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The Case for Conceptual Research in Information Systems

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Abstract

Conceptual Research - a non-empirical research method- is among the three most used research methods in the discipline of Information Systems. However, its principles and foundations are implicitly used by researchers. Thus, its importance for advancement and development of the IS discipline is underestimated when it is compared with empirical research methods. In this research article, we develop the case for conceptual research. For this aim, we first review the main IS research method taxonomies reported in IS literature, and an integrative framework of IS research methods, based on Theory of Systems is developed. Second, we explain the place and relevance of the conceptual research method in this new framework. Finally, we illustrate the framework's usefulness with four exemplary research papers reported in top IS journals.

Keywords

Conceptual research, research methods, research frameworks, interdisciplinary research, systems approach.

1. Introduction

According to Ackoff et al (1962) and Popper's (2002) ideas, the scientific process can be defined as systematic, rational, verifiable/falsifiable process for: (i) answering questions on a natural, artificial or social situation, (ii) solving, resolving or dissolving a problematic well-structured or messy natural, artificial or social situation and/or (iii) developing better instruments and methods for doing (i) and (ii). In pursuing these three core aims, the research process can limit its scope and effect on the reality (based in Midgley (2000), who interprets Habermas (1972)) to: (i) study it without modifying it or (ii) intervene in it in order to purposefully modify or control it.

In the first instance, the research process can be sub-classified according its purpose of: (i) developing an initial scheme of a few explored situation of interest, (ii) developing of a quantitative and/or qualitative description of the situation of interest, (iii) developing and testing of a predictive theory or model of the situation of interest, (iv) developing and testing of an explanatory theory or model of the situation of interest, or (v) developing (designing and testing) of a conceptual instrument for measuring constructs of the of the situation of interest. In the

second instance, the research process purposes can be formulated as: (i) developing (designing, building and testing/evaluating) of a physical artifact for measuring physical properties of other physical artifacts, or (ii) controlling purposefully the application of a designed policy or another treatment (conceptual or physical), seeking some expected effects of interest in the situation. While in the early scientific epochs, the natural sciences (e.g. physics, chemistry and biology) were limited to the first scope, and the sciences of the artificial (e.g. all engineering-based sciences) to the second one, in nowadays, an interdisciplinary approach suggests both research purposes (with the exception at present of some sciences such as History and Astronomy). In the case of management sciences, an ethical-oriented belief is of pursuing only the first scope (e.g. the Critical Systems view (Flood and Room, 1996)). However, given the emergence of new human-based social and system sciences rooted both in sciences of the artificial and management sciences (e.g. information systems), the debate on research scopes can still be considered open. Thus, while it is completely accepted that software information systems are artificially and purposefully designed with a functional testable effect, the achieving of a purposefully designed information systems (including the modification and controlling of the socio-political, and the context-environment sides, besides the technological issues) can still be considered an open research question, as well as the achieving of artificially purposeful designed social situations.

Nevertheless, the research endeavor's aim can be summarized as the search of the best set of truths (e.g. congruency to reality and testable/falsifiable statements) of a conceptual system (e.g. the scientific knowledge system) for understanding and purposeful –when possible- modifying such a reality under study through its associated conceptual knowledge system. For this general aim, several taxonomies of research methods have been developed. According to Vogel and Wheterbe (1984, quoted by Järvinen, 2003, p. 124): "taxonomies help to focus research, clarify representation in the literature, define standards and spot trends or gaps in the research". Furthermore, according to Järvinen (2003), the same authors suggest comprehensiveness, parsimony and usefulness as criteria to assess taxonomies. Thus, a high-quality research method taxonomy must be complete, be non-redundant -with minimal overlaps- and must provide a practical value for researchers. We consider that a taxonomy (as an organized hierarchical classification of concepts) is also useful as far as it permits to establish the relevance of every method to the needs of its application. Moreover, we have found out that the lack of principles and procedures on how to apply the conceptual research method (the focus of this paper) have concealed its value, despite of its extensive use in the IS discipline. That is why, we have reviewed the main taxonomies of IS research methods reported in IS literature, and are showing that there are still some critical knowledge gaps. Then, we introduce an integrative framework (e.g. a taxonomy augmented with the concepts' interrelationships and descriptions) of IS research methods, to accommodate, harmonize and accumulate valuable knowledge generated by previous taxonomies. A case of conceptual research is elaborated and we explain its relevance and correct role in the arsenal of IS discipline research methods. Finally, we illustrate the framework's usefulness with four exemplary research papers reported in top IS journals. A set of initial principles derived from this framework and the exemplary papers for doing high-quality conceptual research in the IS discipline are recommended for a subsequent research.

2. Review of Related Studies in IS Research Methodological Taxonomies

Taxonomies for IS research methods have been developed either directly (e.g. the focus was such a classificatory scheme) (Galliers & Land, 1987; March & Smith, 1995; Järvinen, 2000; Hevner,March, Park & Ram, 2004; Gonzalez & Dahanayake, 2007) or indirectly (e.g. the taxonomy was developed for reviewing IS research that was conducted during a period, introducing a new research method or explaining what is the discipline of study) (Denning et al, 1989; Nunamaker, Chen & Purdin, 1991; Orlikowski & Baroudi, 1991; Lending & Wheterbe, 1992[i]; Alavi & Carlson, 1992; Glass, Ramesh & Vessery, 2004). These reported taxonomies (Table 1) have used the following main classificatory criteria: (i) the real or conceptual existence of the unit of study (e.g. empirical method vs non-empirical methods), (ii) the hierarchical analysis level of the object of study (society, organization, group/project, individual, system, or component), (iii) the type of research outcome (construct, model, method or instantiation) and/or (iv) the underlying philosophy in the research method (positivist, interpretative, critical, or critical realism).

Taxonomy	Real vs conceptual unit of study	Level of unit of analysis	Type of research outcome	Underlying philosophy
Galliers & Land (1987)	√	√	no considered	implicit use
Denning et al (1989)	√	no considered	no considered	implicit use
Nunamaker at al (1991)	implicit use	no considered	no considered	implicit use
Orlikowski & Baroudi (1991)	√	√	no considered	√
Lending & Wheterbe (1992)	√	no considered	no considered	no considered
Alavi & Carlson (1992)	√	√	no considered	no considered
March & Smith (1995)	implicit use	no considered	√	√
Jarvinen (2000)	√	no considered	no considered	no considered
Hevner et al (2004)	implicit use	√	√	implicit use
Glass at al (2004)	implicit use	√	implicit use	no considered
Gonzalez & Dahanayake (2007)	√	no considered	no considered	√

Table 1: Classification Criteria for Main IS Research Methodological Taxonomies

We can infer –from the Table 1- that a comprehensive taxonomy with the main criteria used is missing. Furthermore, the implicit differentiation of the conceptual or real domain of the objects of study in several taxonomies suggests a well-understood relevance and value for both kinds of research approaches. However, while that some studies do that (e.g. assign a similar scientific value to both approaches) others report a biased negative view of non-empirical approaches. For example, Galliers & Land (1987) quoting Vogel & Wheterbe (1984) and Alavi & Carlson (1984) point out that the conceptual research (e.g. subjective/argumentative) is based on speculations rather than systematic data collecting procedures. Orlikowski & Baroudi (1991, p. 3) also consider that research is not conducted through conceptual methods. Since these papers are very relevant in the IS literature, these statements convey a less scientific value to the conceptual approach and potentially are forming a bias toward its non-utilization (e.g. according them the dominant paradigm must be empirical methods and scientific research is only conducted via empirical methods). However, despite the conceptual method is less used in the IS discipline (Straub at al, 1994) than the survey and case study empirical methods, in other disciplines it is

considered of high value (Blalock, 1969; Whetten, 1989; Denning at al, 1989; Counelis, 2000). For instance: (i) in Education domain, Counelis (2000, p. 54) reports the conceptual (review) research as conducted on the ideas of real subjects or objects rather than on themselves (similar to the approach of empirical methods) , (ii) in Sociology, Blalock (1969, p. 3), while encouraging the ideal of transforming any verbal theory/model in a mathematical theory/model, also proposes that the complex social reality limits (at first) the elaboration of simple verbal models that will be extended lately, (iii) in Management Science, Whetten (1989) develops a set of seven criteria to assess the quality of conceptual research papers, and (iv) in Computer Sciences, Denning et al (1989) propose the abstraction approach (e.g. the design of conceptual models) as a research method among the three most adequate methods for this discipline. Furthermore, several IS studies (Orlikowski & Baroudi, 1991; Lending & Wheterbe, 1992; Alavi & Carlson, 1992; Glass at al, 2004) report it among the first three approaches used. The Table 2 shows a distribution of percentage utilization of the five main IS research methods or the study's acknowledgement (√) of the research method as feasible to be used in IS research.

Study	Survey	**Conceptual**	Case study	Engineering	Experiment	Mathematical methods	Others
Galliers & Land (1987)	√	**√**	√	-	√	√	√
Denning et al (1989)	-	**√**	-	√	√	√	-
Nunamaker at al (1991)	√	**√**	√	√	√	√	√
Orlikowski & Baroudi (1991)	49.1	-	13.5	-	29.7	-	7.7
Lending & Wheterbe (1992)	28.9	**21.1**	16.0	14.1	10.9	4.8	4.2
Alavi & Carlson (1992)	16.0	**49.0**	4.0	-	9.0	-	21.0
March & Smith (1995)	√	√	√	√	√	√	-
Järvinen (2000)	√	√	√	√	√	√	-
Hevner et al (2004)	√	√	√	√	√	√	-
Vessey at al (2002)	26.8	**14.8**	13.7	-	19.1	12.3	13.3
Glass at al (2004)	24.5	**14.7**	12.5	-	17.8	12.3	18.2
Gonzalez & Dahanayake (2007)	√	√	√	√	√	-	-

Table 2: Utilization Percentages or Acknowledgements of IS Research Methods

The categories and data shown in Table 2 require additional remarks. The survey category corresponds to the quantitative empirical studies of a population sample examination. However, some authors include Literature Survey in this category (Lending & Whetherbe, 1992), but we consider such studies to belong to a different category. The Conceptual category corresponds to the non-empirical study of ideas related to real objects including as well original Conceptual studies (designing a new conceptual artifact: a construct, a framework/model[ii], a method/process or a system/component) and scholastic studies (reviews, tutorials and normative writing (Gonzalez & Dahanayake, 2007)). The Case Study category corresponds to the qualitative empirical examination of organizations. The Engineering category corresponds to the study of purposeful design of physical artifacts[iii]. The Experiment category corresponds to the empirical controlled study of subjects in a laboratory or the field setting. Mathematical methods are non-

empirical studies on mathematical structures using formal mathematical procedures (theorem proof, mathematical analysis). In the Others category are grouped less frequent research methods such as action research, ethnography, historical method, and grounded theory. The development of psychometric instruments using survey techniques is included in the Survey category. In turn, the development of physical instruments is included in the Engineering category. Hence, we can claim that the conceptual research method(s) is(are) relevant and commonly used in IS discipline. However, there is a knowledge gap on the principles and procedures for conducting it with high-quality parameters in the IS literature. An initial proposal for addressing this problematic situation follows in the remainder of this article.

3. A New Framework for IS Research Methods

According Jackson (1990, p. 12) –interpreting to Checkland and Howell (1998)- an inquiry research process is a system[iv] of theoretical frameworks (F's), methodologies (M's) and situational areas (A's) under the study. We argue, then, that based on the findings and knowledge gaps identified in Tables 1 and 2, a new and integrative IS research methodological framework for IS research is necessary and could be elaborated by using the Theory of Systems. This new IS methodological research framework must relate the situational areas under study (A's), the knowledge known in such situations (F's) and the knowledge about the methodological issues (M's) that are permitting to study the A's, with valuable assertions reported in the previous frameworks. The Figure 1 shows the proposed framework. Two core criteria are used to elaborate this framework: (i) the conceptual vs reality dimension and (ii) the natural/behavioral vs purposeful design dimension. The conceptual dimension accounts for the subsystem of organized and verifiable/falsifiable knowledge on the reality as well as the conceptual things per se. The reality dimension (Bhaskar, 1975; Mingers, 2000) accounts for the domain of observable events (the empirical domain), the domain of non-observable events (the actual domain) and the stratified domain of the deep physical and social product-producer generative structures and mechanisms (the whole reality). According Bhaskar (1975), the reality exists independently of the human beings. However, the scientific knowledge and the conceptual domain are socially generated by human beings in concordance with the reality (the truth criteria) and are space-temporal related. The second criterion contrasts the study of conceptual and empirical events and things generated by nature and social structures and mechanisms without an intervening/modifying purpose (e.g. to explore, describe, predict or explain) from those with the intervening/modifying and creating purpose of concrete and abstract artifacts (e.g. to design, build and test/evaluate new artifacts or policies) (based on Hevner et al, 2004). These two criteria divide the research process into the following four quadrants: (i) the conceptual behavioral research, (ii) the conceptual design research, (iii) the empirical behavioral research and (iv) the empirical design research.

The first quadrant (the conceptual behavioral research) accounts for the explorative, descriptive (review) and scholastic (tutorial) research purposes on conceptual entities related with real things. This research is performed through four general activities: CB.1 knowledge gap identification, CB.2 research purpose and method selection from conceptual exploratory, descriptive or tutorial review, CB.3 conceptual data collection, and CB.4 conceptual analysis and synthesis, where an exploratory, descriptive or tutorial conceptual outcome is generated. In these studies the researcher uses a conceptual framework or model previously designed (through conceptual design research) to conduct the review. The analysis level of the entities under study

is knowledge of: society, organizations, individuals and/or technology/systems. The underlying philosophies supported are positivist, interpretative, critical and critical realism.

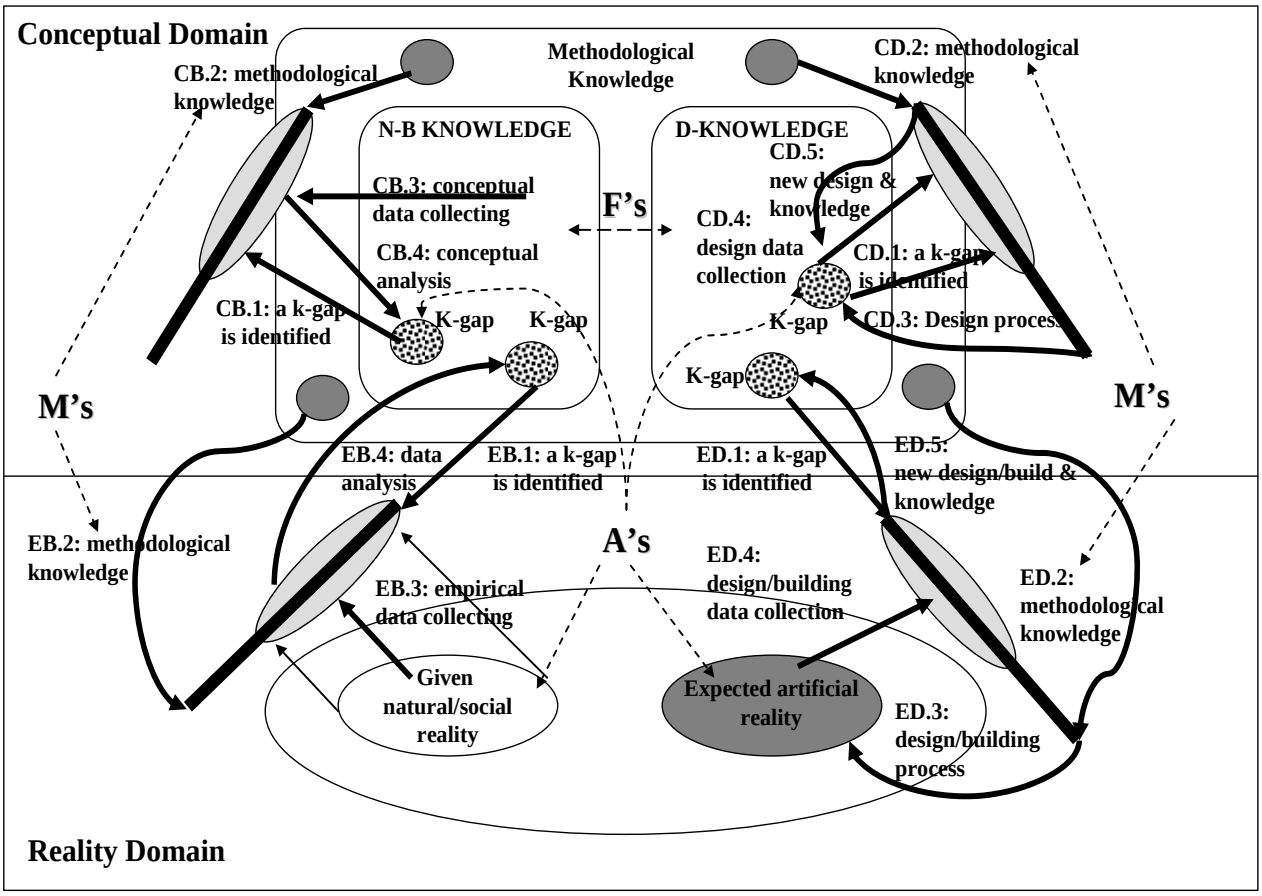

Figure 1: A Systemic IS Methodological Research Framework

The second quadrant (the conceptual design research) accounts for the explorative and conceptual artifact design research purposes. This research follows the following five activities: CD.1 knowledge gap identification, CD.2 research purpose and method selection from conceptual exploratory design or conceptual artifact design, CD.3 conceptual design, CD.4 conceptual data collection for evaluating the designed artifact, and CD.5 analysis and synthesis of findings where a new conceptual artifact outcome is generated among the following: construct, framework/model/theory, method, or system/component (not instanced in a real object). Constructs refer to new concepts. Framework/model/theory refers to conceptual structures created to organize and classify knowledge as well as to descriptive, predictive or explanatory theories and models of a reality when they are theoretically elaborated and not obtained from empirical data. Methods include processes, algorithms and theorems. System/components refer to the conceptual design of potentially real physical artifacts but evaluated without the physical building (e.g. usually through a panel of experts, mathematical analysis or simulation). Then, in this quadrant are included the research methods of mathematical analysis, theorem proof and simulation. The main goal of the conceptual design research is the purposeful design of conceptual artifacts. Such designs are contrasted with the generation of

models used in the empirical behavioral research (e.g. field surveys, case study or experiments with human subjects) where the quantitative or qualitative methods suggest the best model that fits the empirical data. Thus, the reality situation dictates the design. In contrast, in design research, the designed artifact – which must satisfy a set of constrains and requirements- is dictated by the design goals. An interesting case for debate is the conceptual instrument development (e.g. to measure a construct). In the case where empirical data dictates how the instrument must be designed (e.g. via exploratory factor analysis or PLS techniques) this research is considered in the behavioral empirical research quadrant as a descriptive measurement purpose. However, in the case of a conceptual design on the concepts required for describe/measure a situation, this can be considered as a piece of conceptual research. The design of a physical measurement instrument is empirical design research when the artifact is built. If the instrument is not built and is only tested via a computer simulation, this research can be considered as conceptual research. The analysis level of the entities under study is the knowledge of: society, organizations, individuals or technology/systems. The underlying philosophies supported are: positivist, interpretative, critical and critical realism. The third quadrant (the empirical behavioral research) accounts for the study of observable and given real entities. This research is conducted through the following activities: EB.1 knowledge gap identification, EB.2 research purpose and method selection from field survey, case study, experiments (laboratory or field with human subjects), grounded theory[v], ethnography or historical methods, EB.3 empirical data collection, and EB.4 data analysis with the generation of knowledge. This kind of research develops and justifies constructs, models/theories from empirical data (Hevner et al, 2004). The possible units of study are: society, organizations, individuals and technology/systems. The underlying philosophies supported are: positivist, interpretative, critical and critical realism.

Finally, the fourth quadrant corresponds to the empirical design research. This research accounts for the study of design methods and theories to build real artifacts. This research includes the following five activities: ED.1 knowledge gap identification, ED.2 research purpose and method selection from empirical exploratory design or empirical artifact design (e.g. the engineering method), ED.3 empirical artifact design and building, ED.4 empirical data collection for evaluating the designed artifact, and ED.5 analysis and synthesis where a new real artifact outcome is generated from: construct, framework/model/theory, method, system/component (e.g. the artifact is instanced or used in a real object or real situation). The analysis level of the entities under study is a technology/system. Underlying supported philosophies are: positivist and critical realism.

Hence, we claim that this new IS research methodological framework enables us to re-evaluate the correct scientific value of the conceptual research methods and avoid the biased perception of a less scientific value when it is considered as "speculative argumentation" (e.g. guessing without data). We also claim that this new IS research framework (a piece of the conceptual design research) integrates, harmonizes and accumulates valuable knowledge generated by previous studies, and that it is comprehensive and parsimonious. Its usefulness is illustrated in the next section.

4. IS Research Methodological Framework Illustration

The usefulness of this framework is illustrated with four exemplary research papers published in top journals in the domains of knowledge management or decision support systems. Table 3

shows the core attributes according to the new IS research methodological framework.

Quadrant I	**Conceptual Behavioral Research**
Exemplary paper	Alavi & Leidner (2001)
IS research domain	knowledge management
Research outcome	a tutorial and descriptive study on what is KM, what is known and what are their research challenges
Research method	conceptual descriptive and tutorial review
Unit of study	multiple conceptual units
Underlying philosophy	positivism
Quadrant II	**Conceptual Design Research**
Exemplary paper	Huber (1990)
IS research domain	decision support systems
Research outcome	a theory-model on the effects of advanced IT on the business intelligence capability in organizations
Research method	conceptual artifact (predictive model) design
Unit of study	organization
Underlying philosophy	positivism
Quadrant III	**Empirical Behavioral Research**
Exemplary paper	Kulkarni et al (2006)
IS research domain	knowledge management
Research outcome	a quantitative and explanatory[vi] model on the plausible causal links between the following constructs: quality of available knowledge, quality of the built KM systems to share and reuse knowledge, managerial support type, and knowledge management (KM) success.
Research method	empirical behavioral research (field survey)
Unit of study	individual
Underlying philosophy	positivism
Quadrant IV	**Empirical Design Research**
Exemplary paper	Shane at al (1987)
IS research domain	decision support systems
Research outcome	A DSS for investment portfolio selection process
Research method	empirical artifact (software system) design
Unit of study	technology
Underlying philosophy	positivism

Table 3: Exemplary Cases of IS Research Types Defined in the IS Research Methodological Framework

This framework enables researchers of methodological issues to acquire a holistic view of the research process perceived as an answering systematic system as well as a design-oriented problem-solving system (Ackoff et al., 1962). The framework is also useful to re-assess the value assigned to the conceptual research and to distinguish conceptual descriptive/scholastic from conceptual design research. Since Hevner et al.'s study (2004) is one of the most current and comprehensive IS research framework, we believe that our framework captures all essential identified findings by them and enriches our understanding of the scientific process for doing research in the domain of information systems. The design of this framework can be classified as type II (conceptual design research) and the initial utilization with the four exemplary cases as type I (conceptual behavioral (explorative) research).

5. Conclusions

In this paper, we have reviewed the main IS research methodological frameworks. We identify knowledge gaps and design a new framework based in the Theory of Systems. The main motivation was to clarify the value of conceptual research methods because some literature considers such an approach of less scientific value than empirical methods. Through this new framework, we define the characteristics of the conceptual research methods. Four exemplary cases from top journals were used to illustrate the framework's usefulness. Further research is planned for improving the definition of the four quadrants reported in this framework, as well as for defining a set of principles on how to conduct high-quality conceptual research in the IS discipline. This research can be also classified as a piece of conceptual design research and conceptual behavioral (exploratory) research. Hence, we claim that we have developed an initial case for conceptual research.

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[i] This study updates the classic Vogel and Wheterbe's (1984) study.

[ii] Please note that a conceptual model can be a simulation model. We consider that to conduct experiments on such models are not the most creative but methodic part. Thus, its creative theoretically-based design formulation is that justifies its inclusion in the Conceptual category.

[iii] Please note that conceptual research can also design artifacts but of conceptual nature.

[iv] A system view of research process has been also reported by other authors (Gelman & Garcia, 1989; Gelman et al, 2005; Mora et al, 2007).

[v] Grounded theory could be also used with conceptual objects in a first stage of the overall process. However, its essential focus is empirical due to the inductive way of generating a theory from qualitative data.

[vi] Explanatory model is considered under the required theoretical assumptions of utilization of LISREL technique.