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Qualitative research approach in production engineering – an assessment of a research project and a sample of master of science dissertations

*Pesquisas com abordagem qualitativa na engenharia de produção –
uma avaliação de um projeto de pesquisa e uma amostra
de dissertações de mestrado*

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Abstract

This paper aims at demonstrating applications of qualitative research approaches in the subject of operations management (OM), more specifically in industrial engineering. It firstly presents a brief review of research methods when using qualitative research approaches. This provides the backdrop for a content analysis of qualitative research in a research project in which a case study approach was employed. In addition, it analyses a sample of dissertations of a post graduate program in industrial engineering with regard to the qualitative research approaches used. These two cases highlighted are then used as the basis for a discussion of qualitative research approach in OM. The paper concludes that critical appraisal of qualitative research approach is needed and offers some recommendations for future work in this direction.

Key words: Empirical study. Industrial engineering. Operations management. Research methodology.

Resumo

Este artigo objetiva demonstrar a aplicação de abordagens de pesquisa qualitativas na gestão de operações, mais especificamente na prática da engenharia de produção. Primeiramente, apresenta uma breve revisão sobre métodos de pesquisa na adoção de abordagem qualitativa de pesquisa. Esta revisão é base para uma análise do conteúdo de um projeto de pesquisa na qual a abordagem de estudo de caso é empregada. Adicionalmente, o trabalho analisa uma amostra de dissertações de mestrado de um programa de pós-graduação em engenharia de produção quanto à abordagem qualitativa de pesquisa. Essas duas análises são então utilizadas como base para uma discussão sobre a abordagem qualitativa de pesquisa na gestão de operações. Neste trabalho, conclui-se que uma avaliação crítica da abordagem qualitativa de pesquisa é necessária e oferece algumas recomendações para estudos futuros nessa direção.

Palavras-chave: Estudo empírico. Engenharia de produção. Gestão de operações. Metodologia de pesquisa.

1 Introduction

Qualitative research methods originated in the social and behavioural sciences such as sociology, anthropology and psychology. Currently, they have been applied in a number of other fields, especially those related to management. One of these fields is operations management (OM), which consists of different academic disciplinary inputs and practical fields of application, e.g. industrial engineering (SLACK et al., 2004).

However, according to Voss et al. (2002), most of the research conducted in the field of operations management is based on rational research methods and primarily statistical survey analysis. The main characteristic of rational research is that the phenomenon being studied exists “out there”, independent of the research context or beliefs and assumptions of the researchers (VOSS et al., 2002). Nevertheless, OM is very much an applied discipline from the need to offer answers to the concrete problems that emerge within both industry and services (Filippini, 1997). In this sense, qualitative research can be considered as a powerful methodology since it attempts to increase the understanding of a phenomenon within its context. As Drejer et al. (1998) point out, OM differs from most other areas of management research, in that it addresses both the physical and human elements of the organization.

In fact, research approaches such as the OM have been recently applied in the context of qualitative methodology, as in the case study and in the action research. Relevant publications in these approaches are offered by Voss et al. (2002) and Coughlan and Coughlan (2002), respectively. Additionally, empirical research makes an important contribution to the development of OM knowledge and theory which can bridge the gap between OM research and practice (FILIPPINI, 1997). For instance, Slack et al. (2004) propose a representa-

tion that articulated two different research processes that seek to reconcile theory and practice. In any case, qualitative research and its approaches and methods surely can contribute to OM research.

In this context, the aim in this paper is to demonstrate the application of qualitative research in the subject of OM, more specifically within a practice field of industrial engineering. In the first part of the article, aspects of the research methodology are discussed including a comparison between quantitative and qualitative approaches. Then, qualitative research approaches and methods are described in order to establish the theoretical boundaries of this work. In the main part, the article explores some applications of qualitative empirical work in a research project as well as in a number of dissertations. Firstly, an assessment of a research project with regard to the qualitative approach employed is performed. The research project is outlined followed by its appraisal using ten statements for qualitative research assessment. In evaluating the research process, opportunities for improvements can be identified for other future projects. Secondly, the paper analysis a sample of dissertations with regard to the chosen research methodology. Finally, some concluding remarks are drawn from the theoretical background and worked examples.

2 An overview of research methodology

Since research is a process of systematic investigation of a subject, different approaches should take in place depending on the nature of the variables involved in the subject. According to Meredith et al. (1989), these approaches can be classified into two key dimensions. The first concerns the approach adopted to generating knowledge which has two extremes (FILIPPINI, 1997): on the one hand, the deductive approach and, on the other, the in-

ductive approach. The second dimension concerns the source and kind of information used in the research which has, on one hand, direct observation and, on the other, subjectivism, i.e. artificial reconstruction of reality (FILIPPINI, 1997). Actually, research approaches can be grouped in some categories according to:

- nature of the variables (quantitative or qualitative);
- relationship between the variables (descriptive or causal);
- level of knowledge of the research problem (exploratory or conclusive);
- way to gather data (communication or observation);
- control of the variables (experimental or *ex-post-facto*);
- research approach in terms of depth and amplitude (field/case study or surveys).

These approaches are not, however, mutually exclusive. A given research can be classified according to all categories, i.e. it might be, for example, qualitative, descriptive, exploratory, employing observation and field study through the use of multiple case study. In fact, there are broadly two approaches (HANCOCK, 1998): quantitative research and qualitative research. These approaches are outlined next.

2.1 Qualitative and quantitative research approaches

Quantitative research should begin with an idea (usually articulated as a hypothesis), which then, through measurement, generates data and, by deduction, allows a conclusion to be drawn (GREENHALGH; TAYLOR, 1997). In contrast, qualitative research begins with an intention to explore a particular area, collects “data”, and generates ideas and hypotheses from these

data largely through what is known as inductive reasoning (MAYS; POPE, 1996). Table 1 summarises the differences between qualitative and quantitative approaches to research. In reality, there is a great deal of overlap between them, the importance of which is increasingly being recognised (ABELL, 1990).

Table 1: Quantitative versus qualitative research

Item	Qualitative	Quantitative
Social theory	Action	Structure
Methods	Observation, interview	Experiment, survey
Question	What is X? (classification)	How many Xs? (enumeration)
Reasoning	Inductive	Deductive
Sampling method	Theoretical	Statistical
Strength	Validity	Reliability

Source: Mays and Pope (1996).

According to Greenhalgh and Taylor (1997), the strength of quantitative approach lies in its reliability in terms of repeatability, which is the degree to which a measure is free from random error components (VOSS et al., 2002) and should yield the same results time after time (GREENHALGH; TAYLOR, 1997). On the other hand, qualitative research lies in validity (closeness to the truth), i.e. is the degree to which a measure only reflects the desired construct without contamination from other systematically varying constructs (DEVELLIS, 1991). Good qualitative research, using a selection of data collection methods, really should touch the core of what is going on rather than just skimming the surface (GREENHALGH; TAYLOR, 1997).

2.2 Qualitative research – strategies and methods

Qualitative research is an investigation in which the researcher attempts to understand some larger reality by examining it in a holistic way or by examining components of that reality within



their contextual setting. In this sense, by its very nature, qualitative research is non-standard, unconfined, and dependent on the subjective experience of both the researcher and the researched (GREENHALGH; TAYLOR, 1997). Particular strategies usually employed by qualitative research include: action research, case study, ethnography study, phenomenology, and grounded theory. These are outlined next.

Action research is a generic term which covers many forms of action-oriented research, and indicates diversity in theory and practice among action researchers, so providing a wide choice for potential action researchers as to what might be appropriate for their research question (REASON; BRADBURY, 2001). The outcomes are an action and research which, unlike traditional positive science, aims at creating knowledge only (COUGHLAN; COUGHLAN, 2002).

A broader view of ethnography consists of the art and science to describe a group or a culture (FETTERMAN, 1989). It has a background in anthropology and embraces the description of events that occur in the life of a group, with special attention to social structures and behaviour of the group members (GODOY, 1995).

Generally, case studies are the preferred strategy when the investigator has little control over events, and when the focus is on a contemporary phenomenon within some real-life context (YIN, 1994). Case research is not only good for investigating “how” and “why” questions, but also it is particularly appropriate for developing new theory and ideas and can also be used for theory testing and refinement (VOSS et al., 2002).

Phenomenology literally means the study of phenomena, which may be events, situations, experiences or concepts. It is a way of describing something that exists as part of the world in which individuals live (HANCOCK, 1998). The previous author adds that phenomenological research will

not necessarily provide definitive explanations but it does raise awareness and increases insight.

The main feature of grounded theory is the development of new theory through the collection and analysis of data about a phenomenon. Actually, it goes beyond phenomenology because the explanations that emerge are genuinely new knowledge and are used to develop new theories about a phenomenon (HANCOCK, 1998). Grounded theory is a longitudinal research methodology that intrinsically relies on gathering data taken at a given point in time (LEONARD; MCADAM, 2002). Wolfgramm et al. (1998) describe grounded theory as inquiring into the processual pattern of change at institutional, organizational, and strategic level.

To implement the different strategies in qualitative research, a number of methods for gathering data can be employed. The main methods of collecting qualitative data are structured, semi-structured, and unstructured interviews; focus group; passive or participant observation, and documentary analysis.

The described strategies and their respective methods are broadly applied in operations management research. For instance, case research has consistently been one of the most powerful research methods in operations management (VOSS et al., 2002). According to Filippini (1997), research efforts have been made along empirical lines, particularly in the field of Total Quality Management (TQM), as demonstrated by Leonard and McAdam (2002).

3 Research approaches in operations management

Operations management (OM) is very much an applied discipline from the need to offer answers to the concrete problems that emerge within both

industry and services (FILIPPINI, 1997). Slack et al. (2004) complement this by arguing that the genealogy of operations management is an amalgam of different disciplinary academic inputs, e.g. systems theory, practical fields of application, industrial engineering, and others. Actually, the field of operations research is relatively new if compared to more technical areas. The issues dealt with OM are diverse and call for theoretical bases and methodologies from many different areas and school of science. As a consequence, it results in a vast scope of research approaches, usually classified as modelling, survey, theoretical/conceptual, simulation, field study, case study, and laboratory experimentation (FILIPPINI, 1997).

As an embryonic attempt to establish the extent of relation between qualitative research approaches and operations management, this paper offers two worked examples. Firstly, it examines a research project of which case study was the methodological qualitative approach employed. Next, it highlights an assessment of a sample of dissertation developed in a post graduate program of industrial engineering.

3.1 Assessment of a case-based research project

The qualitative research effort for this project was designed to conduct case studies in order to identify best practices when using Quality Function Deployment (QFD) for product development as well as to understand factors that contribute to successful QFD application. Given the investigative nature of this research project, a case study approach seemed appropriate. An exploratory case study can be considered for this project because this study began with setting some direction in order to understand QFD best practices. Next, a theory development behind the application of the method is to be conducted.

In designing case studies, there is a primary distinction between single- and multiple-case designs. The latter has distinct advantages and disadvantages in comparison to the former. The evidence from multiple cases is often considered more compelling, and the overall study is therefore regarded as being more robust (YIN, 1994). From the perspective of this study, the multiple-case study format was chosen due to its inherent advantages. Previous investigation (CAUCHICK MIGUEL, 2003) identified the companies where the cases should be studied, since each case must be carefully selected (YIN, 1994).

This qualitative research approach employed some efforts for gathering data and information. The first effort was a series of interviews. In some of them, due to the number of people and the extension of the discussion, the interviews were more similar to a focus group. Document and archival analysis were also employed as another effort for gathering data in addition to published material.

3.1.1 Selection of participants

As stated earlier, the companies were selected based on the findings of a previous study (CAUCHICK MIGUEL, 2003). This previous study was a descriptive survey (BABBIE, 1973) to investigate current QFD applications. The results from the survey pointed out some issues for further development that have lead to a more in-depth analysis. Then, seven companies were investigated in a multiple case study. These companies were involved in a diverse range of industries and also differ in size, nationality, and annual revenue. Appropriate representatives involved with new product development, with responsibility for planning or managing product development projects were identified for interviewing. In order to foster an environment conducive to an open discussion of possible sensitive issues, the participants were offered confidentiality regarding contribution of their comments.



3.1.2 Interviews – format and contents

Semi-structured interviews were the main technique employed to gather the data *in loco*. This approach enabled participants to identify issues without prompting by the researcher, but in particular; interviews explored the issues of QFD application for product development as well as the product development process itself. To conduct the interviews, two or more researchers participated in each interview, with one researcher conducting the interview and other(s) taking notes and observing reactions. Typically, the interviews lasted about 1.5 hours (on average), but some reached up to 2 hours. All interviews were taped.

An interview protocol check-list, which consisted of ten open-ended questions, was employed on which notes and annotations were made as the interview progressed. Yet, it was allowed discussions that deviated considerably from the protocol when they took an informative turn.

3.1.3 Data analysis

Generally, the analysis was conducted according to the following stages: transcription, data organization, familiarization, coding, theme identification, and analysis (LACEY; LUFF, 2001).

The interviews were audiotaped, transcribed verbatim and the transcripts checked for accuracy against the original recording. Data were also organized into easily retrievable sections. Transcripts were coded and these codes, reflecting the passages of transcribed text, were sorted. The sorting of codes was broadly structured around five groups of themes: QFD introduction and operational aspects of its current use, the new product development process employed by the company, how QFD was part of their product development practice, in what stages QFD was used, data and results of QFD implementation. The aggregation of results was done *a posteriori*. The transcripts were combined with the notes from the interviews and with

official and unofficial documentation in order to construct each case. The results were then analysed by comparing the companies to each other as well as the findings with the literature. Further details of the research methodology and results from the cases can be found in Cauchick Miguel (2005).

It is worth mentioning that other sources were used for gathering and analysing data, such as archived material, current company documentation, published references, and so on. In doing so, a process of comparing different sources of data was also conducted. This was performed to obtain a valid theoretical constructs, usually referred to as triangulation (CARSON; COVIELLO, 1996). Through triangulation with multiple means of data collection, the validity can be increased further (VOSS et al., 2002). This was done in order to ensure rigor in terms of validity.

In order to appraise the qualitative approach used in this research project a number of statements adapted from the work of Greenhalgh and Taylor (1997) were used. Then, a five point Lickert scale (1 – strongly disagree to 5 – strongly agree) was employed to verify how much these statements were met. The results are shown in Table 2.

As can be seen in Table 2 there are some opportunities for improvement in the studied research project. While the issues of “the use of qualitative approach”, “selection of subjects”, “methods used to collect data”, and “transferability of the findings” are fully met, others are just adequate (level 3 – do not agree nor disagree), such as “the methods used to analyse the data”, “relevance to the current body of knowledge”, and “contribution to theory building”. By self-assessing the project and identifying the gaps for improvement, more cautious in terms of the methodology may be taken for the next research projects.

When using these statements for appraising the research project, an important finding is with regard to the appropriateness of using the case

Table 2: Assessment of qualitative approach used in the QFD research project

Issues	Assessment
1) The research describe a relevant problem addressed via a clearly formulated question	4
2) The use of a qualitative approach to answer this question is appropriate	5
3) The setting and the subjects are effectively selected	5
4) The researchers' perspective is not taken into account	4
5) The methods used to collect the data are appropriate and described in enough detail	5
6) The methods used to analyse the data are appropriate and control methods are implemented (e.g. for ensuring reliability and validity)	3
7) The results are credible and relevant to the current body of knowledge	3
8) The conclusions are supported and justified by the findings	4
9) The findings of the study are transferable to other settings	5
10) The findings can contribute to theory building or testing	3

Source: The author.

study within the qualitative approach. Further, the methods for gathering data were suitable (semi-structured interviews, documentary analysis, and so on). Yet further, the chosen companies (subjects) were effective since this in an on-going project and the selection of the organizations came from a previous stage (survey) of this project.

If the case study approach employed to this research project was conducted for theory building (or testing) then the result for question 10 could become more relevant for this specific case. However, if the case study approach was used for exploration, i.e. to develop research ideas and questions in earlier stages of research (VOSS et al., 2002), the result for question 10 could be less relevant.

3.1.4 Analysis of qualitative research in a sample of dissertations

In order to obtain an approximate measure of the research activities in an Industrial Engineering

post graduate program in Brazil, 60 M.Sc. dissertations were examined with regard to the methodology employed. Yet, some needed initial remarks are:

- Although these monographs are titled MSc. they are, in fact, MPhil. dissertations, i.e. their research contents are, in general, more robust than traditional MSc. work;
- They were dissertations available in the library for the time when the study was completed. It covers a period of five years. The sample corresponds to 71% of the total dissertations of the program;
- The research topics were within the following main areas of study: environmental management/policy, production management, quality (assurance and management), and strategy and organizations. These are the main research areas of the program.

Analysis of these dissertations firstly involved a categorization in qualitative or quantitative research. From the total, 82% of the research applied a qualitative approach. This demonstrates a relatively high application of qualitative research in this studied case. Then, further classification of the dissertations was conducted based on the research approaches proposed by Filippini (1997), as shown in Table 3. Furthermore, an assessment of the robustness of the research methodology for each dissertation was also carried out by using a Lickert five-point scale. Table 3 presents the sets of findings, in rank order, considering the qualitative approach employed. In addition, it also shows the result of the robustness assessment of the dissertations.

As Table 3 illustrates, case study is receiving more attention as the chosen methodology approach. Usually, case studies have been used to provide examples and, in the earlier stages of research, for describing the phenomena and related



variables. The proportion on this kind of approach reflects the profile of the students. Most of them are part time middle-managers from industry and they usually uses their organization as a scenario for development their research projects.

Table 3: Dissertation analysis with regard to the approach for qualitative research

Ranked approach	Dissertations (n=60)	Assessment (modal result) ^{1,2}
Case study	55%	1
Action research	12%	3
Theoretical/conceptual	12%	1
Field study	3%	2

Notes:

¹Assessment of the methodology the dissertations using a five point Lickert scale: 0-no robustness; 1- poor robustness, 2-moderate robustness, 3-robust, 4-very robust;

² The result shown in the table corresponds to the most frequent.

Source: The author.

When assessing the methodology employed, Table 3 shows that the robustness of the dissertations, in terms of modal results, is “moderate” for “field study” and “poor” for “theoretical work” and “case study”. Although, case study approach was more frequently employed, its results in terms of robustness was not as good as for action research. Since action research requires intervention as well as it is participative, concurrent with action, and employs a sequence of events and an approach to problem solving (COUGHLAN; COUGHLAN, 2002), this might lead to a more robust methodology in order to achieve effective research results. Nevertheless, in all approaches, the results indicated that a methodological improvement is needed.

It is worth observing that there are some limits in terms of validity and reliability of any findings from this analysis – especially with respect to the interpretative nature of the dissertation research methodology classification and contents as well as the use of this narrowly-based sample.

The objective was to illustrate some experiences of qualitative research in a traditional area of operations management, i.e. industrial engineering. Of course, merely analysis of this sample is not enough if one is seeking to understand fully research practice of qualitative work in this field. Nevertheless, it might provide a general and, perhaps, preliminary view of its application in industrial engineering as a particular field of operations management.

4 Concluding remarks

Operations management research embraces a broad array of schools of science. As a consequence, it results in a vast scope of research approaches either for theory development or empirical studies. Although most of the research conducted in the field of operations management is based on statistical survey analysis and mathematical modelling, i.e. chiefly quantitative, qualitative research seems to be increasingly being used. Recent examples of this concern are provided by the literature. Therefore, researchers can take the advantages when a qualitative approach is undertaken. It provides another stream of methodological approach for planning his/her research in a way that is appropriate to respond their research question. This is particularly important with regard to case study when considering theory building and theory testing. In this sense, further research will concentrate of the application of empirical research for theory building in order to identify the missing gaps.

Another issue to be concerned when applying qualitative approaches is its “methodological quality”. It is understood that the ability to appraise the methodological aspects of such research approach is needed. Critical appraisal of qualitative research is a relatively underdeveloped science, but the proposal of having some criteria for appraisal

ing it is of paramount importance. In this sense, the developed statements showed in this paper can assist to assess the 'methodological quality', as illustrated in the worked example. Nevertheless, this is just a preliminary proposition and has to be refined. This is another direction that future work will be concentrated.

Finally, the analysis of a sample of dissertations could give some hints about what is going on in terms of the application of qualitative approaches. Once again, there are clear limits to the validity and reliability of the findings in this analysis. Nevertheless, they can be considered as indicative findings. Therefore, another task is required, for instance for examining PhD work since those work usually tend to be more methodologically robust.

This work raised a number of questions beyond the capability to be answered in this paper. Questions address issues such as the 'quality' of qualitative research, the relevance and legitimacy of this approach in operations management, and its contribution to this field. It is believed that even an attempt to respond those questions in the future may contribute for qualitative research consolidation in the field of operations management and industrial engineering.

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