Linking Ontology, Epistemology and Research Methodology

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Abstract

The purpose of this paper is to offer insights that can help researchers to link ontology, epistemology and research methodology. This paper outlines the links among ontology, epistemology and research methodology by exploring ontological, epistemological and methodological perspectives in the research. It discusses how ontological and epistemological issues influence research methodology by providing a clear understanding of different research methodologies based on ontology and epistemology. Furthermore, attention is given to research aspects such as the elements of the research process, research philosophy, research approach, research strategy, the choice of method, and research design.
Keywords: ontology; epistemology; research methodology.[§]

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1 Introduction

This paper discusses the research process from ontological, epistemological and methodological perspectives to explore and understand the social phenomena. The goal of this review is to provide a clear understanding of different research methodologies based on ontology and epistemology. The research methodologies can generally be subdivided into quantitative and qualitative research methodology. Quantitative methodology generates knowledge by investigating things which we could measure in some way. Qualitative methodology increases understanding of why things are and the way they are in the social world, and why people act the ways they do.

The differences amongst research methodologies are based on a philosophical and theoretical view of research that guides researchers in their social science research. Furthermore, researchers can select the research methodology in social science and that depends on philosophical issues, which are related to ontology (the nature of reality) and epistemology (the nature of knowledge). This paper is an attempt to make the reader aware of the research methodologies and their basis of difference from ontological, epistemological and methodological perspectives.

2 Research Process

The research process consists of four elements, namely epistemology, theoretical perspective, methodology, and methods that inform one another, as shown in Figure 1. In other words, epistemology informs the theoretical perspectives, these perspectives determine research methodology, and then methodology governs and chooses the methods of research (Crotty, 1998).
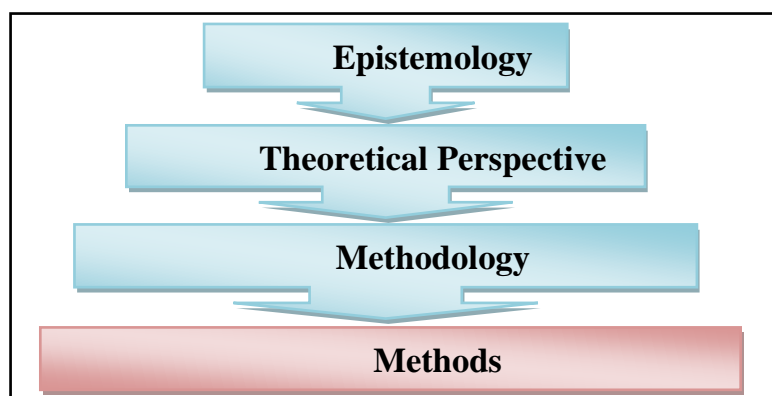

Figure 1: The Basic Elements of Research Process (Crotty, 1998, p.4).

Crotty (1998: p.3) defined the basic elements of research process as the following:

- Epistemology: "The theory of knowledge embedded in the theoretical perspective and thereby in the methodology".
- Theoretical Perspective: "The philosophical stance informing the methodology and thus providing a context for the process and grounding its logic and criteria".
- Methodology: "The strategy, plan of action, process or design lying behind the choice and use of particular methods and linking the choice and use of methods to the desired outcomes".
- Methods: "The techniques or procedures used to gather and analyze data related to some research question or hypothesis".

The first element, epistemology is described as inherent in the theoretical perspective as "a way of looking at the world and making sense of it". Major types of epistemology are: objectivism, constructionism, and subjectivism. The second element, a theoretical perspective describes the philosophical stance that lies behind the chosen methodology. It grounds the main assumptions of choosing methodology. Main types of theoretical perspective are: positivism (and post-positivism), interpretivism, critical inquiry, feminism, postmodernism, etc. The third element, research methodology represents the strategy and plan of action, which refers to the research design that shapes chosen research methods. Methodology provides a rationale for the choice of methods and the particular forms in which the methods are employed. Major types of methodology are: experimental research, survey research, ethnography, phenomenological research, grounded theory, heuristic inquiry, action research, discourse analysis, feminist standpoint research, etc. The last element, research methods refer to the techniques or procedures that including certain activities to collect and analyse data based on research question or hypotheses. Some of major research methods such as: sampling measurement and scaling, questionnaire, observation, interview , focus group, case study, life history, narrative, visual ethnographic methods, statistical analysis, data reduction, theme identification, comparative analysis, cognitive mapping, interpretive methods, document analysis, content analysis, conversation analysis, etc. (Crotty, 1998).

On the other hand, Saunders, Lewis, & Thornhill (2009) explained the research process as an onion including several important layers; each layer leads to another till the centre of research onion including the choice of data collection techniques and data analysis procedures as shown in Figure 2. The first layer represents the research philosophy which relates to the nature and development of knowledge. Thus, the researchers can adopt different research philosophies as positivism, interpretivism, realism, and pragmatism. After selecting research philosophy, the researchers have to select research approach

in the second layer either deductive or inductive. In the third layer, different research strategies such as experiment, survey, case study, action research, grounded theory, ethnography, and archival research, can be applied to answer the research questions. Research method in the fourth layer can be different types to collect data, namely mono method, mixed methods, and multi-method. Time is important aspect in the research in the fifth layer, and therefore the research can collect data just once over a short period of time 'Cross-sectional' or collect data several times over a period of time 'longitudinal'. Finally, the centre of onion is the core of research that including data collection techniques and procedures of data analysis.
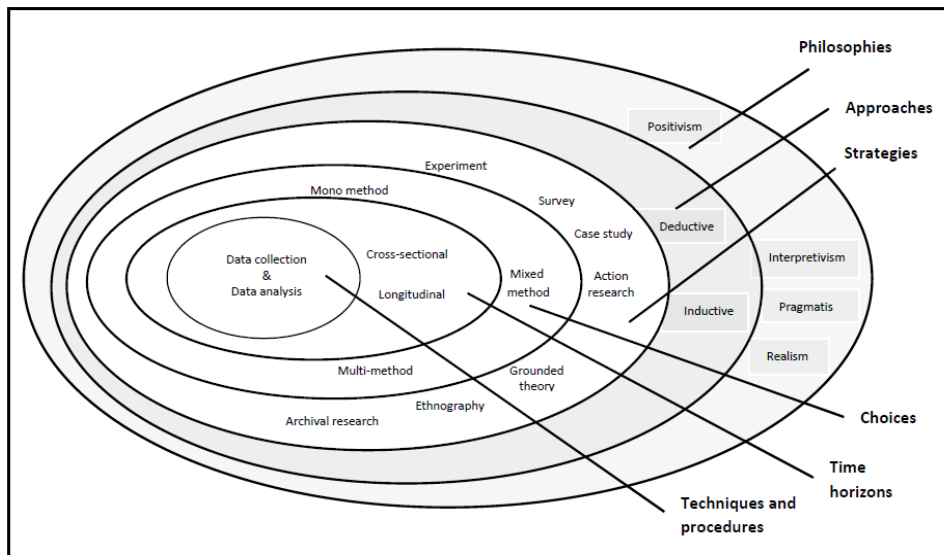

Figure 2: The Research Onion (Saunders et al., 2009, p.108)

2.1   Epistemology

Epistemology involves knowledge and embodies a certain understanding of what is entailed in knowing, that represents how we know what we know (Crotty, 1998). Epistemology deals with 'the nature of knowledge, its possibility, scope and general basis' (Hamlyn, 1995: p. 242) as cited by Crotty (1998: p.8). Furthermore, Maynard (1994) as cited by Crotty (1998: p.8) explains that 'epistemology is concerned with providing a philosophical grounding for what kinds of knowledge are possible and how we can ensure that they are both adequate and legitimate'. Epistemology is concerned with the acceptable of knowledge in the study field (Saunders et al., 2009).

Major types of epistemology are objectivism, constructionism, and subjectivism (Crotty, 1998). Objectivism means that meaning and meaningful

reality exists as such apart from the operation of any consciousness (Crotty, 1998), and it represents "the position that social entities exist in reality external to social actors" (Saunders et al., 2009: p.110). Constructionism refers to the meaning that comes into existence in and out of human engagement with the realities in the world due to there is no truth waiting to discover it as well no meaning without a mind. This view supports that subject and object emerge as partners in the generation of meaning. Finally, subjectivism refers to the meaning comes from anything but the object to which it is ascribed, that means the object itself makes no contribution to the meaning that is imposed on the object by the subject (Crotty, 1998). Saunders et al. (2009: p.111) considered subjectivist view as "social phenomena are created from the perceptions and consequent actions of social actors". On the basis that the phenomena to be investigated exist independent of consciousness and individuals are in direct contact with reality through sensory perception, and therefore this research leans more towards an objectivist epistemology.

2.2   Research Philosophy (Theoretical Perspective)

A theoretical perspective describes the philosophical stance of informing and determining the research methodology (Crotty, 1998). Research philosophy is an important element as it is useful for determining which research design is going to apply and why (Easterby-Smith, Thorpe, & Lowe, 1999), while Saunders et al. (2009) considered research philosophy as a researcher thinking about the development of knowledge. However, there are four types of the research philosophy based on researchers' views about the research process: positivism, interpretivism, realism, pragmatism (Saunders et al., 2009). Whereas, Collis and Hussey (2003) classified the research paradigms into two types: the positivistic paradigm and the phenomenological (or interpretivist) paradigm. More specifically, paradigm refers to "the progress of scientific practice based on people's philosophies and assumptions about the world and the nature of knowledge" (p.46). In other words, people's beliefs about the world will impact research design and the procedures of research (Collis and Hussey, 2003).

2.2.1 Positivism

Positivism provides assurance of unambiguous and accurate knowledge of the world. It refers to something that is posited (i.e. something that is given). Positivism is interested in the development of a comprehensive social that apply the scientific method to the study of society and human beings for their benefit. Positive science based on direct experience, not speculation. Knowledge in this science is grounded firmly and exclusively in something that is posited, and it does not arrived at speculatively. Therefore, positive science (or positivists) is defined as what is posited or given in direct experience is what is observed in scientific methods. Contemporary positivism

is linked to empirical science as closely as ever (Crotty, 1998). The Positivist philosophy adopts the philosophical stance of the natural scientist, and the results of this research philosophy can be law-like generalisations, similar to the results obtained by physical and natural scientists (Saunders et al., 2009). Positivism presents scientific discovery and technology the driving force for progress. Scientific knowledge is both accurate and certain, which represents the confidence in science. Positivism is objectivist completely. Objects in the world from the positivist viewpoint, have meaning prior to, and independently of, any consciousness of them. As well, it is necessary to maintain the distinction between objective, empirically verifiable knowledge and subjective, unverifiable knowledge (Crotty, 1998). In the positivism philosophy, researchers deal with issues objectively without impacting the real problem being studied. Thus, positivism philosophy needs very well structured methodology, quantifiable observations and statistical analysis (Remenyi, Williams, Money, & Swartz, 2005). Consequently, positivism supposes that researchers make an objective analysis and interpretation for collected data (Saunders et al., 2009).

2.2.2 Interpretivism

Phenomenology (or interpretivism) is another theoretical perspective that emerged in contradistinction to positivism to understand and explain human and social reality. The interpretive approach looks for culturally derived and historically situated interpretations of the social life world. Whereas, the positivist approach follows the methods of natural sciences by way of purportedly value-free, detached observation, identifying universal characteristics of human-hood, society and history that provides explanation and consequently predictability and control (Crotty, 1998). This philosophy looks to the social world of business and management science as too complex to be treated as a physical science due to complex management studies in the social world will be lost if its complexity is reduced to law-like generalisations. Interpretivism philosophy considers the situation in each business is unique, and differs from other situations. This methodology is not an appropriate method for generalisation due to the changing state of business organisation and various interpretations by people as well as the complexity and uniqueness of the world (Saunders et al., 2009). This interpretivist philosophy develops knowledge in a different way by focusing on a subjective and descriptive method to deal with complicated situations rather than an objective and statistical method (Remenyi et al., 2005). Social research is complex and does not lend itself to theorising by definite laws such as other research in science. Social research requires investigating behind law-like generalisations due to the complexity of the social sciences, and the philosophy of this research is interpretivist (Saunders et al., 2009).

2.2.3 Realism

Realism is another research philosophy relates to scientific enquiry. The Realist philosophy is based on the belief that reality exists in the world, and this reality is independent of human thoughts and beliefs. Realism is opposed to idealism due to the existence of reality is independent. Realism is one type of epistemology, and therefore it is similar to positivism that assumes a scientific approach to develop knowledge. However, there are two types of realism, namely *direct realism* 'what we see is what we get', and the researchers see the real world accurately; and *critical realism* 'what we see is not what we got' researchers see the world as sensations, not the real things directly, that requires more criticism in the reality (Saunders et al., 2009: pp.114-115).

2.2.4 Pragmatism

Pragmatism declares that the reality exists in the world, and it supports the objective nature of science. As well this philosophy assumes that individuality may impact how people perceive the world, and therefore research is subjective. The view of this philosophy brings multiple explanations and interpretations for science. This philosophy uses both objective and subjective criteria (Saunders, Lewis, & Thornhill, 2003). Hence, the pragmatist philosophy is between positivist and interpretivist research philosophy, it refers to there is no one appropriate philosophy and therefore researchers can adopt more than one research philosophy. Pragmatism argues that is possible to work with variations in epistemology (Saunders et al., 2009).

According to Creswell's (1994) classification, he refers that positivistic paradigm as quantitative paradigm, and phenomenological paradigm as qualitative paradigm (Collis and Hussey, 2003). Whereas, Collis and Hussey (2003) summarised the main features of positivistic paradigm and phenomenological paradigm related to research methodology and method. Table 1 shows the features of main paradigms.

Concept	Positivistic Paradigm	Phenomenological Paradigm
Data collection technique	Quantitative	Qualitative
Epistemology	Objectivist	Subjectivist
Practice	Scientific	Humanistic
Research philosophy	Experimentalist, Traditionalist	Interpretivist

Sample size	Large samples	Small samples
Research approach	Hypothesis testing	Generating theories
Collected data	Highly specific and precise	Rich and subjective
Location	Artificial	Natural
Reliability	high	low
Validity	low	high
Generalizability	Generalises from sample to population	Generalises from one setting to another

Table 1: The Features of the Main Research Paradigms (Collis and Hussey, 2003, p.47, 55).

On the other hand, Saunders et al. (2009) compared between the four research philosophies in terms of Ontology 'the nature of reality', Epistemology 'the acceptable knowledge', Axiology 'the role of values in research', and data collection techniques, as shown in Table 2.

Concept	Positivism	Interpretivism	Realism	Pragmatism
Ontology	External, objective and independent of social actors.	Socially constructed, subjective, may change, multiple.	Is objective. Exists independently of human thoughts and beliefs or knowledge of their existence (realist), but is interpreted through social conditioning (critical relist)	External, multiple, view chosen to best enable answering of research question.
Epistemology	Only observable phenomena can provide credible data, facts. Focus on causality and law like generalisati	Subjective meanings and social phenomena. Focus upon the details of situation, a reality details, subjective meanings	Observable phenomena provide credible data, facts. Insufficient data means inaccuracies in sensations (direct	Either or both observable phenomena and subjective meanings can provide acceptable knowledge

		motivating actions.	realism). Alternatively, phenomena create sensations which are open to misinterpretati on (critical realism). Focus on explaining within a context or contexts.	dependent upon the research question. Focus on practical applied research, integrating different perspectives to help interpret the data.
	ons, reducing phenomena to simplest elements.			
Axiology	Research is undertaken in a value-free way, the researcher is independent of the data and maintains an objective stance.	Research is value bound, the researcher is part of what is being researched, cannot be separated and so will be subjective.	Research is value laden; the researcher is biased by world views, cultural experiences and upbringing. These will impact on the research.	Values play a large role in interpreting results, the researcher adopting both objective and subjective points of view.
Data Collection Techniques	Highly structured, large samples, measurement , quantitative, but can use qualitative.	Small samples, in-depth investigations, qualitative.	Methods chosen must fit the subject matter, quantitative or qualitative.	Mixed or multiple method designs, quantitative and qualitative.

Table 2: Comparison of the Research Philosophies (Saunders et al., 2009, p.119).

Based on the features of the main research paradigms as discussed by Collis and Hussey (2003) as shown in Table 1, and further comparison of the research philosophies as explained by Saunders et al. (2009) is presented in

Table 2. The researcher found that the criteria of a positivist philosophy are suitable to the research objectives such as: independence of researcher, exploration of the relationships and causality between variables, objective criteria, deductive approach, quantitative and qualitative measurements, and generalisation. Consequently, this research selected positivism philosophy to understand the causation among variables, and to explain antecedents related to those variables causally (Crotty, 1998).

3   Research Design

Research design is a crucial part of any research as it is concerned with turning research questions into projects. Research design is important in deciding the research processes and elements such as research methods, research strategy, and sampling (Robson, 2002). Figure 3 displays the components of research design.
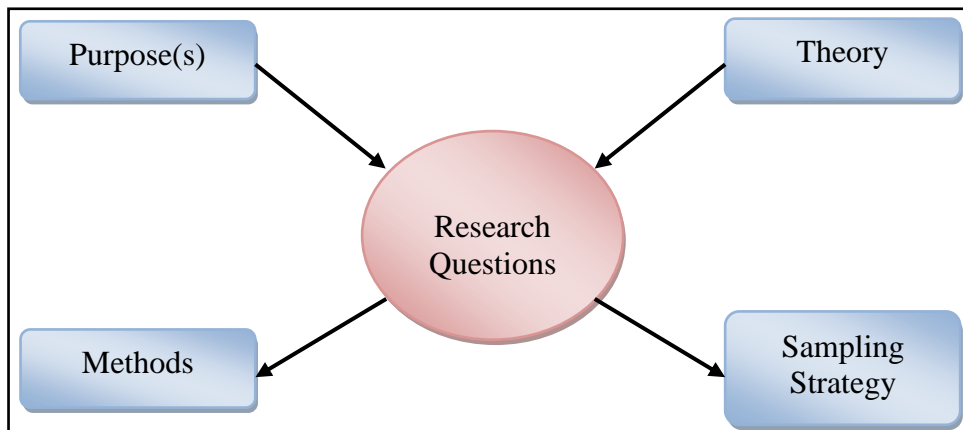

Figure 3: A Framework for Research Design (Robson, 2002, p.82).

The choice of research design depends on the purpose(s) of research, and hence there are four types of research design which are: exploratory study, descriptive study, explanatory study (Saunders et al., 2009), and emancipatory study (Robson, 2002).

1. Exploratory Study: This type of studies focuses on investigating what is happening, asking questions, seeking new insights, assessing phenomena in a new light, as well generating ideas and hypothesis for future researches. An exploratory study is characterised as a flexible design (Robson, 2002). The exploratory study is conducted when there is no information is available or little information is known about how similar research has been conducted in the past. Therefore, exploratory study provides a better understanding of the nature of the problem

being researched since very few studies have been conducted in the same area (Sekaran, 2003). This study is useful for clarifying and understanding of an imprecise problem, it can be conducted based on three main ways are: a search of the literature, interviewing experts, and conducting focus group interviews (Saunders et al., 2009).

2. Descriptive Study: This study displays an accurate profile of persons, situations or event. This type requires collecting a lot of information about the situation that will be studied. The descriptive study may be flexible and /or fixed design (Robson, 2002). Descriptive study is conducted in order to determine and describe the characteristics of the variables in the situation. Therefore, the descriptive study aims to provide researcher a profile or describe aspects of the phenomena being researched at different levels such as individual, organisational, industry-oriented, and other perspective (Sekaran, 2003). This study is considered as a piece of, or a forerunner to exploratory research, and therefore it is necessary to have a clear picture of phenomena before conducting exploratory study (Saunders et al., 2009).

3. Explanatory Study: This study seeks an explanation of a situation or problem being studied and not necessary to be in causal relationship, and explain of patterns relating to studied phenomenon. This study may be flexible and /or fixed design (Robson, 2002). Explanatory study investigates the relationship between variables of phenomenon in order to establish a causal relationships between variables (Robson, 2002; Saunders et al., 2009). Other authors called this type of study as hypotheses testing. Hypotheses testing are usually conducted to explain the nature of the specific relationships, or indicate the difference among groups of independent variables, as well as explain the variance in the dependent variables or to predict outcomes (Sekaran, 2003).

4. Emancipatory Study: This study is not common but it creates opportunities and the will to engage in social action. This study is a flexible design (Robson, 2002).

4 Research Approach

The research approach can be classified into two approaches: deductive approach, and inductive approach. The deductive approach should be used when research focuses on developing theory and hypotheses, and designs a research strategy to test hypotheses. The inductive approach should be used when collecting data and developing a theory as a finding of the data analysis (Saunders et al., 2003). It is necessary to match research philosophies and research approaches; the deductive approach relates more to the positivist philosophy and the inductive approach to the interpretivist philosophy

(Saunders et al., 2009). A deductive approach was chosen in this study by using theoretical arguments based on existing phenomena and testing hypotheses (Blaikie, 2000). This approach is used to describe the causal relationship between variables, testing hypotheses, and generalising the regularities in human social behaviour (Saunders et al., 2009).

On the other hand, Creswell (1994) identified that there are two types of research paradigms based on the assumptions of the paradigms. Firstly, the quantitative paradigm is termed traditional, positivist, experimental, or empiricist paradigm. Secondly, the qualitative paradigm is termed, constructivist approach or naturalistic, interpretative approach, or post-positivist or postmodern perspective. Table 3 explains the main paradigm assumptions for quantitative and qualitative showing.

Assumption	Question	Quantitative	Qualitative
Ontological Assumption	What is the nature of reality?	Reality is objective and singular, apart from the researcher.	Reality is subjective and multiple, as seen by participants in a study.
Epistemological Assumption	What is the relationship of the researcher to that researched?	Researcher is independent from that being researched.	Researcher interacts with that being researched.
Axiological Assumption	What is the role of values?	Value-free and unbiased.	Value–laden and biased.
Rhetorical Assumption	What is the language of research?	Formal. Based on set definitions. Impersonal voice. Use of accepted quantitative words.	Informal. Evolving decisions. Personal voice. Accepted qualitative words.
Methodological Assumption	What is the process of research?	Deductive process. Cause and effect. Static design-categories isolated before study. Context-free. Generalisation leading to	Inductive process. Mutual simultaneous shaping of factors. Emerging design–categories identified during research process. Context-bound. Patterns, theories developed for

		prediction, explanation, and understanding.	understanding.
		Accurate and reliable through validity and reliability.	Accurate and reliable through verification.

Table 3: The Assumptions of Quantitative and Qualitative Paradigm
(Creswell,1994, p.5)

In order to explain the relationship between the study's variables, therefore, a deductive approach can be used to describe causal relationships between variables, and measure facts of variables quantitatively (Saunders et al., 2003). To analyse that association a quantitative methodology can be used to test hypotheses in a cause-and-effect relationship by using a deductive approach (Creswell, 1994). Indeed, qualitative paradigm can be used as a part of quantitative paradigm.

5 Research Strategy

The research strategy is a general plan of how to answer the research question(s) that includes clarify research objectives, specify the sources of data collection, and consider research constraints. There are various research strategies are: experiment, survey, case study, grounded theory, ethnography, action research (Saunders et al., 2003), and archival research (Saunders et al., 2009). However, Saunders et al. (2009) reported that no specific research strategy is better than any other strategies, and therefore selecting research strategy is based on research question(s) and objective(s), research philosophy, and the extent of existing knowledge.

Survey strategy is a common strategy in social research due to it authoritative by people, and this strategy is related to deductive approach (Saunders et al., 2009). Survey strategy is considered a positivistic methodology. There are two types of survey: a descriptive survey is concerned with identifying the frequencies among participations related to specific issues for one time or several times for comparison. The other type is an analytical survey is concerned with investigating the relationship between various variables (Collis and Hussey, 2003). In addition, survey strategy tends to be used in the exploratory study and descriptive study, and therefore this strategy allows researcher to collect quantitative data and analyse these data quantitatively through descriptive and inferential statistics (Saunders et al., 2009). The questionnaire is not the only data collection technique that belongs to survey strategy, and other data collection techniques can be used as

structured observation, and structured interviews (Saunders et al., 2009). A survey strategy can collect primary data more efficiently, accurately, inexpensively, and quickly (Zikmund, 2003).

6 Research Method

The research methods can have three techniques for collecting data are mono method which refers to use a single data collection technique (quantitative or qualitative); multi-method refers to those combinations between more than one data collection technique (Tashakkori and Teddlie, 2003); and mixed-method which refers to use both quantitative and qualitative data collection techniques (Saunders et al., 2009). Multi-method research can be either quantitative 'multi-method quantitative study' or qualitative 'multi-method qualitative study', while mixed-method can be classified into two types are 'mixed method research' uses quantitative and qualitative data collection techniques with relative analysis technique for each data, 'mixed model research' combines quantitative and qualitative data collection techniques and analysis procedures (Saunders et al., 2009). Multiple methods are considered very useful for research due to they provide better opportunities to answer research questions, and better interpreting for research findings (Tashakkori and Teddlie, 2003).

One of the main reasons for using a mixed-method design is triangulation (Saunders et al., 2009). Furthermore, triangulation methodology is a multi-method research using more than one approach for collecting data in order to enhance confidence in the results. Triangulation refers to the attempt to obtain the right data by combining different ways of looking at it (method triangulation) or different findings (data triangulation) (Silverman, 2010). Similarly, Saunders et al. (2009) viewed triangulation as the use of different techniques for data collection within one study to ensure that the data are telling the researcher what he/she think they are telling he/she. For instance, the collected qualitative data through semi-structured interviews may be a valuable way of triangulating collected quantitative data through a questionnaire. Thus, the various data collection techniques (data triangulation) can obtain the right data, and more specifically.

Regarding time horizons, there are two approaches for collecting data are cross-sectional studies, and longitudinal studies. Cross-sectional approach is a positivistic methodology designed to obtain data from different contexts at the same time. In this approach, data is collected just once over a short period of time, it takes a snapshot of an on-going situation. Therefore, cross-sectional approach conducts to investigate the existence of correlations among variables in large samples, and it is the most common approach in the literature. On the other hand, longitudinal approach aims to investigate the dynamics of problem

continuously for several times. This approach allows researchers to investigate the changes related to problem being researched over the time. Longitudinal approach is often related to positivist methodology, it based mainly on a qualitative approach (Collis and Hussey, 2003).

On the basis that the phenomena (i.e. service quality and customer satisfaction) to be investigated as a research. The research leans more towards an objectivist epistemology. Whereas, the theoretical perspective of this research tends to be a positivist philosophy, and a positivist philosophy is suitable to the research objectives to understand the causation among variables, and to explain antecedents related to those variables causally. For example, one study may use a deductive approach to describe causal relationships between variables, and measure facts of variables quantitatively to explain the relationship between those variables. Both quantitative and qualitative methodologies can be used to test hypotheses in a cause-and-effect relationship by using a deductive approach. The research can apply an objectivist view as epistemology, positivist philosophy as theoretical perspective, survey strategy as research methodology, and quantitative method of statistical analysis and qualitative method of content analysis as research methods as shown in Figure 4.
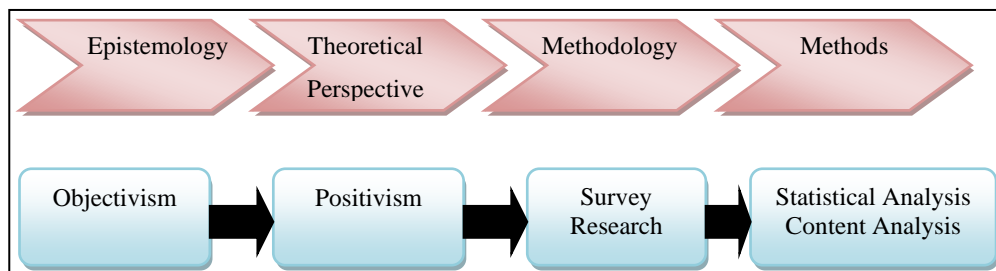

Figure 4: The Elements of Research

As shown in Figure 4, survey strategy is considered a positivistic methodology and it related to deductive approach. Thus, survey strategy allows the researcher to collect quantitative and qualitative data and analyse quantitative data quantitatively through descriptive and inferential statistics through descriptive survey (it concerned with identifying the frequencies among participations related to specific issues), and analytical survey (it concerned with investigating the relationship between various variables), while qualitative data will be analysed qualitatively through content analysis. On the other hand, a holistic view of the research design, more specifically, the research can use positivism as research philosophy, deductive as research approach, survey as research strategy, mixed methods as research method, cross-sectional approach to collect data once, and finally, structured interviews (qualitative data) collaborate with questionnaire (quantitative data) to achieve

triangulation, and therefore data can be analysed by using both statistical analysis and content analysis.

7 Conclusions

The two major forms of research methodology are quantitative methodology, which is grounded on positivist paradigm and qualitative methodology, which is grounded on interpretivist paradigm and quantitative methodology, which is grounded on positivist paradigm. Qualitative methodology is concerned with understanding the meaning of social phenomena. On the other hand, quantitative methodology is concerned with attempts to measure social phenomena by collecting and analyzing data. A clear understanding of the philosophical orientation can guide researchers to conduct their research. Hence, linking research and philosophical traditions helps researchers to clarify their research's theoretical frameworks. The research framework includes the beliefs about the nature of reality (ontology), the theory of knowledge that informs the research (epistemology), and how that knowledge may be gained (methodology) that present different research methodologies used in research.

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