' responses was markedly lower than for the other four statements in this group. This implies that quality of the outcome in terms of sustainability performance is considered more important than an emphasis on speed of processing.

Question 6: Elements of effective IA practice

Four elements of effective IA practice were almost equally rated by respondents:

- Explicitly address the need or justification for change (93%);
- Accommodate public values and concerns (98%);
- Explicitly address the trade-offs at stake (95%); and
- Propose creative solutions to problems (99%).

The last of these particularly stands out in that almost half of respondents (49%) chose the 'strongly agree' option. The notion that effective IA practice must be adapted to the political realities of proposals was strongly supported overall (80% total agree) but appears to have attracted a more cautious response rating, largely consistent with other questions discussed previously that concerned political aspects of IA practice, with the 'partly agree' response dominating (38%).

Question 7: Basis for effective IA practice

Respondents were asked to consider the basis for effective IA practice in light of five statements. There was near unanimous agreement on four bases:

- 'Expert analysis by qualified specialists' (100%);
- Use of 'objective knowledge' (99%);
- 'Verifiable data and information' (99%); and
- 'Report of findings of significant impact' (98%).

Only slightly less support was given to the notion that effective IA practice requires 'technical input to decision-makers that does not take a particular position' (88%), pointing perhaps to the perceived importance of objective, dispassionate analysis. Arguably, this factor, as much as the others, is a basis for the preparation of a scientifically credible report, which also received almost unanimous endorsement as a key result of an effective IA process (Question 4).

Qualitative interpretation of the art–science relationship

This section reports on qualitative interpretations of the art and science of impact assessment and how to merge them in practice. These are derived from written responses to three open questions. It focuses selectively on only a usable sub-set of responses that directly and specifically address the question. Other responses that did not do so or were ambiguous or hard to understand were eliminated, notwithstanding that some interesting comments about IA practice generally were provided in this sample.

Question 8: Defining interpretations of the science of impact assessment

Some 256 one-sentence definitions of the 'science of impact assessment' were obtained in response to question 8 of the survey. More than 80% of the overall responses referred to the application of scientific methods in the collection and analysis of information and/or its subsequent use in decision-making. Terms that were most commonly used included technological, reproducible, verifiable, validated, comprehensive, expert, multi-disciplinary, quantitative, factual, sound, accurate, objective, rational, rigorous, robust, evidence-based and precise. Most of these words would typically be associated with descriptions of the methods applied in scientific analysis or research, and some appeared in earlier questions, which very likely influenced respondents' use of them.

Some examples of interpretations of the science of IA included the following:

- Comprehensive description of project impacts and options to mitigate them, using verifiable or reproducible facts, figures, modelling and expert technical commentary to quantify and qualify the impacts.
- Use of rigorous science, based on testable hypotheses, best available scientific data and objective evidence.
- Systematic collection of data, sound analysis and use of proven or justifiable techniques to predict effects.

A small number of respondents emphatically stated that IA is not a science (or phrases to that effect), for example considering it to be primarily a 'management process' or 'procedure for compiling knowledge'. Some pointed out that science is only one component of IA. Others used expressions that normally would not be associated with the pursuit of science, such as developing a credible (or defensible) 'story' or that science and 'art' when used like this are metaphors not something to be defined.

Question 9: Defining the art of impact assessment

In the 270 definitions of the 'art of impact assessment', a diverse range of perspectives were expressed. There was no particular dominant type of response (unlike the definition of science). However, some common themes and use of terminology were apparent. These included the notion that the art component of IA is the non-scientific aspect, comprising non-quantified or non-technical data, values, and the inclusion of socio-economic, political and cultural aspects more generally. Frequently, public participation or otherwise packaging information in an IA for effective communication to the public and decision-makers was mentioned. Terms such as 'integrating', 'weighting', 'balancing' or 'blending' and making 'trade-offs' were commonly used regarding treatment of different information (e.g. scientific vs. non-scientific) or incorporating stakeholder interests and values in IA practice. Words such as 'creative' or 'innovative' were also sometimes used. Similarly the concept of 'sustainability' was quite often included, especially in the sense that the art of IA lies in trying to deliver sustainable outcomes from the process. Some practitioners suggested that 'art' is essentially what the practitioner does in order to conduct IA overall or more specifically in drawing together information for communication purposes (e.g. report writing); that is, both relate to the skills and integrity of practitioners. Others referred to the overall framework or context of a given IA as directly pertaining to the art aspects. As with science a small number of respondents stated that there is no art of IA.

Some examples of interpretations of the art of IA included the following:

- Non-quantifiable aspects, together with public perception.
- Accommodating the interests (political, social, environmental and economic) of all stakeholders including the proponent, government agencies and the affected community.
- Integration and weighting of different impacts, balancing socio-political and objective, scientific findings.

- Negotiating trade-offs and making transparent the information and values that inform decision-making.
- The total management of the EIA process.

Question 10: Marrying art and science in effective impact assessment

Approximately 260 responses were obtained on how art and science should be married in effective impact assessment. Many did not explicitly or obviously provide clear guidance on this issue compared to the responses on the previous two questions. Often respondents would state that both art and science are needed, especially with respect to achieving sustainable outcomes in IA, but they did not necessarily explain how they should be used or combined. As might be expected from the separate definitions discussed previously, science was often related to information or content and art more to process, which included balancing and accommodating competing values or interests. The term 'integration' was commonly used, often as a synonym for the 'marriage' concept itself. There appeared to be general consensus that the two should be applied in IA, although a small number of respondents suggested that they were either not related or should be kept separate.

Some examples of responses on how to marry art and science in effective IA included the following:

- Art provides direction to IA (what should be studied), science guides analysis (how to carry out a study).
- Both are needed to synthesise evidence-based findings, socio-economic considerations and the political and community expectations into a coherent whole to inform decision-making.
- Integration of human values within an objective, sustainability-focused framework.
- Requires open-mindedness, inclusive processes, structures that can reflect quantitative and qualitative findings and bridge uncertainties and participatory learning.

Question 16: Other comments regarding the art and science of impact assessment

The final question on the survey provided participants with an opportunity to add any other comments regarding the art and science of impact assessment. While over 100 responses were received, many were comments about aspects of IA or the IAIA08 conference more generally rather than addressing the art and science theme. A selection of comments that specifically mentioned the theme is reproduced in Box 2. Several respondents highlighted an over-emphasis on science in IA, particularly reductionist Western science, and pointed out that alternative sources of traditional and indigenous knowledge and the 'art' of IA are equally important. A small number of respondents focused on the purpose and outcomes of IA, suggesting that a focus on the extent to which it is an art or a science is not as important as what the process delivers overall.

Conclusions: key findings and next steps

In this survey, we looked to tap the 'wisdom of the crowd',[3] in this case made up of IAIA members, to gain proxy measures and similes of the art and science of impact assessment and the nexus with effectiveness. Some of the responses, to be sure, confirm what is known already but in very high aggregate numbers, for example statements of effective IA process and practice (questions 5–7). Other responses add new perspectives, for example on the state of practice of IA as policy art. What also emerges from this survey are: (i) strong support for a rational–scientific approach to information gathering and analysis (a paradigm subject to much criticism); and (ii) the importance of alloying this approach with a participative and communicative strategy that takes account of political and contextual realities (a paradigm subject to much theorising).

While the role of both science and art for effective IA was emphatically acknowledged in the survey responses, stronger sentiments were expressed for the first; participants more typically selected 'strongly agree' for the statements concerning rational, objective or 'scientific' aspects of EIA relative to equivalent questions regarding policy, values or 'art' aspects of IA, where 'partly agree' was more common. This suggests that these aspects and particularly overly political influences of IA are still viewed with some suspicion, although this should not obscure an undercurrent of concern about prominence of rational-objective science on the part of some respondents. We still have more to learn, at

Box 2. Some other comments on the art and science of impact assessment

- It is important that we do not produce graduates in this field who believe unquestioningly in the technical rationalist paradigm, i.e. that the expert always knows best and that community empowerment can be discounted. So art and science combines technical expertise and empathy with public aspirations.
- More focus should be placed on the 'art' of impact assessment. Much of the literature focuses on the processes and academic nature of EIA whereas the main bulk of my EIA workload revolves around the communication of impacts to stakeholders and adapting regulatory 'science' to allow for actual environmental protection.
- Impact assessment is a complex interactive evaluation process: the extent to which it is a science determines its validity, the extent to which it is an art determines its achievability.
- Need to take on the big issues confronting our environment, in particular global warming and climate change. There is no point assessing the effects of a stream diversion and ignoring the looming tidal wave.

least to become more comfortable with the less tangible elements of IA practice.

Much remains to be done to unpack this relationship further — both through future surveys and digesting the papers and discussions of the proceedings of IAIA08. In particular, from an IA effectiveness perspective, we look to parse the triangle of IA good practice that connects sound science and policy art as a basis for informed decision-making that approximates to sustainable outcomes. As professionals, we spend considerable time and effort to try to gain an understanding of the architecture and dynamics of IA, whether at a macro or micro level. Probing the perceptions of practitioners and analysts, as we have tried to do here, affords a further lens on IA. In that regard, we leave the last word to an anonymous respondent to the survey:

> IAIA and its individual members must show leadership through their own professional behaviour and practice and should stop fiddling while Rome burns [an allusion to climate change]. An effective response to the scale of problems that confront us will require art and science of the highest order.

Notes

1. The terms 'art' and 'science' are open to interpretation. In this discussion, we use them generically whereby science refers to method of inquiry, knowledge that is acquired systematically and their application in impact assessment practice, and art means policy skills and acumen that is acquired experientially and adapted to purpose and context in impact assessment.
2. Further information on the IAIA conference can be found at <http://www.iaia.org/conferences/iaia08/>, last accessed 19 February 2010.
3. The 'wisdom of crowds' is the title of the book by Surowiecki (2004) which marshals an impressive body of evidence on the averaged judgement of the many.

References

Surowiecki, J 2004. *The Wisdom of Crowds*. New York: Random House.