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Abstract

The dominant mode of knowledge production in the field of management is in terms of Gibbons et al. (1994) mode 1. However, this tends to lead to research products of limited relevance outside academia. In order to increase this external relevance I propose to use more mode 2 knowledge production. I describe the nature of this mode of knowledge production for the field of management and subsequently its research products, viz. tested and grounded technological rules.

1. Introduction

In the old days the field of management was a practice-based craft. Business schools and Grand Ecoles employed experienced managers to teach their students what they had learned in their long and successful careers. Priority was given to professional training and the literature was dominated by grand old men with a strong background in business, like Taylor, Fayol and Barnard. However, after the influential Ford and Carnegie Foundation reports (Gordon and Howell, 1959; Pierson and Others, 1959), a process of “scientization” started, ultimately transforming the field into a solid research-based academic discipline, both in the United States and in Europe.

This transformation process could have followed the examples of Medicine and Engineering, whose stunning successes since the 19th century are based on the application of the research products and of the research and testing methods of the natural sciences. Those disciplines did not try to emulate Physics, but translated its products and approaches to their own needs. Professional training remains the core mission of Medical and Engineering Schools; the training of researchers is largely seen as secondary.

But, the “scientization process” of the Business Schools did not follow the example of Medicine or Engineering, but rather the example of Social Sciences like Economy, Sociology and Psychology. At that time those disciplines did regard Physics more or less as the example to follow and tried to achieve a similar academic respectability by trying to discover economic and social laws. Their mission in teaching was – and remains largely so – to train researchers, not
professionals. Accordingly, the academic research in these disciplines was and is very much description-driven (like Physics, whose core mission in education is also the training of researchers).

By and large the mission in teaching of Business Schools is, or should be, professional training as the great majority of their students aspire a career in business. But academic research in business schools tends to be description-driven rather than prescription-driven as prescriptions have in this field a low academic respectability. This leads, as we will see, to research products of only limited relevance outside academia and thus also of limited relevance for Business School students.

Research strategies can be described in terms of mode 1 or mode 2 knowledge production (Gibbons et al., 1994). Mode 1 knowledge production is executed within universities and is dominated by an academic agenda with little interest in application, while mode 2 is done in intensive interaction with application and is driven by a broad range of interests. As I will discuss below, the research strategies in the field of management can largely be characterized as mode 1 knowledge production, the resulting research products having limited external relevance. I will propose to make more use of research strategies of mode 2 in order to increase the external relevance of research products. I will discuss the nature of such a mode 2 knowledge production in this field and the nature of the resulting research products, which will often be “tested and grounded technological rules”.

2. The external relevance problem

Present academic management research does produce by and large valid research products. These are relevant, as they contribute to academic understanding of the world of management and organization and to the academic debate and they enhance the position of the researchers in question in the academic reputation system. My problem is not with this internal relevance, but with its relevance outside academia.

Already in 1982 Beyer and Trice remarked, “Recently (...) scholars have expressed concern about why organizational research is not more widely used (Beyer and Trice, 1982, p.591). Thomas and Tymon (1982) cite an impressive list of criticisms with respect to the relevance of academic organizational research, while, according to a survey at that time, academics considered only some 20% of well-established academic organizational theories as having a better than questionable usefulness (Miner, 1984). A major reason for Daft and Lewin to launch a new academic journal, *Organization Science*, was their dissatisfaction with the external relevance of received academic organizational theories (Daft and Lewin, 1990). Somewhat later Hambrick, at that time President of the American Academy of Management, bemoaned the Academy’s limited impact on the world of organization and business (Hambrick, 1994). Some may have given up their ambitions with respect to external relevance. Until 1999 the Academy of Management Review, one of the leading academic journals in the field, aimed, according to its instructions to contributors, to publish articles that “advance the science and practice of management” (my italics). Nowadays it has dropped the “and practice” and confines itself tellingly to “understanding”. Others, however, still keep such ambitions, see e.g. Tranfield and Starkey (1998).

A key reason for the limited external relevance of academic management literature is, in my opinion, that it is largely description-driven. Prescriptions have in the field of management in general a low academic respectability. One reason is that prescriptions tend to be equated with the recommendations given in non-academic management literature (the so-called “Heathrow-
literature” (Burrell, 1989) or, more kindly, Literature or Principles, Whitley, 1988). This type of literature tends to have a generalization problem (based only the writers’ own experience), or a justification problem (being weak in providing evidence on the effects of the proposed actions). At the same time this type of literature is widely read by practising managers. Valid and relevant academic management literature should be a powerful competitor for this type of literature.

A second reason for the limited interest in prescriptions is the idea that the mission of all academic research should be – like in Physics – the classical trinity of description, explanation and prediction (see e.g. Nagel, 1979; Emory, 1985). Or even more limited in the words of Seth and Zinkhan (1991, p.35): “the essence of science is explanation by law”, thus forcing research results into overly reductionistic quantitative form. These approaches are quite different from the more prescription-driven views in the field of Medicine and Engineering (which I have called elsewhere “design sciences” - as opposed to “explanatory sciences” like Physics and Sociology – because their core mission is to develop valid knowledge to be used in designing solutions to problems, see Van Aken, 2001).

This is not to say that description-driven management research has no external relevance. Practitioners can make conceptual use of its research products, i.e. use them for general enlightenment of the issue in question. However, one can improve on the external relevance of academic research products by aiming at the more ambitious objective of instrumental use, i.e. use in more specific and direct ways, i.e. as prescriptions (the distinction of conceptual versus instrumental use of research products is due to Pelz, 1978).

Valid prescriptions have by their very nature more relevance for practitioners than descriptions. Description-driven research is problem-focused, rather than solution-focused. The idea may be that general enlightenment and understanding of the problem at hand makes its solution trivial. However, although understanding the problem is important, it is only halfway to solving it. The second step is to develop (alternative) solutions. Understanding the sources of resistance to certain organizational changes, still leaves undone the task of developing sound change programmes. Understanding the reasons for delays in New Product Development still leaves undone the task of developing effective product development systems. Understanding the changes on certain markets, still leaves undone the task of developing successful strategies. So, in order to solve the external relevance problem, academic management research should complement description-driven research with prescription-driven research in order to develop research products which can be used in designing solutions for managerial problems. By this I do not mean the actual application of scientific knowledge to solve a specific problem, which is the domain of practitioners, but the development of valid knowledge which can be used in designing solutions for a class of managerial problems.

3. Mode 1 and mode 2 knowledge production

As mentioned in the introduction, research strategies can be described in terms of mode 1 or mode 2 knowledge production (Gibbons et al., 1994). Mode 1 knowledge production is dominated by an academic agenda, is largely executed inside academia, is focused on analysis and on “fundamental knowledge” (as opposed to “applied knowledge”), has a preference for mono-disciplinarity and its products are primarily shared with fellow researchers. Further dissemination occurs downstream of knowledge production and there is little interest in the exploitation of such knowledge by practitioners.

Quality control, usually in the form of peer review, plays a crucial role in mode 1 knowledge production. It does so not only by selecting the research products that are allowed to reach the
academic forum, but also by exerting through its jurisprudence an all pervading influence on the research questions asked and especially on the research methods used. It is this quality control that creates Kuhn’s (1962) normal science.

In contrast, mode 2 knowledge production is solution-focused, oriented not only on analyses of problems but also on designing solutions. It is often trans-disciplinary in nature, and “characterized by a constant flow back and forth between the fundamental and the applied, between the theoretical and the practical” (Gibbons et al., 1994, p.19). It can be regarded as following Starbuck and Nyström’s (1981) adage, “if you want to understand a system, try to change it”. In this mode knowledge is produced in the context of application and there is a strong interplay between the tacit knowledge of the practitioners involved and the activities of researchers to produce codified knowledge.

Where quality control in mode 1 knowledge production can be seen as supporting a quest for truth, quality control in mode 2 knowledge production may be seen as supporting a quest for human performance. Interestingly, Gibbons et al. (1994) seem to make no distinction between producing specific knowledge to solve a specific problem and general knowledge to solve a class of similar problems. Or, in the terms I’ll use below, they seem not to make a distinction between the regulative and the reflective cycle.

4. Mode 1 knowledge production in the field of management.

In the field of management knowledge production by academic research can largely be characterized as mode 1. Case-study based research and qualitative theory building is becoming more and more accepted, but the dominant research strategies are still survey-based, especially for research aiming for the leading academic journals and for research executed by junior researchers, driven by their supervisors to do surveys in order to learn the handiwork of their craft. Survey-based research tends to have limited interaction with practitioners, is dominated by the academic agenda and is done predominantly within academic institutions. Subsequently the research results are primarily shared with fellow researchers at academic conferences and through academic journals. Hambrick mentions a need to “open up the incestuous, closed loop of the (American, JvA) Academy’s conferences” (Hambrick, 1994, p.13). The conferences of the Strategic Management Society are somewhat less “incestuous”, as usually one or two successful top managers are allowed to deliver plenary speeches and some consultants mix with the majority of academics. However, such is the power of the academic mode 1 quality control that little of this reaches the (academically top ranking) Strategic Management Journal.

If the survey is the dominant research strategy of mode 1 knowledge production, the causal model is the typical research product. The causal model explains, preferably in quantitative terms, the behaviour of one or more dependent variables in terms of the behaviour of a number of independent ones. It is developed to support the understanding of the problem at hand. As discussed, this still leaves the task undone to develop alternative solutions for those problems. But in mode 1 knowledge production, the managerial implications of research results are more or less treated as an afterthought. Typically they take at best only one or two of the last pages of an academic article.
5. Tested and grounded technological rules.

As said, mode 1 knowledge production tends to be description-driven and is problem-focused rather than solution-focused, more interested in analysis than in design. Mode 2 knowledge production, with its intensive interaction between knowledge production and application is much more solution-focused, design-oriented, much more prescription-driven.

Prescriptions generally follow the logic of “if you want to achieve Y in situation Z, then perform action X”. There are algorithmic prescriptions which operate like a recipe and which typically have a quantitative format. And there are heuristic prescriptions, following the logic of “If you want to achieve Y in situation 2, then do something like action X”. This formulation means that the prescription is not to be used as a recipe but as a design exemplar. It is a general prescription which still has to be translated to the specific problem at hand. In solving that problem the practitioner has to design a specific variant of that design exemplar.

In management an example of an algorithmic technologic rule is the well-known Economic Order Quantity formula: if you want to minimize inventory and ordering costs for a given item with a given demand level and given costs of holding inventory and of ordering, then use this formula to calculate the optimal order quantity (see e.g. Slack et al., 1995). An example of a heuristic technological rule is “If you want to manage the operating core of a professional organization, then use standardization of skills” (Mintzberg, 1979).

Prescriptions can be called in terms of Bunge’s (1967) philosophy of technology technological rules. A technological rule is “an instruction to perform a limited number of acts in a given order and with a given aim” (Bunge, 1967, p. 132). Bunge (1967) also introduced a specific subset of technological rules, i.e. the tested and grounded technological rules, rules the effects of which have been tested within their intended context and have been explained by grounding them on natural laws.

In the field of management the testing of the effects of algorithmic technological rules can lead to conclusive proof. However, the indeterminate nature of heuristic rules, and in management technological rules will often be heuristic, however, makes it impossible to get conclusive proof. In this case testing will ultimately lead to “saturated supporting evidence” (Eisenhardt, 1989).

Grounding of technological rules in the field of management cannot be done with the help of natural laws and probably neither with the help of the “laws of business”. In this field grounding can be done with the help of generative mechanisms. This concept is taken from Pawson and Tilly (1997), discussing evaluation research of social programmes. Their approach to such evaluation research is not to try to answer the (rather uninformative) question of “does it work or not”. Instead they try to find the mechanisms that make it work in order to (re)design the programme to its maximum effect.

Such generative mechanisms can both be of a material and an immaterial nature, in the latter case based on managerial cognitive processes (Ilgen and Klein, 1988). An example in management of an generative mechanism of a material nature can be found in Goldratt’s Theory-of-Constrains (Goldrath and Cox, 1986). The rule is that in managing the throughput of a factory, one should focus on optimising the use of the constraining capacity group. The generative mechanism behind that rule is that it is this group that determines the overall output of the factory. An example of a more immaterial generative mechanism can be found in Tichy’s TPC-model. One rule is that, if a given organizational change hurts real interests of a certain subgroup, one should use political interventions rather than technical or cultural ones. The generative mechanism is that technical, i.e. content-oriented interventions will demonstrate ever more clearly to that subgroup that its interests are hurt, which will not help to overcome their resistance to that change, that cultural interventions, i.e. inviting participation, will give them the
opportunity to organise coalitions against the change, while political, i.e. power interventions may be accepted, among other things because they can be accepted as being the duty of top management to act in the interests of the organization as a whole.

Actual application of a technological rule means that it is used in managerial problem-solving. In general the practitioner uses for this the problem-solving cycle, also called the *regulative cycle* (van Strien, 1997), consisting roughly of: defining the problem out of its “messy” context (Schön’s, 1983, “naming and framing”), planning the intervention (diagnosis, design of alternative solutions, selection of solution), applying the intervention and evaluating.

The technological rule is used in the planning phase. If it is a heuristic one, the practitioner has to design a specific variant of the rule for his or her specific situation, he or she has to translate from the general to the specific. That needs a deep understanding of the nature of the rule, of the generative mechanisms that make it work and of its dependence on context. Hence one needs “thick” descriptions (Geertz, 1973) and the rich evidence obtained from field testing. Generally, application of a technical rule needs quite some tacit knowledge from the practitioner as rule, grounding mechanisms and evidence still tend not to provide a complete understanding of problem and situation.

Understandably, prescriptions as found in “Heathrow-literature” have a low academic respectability, while simple recipes are academically uninteresting. However, like in Medicine and Engineering, tested and grounded technological rules can be valid and respectable research products of academic management research, which can at the same time have significant external relevance.

6. **Mode 2 knowledge production in the field of management.**

The technological rule prescribes a (series) of interventions. In general the effects of such interventions are strongly context-dependent. In Engineering this context-dependence is generally much less, or can be calculated or simulated. So in this field technological rules often can be developed and tested under closed-system-conditions, i.e. in the laboratory. In Medicine the context-dependence of interventions often is much more complex, so one develops and tests technological rules under open-system-conditions, i.e. through clinical research, as an essential complement to laboratory research on e.g. cells or rats. Likewise, in the field of management one has to develop and test technological rules under open-system-conditions, i.e. in the context of their intended application.

The typical research strategy for developing heuristic technological rules is the multiple case-study (see Eisenhardt, 1989 and 1991, and Parkhe, 1993, on the power of the multiple case-study). One mode of this is the developing multiple case-study: a series of problems of the same class is solved, e.g. developing an approach for reorganizing the shop floor in small industrial companies (Verweij, 1997), or developing a method for diagnosing and managing the risks of large product innovation projects (Halman, 1994; Keizer, Halman and Song, 2001).

In each case improvements in organization, or in operational processes, or in management processes are designed and implemented using the regulative cycle, discussed above. Design knowledge is built up through the reflective cycle (Van Aken, 1994, 2001): a case is solved, one reflects on the lessons learnt, uses those lessons in the next case, reflects again, and so on. The “rules”, i.e. ideas on how to tackle this type of problems in general, are developed during this cycle through analytic induction (Manning, 1982; Hammersley and Atkinson, 1995; Johnson, 1998). The term “induction” refers “to the processes by which observers reflect upon their
experience of social phenomena and then attempt to formulate explanations that may be used to form an abstract rule, or guiding principle, which can be extrapolated to explain and predict new or similar experiences” (Kolb et al, 1979). This formulation, although developed for description-driven research, is also valid for the design of technological rules. The thus designed rules are subsequently tested and further refined during the following cases.

Furthermore, on the basis of cross-case analyses hypotheses are developed on the relevant generative mechanisms and these hypotheses are also tested through further cross-case analyses. Successes as well as failures (or less-successful cases) are interesting, as one wants to know both the driving and the blocking generative mechanisms behind the rules. This leads to a set of indications and contra-indications for the use of the rules.

Both the induction of technological rules and especially of generative mechanisms can, of course, also use the research products of prior description-driven mode 1 knowledge production. Although one may use existing theoretical frameworks as well, one often will choose rather a grounded-theory-like approach (Glaser and Strauss, 1967; Partington, 2000). A theoretical framework can guide data-collection and data-analysis, but has the drawback that it may blind the researcher for important aspects of the cases outside that framework.

Each set of rules has a certain intended application domain (as can be seen in the examples given above). Cases are selected through “theoretical sampling” (Glaser and Strauss, 1967, p 184) on the basis of an analysis of that intended application domain. Using general knowledge, prior research or explorative research in the first phase of the multiple case-study, one tries to establish the variables on which the performance of the rules to be developed may depend (e.g. size and age of the company, type of business, type of technology, degree of bureaucratization, etc.). The cases should then cover as good as possible the whole spectrum of variation within the intended application domain.

After testing and refining of the rules by the researchers themselves, one should have a phase of “β-testing”, i.e. testing of the rules by third parties (this term is borrowed from software development, see e.g. Dolan and Matthews, 1993; testing by the developers of the rules themselves is called α-testing). This explicit α- and β-testing of research recommendations is a key difference between mode 2 knowledge production and the formulation of management implications after the results of description-driven mode 1 knowledge production have been obtained.

β-testing can be seen as a kind of replication research (Tsang and Kwan, 1999), but, because of its solution-focus, it has maybe more in common with evaluation research of social programmes (see, e.g. Cook and Campell, 1979; Guba and Lincoln, 1989 and especially Pawson and Tilly, 1997).

Next to the above-described developing multiple case-study, in which the researchers develop the rules themselves, one can also have the extracting multiple case-study, in which researchers do case-studies in order to extract best practices. An example is the extraction of best practices in the field of marketing with respect to product feature management (Thoelke, 1998). Like the recommendations of the “Heathrow-literature”, best-practice-research has a low status in academic circles, as it tends to result in just recipes: “become a world-class manufacturer in seven easy steps”. However, if aimed at tested and grounded technological rules, the extracting multiple case-study should also be an acceptable research strategy, even for top ranking academic journals.

The developing and extracting multiple case-studies have much in common with action research (see e.g. Argyris, Putnam and McClain Smith, 1985; Karlsen, 1991), in which the researcher
collaborates with a client system to diagnose and solve a specific problem of that client system. The emphasis may be different, however. Much action research focuses on the uniqueness of the case. It then has a kind of ethnographic orientation: the case is interesting in itself, like it is interesting to learn about the culture of certain groups of adolescents in Boston (Whyte, 1943). However, in the multiple case-study discussed here, the emphasis is on generalizability: what can we learn from these cases for other contexts?

Mode 2 knowledge production in management will tend to use qualitative research strategies. This should be seen as an instrumental choice, based on the nature of research questions and intended research products. It is not a paradigmatic choice, e.g. a choice for an interpretative paradigm or a post-modernistic paradigm, because the problem- and solution-focus of mode 2 knowledge production makes a paradigmatic straitjacket unattractive. So one will try to work with multiple paradigms (Schulz and Hatch, 1991; Lewis and Grimes, 1999) and to operate as a “bricoleur” (Derzin and Lincoln, 1998, p.3), i.e. assembling a research design on the basis of a variety of methods.

Researchers regarding the qualitative-quantitative choice as purely instrumental, tend to see qualitative methods as just a type of data collection and qualitative data as just a type of evidence. However, qualitative methods also produce a certain type of research products. As discussed above, heuristic rules and their evidence should be given as “thick” descriptions, more emic than etic (Pike, 1967; Morris et al., 1999) in order to enable practitioners to translate them to their specific cases.

7. Conclusion

The dominant mode of knowledge production in academic management research is the description-driven mode 1. The thesis of this article is not that the prescription-driven mode 2 knowledge production, as discussed above, is new. As the examples cited show, it is already done. The thesis is that one should do more prescription-driven, design-oriented mode 2 research to complement the description-driven, analysis oriented mode 1 research, and that in Business Schools, having the educational mission of training professionals, mode 2 knowledge production should get a similar academic respectability as the more traditional mode 1.

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