

## **Scientific maturity of purchasing management research**

a rapidly growing puppy that still has to learn some manners

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### **Abstract**

The field of purchasing management (PM) is still young. In this paper we investigate the status of PM research by looking at the historical development of other research fields that have already matured. For this investigation we categorise scientific research as (1) either deductive (theoretical) or inductive (empirical) and (2) either quantitative (formal) or qualitative. It appears that all mature management research fields include both types of research. Furthermore, we find that in PM the focus has mainly been on empirical research and some qualitative deductive research until now. We conclude that in PM research there is a lack of attention for quantitative deductive research.

**Keywords:** purchasing management research, philosophy of science

## **1. Introduction**

Purchasing management (PM) is not a new research field, but still relatively young compared to established scientific fields.

In this paper we investigate the question what the current scientific status of PM research is. Furthermore, if the status of PM is still immature, what changes in research directions could be considered for improving the status? We try to position PM research by looking for similarities in the way established research fields have developed over history.

In the next section we consider what ingredients are necessary for research to be scientific. We start off with some philosophical points of view in this matter. After that we focus on three specific components of scientific research: (1) structure of scientific communities, (2) empirical research and (3) deductive research. In section 6 we zoom in on the status of management research and two subfields in particular: operations management and marketing. With this background we will be able to describe the status of PM research in section 7, followed by the conclusions in section 8.

## **2. What is scientific research?**

The goal of scientific research is to provide scientific knowledge about the world in which we live. What scientific knowledge is and what the proper method for gaining this knowledge is, is subject to debate. These two questions form the focus for the philosophy of science. A contemporary overview of the main streams in this debate is given below (see Chalmers, 1978; Keys, 1991).

Nowadays the most common view on what scientific knowledge is and how it can be obtained is still based on *inductivism*. Already Aristotle propagated this view and it became especially popular with scientists like Galileo and Newton during the Scientific Revolution in the seventeenth century. According to inductivism all science starts with observation. With sufficient empirical evidence generalised statements such as laws and theories can be induced. These theories enable a scientist to explain and predict using deductive reasoning. Scientific knowledge is knowledge based on and not contradicted by observation. It is gradually accumulated over time as the number of observations increases.

An obvious problem of inductivism is: when is empirical evidence sufficient? Another more fundamental critique is that observations are theory dependent. Observation statements can only be made with presupposed theoretical knowledge. These statements are therefore guided by theory, which contradicts the assumption of taking observation as starting point of science.

To overcome the problems of inductivism a new view developed mainly by Popper known as *falsificationism* (Popper, 1980). In his view a hypothesis can never be proven true, it can only be proven wrong (falsified). But the more falsification

attempts fail, the more credible the hypothesis is. This also holds for a theory. Theory is considered to be a more general statement from which hypotheses can be deduced. Scientific knowledge therefore consists of theories that can be falsified and scientific research is the process to formulate theories / hypotheses and trying to falsify them. Falsificationism also has its limitations though. Observations can contain errors leading to an unjustified falsification of a theory. Furthermore, falsification can be problematic when test situations become so complex, that the test situation itself is responsible for an outcome not in line with the prediction.

Both inductivism and falsificationism fail to characterise how complex theories are developed over time. People like Lakatos (1970) and Kuhn (1970) argued that theories should be seen as structures. Only with structured theories statements and concepts used for these statements can be given a precise meaning. Studying the history this holds for all major sciences. According to Lakatos (1970) research programs provide this structure, giving guidance for future research in both a positive and negative way. Within this program a core of hypotheses and conditions are considered to be true and unfalsifiable (negative), but along the lines of the program research is developed and new phenomena are discovered (positive). A research method is only proper as long as the new hypotheses can be verified independently of the core assumptions. In this philosophy research is scientific if (1) a degree of coherence is available, which involves mapping out a program for further research and (2) the research program leads to the discovery of new phenomena at least occasionally.

Kuhn's ideas are more elaborate taking into account the revolutionary character of science and the sociological characteristics of scientific communities. The research program as Lakatos formulated them is only part of the evolution of scientific research. Kuhn (1970) calls it "normal" science based on a certain paradigm basically involving puzzlesolving activities both theoretically and practically. Research deals with working out the details, uncritical of the core of the paradigm. However there are always anomalies conflicting with the paradigm. When these conflicts become too serious a crisis will occur and rival paradigms solving the anomalies will emerge leading to a revolution. Eventually, one of the rivalling paradigms will be adopted and be considered the new basis of normal science, which closes the evolutionary circle. Thus, within normal science progress is made in a continuous way, but at times of revolution a discontinuous progress occurs. In this view mature science lacks disagreement about the fundamentals. Immature (or revolutionary) science has this debate, but it is a rather disorganised activity. Because of this in an immature science each researcher has to justify his or her approach making it impossible to develop a theory in more detail. Hence, both revolution and normal science serve their purpose. Without revolution researchers would stay trapped in their paradigm and without normal science complex theories would never be developed.

- insert Figure 1 about here -

In Kuhn's view in the accepted paradigm it is prescribed what method is considered to be scientific. However, there is no method describing how to arrive at rivalling paradigms. Feyerabend (1975) even suggested that methodological rules only give

suggestions how to gain knowledge, but they fail to prescribe how to gain it. He argued that it is not realistic to expect a few simple rules to account for the process in which theories are created. It requires a complex analysis of sociological, psychological and historical factors. Therefore, there is no scientific method. In his view science is an ideology and it is institutionalised. Ways of research departing from the main stream are automatically labelled as unscientific. Feyerabend advocates methodological and theoretical pluralism. It is the discussion about and the interaction between different views that will lead to progress.

Summarising the main views in the philosophy of science, they all agree that scientific research consists of an empirical and a deductive component. It is the dominant paradigm or structure of the scientific community that determines which method of doing empirical and / or deductive research is considered to be scientific. We will elaborate on these three dimensions: the structure of scientific communities, empirical and deductive research methods (see Figure 1).

### **3. Structure of scientific communities**

Point of departure for discussing the structure of scientific communities is Whitley's framework. Whitley (1984) argued that "fields organised and controlled in different ways produce different organised knowledge and become established in different contextual circumstances (p. 33)". In his view the two main variables determining the organisational structure are the *mutual dependence* between researchers and the *uncertainty in the task*.

Both variables have two components. *Mutual dependence* between researchers can be strategic and functional. Strategic dependence concerns the extent to which other researchers have to be convinced of the importance of the contribution. When the strategic dependence is high, it means research has to be more co-ordinated and research groups need to set common goals. Functional dependence has to do with the skills involved. A high functional dependence means research will only be accepted as a scientific contribution if it clearly fits with the existing knowledge base view and uses common methods and techniques.

*Task uncertainty* can be strategic and technical. Strategic uncertainty involves the uncertainty in setting research priorities and significance of the research. When the strategic uncertainty is high, the variety of research topics in the field is considerable and the importance of certain topics is perceived differently by different researchers. Technical uncertainty deals with the extent to which working procedures are well understood and produce reliable result. High technical uncertainty means results are more subject to different interpretations.

Combining the four components mentioned above with each component having a value "high" or "low" Whitley (1984) arrives at a 16-cell matrix. Nine cells he considers to be unstable, as interdependence between the components exists. The remaining seven cells describe seven stable types of research communities (see Table 1).

As stated above a scientific community, in which a researcher operates, determines the perceived value of a scientific research contribution. Therefore, a researcher who

wants to make a scientific contribution, which is recognised as such in a particular field, has to be aware in what type of research field he operates.

- insert Table 1 about here -

#### **4. Empirical research**

In the natural science it was assumed that observation could always be done objectively without interaction with the observed phenomenon. Within the natural sciences this assumption has been challenged in the 1930s with the developments of quantum mechanics. But especially the emerging research in social sciences has led to renewed debate.

Compared to the traditional natural sciences social sciences have a major drawback with respect to generalisation. In the natural sciences phenomena are independent of time and space when the same experimental conditions are applied. This allows duplication of results by other researchers and generalisation. Social sciences involve studying human and organisational behaviour. Even if current relationships between observed variables are completely known, technological advances can change these relationships permanently (Ackoff, 1962). Also, assuming human behaviour is not completely deterministic means generalisation of statements is intrinsically limited.

This difficulty applies to all social sciences and has led to the philosophical debate on how scientific observations and therefore empirical research should be conducted.

It revolves around the question whether observation can be conducted with or without interacting with the object and whether observations are independent of the observer. Can observation really be done in an objective way or is it always subjective? We will take the viewpoint of Burrell and Morgan (1979), who have given a good overview of this debate. In addition, they have provided a framework that fits all views within social sciences into four distinct paradigms. These paradigms are based on two dimensions: the "subjective – objective" dimension and the "nature of society" dimension.

- insert Figure 2 about here -

Burrell and Morgan (1979) split up the subjective - objective dimension into four underlying assumptions of researchers about: ontology, epistemology, human nature and methodology. In each case these assumptions can be subjective or objective. (see Figure 2). Regarding ontology the question is, whether reality is of an objective "nature" or reality is a product of individual consciousness. The same holds for epistemology. Is knowledge an independent "entity" or does it merely exist in the eye of the beholder? For the social sciences especially the assumption about human nature is important: whether humans have a "free will" or they respond deterministically to situations.

All assumptions just mentioned have their reflection on what methodology is considered to be a proper one. A subjectivist assumes knowledge can only be gained by getting close to and involved with one's subject and analysing the background in great detail. In an extreme form this approach could be aimed at only trying to

understand the individual study object rather than finding universal truths. According to an objectivist research should be based upon systematic protocol, like testing hypotheses using quantitative techniques. Obviously the latter relates directly to the approach used in the natural sciences.

The second dimension Burrell and Morgan (1979) consider is the nature of society. They distinguish between the assumption that emphasises society as orderly, stable and cohesive and the assumption that emphasises society as a set of conflicts and radically changing. This dimension mainly focuses on which aspects of society are important to study for the social sciences. So with respect to empirical research methods in general this dimension is less interesting.

Focusing on empirical research methods the main distinction is between the ideographic (subjective) and nomothetic (objective) approach. The subjective approach (also often referred to as interpretative or qualitative) advocates research like in-depth case studies. The objective approach (also often referred to as functionalist or quantitative) advocates research based on statistical analyses of surveys.

## **5. Deductive research: use of models**

"Somewhat analogous to the way theorems are derived in geometry the physicist begins with a set of idealised assumptions from which using rigorous logical procedures, consequences are deduced (Begeed-Dov et al, 1967)". From this quote it seems rather straightforward how to proceed when conducting deductive research.

However, it does not say how to determine this set of idealised assumptions. It involves developing a model: a simplification of reality.

In order to be able to deduce anything models are used as a frame of reference and represents the theory behind it. Basically, models can be anything ranging from almost resembling reality to very abstract. We will mention four categories. First, there is the physical model such as a small aeroplane that can for instance be used in wind tunnel testing. Secondly, there is the verbal model describing the reality without making a physical representation of it. This verbal model can be made into an abstract model by translating descriptions used in the verbal model into general concepts. Finally, the concepts of the abstract model can be linked together in a formal way, leading to a formal or mathematical model. Similar to splitting empirical research in being quantitative and qualitative, in deductive research the formal modelling approach is referred to as quantitative, whereas verbal and abstract modelling are referred to as qualitative.

- insert Figure 3 about here -

Developing a formal model has advantages over the other modelling approaches with regard to three aspects (Begeed-Dov et al, 1967): conceptual clarity, conceptual relevance and identification of equivalent theories. Formalisation of a model requires clear statements. In a verbal or abstract model the relationships between variables can be kept somewhat vague, because it is not necessary to make them very clear. Providing an unambiguous definition of a concept can be quite difficult, but for formal model this has to be done. In a formal model everything has to be made

explicit, that is why it leads to conceptual clarity. Because of this conceptual clarity conceptual relevance can be shown in a more straightforward manner. It means showing which aspects of a theory are affected by an experimental result. The last aspect is the identification of equivalent theories and theorems. Formalisation of theories gives a better possibility to identify to what extent theories differ from each other.

As for the purpose of models, no matter which model is used, the purpose is always the same. As said before, models are used as a frame of reference to be able to deduce consequences given an empirical (starting) situation. These consequences can be verified with empirical data. This verification may lead to confirmation of the model, adjustments of the model and its assumptions or even completely discarding the model, as illustrated in Figure 3.

Models can be seen as mediators between theory and observation as shown by Morgan and Morrison (1999). Furthermore, they argue there are no general agreed upon rules for model construction, a quote: "models are typically constructed by fitting together a set of bits, which come from disparate sources" (p. 15). Model building is the creative process of making the frame of reference or background on which the deductive reasoning takes place. Figure 4 provides insight how a model acts as mediator (based on Telgen, 1988). It is similar to Figure 3, but it emphasises the fact that when a solution to a model is found it does not necessarily imply that the practical problem has also been solved. Finding a solution to the model always involves a trick, which can be relatively simply obvious or mathematically very sophisticated. But this will only solve the model not the real world problem.

However, when the model has been constructed properly, the solution should also be helpful for the real world problem.

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Furthermore, model building is typically not a one-step process, but it involves several intermediate steps to come to a model that is considered satisfactory (see Figure 5). Satisfaction is based on two criteria: accuracy of prediction and applicability to practical situations. The more accurate the model predicts, but also the more widely it is applicable the more valuable is a model. The idea is that starting off with a simple model using very restrictive assumptions provides a good understanding of the basic properties. This allows for the researcher to learn and eventually develop a more complicated and satisfactory model.

Summarising the last three sections, we identify four types of research: empirical and deductive research which both can be either qualitative or quantitative (see Figure 6). In principle all types of research add to the scientific body of knowledge. Therefore, in a particular research field the most scientific progress can be made by embracing all these research types. For a single researcher it means that he / she can focus on one research type, as long as in the research field as a whole all different research types are being conducted. Although this is in principle true, it is not always recognised as such due to the structure of the community in which the researcher operates. If a community has developed in such a way that only quantitative research is considered to be scientific (like in the natural sciences), a qualitative contribution will be labelled unscientific in this community. Of course, putting such a label on a

type of research holds this type of research back. Hence, the role of the scientific community should not be neglected.

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## **6. Scientific status of management research**

Whereas the previous sections focused on aspects of scientific research in general, we will now narrow our focus to scientific management research. We will study the structure of this research field and the empirical and deductive research methods used.

First we consider in more detail the structure of scientific management research. Using the terminology of Whitley (see also Table 1) management research can be described as a fragmented adhocracy. In this field type there is a high task uncertainty both strategic and technical. In addition, there is low mutual dependence between researchers both strategically and functional. A quote from Whitley (1984, p. 159) gives a more detailed characterisation a fragmented adhocracy: "Typically, these fields are open to the general 'educated' public and have some difficulties in excluding 'amateurs' from competent contributions and from affecting competence standards. The political system is therefore pluralistic and fluid with dominant coalitions being formed by temporary and unstable controllers of resources and charismatic reputational leaders." Therefore, in this field type certain research methods can be more fashionable than others, but this may change over time because of the unstable overall situation. Engwall (1995) gave some empirical evidence for

Whitley's assumption about management research as a fragmented adhocracy by looking at citations in the Scandinavian Journal of Management.

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In a fragmented adhocracy, because of its pluralistic nature, there is room for conducting all types of research. In this structure it would be best to have a combination of both quantitative and qualitative approaches in both empirical and deductive research, because each approach is accepted as scientific and can add to the body of knowledge.

Before looking at empirical and deductive research methods used in management research let us first focus on management as a research topic itself. Management is about managing organisational processes that involve human interference. Management research can be positioned in between natural and social sciences, as it takes into account human interaction, but it is not purely focused on these interactions.

When management research in general started to evolve in the nineteenth century as a scientific field the natural sciences were the established scientific fields. Only the objective approach was considered to be scientific. Logically this approach became dominant in empirical management research and in fact it still is. With the slow acceptance of the subjective approach to be scientific as well, case study research has gained popularity over the last decades, but it still is not as accepted as quantitative techniques.

Nowadays management research is an umbrella term for many separate established scientific fields such as: operations management, marketing, strategic management organisational behaviour, finance & accounting, information management. Whether or not PM should be mentioned here, will be discussed in the next section. However, we would like to illustrate what has been described about management research in general terms above with the development of two management fields in particular: operations management (OM) and marketing.

Until about the 1950s OM research was highly descriptive in nature (Buffa, 1980). From the 1960s the mathematical approach known as operations research (OR) or management science became dominant in this field (for more background information see Eilon, 1995; Keys, 1991; Meredith et al, 2002). Despite the earlier mentioned drawbacks of solely using a quantitative approach, using this method proved to be very successful. With this formal approach in line with the natural sciences OM developed to an established field.

Until the 1970s OM almost only focused on quantitative deductive research: focusing on problems that could be solved with the OR techniques together with improving these techniques and very limited attention to empirical research. This led to a crisis, as the relevance was starting to be questioned. After this crisis the field awakened and tried to take a more practitioner oriented view: more empirical research and sometimes even a more qualitative approach. Nowadays, in the year 2002, this view is still encouraged (see also Telgen, 1988), but although the amount of empirical research is increasing, reality is that the majority of the research is still

of a formal deductive nature. To provide some evidence for this statement Scudder and Hill (1998) found that the percentage of articles in OM journals presenting empirical research ranges from only 3% in 1985 to 11% in 1995. Pidd and Dunning-Lewis (2001) found that most OR papers focus on untested theory rather than application. This conclusion is shared by Pannirselvam et al (1999). It seems that a lack of empirical research slows down scientific development, as only incremental theoretical improvements are being made to existing models. However it is this theoretical approach which made OM an established scientific research field, which causes researchers to stick to it.

The development of marketing as an established scientific field is very much in line with the development of OM. Similarly, during the 1960s marketing was transformed from a descriptive and qualitative nature into a highly quantitative one. Also, in the late 1970s a debate emerged about the philosophical basis of marketing: the objective versus the subjective approach (Easton, 2002). Again this seems similar to OM, but there is a major difference. In marketing research unlike OM empirical research always played an important role. So the debate was not about increasing the amount of empirical research, but about whether the objective approach both in empirical and deductive research was the right one. Although the subjective approach gained popularity, the main stream until now is still the objective approach. Looking at published articles from 1970 to 1997 Chung and Alagaratnam (2001) found there has only been a slight shift towards the interpretative paradigm.

Li and Cavusgil (1995) have given an indication of the amount of empirical research. They conducted a content analysis of several scientific marketing journals from 1982

to 1990 focusing on international marketing. Their analysis shows that 69% of the 757 investigated studies are empirical research and the other 31% are conceptual. From the empirical research 66% is classified as statistical (quantitative) and the rest as non-statistical (qualitative). The research by Leeflang and Wittink (2000) indicates that using formal models in quantitative deductive research has played an important role throughout the years.

What both OM and marketing management have in common is that they both focused on one type of research at some point in time. This nearly led to a dead end in the sense that the relevance of the research field was starting to be questioned and therefore its scientific status. Only by incorporating all types of research, both empirical and deductive, both quantitative and qualitative, these fields were able to elevate their declining status. However, it is clear that quantitative research is still the main stream for both fields.

Both fields can be seen as a good example of how a specific field in management research has developed into a mature field because of this focus on a greater variety of research. It prevents a field from getting stuck in too narrow a scope, a danger, which still lurks around the corner, especially in OM research.

## **7. Scientific status of PM research**

Although Chandler (1962) showed that purchasing played an important role in the rise of American companies in the beginning of the 20<sup>th</sup> century, the recognition of purchasing having strategic value declined enormously in the 1950s and 1960s

(Farmer, 1997). Farmer (1997) sees the vertical integration and diversification of companies leading to increased bureaucracy as a possible cause for this decline. At that time purchasing was merely seen as a clerical, administrative task.

New interest in PM only emerged in the 1970s. The main reason was the oil crises and the lack of raw materials it caused. This drew the attention to the importance of purchasing (Ellram and Carr, 1994). Another reason was emergence of Japanese companies together with their way of more actively managing their suppliers using concept like Just In Time (JIT) deliveries (Farmer, 1997). Also, from the marketing field some interest was shown in industrial buying behaviour, as understanding this behaviour could result in improved performance of marketers. A result was the foundation of the International Marketing and Purchasing (IMP) group in the middle 1970s by researchers from various European countries (Hakansson, 1982). These developments coincided with the changing view on corporations, namely focusing more on core competencies. This led to less vertical integration of business and more outsourcing. Nowadays it is fair to say that on average from each dollar received through sales, more than half a dollar is spent on purchases. Thus PM is interesting from a financial point of view as well.

With the recognition of its importance purchasing developed into a management research field. Researchers focusing on a new field have come from various related fields and apply theories and methods that are used in these fields. For purchasing these fields are: OM, marketing, economics, social sciences, organisational behaviour and law. During the last decades a pluralistic body of purchasing knowledge has been built up. The fast increase in the number of dissertations shows

that the amount of purchasing research has been increasing rapidly (Williams, 1986; Das and Handfield, 1997). Das and Handfield (1997) also classify the twelve key purchasing areas. They are worth mentioning here to give an idea of what purchasing research consists of:

- purchasing information systems
- early supplier involvement / new product development
- global sourcing
- purchasing planning, organisation, policies and personnel
- purchasing performance measurement
- single / multiple sourcing
- supply chain integration
- supplier selection and development
- buyer-supplier relationships
- supplier quality
- legal, ethical and environmental issues
- cost, pricing and contracts

A similar list of topics can be found in Morlacchi et al (2002). They give an overview of the largest international purchasing research network called IPSERA (International Purchasing & Supply Research & Education Association). Founded in 1991, it currently has about 300 members. The main event organised is the annual conference. Morlacchi et al (2002) evaluated all conference proceedings giving interesting insights in the topics and research methods used.

Das and Handfield (1997) find that no dominant paradigms and theories in PM research exist. Therefore, in Whitley's (1984) terminology, researchers seem to have a low strategic mutual dependence. Also the functional dependence is low, as researchers come from various backgrounds and apply different research methods. The wide variety of topics shown above indicates a high strategic task uncertainty. Finally the technical task uncertainty is also high, as PM is a young field and working procedures are still being developed and various methods are being applied. Taking the values of mutual dependence and task uncertainty together PM can be classified as a fragmented adhocracy, similar to management research in general.

Focusing on the type of PM research, Das and Handfield (1997) conclude that it is still largely exploratory and descriptive. They argue that in a new field research always starts off exploratory, but with the passing of time more normative research should be conducted. As normative research still lacks in PM, PM research can therefore still be considered an immature field.

With regard to empirical research both qualitative and quantitative research are present in PM. From purchasing dissertations investigated by Das and Handfield (1997) 62 employed surveys and 25 case studies. The investigation of the IPSERA conference proceedings by Morlacchi et al presents a slightly different outcome. About 70% of the papers present empirical research: about 40% case studies, about 20% surveys and the rest other methodologies such as action research, focus groups and multiple methods.

Ramsay (1998) discusses the problems of empirical research and their implications for PM research in more detail. He argues that both quantitative and qualitative empirical research have their merits for PM research, but they also have their limitations. He therefore favours triangulation of methods. He especially warns for embracing only quantitative methods, as in his view unfortunately many established disciplines have done.

In deductive research until now the focus has mainly been on qualitative models, i.e. conceptual models used as frameworks for putting ideas together. For quantitative deductive research Das and Handfield (1997) find "for instance the relative lack of simulation / mathematical approaches in most topic areas is noticeable (p. 113)." Olsen and Ellram (1997) investigated different research approaches on buyer-supplier relationships (one of the key areas mentioned above) and they come to a similar conclusion: "The authors believe that theoretically developed and tested normative research is greatly needed (p. 229)."

Analysis of all IPSERA proceedings by Morlacchi et al (2001) shows that 30% of the papers are of a conceptual nature (no empirical results). We conducted a little more in depth analysis of the proceedings looking at the number of papers that actually use quantitative deductive research in the last five years. In addition, we examined the articles published in the last five years in two leading PM journals: the European Journal of Purchasing & Supply Management and the Journal of Supply Chain Management.

Table 2 shows the results. A paper has been considered quantitative deductive, if anything of quantitative deductive nature was written in that paper. Hence, the paper could also contain other types of research. Both in the journals and the proceedings quantitative deductive research make up only a very small segment.

Our analysis of both the journals and proceedings confirms the statement that in PM a lack exists in quantitative deductive research. An explanation for this lack can be found in De Boer's thesis (1998). He links the fact that the 1960s and early 1970s were the eras in which (a) the quantitative deductive research approach (Operations Research) was booming and (b) purchasing management was not considered strategic. Hence, there was no attention for developing quantitative models for purchasing at that time. And by the time PM was gaining importance, the mathematical approach of management problems was under fire with respect to its relevance (see above).

- insert Table 2 about here -

## **8. Conclusions**

The objective of this chapter has been to determine the status of PM research. We argue that scientifically PM theory and research is still in its infancy. The focus is mainly on inductive explanations of practice. The use of deductive reasoning has been limited until now. It often makes use of qualitative models only. In other management fields such as OM and marketing it has been shown that formal analysis of decision problems provides unique opportunities to establish these fields and to

bring them forward scientifically. It provides fundamental new insights and predictions, although other types of research should not be neglected.

It seems that PM is not different from these fields in this respect. Therefore, attention should be paid to the current lack in quantitative deductive research. Increasing research efforts in that area will be of great help to increase the knowledge base of PM and will help improving the status of PM. Filling up this research gap gives the possibility for PM to develop along the lines of other management research such as marketing. Marketing is an established research field incorporating quantitative and qualitative approaches in empirical as well as deductive research. With extra effort in quantitative deductive research PM will have the same completeness. Continuing like this will without doubt establish PM as a mature scientific field in the near future.

### **Acknowledgements**

The author would like to thank Prof. Jan Telgen for his valuable comments on earlier drafts of this paper

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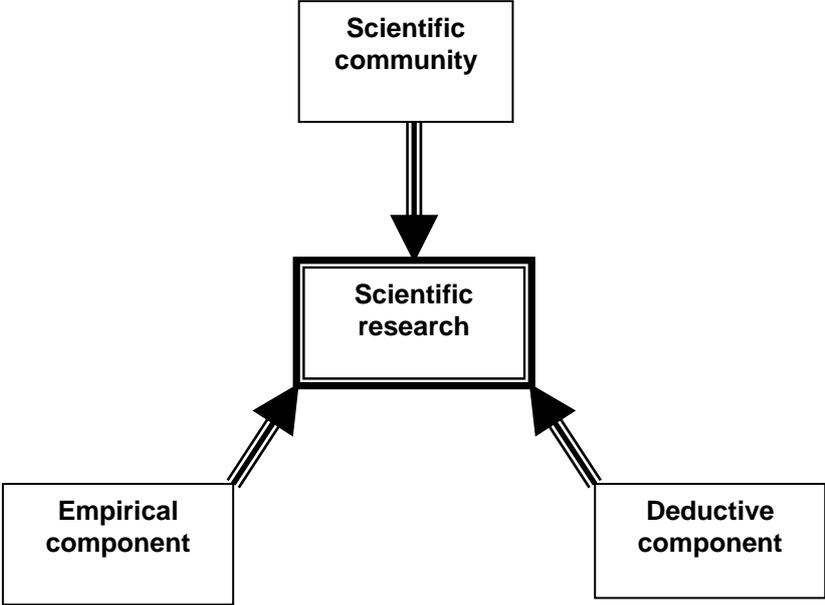
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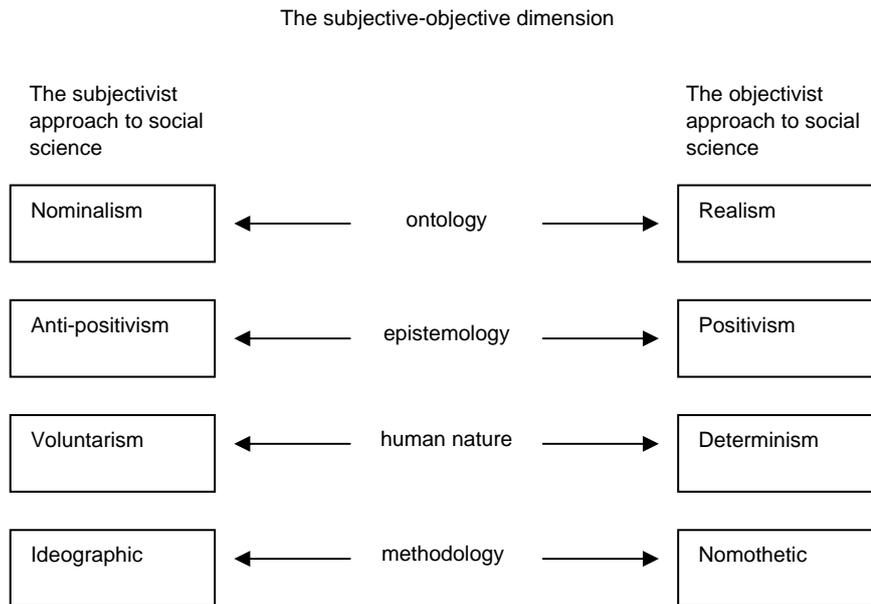
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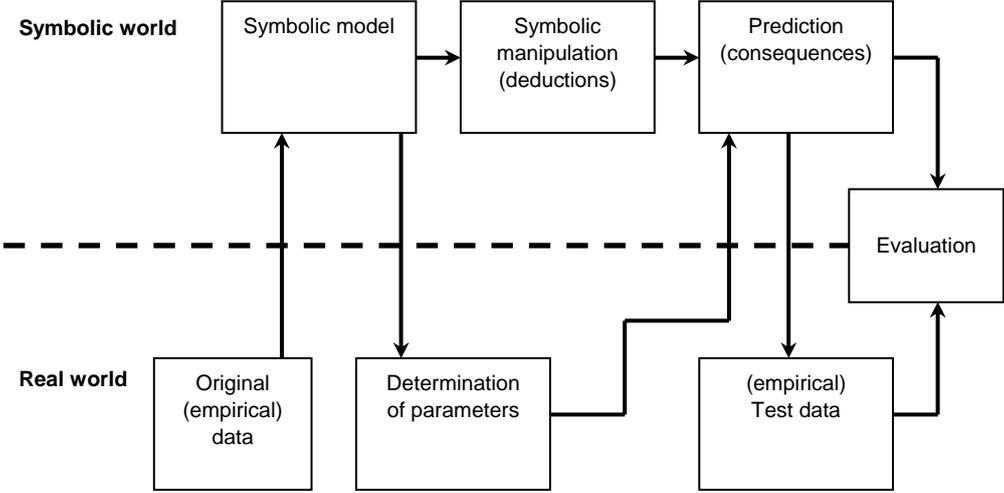
**Figure 1: Dimensions of scientific research**



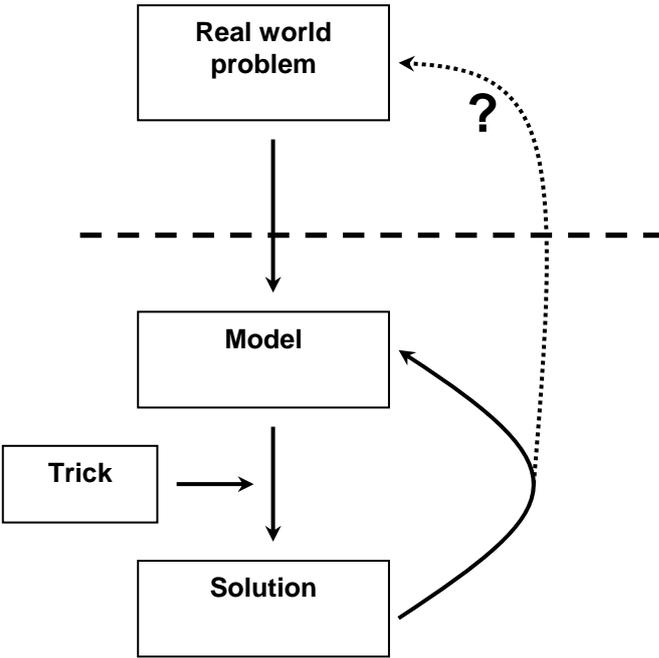
**Figure 2: A scheme for analysing assumptions about the nature of social science (from Burrell and Morgan, 1979, p.3)**



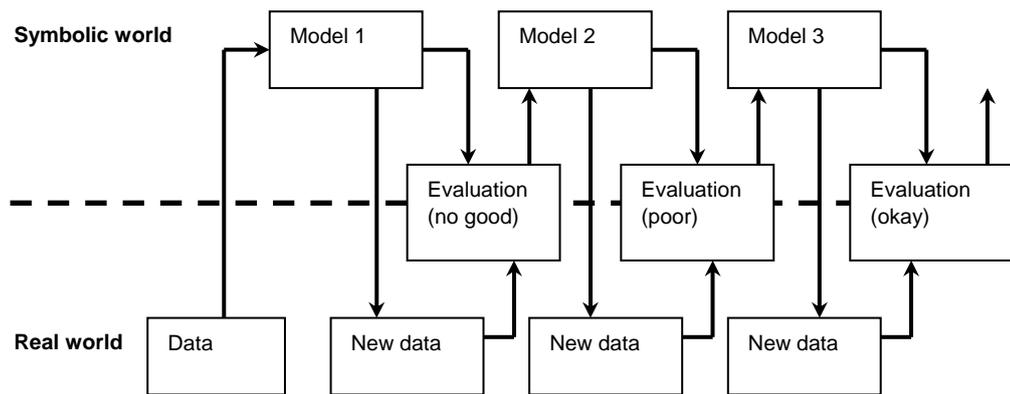
**Figure 3: Research using models (adapted from Levin and Lamone, 1969).**



**Figure 4: Models act as a mediator (based on Telgen, 1988).**



**Figure 5: Evolution of a model (adapted from Levin and Lamone, 1969).**



**Figure 6: Four types of research.**

	qualitative	quantitative
empirical	I	II
deductive	III	IV

**Table 1: Types of scientific fields (from Whitley, 1984, p.158).**

Type of scientific field	Mutual dependence		Task uncertainty		Example
	strategic	functional	strategic	technical	
Fragmented adhocracy	low	low	high	high	Management studies
Polycentric oligarchy	high	low	high	high	Continental European ecology
Partitioned bureaucracy	high	low	low	high	Anglo-Saxon economics
Professional adhocracy	low	high	high	low	Bio-medical science
Polycentric profession	high	high	high	low	Continental mathematics
Technologically integrated bureaucracy	low	high	low	low	Twentieth-century chemistry
Conceptually integrated bureaucracy	high	high	low	low	Post-1945 physics

**Table 2: Quantitative deductive (QD) research in PM literature.**

Year	EJPSM <sup>1</sup>		JSCM <sup>2</sup>		IPSERA <sup>3</sup>	
	Total	QD	Total	QD	Total	QD
2002					63	6
2001	23	1	23	2	76	3
2000	22	1	22	1	80	5
1999	19	2	24	1	76	3
1998	23	3	23	1	54	3
1997	23	2	23	0		
<b>Total</b>	<b>110</b>	<b>9</b>	<b>115</b>	<b>5</b>	<b>349</b>	<b>20</b>
		<b>(8.2%)</b>		<b>(4.3%)</b>		<b>(5.7%)</b>

<sup>1</sup> European Journal of Purchasing & Supply Management

<sup>2</sup> Journal of Supply Chain Management (before 1999 International Journal of Purchasing & Materials Management)

<sup>3</sup> Proceedings of the annual IPSERA conference