Review on the Evaluation Frameworks of Non-academic Impact of Scientific Research

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Abstract. Assessing the academic impact of scientific research had made great achievement, but non-academic impact had been neglected for long time in China. This paper used documentary research to analyze representative evaluation frameworks and then summarize the corresponding relation between different evaluation frameworks and their guiding theories. This paper believed that people need to analyze the different conditions when using them because of different frameworks with different background. At last this paper advocated the non-academic impact of research should be paid attention to knowledge consumers from the wider social class, not only to decision makers. It was also well worth studying the timing of non-academic impact of research.

1 Introduction

The research findings can be recognized and used that was the only way to realize the value of scientific research. They can be recognized by academic peers which we called peer review (academic impact), or by the public by the way of social applications which we called non-academic impact. The former had been concerned, while the latter had been neglected for a long time.

What did non-academic impact mean? In short it meant all kinds of impact beyond the academic circle, including political, cultural, economic, environmental and social impact, and so on. There were many similar names such as “societal impact of research”, “usefulness of research”, “public values”, “knowledge transfer”, “societal relevance”, and so on. We defined it as social contributions beyond academic contributions. It was social utility in essence. That was to say that research played a role in promoting or hindering social development. From that aspect, we thought that its impact may be good or bad. From the literature and practice cases we can see that the non-academic impact of scientific research sometimes referring to the policy impact--the transformation of knowledge into policy.

2 The typical evaluation framework of non-academic impact and its application

It was most difficult to measure and evaluate non-academic impact of scientific research. There have been many models and frameworks to try to solve this problem, but so far there had been no absolute answer.

We would introduce and analyze several representative evaluation frameworks below.

2.1 The payback framework

U.S. non-profit research group Rand Corporation used payback framework to evaluate political and social impact of FoW (the Future of Work Programme) being funded by ESRC (Economic and Social Research Council). This framework divided the impact of scientific research into five parts: knowledge contribution, impact on future research, policy impact, social and economic impact. And also divided non-academic impact of scientific research into five parts: policy impact, potential policy impact, practice impact, potential practice impact and the impact on researchers' career promotion. It thought knowledge playing a role in changing potential users' inner cognition was sometimes soon and sometimes slow. Therefore it was very important to identify its time span.

Table 1. Impact classification of science research

Impact of scientific research	Knowledge contribution
	Impact on future research
	Policy impact
	Social impact
	Economic impact
Non-academic impact of scientific research	Policy impact
	Potential policy impact
	Practice impact
	Potential practice impact
	The impact on researchers' career promotion

Through questionnaire, interview and case analysis, this report drew some valuable conclusions:

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- Policy environment played a decisive role in non-academic impact.

- The media played a supporting role in non-academic impact.

- Lack of application record mechanism led to track the non-academic impact more difficult.

- In general, research projects rarely caused radical policy change, usually playing a role in waving of public opinion or leading policy fine-tuning.

Payback framework used the forward-tracking method to evaluate the non-academic impact, and had some limitations:

- It was not convincing to evaluate the overall impact of a plan which included many projects by sampling. Because different projects had different ways to play their role in policy and society, there was a unified and same pattern.

- The framework was a linear evaluation model which focused on outcome evaluation, but the process of research impact was much more complex than it in reality.

- It ignored the environment of research, the evaluation conclusions may be effective in some condition, but in another condition was not.

This framework provided a set of practical and operable indicators for evaluating non-academic impact of scientific research, and was widely used in social science.

2.2 ESRC framework

This framework was used to track and assess the non-academic impact of an AIDS project funded by ESRC. It divided assessment elements into three types: research outputs, diffusion channels and impacts.

Table 2. Three types of the elements in ESRC framework

Research outputs	The codified knowledge being used to record new skills, new methodologies and new tools, or conceptual descriptions.
Diffusion channels	The channels by which research was transferred, such as the media, publication, networks.
Impacts	The ways in which non-academic users used the research outputs, for example helping users directly or indirectly solve the production or life problems, change the users' awareness and judgment.

This framework was not linear. It took into account the sequential and simultaneous impacts.

2.3 Approach to measure the impacts of medical research on decision making

Lavis et al. examined and analyzed eight cases from Ontario and Saskatchewan in Canada (four health research programs in each province). They found the key informants for each program according to clues provided by program managers and users. They asked

these informants to describe whether health research played a role in decision making, and what were the processes and conditions. They built a framework of impact assessment by investigation. This framework mainly evaluated the impact of health research on decision making, not the societal changes. Users were identified and the impact measures were divided into three categories:

- Producer (researcher)–push measures

- User (decision maker, the public, patients, clinician, manager, development officer, and so on)–pull measures

- Exchange measures, joint effort by both groups to solve the problem.

Within each of these categories can be grouped according to the process, the intermediate outputs and the full outputs.

Lavis et al. advocated the receptor mechanism to drive the communication between producers and users. The decision makers need to establish accountability mechanisms for the practical application of projects, not only focus on the citation. If people only evaluated the immediate and direct impacts and ignored the potential and indirect impacts, the important value of research may be covered up, missing the best opportunity to use research results.

2.4 CHASS framework

This framework was developed by Council for the Humanities, Arts & Social Science (CHASS) for evaluating research projects funded by CHASS, including the quality, impact and final goals. It consisted of four parts:

Part one: sources of funding, mainly referring to the project sponsor, including private and public funding.

Part two: research process. These problems need to be answered as followed: who it was done by? where it was done?

Part three: the outputs of the research, including the publication channels such as the media, the media or the internet.

Part four: the outcomes of research, mainly societal benefits.

CHASS was developed on the basis of Payback Model. It took two-communities theory as a guide and thought that there was a significant difference in the values, the preference of knowledge dissemination between researchers and decision makers. So the evaluation was done according to the source of the project, the research process and the outputs, which directly or indirectly reflected and decided the communication between the two groups.

2.5 IDRC framework

Lindquist believed that people should have a realistic anticipation about the potential impact of the projects funded by International Development Research Center (IDRC). The public institutions supported the policy consultation not only for the direct and obvious impacts but also for promoting the negotiation and dialogue among related parties and sharing some good ideas. In fact most ideas and even innovations were not directly transferred into policies, and a few may even be eliminated for various kinds of reasons. Therefore it need classify and identify all kinds of impacts. Lindquist divided the policy influence into nine types (see Table3).

Table 3. Three types of policy impacts of research in IDRC framework

Expanding policy capacities	Increasing the knowledge/data storage of actors
	Opening up ideas of decision makers

Broadening policy horizons	Promoting the ideological communication
	Training research and analysis talents
	Building a communication network
	Proposing new ideas and new concepts that put on the political agenda, and arousing the public debate
	Helping researchers and participants forming a better understanding of the problem
Affecting policy regimes	Promoting calm dialogue among policy makers
	Causing the revision of the existing policy and planning
	Reversing the existing planning or policy and redesigning it

IDRC framework summarized the problems of evaluation into three sets: the policy problems, the objectives and expectations and key outputs and events (see Fig. 1).

Fig. 1. IDRC strategic evaluation framework

2.6 The survey of knowledge transfer in CSCI research groups

INGENIO (CSCI-UPV, the Polytechnic University of Valencia) launched a survey and further evaluated knowledge transfer in CSCI research groups. They

summarized the ways of knowledge transfer in social science including the media (TV, radio, newspaper and magazines). Close collaboration with company, country's public sector, foundation, NGO was another way to promote knowledge transfer. The mechanism of knowledge transfer was summarized five types (see Table4).

Table 4. Ways and mechanism of knowledge transfer in social science

Ways of knowledge transfer in social science	The media (TV, radio, newspaper and magazines)
	Collaboration with company, country's public sector, foundation, NGO
Knowledge transfer mechanism in social science	Technical consultation
	Cooperation contract
	Research result exchange among individuals
	Training
	Intellectual property

It was found that, unlike natural science, intellectual property was not a main tool to transfer knowledge for social science. Informal exchange and cooperation was a more common than it.

The survey paid special attention to the potential users and beneficiaries. But the results showed the communication between researchers and potential users was disappointing, and some researchers even didn't know who their users were. The main reason may not lie in users (such as the differences of their education and occupation), but the research was not sufficiently disseminated by CSCI. Academic papers were most important indicator of career promotion in CSCI, but knowledge transfer was realized mainly through some commercial activities such as R&D contracts, patents, licenses and derivatives, which were appropriate criteria in natural science but not appropriate in social science.

3 The guiding theories of evaluation frameworks

3.1 The guiding theories

Many theories and models were put forth when scholars analyzed knowledge transfer and non-academic impact of research. On the basis of knowledge flow between researchers and users, this paper summarize a logical system for it (see Table5).

Table 5. The model system of research utilization

First categories	Second categories	Third categories	Presenters
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Linear model	Research-driven models	Knowledge-driven model	Weiss
		Engineering model	B. Wittrock
		Expert politics model	B. Wittrock
		The embedded research model	Walter
		The two-communities theory	Caplan
	Demand-pull models	Policy-driven model	B. Wittrock
		Problem-driven model	Weiss
		Political model	Weiss
		Tactical model	Weiss
		Instrumental model	Lavis
		Conceptual model	Lavis
		Evidence-based decision model	Rand
		The two-communities theory	Caplan
		The ladder of research utilization	Knott, Wildavsky
	Non-linear model	Interactiv e model	
		The organizational excellence model	Davies
		Collaborative approach/linkage and exchange	Kogan, Henkel
		Enlightenment model	Weiss
		The symbolic model	Lavis

The frameworks in the second chapter were summarized by research practice on basis of these models and theories. Table6 summarized the guiding theories of these frameworks.

Table6. Evaluation frameworks and their guiding theories

Frameworks	The guiding theories	Areas of application
Payback framework	The Two-communities theory	Economics/social science
CHASS framework	The Two-communities theory	Humanities and social science
ESRC framework	Enlightenment model	Economics/social science
Approach to measure the	Collaborative approach/linkage	Health

impacts of medical research on decision making	e and exchange	
IDRC framework	Enlightenment model	All areas
CSCI knowledge transfer survey	Knowledge transfer theory	Humanities and social science

3.2 Characteristics analysis

Through the review of evaluation framework, we found that:

(1) The research of non-academic impact was not a new direction without any progress, and it had achieved a lot in the aspects of theories and frameworks.

(2) An evaluation framework was often designed for a specific organization or even for a project to satisfy users' demands in line with the objective conditions at that time. Therefore there was no uniform framework to be generally applicable to all problems of non-academic impact. When we assessed non-academic impacts of research we should design a case-by-case framework according to its concrete realities and conditions in order to the objectivity and accuracy of results.

(3) These frameworks abstracted the "influence" into "process". These frameworks evaluated the non-impact of research mainly based on the project process and time sequence.

4 Conclusions

The non-academic impact of research was paid more and more attention with social development. These frameworks broke through narrow understanding about "impact". The non-impact of research included not only the policy impact but also social, economic, cultural and environmental impact. Through a comprehensive study, we believed there were following aspects worth thinking:

(1) The non-academic impact of research would be a long-term and top topic for a long time. The topic on non-academic impact of research remained largely ignored until a so-called New Social Compact carrying over to social science. With the emergence of these concepts such as new public administration, new public management, decision consultation, think tank and so on, and with the change of assessment of publicly funded research from academic value evaluation to practical value evaluation, the non-

academic impact of research would be a long-term topic.

(2) The studies on non-academic impact often paid more attention to producers rather than users. How can users discover these projects and get new information and absorb new knowledge from them, and what was the result? Those questions need we thoroughly ponder and research. The "policy narrative" theory of Roe was just a start.

(3) The studies on non-academic impact paid more attention to the transfer between knowledge and policy, and paid more attention to policymakers' demand. That showed research was a strongly utilitarian. The users of the publicly funded projects were not only policymakers, but also people of all walks of life who can also spread knowledge and had an influence on policy through various channels. So the future research should also pay attention to the different users' demand and the evaluation criteria should be more pluralistic.

(4) The research of time law on non-academic impact. Garfield believed that paper cited peak time often was two years. Enlightened by Garfield's cited peak time theory and Bernal's half-life of literature, We also asked whether non-academic impact of research was time limited. We thought there can be no doubt about the answer, because research was carried out in a certain environment, and non-academic impact must be environmentally sensitive. The social value of some basic research may have emerged three or five years later. It was important for researchers to have the patience to wait for an appropriate occasion. However, the non-academic impact of the research for hot spots of society was more time-limited. It was well worth studying the timing of non-academic impact.

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