

# When to Collect Data? Choosing an Appropriate Time Frame for Data Collection During Ph.D. Program in India?

H. R. Ganesha<sup>1</sup> & Aithal P. S.<sup>2</sup>

<sup>1</sup> Research Professor, Institute of Management & Commerce, Srinivas University,  
Mangaluru, India, and Board Member, Gramss Retail Trading Private Limited, Bengaluru,  
India,

OrcidID: 0000-0002-5878-8844; E-mail: [hrganesha@yahoo.co.in](mailto:hrganesha@yahoo.co.in)

<sup>2</sup> Professor & Vice-Chancellor, Srinivas University, Mangaluru, India,

OrcidID: 0000-0002-4691-8736; E-mail: [psaithal@gmail.com](mailto:psaithal@gmail.com)

**Subject Area:** Research Methodology.

**Type of the Paper:** Conceptual Paper.

**Type of Review:** Peer Reviewed as per [C|O|P|E](#) guidance.

**Indexed In:** OpenAIRE.

**DOI:** <https://doi.org/10.5281/zenodo.7296552>

**Google Scholar Citation:** [IJAEML](#)

## How to Cite this Paper:

Ganesha, H. R., & Aithal, P. S., (2022). When to Collect Data? Choosing an Appropriate Time Frame for Data Collection During Ph.D. Program in India?. *International Journal of Applied Engineering and Management Letters (IJAEML)*, 6(2), 271-287. DOI: <https://doi.org/10.5281/zenodo.7296552>

**International Journal of Applied Engineering and Management Letters (IJAEML)**

A Refereed International Journal of Srinivas University, India.

Crossref DOI: <https://doi.org/10.47992/IJAEML.2581.7000.0158>

Received on: 18/10/2022

Published on: 05/11/2022

© With Authors.



This work is licensed under a [Creative Commons Attribution-Non-Commercial 4.0 International License](#) subject to proper citation to the publication source of the work.

**Disclaimer:** The scholarly papers as reviewed and published by the Srinivas Publications (S.P.), India are the views and opinions of their respective authors and are not the views or opinions of the S.P. The S.P. disclaims of any harm or loss caused due to the published content to any party.

## When to Collect Data? Choosing an Appropriate Time Frame for Data Collection During Ph.D. Program in India?

H. R. Ganesha<sup>1</sup> & Aithal P. S.<sup>2</sup>

<sup>1</sup> Research Professor, Institute of Management & Commerce, Srinivas University, Mangaluru, India, and Board Member, Gramss Retail Trading Private Limited, Bengaluru, India,

OrcidID: 0000-0002-5878-8844; E-mail: [hrganesha@yahoo.co.in](mailto:hrganesha@yahoo.co.in)

<sup>2</sup> Professor & Vice-Chancellor, Srinivas University, Mangaluru, India,

OrcidID: 0000-0002-4691-8736; E-mail: [psaithal@gmail.com](mailto:psaithal@gmail.com)

### ABSTRACT

**Purpose:** *The purpose of this article is to explain various research data collection time frames, their merits, and demerits, and most importantly the suitability of each data collection time frame concerning the stage/phase of research to enable Ph.D. scholars in India to understand the key difference between research methodology/design and research data collection time frames, in turn, guiding them to choose an appropriate data collection time frame.*

**Design/Methodology/Approach:** *Postmodernism philosophical paradigm; Inductive research approach; Observation data collection method; Longitudinal data collection time frame; Qualitative data analysis.*

**Findings/Result:** *As long as the Ph.D. scholars can understand all the available research data collection time frames and make mindful choices of data collection frames at various stages/phases of their research journey to answer their research question they will be able to determine (on their own) all the other choices in succeeding steps of doctoral-level research such as i) sample size; ii) sampling technique; iii) data collection instrument; iv) data analysis techniques. In addition, scholars will also be able to differentiate between research methodology/design and research data collection frames.*

**Originality/Value:** *There are a vast literature about each one of the research data collection time frames viz., Cross-Sectional, and Longitudinal (Panel; Cohort; Retrospective) time frames. However, only a few have explained them together comprehensively. In this article, we have attempted to capture most of the research data collection time frames briefly that would enable Ph.D. scholars in India to glance through and make scholarly data collection time frame choices.*

**Paper Type:** *Conceptual.*

**Keywords:** Research Methodology; Research Design; Research Process; PhD; Ph.D.; Coursework; Doctoral Research; Research Data; Data Collection Time Frame; Data Collection Time Horizon; Time Frame; Time Horizon; Cross-sectional; Longitudinal; Panel Study; Cohort Study; Retrospective Study; Postmodernism

### 1. BACKGROUND :

There is a vast literature about the data collection time frames for doing doctoral-level research. Ph.D. scholars get confused with various terminologies about different types of research viz., Cross-sectional study; Longitudinal study, Panel study; Cohort study; Retrospective study, and so on. We determinedly believe that all these terminologies are related to merely the time frame used by the researchers to collect data. The reality is a majority of stakeholders in the research education system have a lower level of clarity about this predisposition. This lower level of clarity is resulting in the designing of unrealizable research data collection time frames by a majority of Ph.D. scholars in India. Scholars must avoid focussing on these terminologies and just understand that research methodology

and research data collection time frames are not the same. Research data collection time frames are just one of the choices scholars need to make during the doctoral-level research process.

Various research studies have identified factors affecting the Ph.D. success rate across the world. “To name a few a) scholar-supervisor/guide relationship; b) mentorship; c) dissertation process; d) role of the department; e) role of peer qualities; f) transformational learning experience provided; g) level of curiosity and interest in reviewing the existing literature; h) planning and time management skills; i) level of creative thinking and writing skills; j) amount of freedom in the research project; k) level of a supportive environment for Ph.D. scholars’ well-being; l) higher-education practices; m) supervisors’ research capabilities and gender; n) expectations set by the research environment; o) Ph.D. scholars’ expectations; p) support network; q) level of Ph.D. scholars’ socialization with the research community; r) Ph.D. scholars’ navigation system; s) different terminologies for various components of doctoral-level research are given by different disciplines creating undue confusion in scholars’ minds; t) data collection methods which just play the role of data collection and it is just one of the steps of the doctoral-level research process being portrayed as the research methodology/design; u) scholars’ inability to identify their genuine interest in a fact/phenomenon/reality/truth/dependent variable, intensive review of existing literature, locating an important research gap, and finally formulating a research question; v) a lower level of clarity about the most important and indispensable step of the doctoral-level research process i.e., choosing an appropriate research philosophical paradigm that lays stepping stones toward answering the research question in a scientific and scholarly way; w) a lower level of clarity about the most important and indispensable step of the doctoral-level research process i.e., choosing an appropriate research approach/reasoning that paves path for decision concerning data collection and analysis; x) a humongous confusion among Ph.D. scholars in India about the difference between research methodology/design and research data collection methods” [1-52].

Furthermore, in reality, a majority of stakeholders in the research education system have a lower level of clarity about the most important and indispensable step of the doctoral-level research process i.e., choosing an appropriate research data collection frame to logically answer the research question and the difference between research methodology/design and research data collection time frames. In addition to this lower clarity, a majority of them guide the Ph.D. scholars to begin the journey without educating the scholars about the most important aspect of choosing a data collection time frame. In addition, they also mandate that scholars use certain research data collection time frames that are commonly used in a discipline or the one with which they are comfortable. This lower level of clarity and the beginning of the Ph.D. journey without a clear understanding of the essence of research data collection time frames is making it difficult for Ph.D. scholars to complete the journey successfully and most importantly if some scholars complete their Ph.D. journey successfully, their awareness about the reasons for choosing a particular research data collection time frame to answer their research question is very low. We believe that if the scholars can begin their Ph.D. journey by allocating a higher level of focus and time toward understanding various research data collection time frames available to answer their research question their journey will be with a very lower level of complications and with a higher level of awareness about the data collection time frame choice they make. But this reality is knowingly or unknowingly, intentionally, or unintentionally suppressed by a majority of stakeholders in the research education system in India. In other words, this *suppressed reality* has resulted in creating humongous confusion about the difference between research methodology/design and research data collection time frames among Ph.D. scholars in India.

One thing Ph.D. scholars must always remind themselves of throughout their Ph.D. journey is the fact that they will be awarded a Ph.D. degree for doing doctoral-level research. Doing doctoral-level research and generating research outputs such as research articles and a thesis determines the probability of success in getting a Ph.D. degree. The first step of the doctoral-level research process is identifying research gaps and formulating a research question, the second one is choosing an appropriate research philosophical paradigm, the third step is choosing an appropriate research approach/reasoning, the fourth step is choosing the appropriate research data collection method choices that ensure a logical answer is found to the research question, and the fifth step is choosing an appropriate data collection time frame [46-52]. It is thus inevitable and imperative that Ph.D. scholars understand various research data collection methods/method choices in depth and chose the appropriate one. The doctoral-level research which is the single most important requirement of the

Ph.D. program is cognitively demanding and intends to create researchers who can create new knowledge or interpret existing knowledge about reality by using different perspectives, paradigms, and reasoning. Knowledge sharing requires autonomy, good quality time, a stress-free brain for deep thinking, and the freedom to look for more meaningful findings. This is the single most important reason for making doctoral-level research flexible wherein the scientific and scholarly world gives autonomy to Ph.D. scholars to formulate their question and answer it within 3-6 years using an appropriate research approach/reasoning. Nevertheless, only 50% of scholars admitted to Ph.D. in India completed, and that too in ten years whether or not they are aware of the importance of reasoning in doctoral-level research [46].

## 2. OBJECTIVE :

There is humongous confusion among Ph.D. scholars in India about the difference between research methodology/design and research data collection time frames. When we ask the scholars, who are in their final stages of the Ph.D. program about what is their research methodology/design, surprisingly we get answers such as ‘Cross-sectional’, ‘Longitudinal’, ‘Panel Study, or ‘Cohort Study’ from a significant majority of them. Furthermore, choosing one or more appropriate research data collection time frames is just one of the choices a scholar needs to make among many choices in the doctoral-level research process. And all the choices a scholar makes across all the steps of doctoral-level research cumulatively become a research methodology/design. *Owing to such confusion the key objective of this article is to explain various research data collection time frames, their merits, and demerits, and most importantly the suitability of data collection time frames concerning the stage/phase of research to enable Ph.D. scholars in India to understand the key difference between research methodology/design and research data collection time frames, in turn, guiding them to choose an appropriate data collection time frame.*

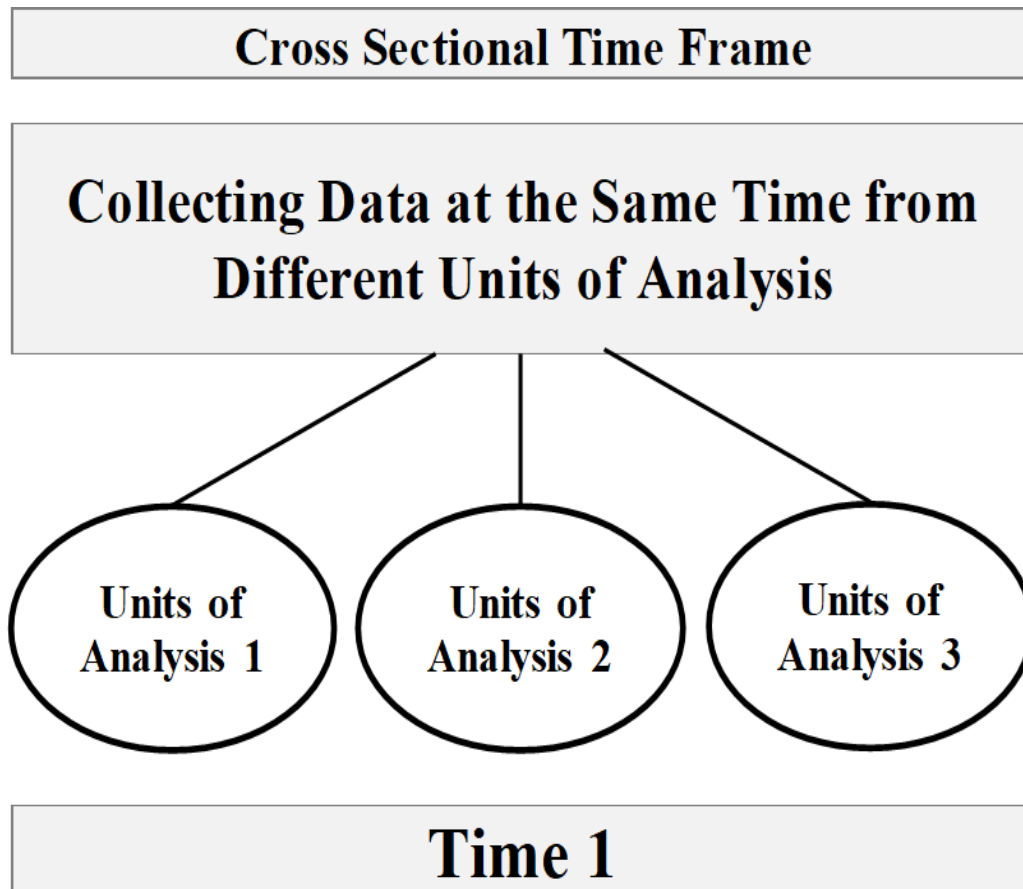
## 3. RESEARCH DATA COLLECTION TIME FRAMES :

The research data collection time frame merely specifies the number of points in time at which scholars intend to gather data to answer their research question. The Cross-sectional and Longitudinal time frames are the two choices available. It is a higher level of decision-making in the Ph.D. research journey that determines the repeatability of research results which is a measure of the ability of the data collection method to generate similar results for multiple preparations of the same sample. It is a scientific/systematic/scholarly way of deciding on ‘when’ to collect data from the units of analysis/samples to answer the research question. An appropriate data collection time frame choice depends upon i) type of the research question (descriptive; relational; causal) [46] [49]; ii) research philosophical paradigm (positivism; interpretivism; critical realism; postmodernism; pragmatism) [46] [50] [52-82]; iii) the research approach/reasoning (deductive; inductive; abductive) [46] [51] [83-124]; iv) time available for scholars to collect data [46]; v) ; vii) data collection method and method choice [56]; vi) resources that are available for scholars to collect data [46]. Choosing a data collection time frame is one of the most important decisions scholars need to make during their Ph.D. journey. We strongly recommend scholars know their competence, research environment, and support system before finalizing a data collection time frame. Do note that the data collection methods tell us ‘How’ to collect data and once we have chosen this ‘How’ now in the immediate next step of doctoral-level research we need to choose ‘When’ to collect the data using the data collection methods/method choices chosen in the previous step [48]. There are two main types of time frames available to collect the research data to answer the research question such as i) Cross-sectional and ii) Longitudinal.

## 4. CROSS-SECTIONAL DATA COLLECTION TIME FRAME :

This type of time frame is also known as a Transverse study, One-shot study, and Prevalence study. Simply put, we will be collecting data from many different respondents/subjects/participants/units of analysis/samples/individuals/groups at a single point in time (just one-time), in other words, data are gathered just once, over a short period or basically, taking a snapshot of an ongoing situation. This time frame helps obtain information/data on variables of the research question in different contexts at the same time and find the relationship among variables of the research question limited to the units of analysis. What is very important to note is the fact that we will be observing variables without influencing them which is why the Cross-sectional time frame is not suitable for collecting data if Ph.D. scholars have chosen data collection methods that require intervention/treatment/experiment

[126-137] [163-164]. However, this time frame is most suitable when there are time and resources constraint and for the preliminary/exploratory phase of research. The findings can be used for further research.



**Fig. 1:** Cross-sectional time frame

We strongly recommend scholars use a Cross-sectional time frame only for the preliminary/exploratory/ early stages of their research during the Ph.D. program. Using this type is not recommended for explanatory, Confirmatory, and application stages/phases of the research. Unfortunately, the Cross-sectional time frame is most preferred by most Indian researchers during and even after the Ph.D. in the name of time constraints. A few examples are listed below to give more clarity about the Cross-sectional time frame of data collection.

- Collecting annual reports of two companies (Units of Analysis/Samples) for the latest year, comparing their financial performance (Dependent variable) and technology adoption (Independent variable) to determine whether or not there is a relationship between these Variables.
- Collecting data on past smoking habits (Independent variable) and current diagnoses of lung cancer (Dependent variable) in patients (Unit of Analysis/Sample) diagnosed with lung cancer.
- To know the prevalence of Covid-19 infection (Dependent Variable) in a village. We can design a population-based survey to assess the prevalence of Covid-19 cases. We can go to all the houses that were supposed to be included such as houses with people (Units of Analysis/Samples) having recent travel (Independent Variable) history in the study and examine the population. If the total sample surveyed is 500. Of these, we have found that 18 individuals have Covid-19 infection. Thus, the prevalence of Covid-19 in this community is (prevalence)  $18/500$  or  $3.60/100$  population.

There are many advantages of using a Cross-sectional time frame for collecting the data such as i) it is relatively cheap and less time-consuming, ii) allows collect data from a large pool of respondents/subjects/participants/cases/units of analysis/samples/groups and compare differences between them, iii) helps capture a specific moment in time (National Censuses), and most importantly, iv) different variables can be observed at a time. However, there are disadvantages of using a Cross-



sectional time frame such as i) it is difficult to establish cause-and-effect relationships and ii) cannot be used to analyze behavior over a period or establish long-term trends and the timing of the cross-sectional snapshot may be unrepresentative of the behavior of the group as a whole. Figure 1 illustrates the Cross-sectional time frame of data collection.

## 5. LONGITUDINAL DATA COLLECTION TIME FRAME :

In this type of time frame, we will be collecting data about variables and units of analysis/samples/groups/respondents/participants/subjects of your research question over a period. This means, investigating the same variables/units of analysis several times continuously over a period through repeated observations to reveal the relative stability of the phenomenon. Collecting the data using a Longitudinal time frame helps us understand the dynamics of the problem in addition to allowing us to understand the change process/trend [138-164]. Scholars can collect the research data using a Longitudinal time frame in three different ways as explained below.

### 5.1. Panel Longitudinal Time Frame :

In this type of Longitudinal time frame of data collection, we will be selecting a cross-section of respondents/participants/groups/subjects/units of analysis/samples which are representative of a more significant population, and data is collected at specified intervals for a more extended period. The same units of analysis are used throughout. A few examples are listed below.

- Samsung Brand appointed 2000 customers (Units of Analysis) across India to collect their experience (Dependent Variable/Effect) with every new model (Independent Variable /Cause/Intervention/Treatment/Experiment) released into the market.
- The Stanford Marshmallow experiment on delayed gratification in 1972. Led by Psychologist Walter Mischel.
- Selecting a retail store (Unit of Analysis), recording sales quantity (Dependent Variable) and discount % (Independent Variable) at the end of every day for 06 months to determine the magnitude of the impact of discount (Independent Variable/Cause/Intervention/Treatment/Experiment) on sales quantity (Effect).
- Selecting a batch of students (Unit of Analysis), recording test scores (Dependent Variable) and mode of teaching (Independent Variable) at the end of every class for 06 months to determine the magnitude of the impact of mode of teaching (Cause/Intervention/Treatment/Experiment) on test scores (Dependent Variable/Effect).

### 5.2. Cohort Longitudinal Time Frame :

This type of Longitudinal time frame of data collection involves selecting respondents/participants/subjects/groups/units of analysis/samples based on a specific event such as year of birth, geographic location, or historical experience (share a common characteristic). In this type, we will merely observe units of analysis without any intervention/treatment/experiment. For example, selecting a group of people who were infected by Covid-19 and recording their psychological state of mind from the day they were infected pre-vaccination and post-vaccination. One can claim the impact of vaccination (Independent Variable) is positive on the psychological state of mind (Dependent Variable) of Covid-19 infected people (Units of Analysis/Samples). A few examples are listed below.

- Selecting a company (Unit of Analysis), recording financial performance (Dependent Variable) and level of technology adoption (Independent Variable) at the end of every month for one year to determine the magnitude of the impact of the level of technology adoption (Cause) on financial performance (Effect)
- Selecting pregnant women (Units of Analysis), recording their diet (Independent Variable) every month for 09 months and the birth weight of the baby (Dependent Variable) to determine the magnitude of the impact of the mother's diet during pregnancy (Cause) on baby's birth weight (Effect).

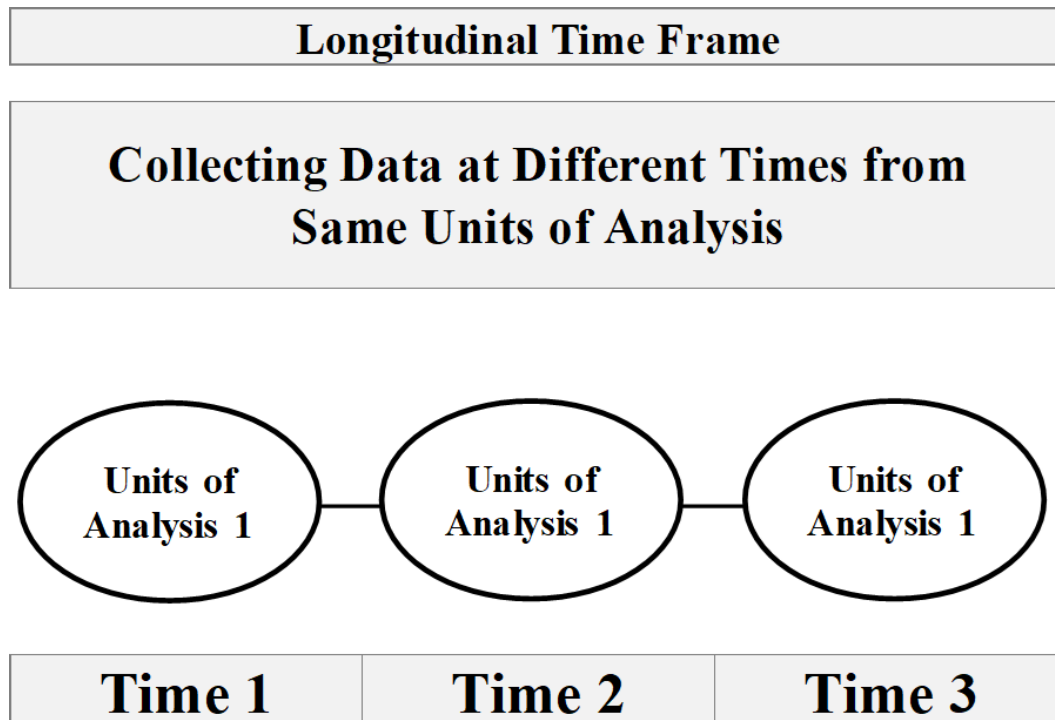


Fig. 2: Longitudinal time frame

### 5.3. Retrospective Longitudinal Time Frame :

This type of Longitudinal time frame of data collection involves looking to the past by looking at historical information such as medical records/archived records/case reports. This is helpful when scholars are planning to use already existing data, collected by an authentic organization or agency. For example, selecting a group of patients undergoing treatment for Cardio Vascular Disease (Units of Analysis) at Jayadeva Hospital, Bengaluru, India. Checking all the records of these patients from the case reports, and recording the Body-Mass-Index (Independent Variable) of patients in all the previous visits to the hospital to determine the causal relationship between levels of Body-Mass-Index (Cause) levels of Cardio Vascular Disease (Effect/Dependent Variable).

There are many advantages of using a Longitudinal time frame for collecting the research data such as i) it provides greater validation of research findings/claims, ii) generates unique data, iii) allows identifying trends, and most importantly iv) allows understanding units of analysis and variables of the research question in-depth. However, there are disadvantages to using a Longitudinal time frame such as i) it requires investing more time and cost, ii) an unpredictability factor is always present, and iii) a large sample size is needed. **Figure 2** illustrates the Longitudinal time frame of research data collection.

### 6. HOW TO CHOOSE AN APPROPRIATE DATA COLLECTION TIME FRAME? :

We cannot rank these two main and three sub-time frames in any order of preference. All of them have their merits and demerits. What is important is the level of evidence that is required to defend/justify scholars' hypotheses and research findings. In addition to the level of confidence, other factors that play an important role in choosing one of these time frames are the stage/phase of the research; Research question (Descriptive; Relational; Causal); Time available; Resources available; Research philosophical paradigm; Research approach; scholar's competence; The level of authenticity, validity, reliability, and generalizability required to claim scholars' research findings/conclusion [46]. To enable scholars, to choose appropriate research data collection time frames we have listed a few options purely based on the phase of the research. Scholars need to be aware of the stage/phase of their research. Scholars are suggested to break their Ph.D. research into different stages/phases and collect the data using different data collection time frames. This will ensure a clear understanding of each component of the research question (dependent variable, independent variable, and units of analysis) in depth before claiming their research findings.

**Exploratory/Identification Phase:** To understand how important the variables are, scholars can use

Cross-sectional time frames or Retrospective Longitudinal time frames

**Descriptive Phase:** To understand the existence of variables, scholars can use Cross-sectional or Retrospective Longitudinal time frames.

**Explanatory Phase:** To understand the direction of the relationship among variables, scholars can use Cross-sectional or Cohort Longitudinal time frames.

**Confirmatory Phase:** To understand the magnitude of the relationship among variables, scholars can use Panel Longitudinal time frames.

**Application Phase:** To understand the practical significance of the relationship among variables, scholars can use Panel Longitudinal time frames.

## 7. CONCLUSION :

Among the two main research data, collection time frames Longitudinal data collection time frame is the most preferred among scholars belonging to the Basic/Natural Science, Engineering, and Technology disciplines, and Cross-sectional time frames are the most preferred data collection time frames for scholars belonging to other disciplines in India. We understand the Ph.D. program is time-bound and hence using a Cross-sectional time frame of data collection during the Ph.D. program is acceptable. But knowingly or unknowingly, intentionally, or unintentionally a significant majority of researchers in India use the Cross-sectional time frame even after the completion of the Ph.D. program. The fear among Indian researchers is that Mixed-method choice and Multi-method choice of data collection require a lot of time investment and most importantly the research output in the form of research article publications will slow down drastically. The mere pressure on Ph.D. scholars and Ph.D. holders in India to publish a certain number of research articles which is connected to their performance measurement is also one of the key reasons for this. However, there are a few Institutes in India that motivate their Ph.D. and Post-doc researchers to use Longitudinal data collection time frames. Ph.D. scholars and Ph.D. holders must be aware that description, explanation, or claim about a reality/fact/truth/effect /dependent variable and a piece of complete knowledge about reality is complete only when they are derived from collecting and evaluating data using both Cross-sectional and Longitudinal data collection time frames.

It is the responsibility of every stakeholder in the research environment and system to ensure that the scholars are made aware of every step involved in carrying out doctoral-level research in addition to the purpose, objective, and key deliverables of various available data collection time frame for them to choose an appropriate one to achieve their key research objective during the Ph.D. journey. Designing robust coursework that is intended to create awareness about the essence of data collection time frames is an appropriate way of fulfilling this responsibility. As long as the Ph.D. scholars can understand all the available research data collection time frames and make mindful choices of time frames across various stages/phases of the research to answer their research question they will be able to determine (on their own) all the other choices in succeeding steps of doctoral-level research such as i) sample size; ii) sampling technique; iii) data collection instrument; iv) data analysis techniques.

## REFERENCES :

- [1] Titus, S. L., & Ballou, J. M. (2013). Faculty members' perceptions of advising versus mentoring: Does the name matter?. *Science and Engineering ethics*, 19(3), 1267-1281. [Google Scholar](#)
- [2] Ali, A., & Kohun, F. (2006). Dealing with isolation feelings in IS doctoral programs. *International Journal of Doctoral Studies*, 1(1), 21-33. [Google Scholar](#)
- [3] Ali, A., Kohun, F., & Levy, Y. (2007). Dealing with Social Isolation to Minimize Doctoral Attrition- A Four Stage Framework. *International Journal of Doctoral Studies*, 2(1), 33-49. [Google Scholar](#)
- [4] Spaulding, L. S., & Rockinson-Szapkiw, A. (2012). Hearing their voices: Factors doctoral candidates attribute to their persistence. *International Journal of Doctoral Studies*, 7, 199. [Google Scholar](#)
- [5] Golde, C. M., & Dore, T. M. (2001). At cross purposes: What the experiences of today's doctoral students reveal about doctoral education, *ERIC Processing and Reference Facility*, 1-62. [Google Scholar](#)



- [6] Golde, C. M. (2005). The role of the department and discipline in doctoral student attrition: Lessons from four departments. *The Journal of Higher Education*, 76(6), 669-700. [Google Scholar](#)
- [7] Golde, C. M., & Walker, G. E. (Eds.). (2006). *Envisioning the future of doctoral education: Preparing stewards of the discipline-Carnegie essays on the doctorate* (Vol. 3). John Wiley & Sons. [Google Scholar](#)
- [8] Gardner, S. K. (2009). Student and faculty attributions of attrition in high and low-completing doctoral programs in the United States. *Higher education*, 58(1), 97-112. [Google Scholar](#)
- [9] Gardner, S. K. (2010). Faculty perspectives on doctoral student socialization in five disciplines. *International Journal of Doctoral Studies*, 5, 39. [Google Scholar](#)
- [10] Solmon, M. A. (2009). How do doctoral candidates learn to be researchers? Developing research training programs in kinesiology departments. *Quest*, 61(1), 74-83. [Google Scholar](#)
- [11] Nogueira-Martins, L. A., Fagnani Neto, R., Macedo, P. C. M., Citero, V. D. A., & Mari, J. D. J. (2004). The mental health of graduate students at the Federal University of São Paulo: a preliminary report. *Brazilian Journal of Medical and Biological Research*, 37, 1519-1524. [Google Scholar](#)
- [12] Knox, S., Schlosser, L. Z., Pruitt, N. T., & Hill, C. E. (2006). A qualitative examination of graduate advising relationships: The advisor perspective. *The Counseling Psychologist*, 34(4), 489-518. [Google Scholar](#)
- [13] Grady, R. K., La Touche, R., Oslawski-Lopez, J., Powers, A., & Simacek, K. (2014). Betwixt and between: The social position and stress experiences of graduate students. *Teaching Sociology*, 42(1), 5-16. [Google Scholar](#)
- [14] Russell, J., Gaudreault, K. L., & Richards, K. A. R. (2016). Doctoral student socialization: Educating stewards of the physical education profession. *Quest*, 68(4), 439-456. [Google Scholar](#)
- [15] Russell, J. A. (2015). Rolling with the punches: Examining the socialization experiences of kinesiology doctoral students. *Research quarterly for exercise and sport*, 86(2), 140-151. [Google Scholar](#)
- [16] Harding-DeKam, J. L., Hamilton, B., & Loyd, S. (2012). The hidden curriculum of doctoral advising. *NACADA Journal*, 32(2), 5-16. [Google Scholar](#)
- [17] Mansson, D. H., & Myers, S. A. (2012). Using mentoring enactment theory to explore the doctoral student–advisor mentoring relationship. *Communication Education*, 61(4), 309-334. [Google Scholar](#)
- [18] Robinson, E. M., & Tagher, C. G. (2017). The companion dissertation: Enriching the doctoral experience. *Journal of Nursing Education*, 56(9), 564-566. [Google Scholar](#)
- [19] Haynes, K. N. (2008). Reasons for doctoral attrition. *Health*, 8, 17-4. [Google Scholar](#)
- [20] Mazerolle, S. M., Bowman, T. G., & Klossner, J. C. (2015). An analysis of doctoral students' perceptions of mentorship during their doctoral studies. *Athletic Training Education Journal*, 10(3), 227-235. [Google Scholar](#)
- [21] Holsinger Jr, J. W. (2008). Situational leadership applied to the dissertation process. *Anatomical Sciences Education*, 1(5), 194-198. [Google Scholar](#)
- [22] McNamara, J. F., Lara-Alecio, R., Hoyle, J., & Irby, B. J. (2010). Doctoral program issues: Commentary on companion dissertations. *A Doctoral Issues Presentation at the National Council of Professors of Educational Administration* Lexington, KY, August 2, 2006. [Google Scholar](#)
- [23] Carter-Veale, W. Y., Tull, R. G., Rutledge, J. C., & Joseph, L. N. (2016). The dissertation house model: Doctoral student experiences coping and writing in a shared knowledge

- community. *CBE—Life Sciences Education*, 15(3), ar34. [Google Scholar](#)
- [24] Devos, C., Boudrenghien, G., Van der Linden, N., Azzi, A., Frenay, M., Galand, B., & Klein, O. (2017). Doctoral students' experiences leading to completion or attrition: A matter of sense, progress and distress. *European journal of psychology of education*, 32(1), 61-77. [Google Scholar](#)
- [25] Beatty, S. E. (2001). The doctoral supervisor-student relationship: some American advice for success. *The Marketing Review*, 2(2), 205-217. [Google Scholar](#)
- [26] Carpenter, S., Makhadmeh, N., & Thornton, L. J. (2015). Mentorship on the doctoral level: An examination of communication faculty mentors' traits and functions. *Communication Education*, 64(3), 366-384. [Google Scholar](#)
- [27] Most, D. E. (2008). Patterns of doctoral student degree completion: A longitudinal analysis. *Journal of College Student Retention: Research, Theory & Practice*, 10(2), 171-190. [Google Scholar](#)
- [28] Stock, W. A., Siegfried, J. J., & Finegan, T. A. (2011). Completion rates and time-to-degree in economics PhD programs (with comments by David Colander, N. Gregory Mankiw, Melissa P. McInerney, James M. Poterba). *American Economic Review*, 101(3), 176-88. [Google Scholar](#)
- [29] Wamala, R., Ocaya, B., & Oonyu, J. C. (2012). Extended Candidature and Non-Completion of a Ph. D. at Makerere University, Uganda. *Contemporary Issues in Education Research*, 5(3), 175-184. [Google Scholar](#)
- [30] <https://academy.pubs.asha.org/2011/12/higher-education-practices-that-promote-phd-completion/>. Retrieved in October 2022.
- [31] Preston, J. P., Ogenchuk, M. J., & Nsiah, J. K. (2014). Peer mentorship and transformational learning: PhD student experiences. *Canadian Journal of Higher Education*, 44(1), 52-68. [Google Scholar](#)
- [32] Devine, K., & Hunter, K. H. (2017). PhD student emotional exhaustion: the role of supportive supervision and self-presentation behaviours. *Innovations in Education and Teaching International*, 54(4), 335-344. [Google Scholar](#)
- [33] Van Rooij, E., Fokkens-Bruinsma, M., & Jansen, E. (2021). Factors that influence PhD candidates' success: the importance of PhD project characteristics. *Studies in Continuing Education*, 43(1), 48-67. [Google Scholar](#)
- [34] Chenevix-Trench, G. (2006). What makes a good PhD student?. *Nature*, 441(7090), 252-252. [Google Scholar](#)
- [35] Dericks, G., Thompson, E., Roberts, M., & Phua, F. (2019). Determinants of PhD student satisfaction: the roles of supervisor, department, and peer qualities. *Assessment & evaluation in higher education volume 44(7)*, 1053-1068. [Google Scholar](#)
- [36] Corsini, A., Pezzoni, M., & Visentin, F. (2022). What makes a productive Ph. D. student?. *Research Policy* 51(10), 104561. [Google Scholar](#)
- [37] Lindvig, K. (2018). The implied PhD student of interdisciplinary research projects within monodisciplinary structures. *Higher Education Research & Development*, 37(6), 1171-1185. [Google Scholar](#)
- [38] Holbrook, A., Shaw, K., Scevak, J., Bourke, S., Cantwell, R., & Budd, J. (2014). PhD candidate expectations: Exploring mismatch with experience. *International Journal of Doctoral Studies*, 9, 329. [Google Scholar](#)
- [39] Björkman, B. (2015). PhD supervisor-PhD student interactions in an English-medium Higher Education (HE) setting: Expressing disagreement. *European Journal of Applied Linguistics*, 3(2), 205-229. [Google Scholar](#)
- [40] Dimitrova, R. (2016). Ingredients of good PhD supervision-evidence from a student survey at

- Stockholm university. *Utbildning och Lärande/Education and Learning*, 10(1), 40-52. [Google Scholar](#)
- [41] Sullivan-Bolyai, S., & L'Esperance, S. (2022). Reflections on virtual research conferences and PhD student socialization: The missing link of in-person human connectedness. *Applied Nursing Research*, 64 (April 2022), 151553. [Google Scholar](#)
- [42] Alpert, F., & Eysell, T. H. (1995). Getting the most from your doctoral program: Advice for the Ph. D. student in finance. *Journal of Financial Education*, 12-20. [Google Scholar](#)
- [43] Groen, J. (2020). *Perceptions of Transformation and Quality in Higher Education: A Case Study of PhD Student Experiences* (Doctoral dissertation, University of Ottawa). [Google Scholar](#)
- [44] Helfer, F., & Drew, S. (2013). A small-scale investigation into Engineering PhD student satisfaction with supervision in an Australian university campus. In *24th Annual Conference of the Australasian Association for Engineering Education* (pp. 1-9). [Google Scholar](#)
- [45] Cunningham-Williams, R. M., Wideman, E., & Fields, L. (2019). Ph. D. Student Development: A Conceptual Model for Research-Intensive Social Work PhD Programs. *Journal of Evidence-Based Social Work*, 16(3), 278-293. [Google Scholar](#)
- [46] Ganesha, H. R. & Aithal, P. S. (2022). *Doing Ph.D. in India. A Step-by-Step Guide*. First Edition. Notion Press. India & Singapore. ISBN: 9798887832005. [Google Scholar](#)
- [47] Ganesha, H. R. & Aithal, P. S. (2022). The '8Fs' Concept for Simplifying the Complications of Ph.D. Journey in India. *International Journal of Case Studies in Business, IT, and Education (IJCSBE)*, 6(2), 320-339. [Google Scholar](#)
- [48] Ganesha, H. R. & Aithal, P. S. (2022). The DDLR Model of Research Process for Designing Robust and Realizable Research Methodology During Ph.D. Program in India. *International Journal of Management, Technology, and Social Sciences (IJMTS)*, 7(2), 400-417. [Google Scholar](#)
- [49] Ganesha, H. R. & Aithal, P. S. (2022). PHDRQ Model for Identifying Research Gaps and Formulating A Research Question During Ph.D. Program in India. *International Journal of Case Studies in Business, IT, and Education (IJCSBE)*, 6(2). 408-421. [Google Scholar](#)
- [50] Ganesha, H. R. & Aithal, P. S. (2022). Why is it Called Doctor of Philosophy and Why Choosing Appropriate Research Philosophical Paradigm is Indispensable During Ph.D. Program in India?. *International Journal of Philosophy and Languages (IJPL)*, 1(1). 42-58. [Google Scholar](#)
- [51] Ganesha, H. R. & Aithal, P. S. (2022). Approaching Research in Different Ways. How to Choose an Appropriate Research Approach/Reasoning During Ph.D. Program in India?. *International Journal of Philosophy and Languages (IJPL)*, 1(1). 59-74. [Google Scholar](#)
- [52] Ganesha, H. R. & Aithal, P. S. (2022). How to Choose an Appropriate Research Data Collection Method and Method Choice Among Various Research Data Collection Methods and Method Choices During Ph.D. Program in India?. *International Journal of Management, Technology, and Social Sciences (IJMTS)*, 7(2), 455-479. [Google Scholar](#)
- [53] Hollander, E. P. (1967). *Principles and methods of social psychology*. Oxford, UK: Oxford University Press. [Google Scholar](#)
- [54] Jaccard, J., & Jacoby, J. (2010). *Theory construction and model-building skills: A practical guide for social scientists*. Guilford publications. [Google Scholar](#)
- [55] Guba, E. G., & Lincoln, Y. S. (1982). Epistemological and methodological bases of naturalistic inquiry. *ECTJ*, 30(4), 233-252. [Google Scholar](#)
- [56] Saunders, M., & Lewis, P. (2017). *Doing research in business and management*. Pearson. Chapter 2, Pages 122-161. [Google Scholar](#)
- [57] Alvesson, M., & Sköldbberg, K. (2017). *Reflexive methodology: New vistas for qualitative research*. sage. [Google Scholar](#)

- [58] Bhaskar, R. (2010). *Reclaiming reality: A critical introduction to contemporary philosophy*. Routledge. [Google Scholar↗](#)
- [59] Buchanan, D., Boddy, D., & McCalman, J. (2013). Getting in, getting on, getting out, and getting back. In *Doing research in organizations* (pp. 53-67). Routledge. [Google Scholar↗](#)
- [60] Burrell, G., & Morgan, G. (2017). *Sociological paradigms and organisational analysis: Elements of the sociology of corporate life*. Routledge. [Google Scholar↗](#)
- [61] Johnson, P., & Clark, M. (Eds.). (2006). *Business and management research methodologies*. Sage. [Google Scholar↗](#)
- [62] Kilduff, M., & Mehra, A. (1997). Postmodernism and organizational research. *Academy of Management Review*, 22(2), 453-481. [Google Scholar↗](#)
- [63] Van Maanen, J., Sørensen, J. B., & Mitchell, T. R. (2007). The interplay between theory and method. *Academy of management review*, 32(4), 1145-1154. [Google Scholar↗](#)
- [64] Fournier, V., & Grey, C. (2000). At the critical moment: Conditions and prospects for critical management studies. *Human relations*, 53(1), 7-32. [Google Scholar↗](#)
- [65] Fleetwood, S. (2005). Ontology in organization and management studies: A critical realist perspective. *Organization*, 12(2), 197-222. [Google Scholar↗](#)
- [66] Elkjaer, B. & Simpson, B. (2011). Pragmatism: A lived and living philosophy. What can it offer to contemporary organization theory?. In *Philosophy and organization theory*. Emerald Group Publishing Limited. [Google Scholar↗](#)
- [67] Knudsen, C. (2005). Pluralism, scientific progress, and the structure of organization theory. In Christian Knudsen, and Haridimos Tsoukas (eds), *The Oxford Handbook of Organization Theory*. [Google Scholar↗](#)
- [68] Chia, R. (2003). Organization theory as a postmodern science. In H. Tsoukas and C. Knudsen (eds) *The Oxford Handbook of Organization Theory: Meta-Theoretical Perspectives*. Oxford: Oxford University Press, pp. 113–40. [Google Scholar↗](#)
- [69] Niglas, K. (2010). The multidimensional model of research methodology: An integrated set of continua. In A. Tashakkori and C. Teddlie (eds) *The Sage Handbook of Mixed Methods in Social and Behavioural Research*. Thousand Oaks, CA: Sage, pp. 215–36. [Google Scholar↗](#)
- [70] Reed, M. (2005). Reflections on the ‘realist turn’ in organization and management studies. *Journal of Management studies*, 42(8), 1621-1644. [Google Scholar↗](#)
- [71] Jonassen, D. H. (1991). Objectivism versus constructivism: Do we need a new philosophical paradigm?. *Educational technology research and development*, 39(3), 5-14. [Google Scholar↗](#)
- [72] Adom, D., Yeboah, A., & Ankrah, A. K. (2016). Constructivism philosophical paradigm: Implication for research, teaching and learning. *Global journal of arts humanities and social sciences*, 4(10), 1-9. [Google Scholar↗](#)
- [73] Kamal, S. S. L. B. A. (2019). Research paradigm and the philosophical foundations of a qualitative study. *PEOPLE: International Journal of Social Sciences*, 4(3), 1386-1394. [Google Scholar↗](#)
- [74] Coombs, W. T. (1993). Philosophical underpinnings: Ramifications of a pluralist paradigm. *Public Relations Review*, 19(2), 111-119. [Google Scholar↗](#)
- [75] Morgan, D. L. (2014). Pragmatism as a paradigm for social research. *Qualitative inquiry*, 20(8), 1045-1053. [Google Scholar↗](#)
- [76] Boon, M., & Van Baalen, S. (2019). Epistemology for interdisciplinary research—shifting philosophical paradigms of science. *European journal for philosophy of science*, 9(1), 1-28. [Google Scholar↗](#)
- [77] Vacariu, G., & Vacariu, M. (2022). A New Philosophical Paradigm of Thinking for Particular



- Sciences: Physics, Cognitive Neuroscience, and Biology. In *Thinking* (pp. 269-283). Springer, Cham. [Google Scholar](#)
- [78] Shah, S. S., Shah, A. A., & Khaskhelly, N. (2019). Pragmatism research paradigm: a philosophical framework of advocating methodological pluralism in social science research. *Grassroots*, 52(1). [Google Scholar](#)
- [79] Higgs, J., & Trede, F. (2010). Philosophical frameworks and research communities. In *Researching Practice* (pp. 31-36). Brill. [Google Scholar](#)
- [80] Krauss, S. E. (2005). Research paradigms and meaning making: A primer. *The qualitative report*, 10(4), 758-770. [Google Scholar](#)
- [81] Kelly, D. A. (1976). Architecture as philosophical paradigm. *Metaphilosophy*, 7(3/4), 173-190. [Google Scholar](#)
- [82] Bechmann, C. Suzanne. (2008). Chapter in a Book - *Doing business research: a guide to theory and practice.*, Written by, Lee, Nick., & Lings, Ian., 1<sup>st</sup> Edition, Sage Publications Ltd., Page 369. [Google Scholar](#)
- [83] Johnson-Laird, P. N. (1999). Deductive reasoning. *Annual review of psychology*, 50(1), 109-135. [Google Scholar](#)
- [84] Goel, V. (2007). Anatomy of deductive reasoning. *Trends in cognitive sciences*, 11(10), 435-441. [Google Scholar](#)
- [85] Johnson-Laird, P. (2010). Deductive reasoning. *Wiley Interdisciplinary Reviews: Cognitive Science*, 1(1), 8-17. [Google Scholar](#)
- [86] Evans, J. B. T. (2019). Deductive reasoning. *The psychology of human thought*, 113-132. [Google Scholar](#)
- [87] Clark, H. H. (1969). Linguistic processes in deductive reasoning. *Psychological review*, 76(4), 387. [Google Scholar](#)
- [88] Dias, M. D. G., & Harris, P. L. (1988). The effect of make-believe play on deductive reasoning. *British journal of developmental psychology*, 6(3), 207-221. [Google Scholar](#)
- [89] Newstead, S. E., Handley, S. J., Harley, C., Wright, H., & Farrelly, D. (2004). Individual differences in deductive reasoning. *The Quarterly Journal of Experimental Psychology Section A*, 57(1), 33-60. [Google Scholar](#)
- [90] Overton, W. F., Ward, S. L., Noveck, I. A., Black, J., & O'brien, D. P. (1987). Form and content in the development of deductive reasoning. *Developmental Psychology*, 23(1), 22. [Google Scholar](#)
- [91] Shynkaruk, J. M., & Thompson, V. A. (2006). Confidence and accuracy in deductive reasoning. *Memory & cognition*, 34(3), 619-632. [Google Scholar](#)
- [92] Rips, L. J. (1994). *The psychology of proof: Deductive reasoning in human thinking*. MIT Press. [Google Scholar](#)
- [93] Schaeken, W., De Vooght, G., & d'Ydewalle, G. (Eds.). (1999). *Deductive reasoning and strategies*. Routledge. [Google Scholar](#)
- [94] Ayalon, M., & Even, R. (2008). Deductive reasoning: In the eye of the beholder. *Educational Studies in Mathematics*, 69(3), 235-247. [Google Scholar](#)
- [95] Hayes, B. K., Heit, E., & Swendsen, H. (2010). Inductive reasoning. *Wiley interdisciplinary reviews: Cognitive science*, 1(2), 278-292. [Google Scholar](#)
- [96] Heit, E. (2000). Properties of inductive reasoning. *Psychonomic Bulletin & Review*, 7(4), 569-592. [Google Scholar](#)
- [97] Klauer, K. J., & Phye, G. D. (2008). Inductive reasoning: A training approach. *Review of educational research*, 78(1), 85-123. [Google Scholar](#)



- [98] Sternberg, R. J., & Gardner, M. K. (1983). Unities in inductive reasoning. *Journal of Experimental Psychology: General*, 112(1), 80. [Google Scholar](#)
- [99] Hayes, B. K., & Heit, E. (2018). Inductive reasoning 2.0. *Wiley Interdisciplinary Reviews: Cognitive Science*, 9(3), e1459. [Google Scholar](#)
- [100] Ketokivi, M., & Mantere, S. (2010). Two strategies for inductive reasoning in organizational research. *Academy of management review*, 35(2), 315-333. [Google Scholar](#)
- [101] Heit, E., & Rubinstein, J. (1994). Similarity and property effects in inductive reasoning. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 20(2), 411. [Google Scholar](#)
- [102] Kemp, C., & Tenenbaum, J. B. (2009). Structured statistical models of inductive reasoning. *Psychological review*, 116(1), 20. [Google Scholar](#)
- [103] Nisbett, R. E., Krantz, D. H., Jepson, C., & Kunda, Z. (1983). The use of statistical heuristics in everyday inductive reasoning. *Psychological review*, 90(4), 339. [Google Scholar](#)
- [104] Pellegrino, J. W., & Glaser, R. (2021). Components of inductive reasoning. In *Aptitude, learning, and instruction* (pp. 177-218). Routledge. [Google Scholar](#)
- [105] McAbee, S. T., Landis, R. S., & Burke, M. I. (2017). Inductive reasoning: The promise of big data. *Human resource Management review*, 27(2), 277-290. [Google Scholar](#)
- [106] Walton, D. (2014). *Abductive reasoning*. University of Alabama Press. [Google Scholar](#)
- [107] Paul, G. (1993). Approaches to abductive reasoning: an overview. *Artificial intelligence review*, 7(2), 109-152. [Google Scholar](#)
- [108] Kovács, G., & Spens, K. M. (2005). Abductive reasoning in logistics research. *International journal of physical distribution & logistics management*. [Google Scholar](#)
- [109] Psillos, S. (1996). On van Fraassen's critique of abductive reasoning. *The Philosophical Quarterly (1950-)*, 46(182), 31-47. [Google Scholar](#)
- [110] Thagard, P., & Shelley, C. (1997). Abductive reasoning: Logic, visual thinking, and coherence. In *Logic and scientific methods* (pp. 413-427). Springer, Dordrecht. [Google Scholar](#)
- [111] Råholm, M. B. (2010). Abductive reasoning and the formation of scientific knowledge within nursing research. *Nursing Philosophy*, 11(4), 260-270. [Google Scholar](#)
- [112] Mirza, N. A., Akhtar-Danesh, N., Noesgaard, C., Martin, L., & Staples, E. (2014). A concept analysis of abductive reasoning. *Journal of advanced nursing*, 70(9), 1980-1994. [Google Scholar](#)
- [113] Lipscomb, M. (2012). Abductive reasoning and qualitative research. *Nursing Philosophy*, 13(4), 244-256. [Google Scholar](#)
- [114] Meheus, J., & Batens, D. (2006). A formal logic for abductive reasoning. *Logic Journal of IGPL*, 14(2), 221-236. [Google Scholar](#)
- [115] Poole, D. (1989). Explanation and prediction: an architecture for default and abductive reasoning. *Computational Intelligence*, 5(2), 97-110. [Google Scholar](#)
- [116] Fischer, H. R. (2001). Abductive reasoning as a way of worldmaking. *Foundations of science*, 6(4), 361-383. [Google Scholar](#)
- [117] Shank, G. (1998). The extraordinary ordinary powers of abductive reasoning. *Theory & Psychology*, 8(6), 841-860. [Google Scholar](#)
- [118] Kapitan, T. (1992). Peirce and the autonomy of abductive reasoning. *Erkenntnis*, 37(1), 1-26. [Google Scholar](#)
- [119] Dong, A., Lovallo, D., & Mounarath, R. (2015). The effect of abductive reasoning on concept selection decisions. *Design studies*, 37, 37-58. [Google Scholar](#)
- [120] Upmeier zu Belzen, A., Engelschalt, P., & Krüger, D. (2021). Modeling as scientific

- reasoning—The role of abductive reasoning for Modeling competence. *Education Sciences*, 11(9), 495. [Google Scholar](#)
- [121] Poole, D. (1990). A methodology for using a default and abductive reasoning system. *International Journal of Intelligent Systems*, 5(5), 521-548. [Google Scholar](#)
- [122] Magnani, L. (1992). Abductive reasoning: philosophical and educational perspectives in medicine. In *Advanced models of cognition for medical training and practice* (pp. 21-41). Springer, Berlin, Heidelberg. [Google Scholar](#)
- [123] Aliseda, A. (2006). *Abductive reasoning* (Vol. 330). Dordrecht: Springer. [Google Scholar](#)
- [124] Karlsen, B., Hillestad, T. M., & Dysvik, E. (2021). Abductive reasoning in nursing: Challenges and possibilities. *Nursing Inquiry*, 28(1), e12374. [Google Scholar](#)
- [126] Levin, K. A. (2006). Study design III: Cross-sectional studies. *Evidence-based dentistry*, 7(1), 24-25. [Google Scholar](#)
- [127] Kesmodel, U. S. (2018). Cross-sectional studies—what are they good for?. *Acta obstetrica et gynecologica Scandinavica*, 97(4), 388-393. [Google Scholar](#)
- [128] Spector, P. E. (2019). Do not cross me: Optimizing the use of cross-sectional designs. *Journal of Business and Psychology*, 34(2), 125-137. [Google Scholar](#)
- [129] Setia, M. S. (2016). Methodology series module 3: Cross-sectional studies. *Indian journal of dermatology*, 61(3), 261. [Google Scholar](#)
- [130] Bethlehem, J. (1999). Cross-sectional research. *Research methodology in the social, behavioural and life sciences*, 110, 142. [Google Scholar](#)
- [131] Pandis, N. (2014). Cross-sectional studies. *American Journal of Orthodontics and Dentofacial Orthopedics*, 146(1), 127-129. [Google Scholar](#)
- [132] Solem, R. C. (2015). Limitation of a cross-sectional study. *American Journal of Orthodontics and Dentofacial Orthopedics*, 148(2), 205. [Google Scholar](#)
- [133] Zangirolami-Raimundo, J., Echeimberg, J. D. O., & Leone, C. (2018). Research methodology topics: Cross-sectional studies. *Journal of Human Growth and Development*, 28(3), 356-360. [Google Scholar](#)
- [134] Busk, P. L. (2005). Cross-sectional design. *Encyclopedia of statistics in Behavioral Science*. [Google Scholar](#)
- [135] Lebo, M. J., & Weber, C. (2015). An effective approach to the repeated cross-sectional design. *American Journal of Political Science*, 59(1), 242-258. [Google Scholar](#)
- [136] Olsen, C., & St George, D. M. M. (2004). Cross-sectional study design and data analysis. *College entrance examination board*, 26(03), 2006. [Google Scholar](#)
- [137] Alander, P., Lassila, L. V., & Vallittu, P. K. (2005). The span length and cross-sectional design affect values of strength. *Dental Materials*, 21(4), 347-353. [Google Scholar](#)
- [138] Udtha, M., Nomie, K., Yu, E., & Sanner, J. (2015). Novel and emerging strategies for longitudinal data collection. *Journal of Nursing Scholarship*, 47(2), 152-160. [Google Scholar](#)
- [139] Walls, T. A., & Schafer, J. L. (Eds.). (2006). *Models for intensive longitudinal data*. Oxford University Press. [Google Scholar](#)
- [140] Collins, L. M. (2006). Analysis of longitudinal data: The integration of theoretical model, temporal design, and statistical model. *Annual Review of Psychology*, 57, 505-528. [Google Scholar](#)
- [141] Nusser, S. M., Intille, S. S., & Maitra, R. (2006). Emerging technologies and next-generation intensive longitudinal data collection. *Models for intensive longitudinal data*, 254-277. [Google Scholar](#)

- [142] Taris, T. W. (2000). A primer in longitudinal data analysis. *A Primer in Longitudinal Data Analysis*, 1-176. [Google Scholar](#)
- [143] van Weel, C. (2005). Longitudinal research and data collection in primary care. *The Annals of Family Medicine*, 3(suppl 1), S46-S51. [Google Scholar](#)
- [144] Clark, R. (1976). A report on methods of longitudinal data collection. *Journal of Child Language*, 3(3), 457-459. [Google Scholar](#)
- [145] Dormann, C., & Guthier, C. (2018). Longitudinal data collection. In *Advanced Research Methods for Applied Psychology* (pp. 146-157). Routledge. [Google Scholar](#)
- [146] Pulkkinen, L., & Kokko, K. (2012). Foundational issues in longitudinal data collection. *Handbook of developmental research methods*, 129-147. [Google Scholar](#)
- [147] Ferrer, E., & Grimm, K. J. (2012). Issues in collecting longitudinal data. In H. Cooper, P. M. Camic, D. L. Long, A. T. Panter, D. Rindskopf, & K. J. Sher (Eds.), *APA handbook of research methods in psychology, Vol. 2. Research designs: Quantitative, qualitative, neuropsychological, and biological* (pp. 275–290). American Psychological Association. [Google Scholar](#)
- [148] Lynn, P., Buck, N., Burton, J., Jäckle, A., & Laurie, H. (2005). A review of methodological research pertinent to longitudinal survey design and data collection. *ISER Working Paper Series, No. 2005-29*. Page 1-65. Institute for Social and Economic Research (ISER), University of Essex. [Google Scholar](#)
- [149] Cernat, A., & Sakshaug, J. W. (Eds.). (2021). *Measurement error in longitudinal data*. Oxford University Press. [Google Scholar](#)
- [150] Menard, S. (Ed.). (2007). *Handbook of longitudinal research: Design, measurement, and analysis*. Elsevier. [Google Scholar](#)
- [151] Little, T. D., Preacher, K. J., Selig, J. P., & Card, N. A. (2007). New developments in latent variable panel analyses of longitudinal data. *International journal of behavioral development*, 31(4), 357-365. [Google Scholar](#)
- [152] Menard, S. (2002). *Longitudinal research* (Vol. 76). Sage. [Google Scholar](#)
- [153] Jöreskog, K. G. (1981). Statistical models for longitudinal studies. In *Longitudinal research* (pp. 118-124). Springer, Dordrecht. [Google Scholar](#)
- [154] Molenberghs, G. (2005). Applied Longitudinal Analysis. Garrett M. Fitzmaurice, Nan M. Laird, and James H. Ware. *Journal of the American Statistical Association*, 100, 709-710. [Google Scholar](#)
- [155] Rajulton, F., & Ravanera, Z. R. (2000). *Theoretical and analytical aspects of longitudinal research*. Population Studies Centre, University of Western Ontario. [Google Scholar](#)
- [156] Von Eye, A. (Ed.). (1990). *Statistical methods in longitudinal research: Principles and structuring change* (Vol. 1). Elsevier. [Google Scholar](#)
- [157] Moerbeek, M. (2011). The effects of the number of cohorts, degree of overlap among cohorts, and frequency of observation on power in accelerated longitudinal designs. *Methodology: European Journal of Research Methods for the Behavioral and Social Sciences*, 7(1), 11. [Google Scholar](#)
- [158] Newsom, J. T. (2013). Basic longitudinal analysis approaches for continuous and categorical variables. In *Longitudinal data analysis* (pp. 143-179). Routledge. [Google Scholar](#)
- [159] Maxwell, S. E. (1998). Longitudinal designs in randomized group comparisons: When will intermediate observations increase statistical power?. *Psychological Methods*, 3(3), 275. [Google Scholar](#)
- [160] Dagum, E. B., Bianconcini, S., & Monari, P. (2009). Nonlinearity in the analysis of longitudinal data. In *Statistical methods for the evaluation of educational services and quality of*

- products* (pp. 47-60). Physica, Heidelberg. [Google Scholar](#)<sup>↗</sup>
- [161] Prinzie, P., & Onghena, P. (2005). Cohort sequential design. *Encyclopedia of statistics in behavioral science*. [Google Scholar](#)<sup>↗</sup>
- [162] Lix, L. M., & Keselman, H. J. (2018). Analysis of variance: repeated-measures designs. In *The reviewer's guide to quantitative methods in the social sciences* (pp. 15-28). Routledge. [Google Scholar](#)<sup>↗</sup>
- [163] Rindfleisch, A., Malter, A. J., Ganesan, S., & Moorman, C. (2008). Cross-sectional versus longitudinal survey research: Concepts, findings, and guidelines. *Journal of marketing research*, 45(3), 261-279. [Google Scholar](#)<sup>↗</sup>
- [164] Feldman, H. A., & McKinlay, S. M. (1994). Cohort versus cross-sectional design in large field trials: precision, sample size, and a unifying model. *Statistics in medicine*, 13(1), 61-78. [Google Scholar](#)<sup>↗</sup>

\*\*\*\*\*