

*Journal of Research Practice*  
Volume 1, Issue 1, Article D1, 2005



*Research Design:*

## **Investigating the Research Approaches for Examining Technology Adoption Issues**

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### **Abstract**

Adoption of technology, a research topic within the Information Systems area, is usually studied at two levels: organizational level and user level. This paper examines the range of methods used for studying technology adoption issues at both these levels. The approaches were selected after conducting a review of 48 articles on technology adoption and usage, published in peer reviewed journals between 1985 and 2003. The journals reviewed include the *MIS Quarterly*, *Information Systems Research*, *European Journal of Information Systems*, *Information Systems Journal*, and other relevant journals in the IS area. The findings suggest that the survey method was used predominantly when investigating the topics of user adoption and the usage of technology. In contrast, the case study method is the most widely used when examining adoption issues at the organizational level.

**Keywords:** research method; information systems; technology adoption; survey; case study

**Suggested Citation:** Choudrie, J., & Dwivedi, Y. K. (2005). Investigating the research approaches for examining technology adoption issues. *Journal of Research Practice*, 1(1), Article D1. Retrieved [Date of Access], from <http://jrp.icaap.org/index.php/jrp/article/view/4/7>

## 1. Introduction

When examining the adoption of technology, there are various stakeholders and contexts to consider. These range from the organizational to the individual. Studies related to adoption of technology within the household context are beginning to emerge in the Information Systems (IS) area. When conducting any research, selecting an appropriate approach and method is a critical issue. Galliers' (1992) taxonomy on IS research approaches provides researchers with a tool that offers a choice of suitable research approaches. The approaches can be applied to investigations focused on a range of subjects such as society, organization or groups, individuals, technology, and methodology. However, the taxonomy is limited (Mingers, 2001), as it does not suggest an approach that can be utilised to explore issues associated with household consumers, who are numerous and varied. Technology adoption appears to be one of the less explored topics in the IS area. Therefore, the aim of this exploratory paper is to ascertain the approaches and methods employed in research on technology adoption. This is pursued by examining the following:

- (i) Prevalence of different research methods in the area of technology adoption and use
- (ii) Prevalence of different research methods in the area of technology adoption and use within the household context
- (iii) Relationship between the research method used and the types of *research artefact* (or *unit of analysis*) examined (i.e., users, consumers, organizations)

To explore the above, a review of articles was undertaken, selecting from those published within peer-reviewed and highly rated journals including *MIS Quarterly*, *European Journal of Information Systems (EJIS)*, *Information Systems Journal (ISJ)*, *Information Systems Research (ISR)*, and other relevant publications.

The paper is structured as follows. Section 2 offers a brief discussion of the recommended research approaches in the IS area. Section 3 provides a brief discussion of the method used to analyze the trends of research approaches. The findings are presented and discussed in Section 4. Finally, Section 5 offers conclusions from this exploratory study.

## 2. Reviewing Information Systems Research Approaches

In the IS area, several attempts have been made to review and classify research approaches (Cheon, Grover, & Sabherwal, 1993; Galliers, 1992; Galliers & Land, 1987; Mingers, 2001, 2003; Nandhakumar & Jones, 1997; Orlikowski & Baroudi, 1991; Walsham, 1995a, 1995b).

An early work was by Galliers, who provided a taxonomy of prevalent IS research approaches. This taxonomy considered a range of *positivist* and *interpretive* research approaches including experiments, surveys, case studies, theorem proof, forecasting, simulation, reviews, action research, futures research, and role/game playing (as shown in Table 1). The other early research was by Orlikowski and Baroudi, who offered a philosophically reflective paper with a North American perspective. In this work the emphasis was on categorizing published IS research according to the epistemologies used and it was found that although positivism was prevalent, *critical epistemology* (Orlikowski & Baroudi, 1991) was also beginning to emerge. A list of the IS research approaches is offered in Table 1.

Table 1. *IS research approaches*

Research Philosophy	Mingers' (2003) classification of research methods	Galliers' (1992) classification of research methods)
Positivist	Observation (passive), measurements, and (statistical) analysis	Laboratory experiment
	Experiments	Field experiment
	Survey, questionnaire, or instrument	Survey
	Case study	Case study
		Theorem proof
		Forecasting
	Simulation	Simulation
Interpretivist	Interviews	Subjective/argumentative
	Qualitative content analysis	Reviews
	Ethnography	Action research
	Grounded theory	Descriptive/interpretive
	Participant observation	Futures research
		Role/game playing
Methods involving interventions	Action research	
	Critical theory	
	Consultancy	

(Adapted from Galliers, 1992; Mingers, 2003)

Recent studies have been conducted by Mingers (2001, 2003), who conducted a review of all the papers published during 1993-1998, in two leading American journals (*MIS Quarterly* and *Information Systems Research*) and four European ones (*European Journal of IS*, *Information Systems Journal*, *Accounting, Management and IT*, and *Journal of Information Technology*). The findings of this study suggest that about 80% of the evaluated papers contained some form of empirical research, where surveys, interviews, experiments, and case studies were the dominant approaches. Alternatively, approaches like participant observation, grounded theory, and Soft Systems Methodology, were rarely used. Mingers' (2001, 2003) studies also indicate the differences between journals, with *ISR* (American IS journal) being oriented towards quantitative approaches and *ISJ* and *AMIT* (European IS journals) towards qualitative.

The aforementioned studies provide evidence that although a several research methods are suggested (Galliers, 1992; Orlikowski & Baroudi, 1991), only surveys, experiments, interviews, and case studies are predominantly used within the IS area. Having established the scene for this study, the following section details the approach and method used in the study reported here.

### **3. Approach and Method**

The method adopted in this study is similar to the previous studies on Information Systems research approaches (Farhoomand, 1992; Hamilton & Ives, 1992; Mingers, 2003; Orlikowski & Baroudi, 1991). The following process was followed, drawing much from Mingers' (2003) work:

- (i) Abstracts of the empirical studies from selected IS journals were reviewed and the research methods recorded.
- (ii) If the method was not clear from the abstract then the original article was reviewed.
- (iii) All the studies were then assigned to appropriate classes using Mingers' (2003) classification scheme, which is discussed below.
- (iv) The research methods of studies on household technology adoption were assigned separately to different categories.

#### **3.1. Sample Selection**

We surveyed articles published during the period 1992-2003. The articles were reviewed from four peer-reviewed and reputed IS journals. Since Mingers' (2003) method was used, we based our sample selection very close to his. Although he considered a sample of six IS journals, we eliminated two journals from Mingers' study: *Information and Organization* and *Journal of Information Technology*. This decision was made because the contents of these journals are not appropriate for the context of this study. A further reason for exclusion is that methodological differences exist in the articles published in the American and UK/European IS journals (Mingers, 2001, 2003; Walsham, 1995). To

avoid any bias and to obtain a common perspective, two American and two European IS Journals were examined. Table 2 offers the names and ranking of the journals included in this study.

Table 2. Ranking of IS journals examined in this research

Journals	(Peffer & Ya, 2003)	(Mylonopoulos & Theoharakis, 2001)
<i>MIS Quarterly</i>	1	1
<i>Information Systems Research (ISR)</i>	2	3
<i>European Journal of Information Systems (EJIS)</i>	4	11
<i>Information Systems Journal (ISJ)</i>	10	16

### 3.2. Description of Research Method Classes

The extant IS literature suggested that different words were used for the same research methods. For instance, the terms ‘survey’ and ‘questionnaire’ were used indistinguishably. Contrastingly, the terms ‘case study’ and ‘interviews’ were used synonymously, although they are distinct from each other (Mingers, 2003). Bearing this in mind, it was felt that a necessity to clarify different words used for different types of research method was essential. For this purpose, we adopted Mingers’ classification and description of research methods. This classification was followed for two reasons: first, Mingers’ research is the most recently published work; second, it encompasses a large number of research methods associated with all three epistemological standpoints, namely *positivist*, *interpretivist*, and *critical*. As a reminder, positivist research methods include: observations, measurements, surveys, questionnaires, instruments, laboratory and field experiments, statistical analysis, simulations, and case studies. Interpretivist research methods consist of interviews, qualitative content analysis, ethnography, grounded theory, and participant observation. Finally, the critical standpoint involves intervention and change, employing the methods of action research, critical theory, and consultancy (Mingers, 2003).

A total of 633 articles appearing during 1992-2003 in four IS journals were examined to select empirical papers addressing the issue of technology adoption and usage. We followed Mingers’ definition of an empirical paper, which states that a paper is empirical if it reports on new data (of any kind) that has been generated by the underlying research and the resultant analysis is a substantive part of the paper’s contribution (Mingers, 2003). Empirical papers focusing on the aforementioned area were then studied and their research method was recorded. Since IS research on technology adoption focuses on *users* as research artifact, another wider search of the relevant literature was conducted, to

examine the approaches used to study adoption and usage of technology in the *household* context.

#### 4. Findings and Discussions

From the 633 articles we examined, 31 articles (4.9%) addressed issues related to technology adoption. This proportion in specific IS journals were as follows: *MIS Quarterly* (6%), *ISR* (5.15 %), *EJIS* (5%) and *ISJ* (2.63%). Table 3 presents this in more detail.

Table 3. *Trend of technology adoption research in IS journals*

Journal	Period	Total Articles	Articles on Technology Adoption	Proportion (per cent)
<i>MIS Quarterly</i>	1994-2003	164	10	6.1
<i>ISR</i>	1998-2003	136	7	5.15
<i>EJIS</i>	1997-2003	219	11	5
<i>ISJ</i>	1996-2003	114	3	2.63

The analysis of the articles suggest that the researchers investigating technology adoption used two main research methods, namely *survey* and *case study* methods. 74% of the articles employed the survey approach (shown in Figure 1), which suggests that it is the most widely used method in technology adoption research. This is similar to previous findings (Farhoomand, 1992; Mingers, 2001; Orlikowski & Baroudi, 1991), that the survey method is more dominant in the IS area. The remaining 26% of the research employed the case study method. No other methods were employed to investigate use or adoption of technology. Another interesting observation is that the case study method was exclusively employed to study organizational adoption of technology, while surveys were used to study a range of contexts. For example, surveys were used to study technology adoption within the context of technology users, household and online consumers, senior executives, and small firms. Although technology adoption is a common topic within the IS area (Venkatesh, Morris, Davis, & Davis, 2003), the research approaches used are of very limited diversity.

Previous research undertaken by Mingers (2001) identified the research approaches reported within the journals published in two different continents (North America and Europe). It was found that the North American journal *ISR* published research that employed the survey method, while the European/British journal *ISJ* tended to publish research that applied the case study approach. Two other highly acclaimed IS journals, *MIS Quarterly* and *EJIS* published articles that utilised both surveys and case studies (as shown in Figure 2).

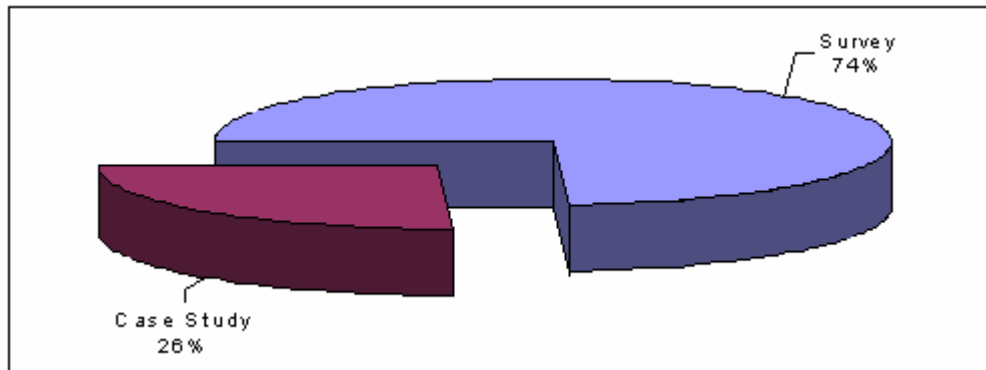


Figure 1. Research approaches used in technology adoption research

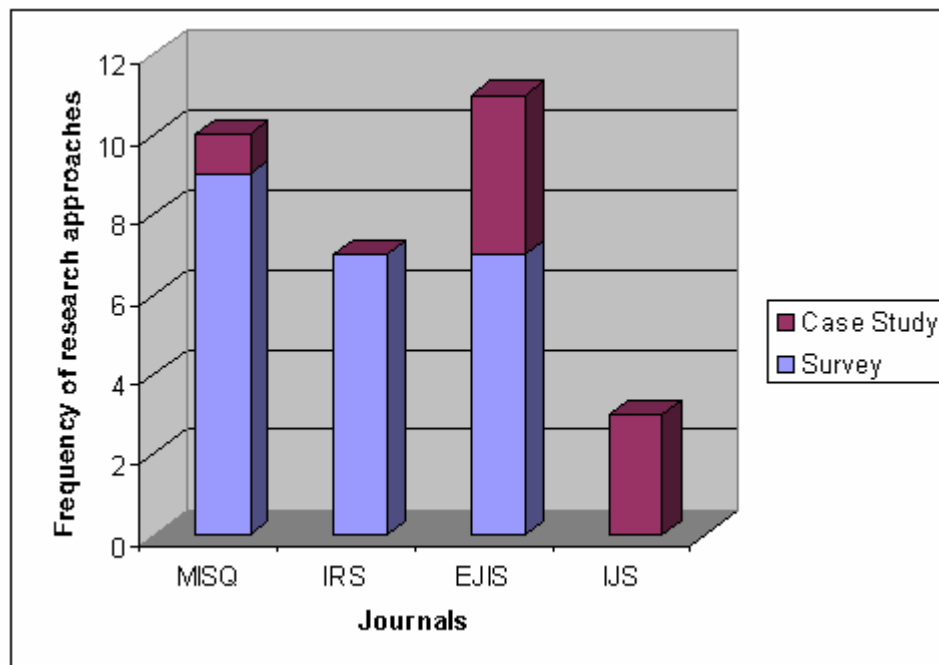


Figure 2. Frequency of research approaches employed in various IS research

The review of articles suggests that research on technology adoption in the context of the household has just begun to emerge. IS researchers have mainly focused on organizational issues. Therefore, another attempt was made to identify publications, which addressed technology adoption issues in the household context. For this purpose articles were extracted from both the IS and non-IS journals including *Advances in Consumer Research*, *American Behavioral Scientist*, *Journal of Marketing*, *Management Science*, and *Journal of Economic Psychology*. Analysis of the selected articles indicated that the survey method is once again dominant in the study of consumer adoption of technology in the household context (as shown in Figure 3). The survey method was

employed in 63% of the articles. The range of tools employed to conduct a survey included postal service, telephone, face-to-face interview, and web questionnaires. 25% of the research reported was conducted using a multi-method approach whereby a combination of survey with either interview or time use diary was employed. Other methods employed were ethnographic study and analysis of secondary data obtained from census figures. For the purpose of investigating *adoption* of technology (especially information and communication technology) within the household, the survey method seemed to be the most predominant. Other approaches including multi-method, ethnographic study, and secondary data analysis were employed mostly for investigating the *usage* of technology in the household.

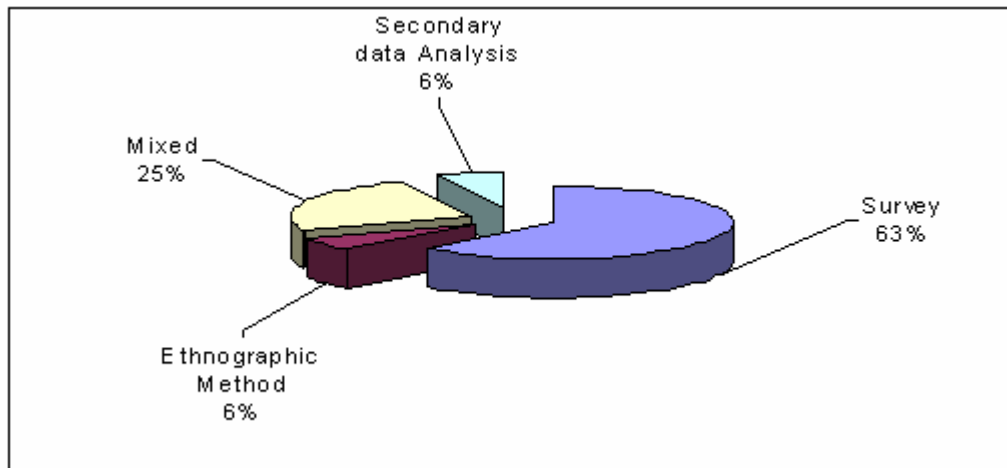


Figure 3. Methods of technology adoption research in the household context

The findings suggest that the most widely used method to examine technology adoption issues both in the contexts of the organizations and households was the survey method. The case study method was employed only for investigating technology adoption issues in the organizational context, particularly when the *unit of analysis* was the organization rather than the individual users. This method was not employed in the household context. Other approaches such as the ethnographic study and time use diaries were employed in the household context, but not in the organizational context (Figure 4).

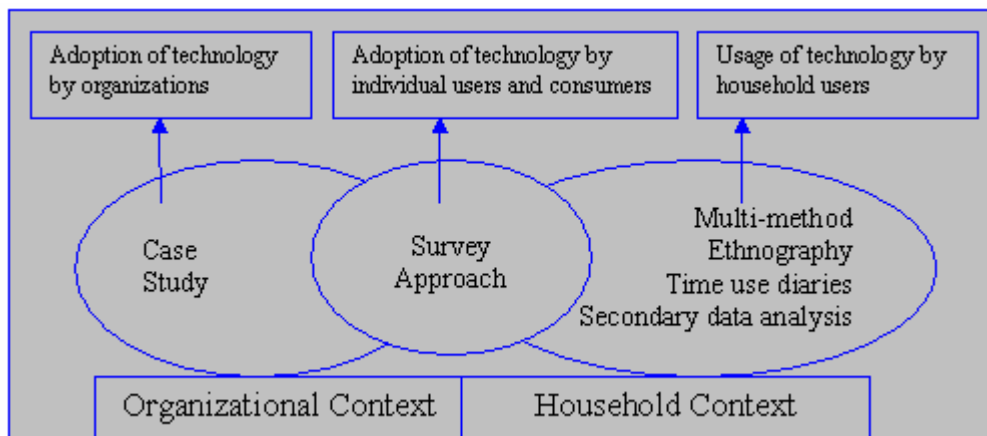
It is possible that researchers follow the method commonly used within their field. Mingers' study also emphasized that "culturally, the problem is that the IS discipline tends to split into subcultures based around particular countries, university departments, journals, or even methods" (Mingers, 2003, p. 246). He observes (on the same page), researchers, especially junior ones, find themselves under pressure to "follow the party line". A geographical divide in the use of research methods is also evident, as in some previous studies (Mingers, 2001, 2003).

Technology is not static in nature. Therefore, studies of its adoption and diffusion should adopt method(s) that can capture this characteristic of technology within particular



contexts. It may be possible to use just one method, for example, a longitudinal survey or longitudinal case study, for an in-depth and insightful investigation of the emerging and evolving phenomenon of technology adoption. Alternatively, a combination of diverse and feasible research methods could be applied to study different phases of the technology diffusion phenomenon. For example, exploratory studies can combine ethnographic studies, observations, interviews, and surveys. Usage and impact aspects of technology diffusion could be studied by employing ethnography, observation, and interviews.

Therefore, technology adoption and diffusion researchers should consider the context, stage of adoption, and the feasibility of using particular methods in designing their research. Apart from a selection of methods, recent IS studies (Applegate & King, 1999; Benbasat & Zmud, 1999; Boudreau, Gefen, & Straub, 2001; Davenport & Markus, 1999; Dube & Pare, 2003; Lee, 1999; Lee, 2000; Lee, 2001; Lee & Baskerville, 2003; Lyytinen, 1999; Massetti, 1998) have emphasized their concern about generalizability, rigour, and relevance of IS research, including content validation and reliability testing while developing instruments for data collection. Although these studies are useful and interesting to discuss within the context of technology adoption and diffusion research, it is beyond the scope of this paper.



*Figure 4.* Most favoured approaches to technology adoption research

## 5. Conclusions

This paper concludes by suggesting that although a range of research methods is available to IS researchers, only a limited set of methods are being used for examining technology adoption issues. Two methods, namely survey and case study, are employed in the organizational context. The choice of method seems to correspond with the unit of analysis. When the researchers considered the organization as a unit of analysis, the case study approach was favoured. In studies related to individual users or consumers, the survey approach was favoured. This can be attributed to issues such as convenience, cost, time, and accessibility (Gilbert, 2001). However, the issues of reliability and validity are

also important factors to consider (Wealleans, 2003). In the household context, several methods have been used, namely survey, multi-methods, ethnographic study, time use diaries, and secondary data analysis.

The extent to which a researcher can be a part of the context being studied may be relevant in the choice of research method. Within the household context, it is difficult for a researcher to be a part of the context; therefore methods involving indirect observation, self-reports, etc., would be feasible. In the organizational context however, a researcher can be part of the context, e.g., by being employed in the organization. In this case, it would be feasible to generate a detailed internal picture of the context by following the case study method.

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*Received 5 July 2004*

*Accepted 28 January 2005*

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