Communication for Industry Innovation

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In Australia since the 1970's, there had been a noticeable decline in the popularity and image of science with the community and with governments. Industry had also not shown a strong commitment for funding science through their R&D programs. Student interest in science as a career tended to fall off. Scientists are finding increasingly that their profession does not pay well: a reflection of the image of science. Jobs were difficult to secure. Surveys show that only 10% of the public have an inherent interest in science

Popularity of science

Benefits from the science knowledge base are poorly encapsulated into everyday life and industry. It is known that much information remains on the shelf. Amongst other factors, this alone points to deficiencies in science communication. When challenged, scientists highlight the successes and better known outcomes affecting peoples' lives. A serious analysis of why so much knowledge sits unused amongst science communities and in libraries, and what improvements should be enacted are seldom rigorously pursued.

Government budgets have increasingly been under pressure to fund non-science priorities such as social, health and welfare issues. To do this has resulted in less funding for research and this flows on with usually less funding for communications on S&T. In turn governments have sought to divert the onus of funding R&D to the private sector. Australia ranks 19th amongst 24 OECD countries in the level of private sector investment in R&D. The actual amount has fallen further this year. This shift for commitment of funds and action offers a major communication challenge to lift the image of science.

Whose problem

One must ask: How good is S&T communication? Has it failed in part?

One can ask ourselves: Are we in an age of wisdom or an age of folly? Who is responsible for the image of science? Are we as science communicators doing enough? Is it a case of the scientific and its supporting community at large not knowing what to do with the information it generates, and/or not wanting to be fully responsible for the logical destiny or impact of that S&T? The general information explosion and the sophisticated and competitive environment that we operate in compound the dilemma. What can be done about this scenario?

Lessons from Landcare in Australia

In Australia, an analysis of the highly successful Landcare movement during the 90's provides some insight into communication issues for science and technology.

A decade ago the community was proactive in issues of the environment. The environment was generally regarded as not being sustainable managed. In fact substantial parts of the natural environment and biodiversity were being damaged or irretrievably lost.

A major perception was that so-called scientific advances were accelerating environmental degradation! Science itself was not seen to adequately manage the environment, certainly to the extent expected. Science communication had partly failed to provide credible leadership and the technology for action. The level of investment in science was not seen worthwhile even though their lives were being increasingly positively affected by ongoing science innovation.

The result was that the community, both urban and rural, got environmental issues into prominence to the extent that a major active grass roots driven Landcare movement arose which focussed on on-the-ground action. About 4,000 voluntary Landcare groups emerged in Australia in the past decade. In a turn around, previously opposing major conservation and farming industry groups joined in a strongly supportive alliance that forced a government response for substantial longterm funding. Governments sought to win votes and popularity and diverted yet more funds from science to avoid budget implications.

On the other-hand, scientists were generally of the view that technology was available to remedy much of the environmental problems. They saw the activity as piecemeal with a low technology base. and often cosmetic – not seen as soundly based on good science and technology. Improvements were seen to have been local at best and make little overall impact on the outcomes sought. The substantial efforts of the Landcare movement were seen to have been inefficient. Science communication had partly failed to establish credibility and its ability to impart its substantial technical knowledge base for effective use by society.

Selling science - Issues

Communication activities have been sidetracked because of political and financial pressures. Competitive economic development and improvement in environment standards of living has slowed. In the big picture, while recognising that scientists and R&D organisations each have active communication activities, these tend to resemble slick, hard sell promotions and 'branding' of the organisation, its people, facilities and programs in one or two way communication flows.

Selinger (1998) commented on the complexities associated with understanding science in the greater social, business and political context as against the public relations spin on science for commercial benefit of the employer. The mass media has a record of publicising only the nasty components of S&T issues. Public slanting of communications is often seen to have political imperatives. On another front, much science communication best fits the entertainment mould. This can be valuable in itself, of course. But it often is deficient in imparting information to complete knowledge for action, or this is left undone.

World's best science and the publish or perish syndrome, whilst laudable, has dominated science and academic cultures, but this alone seldom gets to industry and the public. On the other front, the general public has grown increasingly sceptical about S&T outcomes and the sensationalism that dominates presentations in popular public communications.

Consider the recent publicity of claims to have found evidence of life on Mars from analysis of samples of rock from the Antarctica. Was it a hyped up story by scientists to win cash? Science colleagues have raised enough doubts on the information and interpretation provided.
What about the genetically engineered potato promoted as 'poisonous' in the recent ISB News report, a gross distortion of fact!
DDT is seen to be a nasty, and to some extent it is. But has it not saved tens of millions of lives over several decades. Has the public developed the image of DDT or have the scientists?
The greenhouse gases issue gets much publicity. At the end of this one can ask how much is real fact and who is taking the action needed?

One can easily conclude that there has not been an adequate amount and type of communication of science and technology, especially that focussed on knowledge provision for attitudinal and behavioural change. Scientists have failed to control the agenda to ensure the outcomes needed. One can say that the science community has largely left others to promote science, occasionally jumping in on issues.

The Australian Cooperative Research Centres Program

A far-reaching major successful initiative to deal with the issues outlined is the Cooperative Research Centres (CRC) Program. It has at its core the objectives of ensuring that science has, and is recognised as having, greater impact into everyday life.

Much of the science knowledge affecting peoples' lives is developed in large substantially government funded organisations such as universities and science R&D organisations. The purpose of the CRC Program was to shift the existing R&D culture, especially in the universities and CSIRO, to focus more on impact of science into everyday life, and to get industry to be more directly involved in research, development and innovation. The result aimed for was a better image of science, and greater public and commercial benefits. The CRC Program was to be a major complimentary addition to the range of research and technology funded activities ongoing.

The CRC Program

The objectives of the CRC Program are:

- to contribute to national objectives, including economic and social development, and the establishment of internationally competitive industry sectors through supporting long-term, high quality scientific and technological research;
- to capture the benefits of research, and to strengthen the links between research and its commercial and other applications, by the active involvement of the users of research in the work and management of the centres;
- to promote cooperation in research, and through it a more efficient use of building centres of research concentration and strengthening research networks; and
- to promote the active involvement of researchers from outside the higher education system in educational activities, thus stimulating a broader experience in education and training, particularly in graduate programs and to offer graduate students opportunities to be involved in cooperative user oriented research programs.

CRC Program Features

The first group of seven CRCs was launched in July 1991. There are now 67 and numbers will remain at about this level. A feature of each is that at least one university is an essential partner, with CSIRO and Australian and state government agencies and industry being partners in most centres. Industry and small, medium and large private and corporate organisations are involved in most. There are 906 large and small-to-medium sized enterprises from industry with research links that range from core partners to supporting participants.

At present some 1900 post graduate students are engaged on CRC research projects and CRCs alone now employ about 2300 scientists.

The funding for the program has been substantial: Commonwealth Government $1.1 billion, industry $640 million and other government agencies research organisations and educational institutions have committed about $1.1 billion.

The program is unique in Australia and overseas. There is no other program seeking to address all these objectives in the same way. In an international context, the Interdisciplinary Research Centres Program in the UK has been successful in supporting the establishment of multidisciplinary research and education centres, which encourage collaboration between researchers. The lack of up front industry commitment in this program had produced much more limited industry involvement in research or even research priority setting.

The Fraunhofer Institutes in Germany are the leading area of collaboration with industry on research and education. They also have a heavily short-term research focus including significant testing activity. The Networks of Centres of Excellence program in Canada is encouraging collaboration between researchers but does not have the strength of commitment provided by the legal agreements that form the basis of each centre in the Australian program.

There are two main kinds of benefits from the application of science - commercial or non-commercial/public good benefit. Both are dependent on sufficient sharing of knowledge generated from research, that is, communication leading to changed practice and innovation.

The following attributes when taken together give the CRC program its distinctive nature:

- strategic collaboration;
- research to user linkages;
- central education and training objectives;
- tightly focussed and outcome orientation;
- up front industry commitment of funds and resources based on legally binding agreements;
- onus on participants for management;
- accountability to clients

The benefits come through synergism from up-front industry participation and commitment.

What communications initiatives have CRCs undertaken?

CRCs were set up as new R&D organisations. As such they presented a threat to existing R&D organisations and in turn were then threatened. Much of this antagonism was driven through competition for limited funding.

A central component to the program was therefore to ensure that communication was a cornerstone to all activities. Success has come through the 'commune' component of communication, that is, connection, discussion, articulation, interaction, transmission, and conversation. Communication needs people contact, sharing and interpreting information in a mutual interactive process. This contrasts with the one or two way communication flow that dominates the S&T community. Science understanding is negotiated to overcome the deficiency of transmission of meanings.

This resume focuses on communications for industry innovation. It leaves aside communications that fulfil either general corporate S&T promotions and publicity such as flagship events, open events, science week, science forums and festivals, science centres, special events, general media releases and the like promoting targeted R&D. It also omits the educational programs, especially those targeting the next generation.

How have CRCs contributed to the image of science?

A new culture

A highlight in the Program has been the successful creation and stimulation of the new desired ***culture*** that has brought a new style of communications. Metcalfe and Gascoigne (1996) concluded that scientists needed to be put through a cultural training program to become proficient in their communications responsibilities. This has been possible because of the range of levels of communication undertaken to ensure commitment Features include the genuine cooperation of researchers with various industry sectors made meaningful in the context of user linkages. Industry is involved in priority setting and participates in research and education –see Changing Research Culture Australia, 1995.

Key aspects of the cultural shift in CRCs included-

- a critical mass for R&D;
- funds available for skill development;
- appropriate aids for effective communication;
- rapid arrival of new, young and usually ambitious staff;
- increased accountability to industry and the wider community through vastly greater communications on outputs and the real benefits of S&T; and
- concerted training programs.

Integrated communication strategies and plans

With declining budgets, industry funders of scientific research have attempted to reap the benefits of their funding by requiring researchers to incorporate communications of outcomes from R&D to the stakeholders. They have also sought to have this in a form that has stakeholders successfully incorporating S&T into their own programs. Likewise, governments have required a greater level of accountability of the benefits of their funding.

In general, most scientists had not seen communications as their core role. They had become skilful and somewhat creative in being perceived to meet these communication needs when in fact tokenism and a minimalist approach prevailed. This communication had, in the main, been linear one or two-way communication. Little effective behavioural change resulted

Whilst some scientists are excellent communicators, others are not enthusiastic or committed. Seldom do they have good business skills relating to commercialisation. The older scientists influence new recruits into the conservative culture operating in the old and somewhat traditional arenas. This keeps them to the traditional publishing in scientific refereed journals as the end place for their discoveries. Communications consist of 'I

gave a poster or presentation to an international conference' or 'I published the results in an international journal.' End of story. Reward systems in academia and CSIRO perpetuate this performance; a 'publish or perish' system perpetuated by an element of professional arrogance. One leading international scientist suggested that the catch cry should be changed from 'publish or perish' to 'communicate or cark.'

Communications of S&T are a negotiation involving social processes, as meanings cannot be transmitted; they are developed as an outcome of the communication process. New skills, often outside those of the organisation, were needed.

CRCs needed to meet this challenge to demonstrate that they offered advantages. A fundamental component of their operations has been the development of ***Communications Strategies*** directly related to Centre visions, values and missions. These needed to incorporate a marketing approach. A set of objectives was needed for communications internally, with partners, stakeholders, other researchers, governments and the public at large. The details have varied from Centre to Centre so as to best respond to core business. For example, a public good environment related CRC would have a large community related program compared to one say in an engineering technology, which potentially may only have a handful of clients at the commercial global scale.

In addition to the whole of Centre communication strategy, individual projects have needed targeted communications strategies to meet specific goals. Wherever possible, project teams have included communications specialists and industry members to ensure the quality of this component and for them to specifically contribute expertise, monitor progress, evaluate impact and to tick-off outcomes.

Highly valuable has been the use of industry champions and real life case studies featuring the feelings and emotions of people. Communications that centre on people and the way in which the S&T has or will impact on them has had appeal. The thrust needs to be knowledge directed for the individual. The public is tired of human-interest stories and suffers from information overload. These do have there place, but the public want facts and understanding starting from their perspective about that which directly relates to their lives, either on the job or at leisure.

The CRCs that have done this best employ professional communications specialists. Their Boards have directed that up to 25% of total expenditure be committed to communications budgets. While communications specialists facilitate the communications strategies, scientists retain the communications responsibilities. While conflicts can emerge, proven success coming from first hand experience of effective communications outcomes ultimately override these jealousies.

Multidisciplinary teams

The public and industry usually want to speak with experts or scientists. The general public are sceptical of intermediates who are seen to be filtering information and thought to be hiding important information from the public/consumer or to being perceived as speaking down to the receiver. Many scientists lack the inherent ability or training to make science interesting.

A key development was to get scientists to accept non-science experts in partnership with them in shared visions and actions. This has required trust of other professional disciplines such as sociologists, economists and journalists/communicators. This has mainly come from successful outcomes in which not only the communications outcome have been achieved, but publicity for their science and themselves has arisen These professional people have been able to encapsulate science that makes it attractive to the recipients through economic payoff, better products, protection of resource, etc.

Communication specialists know that messages should be kept simple. There is however a down to this aspect, especially when an attitude and behavioural change is needed that revolves around a complex set of facts often involving several science disciplines and inputs of technology to achieve some value added information. Communication in this situation is dependent on an experiential learning and sharing process and aspirations of continuous improvement. It is a relationship of equal partners sharing a vision. While recognised in the educational world, this is often foreign to scientists even in science academia. CRCs have undertaken major industry training activities to improve the interpersonal skills needed to operate effective multidisciplinary teams.

Client/stakeholder participation

Added to the multidisciplinary team is the client or consumer who ensures a market driven approach. There are two main methods of developing the consumer perspective:

- market research and incorporation of findings into a communications strategy and plan, or
- participation of the consumers in the preparation and packaging of the communication.

Our experience has pointed us overwhelmingly in favour of a partnership of R&D directly with the intended users. The users then tailor communications specific to the S&T and to themselves. This is in line with the CRC Program that has placed importance on industry partners, associates and affiliates.

In our own case we developed an affiliates program. These participated in CRC projects usually as partners in the research process and technology training. They had particular influence in the interpretation of progress and in steering research in new directions. Furthermore, these industry parties developed a new relationship with researchers especially in seeking information that contributed to their own goals. This often stimulated them to sponsor new R&D that best dealt with their aspirations for innovation.

Our market research has shown that branding our communications with partners enhances our credibility and as well as improves knowledge transfer objectives.

There are some critical components to success:

- the users must be involved and committed at an early stage, preferably at the start of the R&D process and in monitoring and reviewing progress even though it may be a minor role at that stage.
- the input from the users at all stages needs to be acted on. As well as improving the research outcome, it undoubtedly ensures a willingness to own and benefit from the new knowledge.
- the acceptance by the researchers of the users as team members throughout the process. They must not be seen as outsiders, a hindrance, time losers and a diverter of funds away from research.
- some training in team and interpersonal relations and project management and problem solving is desired (see importance placed in marketing of science and technology to industry).
- the process must be led and managed well as bad experiences have a marked negative effect on future cooperation.

Our experience showed that the best commitment from scientists came as a result of going through a full communication cycle successfully. Not surprisingly, experience sells itself best and overcomes negative attitudes and false expectations.

The CRC Program Evaluation Committee (1995) cited the University of Melbourne comments as follows: "The shift in culture and the new spirit of cooperation with industry and the CSIRO catalysed by the CRC philosophy cannot be overstated. The CRC program has enabled universities not only to embrace collaboration with industry, government agencies and other public and private research organisations in a manner (in terms of both scale and ease) that was not possible prior to 1990, but also to collaborate less reservedly and more productively with other universities"

Mercer and Stocker (1998) concluded, "one of the most important benefits of the Program is already evident in the changed attitudes and perspectives in industry and research organisations". They concluded that commercialisation can be improved by increasing user involvement in CRCs and that core funding encourages collaboration in a CRC and forms the glue that unites participants into innovation.

Client and stakeholder collaboration has clearly been one of the key successes of CRCs.

Training

There is nothing new about the need for appropriate tailored skilling of people, and CRCs are no different in this respect.
Table 1 provides selected data from a Training Needs Analysis (1997) conducted by the CRC Association.

Three hundred and fifty three people from amongst students, researchers, managers and executive from 32 CRCs responded to a survey. Whilst the survey examined technical and science related needs not reported here, the data presented indicates the significant importance placed on communications related training. This was particularly sought by postgraduate students and newly recruited scientists and strongly supported by managers and executives.

	Post graduate students		Researchers		Managers		Executives	
Marketing science & technology to industry		(69%)	53%	(73%)	65%	(76%)	51%	(78%)
Presentation skills	73%	(65%)				(72%)		(64%)
Writing for science & other	78%	(65%)		(59%)	56%	(71%)		
Dealing with media		(65%)		(62%)		(71%)		
Public speaking & presentation	73%	(65%)				(70%)		

Table 1. Selected positive responses expressed as a % from each of 4 groups responding to their owned perceived needs (or their perceived needs for of the CRC).

Individual students indicated a strong interest in areas associated with communication. Researchers recognised these needs for the CRC but put less significance on communication for themselves. Managers have high expectations of their CRC. Researchers, managers and executives included managing people with divided loyalties highly for CRCs (63%, 71% and 67% respectively). This culture has flowed on to some extent to the partner R&D organisations.

Public owned communication of science

In line with the training initiatives, some of the most successful S&T communications have been the community driven and managed initiatives. Some examples include ’Water Watch", "Frog Watch", "Salt Watch", " Landcare". Another example of scientists taking their research into the commercial or public arena. is given by Rohrsheim, Wilhelm and Auhl (1997) who reflect on an example of a collaborative venture ’where the interests of the scientists are met equally by the interests of the farmers.’ The outcome of the R&D was immediate acceptance by the end user because of their participation. The strength is in the program, which starts from the level of knowledge of the user, adds to it in their frame of reference, and in their environment. The role of the science communicator is to work at the level the client/consumer/farmer and add quality knowledge to their base and level of comprehension, bit by bit, toward an agreed goal. The advantages of this approach are in the levels of motivation, satisfaction, commitment and action. There is usually a lasting result.

There are also some substantial benefits to scientists. They become better informed of client issues and needs and are better able to respond to priorities and adjust their research to meet knowledge needs. Their communications count in a world in which the channels are clogged with information overload

This approach also does away with the ‘we and they’ view and the popular perception that scientists are obscure personalities wearing laboratory coats and glaring at test tubes - not a position that is aspired to!

Further evidence of success of client participation has come from an impact assessment of the Cooperative Research Centre for Soil & Land Management, EconSearch Pty Ltd (1998) reported that 99% of respondents indicated that the performance in the area of education and training was excellent, very good or satisfactory

Conclusion

Our experience with CRCs over seven years has shown a major shift in culture that better encompasses effective communication and information transfer. A market driven strategy now predominates with a focus on the client in an equal experiential learning environment. S&T communication now better uses social skills in which the scientists engage in a mutual and sharing process in partnerships and relationships for new shared visions. It is a multidisciplinary team approach with clients included, and communication plans an essential component.

Importantly, science communication is not left as an add-on after the science has been done!

Better practice in communication in CRCs incorporate

- a new R&D institutional culture
- communication plans as an integral component of R&D
- multidisciplinary teams
- a client centred and marketing approach
- scientist training in a range of communications skills
- client participation
- impact assessments

In public good CRCs, communication strategies using community groups and full use of credible industry champions to promote S&T has been rewarding. The focus is now more on people and the way in which their lives are affected by science rather than on the science itself.

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