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A Review on Analytical Approach in Research Methodology

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ABSTRACT: Finding knowledge is a loose translation of the word "research." It's a systematic and scientific way of researching a particular subject. As a result, research is a form of scientific investigation that seeks to learn more. Analytical research is one of them.

Any kind of research is a way to learn new things. In this research, data and other pertinent information about a project are assembled; after the information is gathered and assessed, the sources are used to support a notion or prove a hypothesis.

KEYWORDS: research,analytical,data,hypothesis,sources

I. INTRODUCTION

Analytical research

This particular kind of research calls for using critical thinking abilities and assessing data and information pertinent to the project at hand.

Determines the causal connections between two or more variables. The analytical study aims to identify the causes and mechanisms underlying the trade deficit's movement throughout a given period.

It is used by various professionals, including psychologists, doctors, and students, to identify the most pertinent material during investigations. One learns crucial information from analytical research that helps them contribute fresh concepts to the work they are producing.[1,2,3]

Some researchers perform it to uncover information that supports ongoing research to strengthen the validity of their findings. Other scholars engage in analytical research to generate fresh perspectives on the subject.

Various approaches to performing research include literary analysis, Gap analysis, general public surveys, clinical trials, and meta-analysis.

Importance of analytical research

The goal of analytical research is to develop new ideas that are more believable by combining numerous minute details.

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The analytical investigation is what explains why a claim should be trusted. Finding out why something occurs is complex. You need to be able to evaluate information critically and think critically.

This kind of information aids in proving the validity of a theory or supporting a hypothesis. It assists in recognizing a claim and determining whether it is true.

Analytical kind of research is valuable to many people, including students, psychologists, marketers, and others. It aids in determining which advertising initiatives within a firm perform best. In the meantime, medical research and research design determine how well a particular treatment does.

Thus, analytical research can help people achieve their goals while saving lives and money.

Methods of conducting analytical research

Analytical research is the process of gathering, analyzing, and interpreting information to make inferences and reach conclusions. Depending on the purpose of the research and the data you have access to, you can conduct analytical research using a variety of methods. Here are a few typical approaches:

- Quantitative research

Numerical data are gathered and analyzed using this method. Statistical methods are then used to analyze the information, which is often collected using surveys, experiments, or pre-existing datasets. Results from quantitative research can be measured, compared, and generalized numerically.

- Qualitative research

In contrast to quantitative research, qualitative research focuses on collecting non-numerical information. It gathers detailed information using techniques like interviews, focus groups, observations, or content research. Understanding social phenomena, exploring experiences, and revealing underlying meanings and motivations are all goals of qualitative research.

- Mixed methods research

This strategy combines quantitative and qualitative methodologies to grasp a research problem thoroughly. Mixed methods research often entails gathering and evaluating both numerical and non-numerical data, integrating the results, and offering a more comprehensive viewpoint on the research issue.[5,7,8]

- Experimental research

Experimental research is frequently employed in scientific trials and investigations to establish causal links between variables. This approach entails modifying variables in a controlled environment to identify cause-and-effect connections. Researchers randomly divide volunteers into several groups, provide various interventions or treatments, and track the results.

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- Observational research

With this approach, behaviors or occurrences are observed and methodically recorded without any outside interference or variable manipulation. Both controlled surroundings and naturalistic settings can be used for observational research. It offers useful insights into behaviors that occur in the actual world and enables researchers to explore events as they naturally occur.

- Case study research

This approach entails thorough research of a single case or a small group of related cases. Case-control studies frequently include a variety of information sources, including observations, records, and interviews. They offer rich, in-depth insights and are particularly helpful for researching complex phenomena in practical settings.

- Secondary data analysis

Examining secondary information is time and money-efficient, enabling researchers to explore new research issues or confirm prior findings. With this approach, researchers examine previously gathered information for a different reason. Information from earlier cohort studies, accessible databases, or corporate documents may be included in this.

- Content analysis

Content research is frequently employed in social sciences, media observational studies, and cross-sectional studies. This approach systematically examines the content of texts, including media, speeches, and written documents. Themes, patterns, or keywords are found and categorized by researchers to make inferences about the content.

Depending on your research objectives, the resources at your disposal, and the type of data you wish to analyze, selecting the most appropriate approach or combination of methodologies is crucial to conduct analytical research.

Examples of analytical research

Analytical research takes a unique measurement. Instead, you would consider the causes and changes to the trade imbalance. Detailed statistics and statistical checks help guarantee that the results are significant.

For example, it can look into why the value of the Japanese Yen has decreased. This is so that an analytical study can consider “how” and “why” questions.

Another example is that someone might conduct analytical research to identify a study’s gap. It presents a fresh perspective on your data. Therefore, it aids in supporting or refuting notions.

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Descriptive vs analytical research

Here are the key differences between descriptive research and analytical research:

Aspect	Descriptive Research	Analytical Research
Objective	Describe and document characteristics or phenomena.	Analyze and interpret data to understand relationships or causality.
Focus	"What" questions	"Why" and "How" questions
Data Analysis	Summarizing information	Statistical research, hypothesis testing, qualitative research
Goal	Provide an accurate and comprehensive description	Gain insights, make inferences, provide explanations or predictions
Causal Relationships	Not the primary focus	Examining underlying factors, causes, or effects
Examples	Surveys, observations, case-control study, content analysis	Experiments, statistical research, qualitative analysis

The study of cause and effect makes extensive use of analytical research. It benefits from numerous academic disciplines, including marketing, health, and psychology, because it offers more conclusive information for addressing research issues.

QuestionPro offers solutions for every issue and industry, making it more than just survey software. For handling data, we also have systems like our InsightsHub research library.

You may make crucial decisions quickly while using QuestionPro to understand your clients and other study subjects better. Make use of the possibilities of the enterprise-grade research suite right away![9,10,11]

II. DISCUSSION

The literature on qualitative data analysis mostly concerns analyses pertaining to an individual research question and the organization of data within that research question. Few authors have written about the entire qualitative dataset from which multiple and separate analyses could be conducted and reported. The concept of analytic direction is a strategy that can assist qualitative researchers in deciding which findings to highlight within a dataset. The objectives of this paper were to: 1) describe the importance of analytic direction in qualitative research, and 2) provide a working example of the concept of analytic direction.

A qualitative dataset from one of the author's research programs was selected for review. Ten potential analytic directions were identified after the initial phenomenological analysis was conducted. Three analytic directions based on the same coding template but different content areas of the data were further developed using phenomenological analysis (n = 2) and qualitative description (n = 1) and are the focus of this paper. Development and selection of

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these three analytic directions was determined partially relying on methodological criteria to promote rigour including a comprehensive examination of the data, the use of multiple analysts, direct quotations to support claims, negative case analysis, and reflexivity.

The three analytic directions addressed topics within the scope of the overall research question. Each analytic direction had its own central point or story line and each highlighted a different perspective or voice. The use of an inductive and deductive approach to analysis and how the role of theory was integrated varied in each analytic direction.

The concept of analytic direction enables researchers to organize their qualitative datasets in order to tell different and unique "stories". The concept relies upon, and promotes, the conduct of rigourous qualitative research.[12,13,15]

III. RESULTS

An analytical framework is a structure that helps us make sense of data in an organized way. We take an analytical approach by dividing a complex problem into clear, manageable segments and then reintegrating the results into a unified solution.

Below, we will explore how and when to use three types of analytical frameworks:

- A Framework for Qualitative Research: Translating problems into numbers.
- Case Study 1: Banner ad strategy.
- A Framework for Quantitative Research: Putting numbers in context.
- Case Study 2: Marketing channel metrics.
- Data Science Methodology: Step-by-step approach to gathering data and drawing conclusions.

Types of Analytical Frameworks

There are three main types of data analytics frameworks, each with its own strengths depending on what it is they help us organize.

1 - Qualitative research frameworks: When dealing with categorical questions such as, "are our clients satisfied with our product?", we need a way to translate that question into numbers in order to create data-based insights. A qualitative research framework does this by transforming "soft" problems into "hard" numbers.

The qualitative research framework also helps us translate abstract concepts into quantifiable data. Its used for questions like "would investing five more hours per week in research add more value to our product?". In this case, we aim to quantify the concept of value to compare different strategies. A qualitative framework eases this process.

2 - Quantitative research frameworks: Let's say that we are already dealing with well-defined numeric quantities. For example, the "daily active users" our application sees is a metric we have extensively defined and measured. This information helps us know how well the app is currently doing - but doesn't say much about where to find improvements.

To improve, we need to understand which factors are driving our key metrics; we need to give our metrics context. Quantitative research analytics frameworks help us understand the relationships between different metrics to put our core metrics in context.

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3 - Data science methodology: Let's say we have defined our concepts and put all our metrics in context, then we're just getting started. We still need to gather data to draw conclusions.

Numerous ways exist to do this, some prone to error or inconsistency. So we need an organized process to reduce risks and maintain organization. Data science methodology frameworks offer a reliable step-by-step approach to drawing conclusions from data.

Now, let's examine how each of these analytical frameworks works.

A Framework for Qualitative Research[17,18,19]
There are a few qualitative research analytical frameworks we could use depending on the context of the business environment. Specific situations and problems call for different approaches; we want to ensure that we are translating the business challenge into numerical measurements in the right way.

Two examples of these approaches include product metric frameworks for measuring success and diagnosing changes in metrics, as well as evaluating the impact of potential feature changes to our product. Another common business case for translating a problem into hard numbers is through A/B tests, which have a framework of their own.

However, each of these specific frameworks follows the same four-step structure outlined below. They begin with a vaguely defined business problem and need to convert it into hard numbers to address it.

The framework to go about finding these solutions has four steps:

1. First, ask clarifying questions. Gather all the context you need to narrow down the scope of the problem and determine what requires further clarification.
2. Second, assess the requirements. Define the problem in terms of precise metrics that can be used to address gaps from the previous step.
3. Third, provide a solution. Each solution will vary depending on the type of problem you're dealing with.
4. Fourth, validate the solution. Do this against your pre-existing knowledge and available data to minimize the likelihood of making mistakes.

Case Study 1: Banner Ad Strategy
Let's look go through each of those framework steps with a business example of an online media company that wants to monetize web traffic by embedding banner ads in their content. Our task is to measure the success of different banner ad strategies and select the best one to scale up.

1 - Clarifying Questions & Assumptions:

Initially, we need to gather context about our monetization method. Will revenue depend on ad impressions, clicks, or the number of users who buy the advertised products?

We also need to identify our audience type. Does it consist of stable (loyal) readers with regular engagement? Or is it primarily composed of click-bait article chasers with low rates of future engagement?

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This information is necessary to define each strategy's success and determine which strategies to test in the future. For example, if we have a click-bait audience, we can observe the revenue for each monetization strategy in the short term and then compare the results.[20,21,22]

However, if we have a regular audience, we need to understand the customer lifetime value for each strategy. This is because strategies like filling the page with ad banners could make us more money in the short term - but contribute to the loss of loyal readers, hurting profits in the long term.

2 - Assessing Requirements:

Once we have gathered context and clarified assumptions, we need to define the solution requirements precisely. Let's say our review reveals that our revenue depends on how many clicks the ads get and that our webpage has a stable user base who reads the webpage regularly.

Now we need to define the metric to optimize our banner ad strategy. We stated that the average customer lifetime value (CLV) was a good choice, which is the total revenue the company expects to make for each of its readers. In this case, the average CLV would be the average number of clicks per session times the average number of times each user views our pages for each banner strategy.

$$CLV = \frac{clicks}{session} \times \frac{sessions}{customer}$$

The resulting metric help us choose between a strategy that generates more clicks in the short term versus a strategy that reduces reader churn. We also need to define the set of strategies we'll evaluate. For simplicity, let's say that we will only test the number of banners we show to each user.

3 - Solution:

At this point, we've defined our problem numerically and can create a data-driven solution.

In general, solutions can involve running experiments, deciding on product features, or explaining metric changes. In this case, we'll design an A/B test to identify the best banner ad strategy, based on our assessment requirements.

In this case, we need to define an A/B test to decide our optimal strategy. Based on our requirements, the A/B test should be user-based instead of session-based: We'll divide users into two groups, showing each group a different number of ads during their visits. For example, Bucket A receives one banner ad per webpage, while Bucket B gets two. Over time, we will be able to capture how the number of ads shown impacts engagement.[23,22,25]

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To reduce causal effects, we must ensure identical banner content for both groups. If Bucket B sees the same two banners, half of Bucket A should see one banner and the other half the other banner. We should also alternate the order of banners for Bucket B to avoid interference from the display order.

Lastly, decide on the experiment duration. To account for long-term effects, we should run the experiment for at least three months.

4 - Validation:

A useful first step is to re-check the numbers and perform a gut instinct check. If results seem odd, we should suspect a problem, investigate the cause, and revise our approach.

In this example, we tested a banner strategy hypothesis. The validation step involves evaluating differences between the test and control groups (users who didn't receive the treatment over three months) and identifying any confounding factors that might have affected the results. We must also determine if the differences and observations are statistically significant or potentially spurious results.

A Framework for Quantitative Research
The second type of analytical approach comes from the quantitative research framework. After we define our key metrics clearly, this framework helps give them context. With this framework, teams can enhance their understanding of the key metric, making it easier to control, track, assign responsibilities, and identify opportunities for improvements.

to understand the factors that drive them, assign responsibilities to team members, and identify opportunities for improvement.

We do this by breaking down the key metric into lower-level metrics. Here's a step-by-step guide:

1. Identify the key metric: Determine the main metric you want to focus on (e.g., revenue for a sales team).
2. Define first-level metrics: Break down the key metric into components that directly relate to it. For a sales team, first-level metrics would be the sales volume and the average selling price because the revenue is the sales volume times the average selling price.[27,28,29]
3. Identify second-level metrics: Further refine your analysis by breaking down the first-level metrics into their underlying factors. For a sales team, second-level metrics could include:

- Sales volume:
- Number of leads generated
- Conversion rate
- Average order value
- Average selling price:
- Discounts and promotions
- Competitor prices

1. Assign responsibility and track progress: With a better understanding of first and second-level metrics, allocate responsibility for improving them to different team members. Track their progress to enhance the key metric.

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Case Study 2: Marketing Channel Metrics

Let's explore an example where we apply the quantitative analytics framework to a company called Mode, which sells B2B analytics dashboards through a SaaS freemium subscription model (users can use the product for free but must pay monthly or annually for advanced features).

Step 1: Identify the key metric

Our key metric is marketing ROI (revenue over expenses) for each of our marketing channels.

Step 2: Define first-level metrics

Two first-level metrics stand out:

- Revenue: Driven by our average Customer Lifetime Value (CLV) - the total revenue we make over the years for each new customer.
- Expenses: Driven by our Customer Acquisition Cost (CAC) - the cost of gaining new customers.

Step 3: Identify second-level metrics

Now we need to identify the second-level metrics for each of our first-level metrics.

First-Level Metric: Customer Lifetime Value

CLV is calculated as the Average Revenue Per Customer (ARPC) - the average amount a customer spends each month - divided by the churn rate (CR) - the percentage of users that stop using the platform each month:

$$CLV = \frac{ARPC}{CR}$$

So ARPC and CR are the second-level metrics driving CLV.

First-Level Metric: Customer Acquisition Cost

On the other side of our marketing ROI equation, CAC is the average amount spent by the sales team in salaried time and equipment/software value to sign up one new customer.

There are quite a few second-level metrics we could investigate under CAC, mostly from looking at the customer acquisition funnel:

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- Cost per View (CPV): The amount it costs the company for each new person to see our landing page.
- Free Sign-Ups per Total Number of Views (FSU/TNV): The percentage of landing page visitors who create a free account.
- Paid Customers per Total Number of Views (PC/TNV): The percentage of landing page visitors who create a premium account directly.
- Paid Customers per Free Sign-Ups (PC/FSU): The percentage of free account users who upgrade to a premium account.

With this information, we can define our CAC as:

$$CAC = \frac{CPV}{\frac{FSU}{TNV} * \frac{PC}{FSU} + \frac{PC}{TNV}}$$

Because our total cost is $CAC = CPV * TNV$ and our total number of customers is $TNV = (\frac{FSU}{TNV} * \frac{PC}{FSU} + \frac{PC}{TNV})$.

So the four metrics we identified serve as our second-level metrics.

Step 4: Assign responsibility and track progress

With a clear understanding of first- and second-level metrics, the sales team can assign responsibilities for improving each metric and track their progress in enhancing the key metric of marketing ROI.[30,31]

Data Science Methodology

Let's say we've defined our concepts and metrics. We translated our business problem into hard numbers using a qualitative framework. Then we used the quantitative framework to get an analytical understanding of the metrics involved and their relationships. Now we want to draw conclusions from the data.

To do this, we need a reliable process that minimizes errors and keeps things organized. This is where our third analytical framework comes into use. The data science methodology provides a step-by-step approach for reaching conclusions from data, which is especially useful when questions become increasingly complex:

1. Data Requirements - Figure out the necessary data, formats, and sources to collect.
2. Data Collection - Gather and validate the data, ensuring it's representative of the problem.
3. Data Processing - Clean and transform the data.
4. Modeling - Build models to predict or describe outcomes.
5. Evaluation - Check if the model meets business requirements and is high-quality.
6. Deployment - Prepare the model for real-world use.
7. Feedback - Refine the model based on its performance and impact.

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Imagine you're working at a company that wants to boost customer retention in its online store. They collect customer data through website analytics and a customer database. Here's how they might follow the data science methodology:

Going through each of the steps would look something like this:

1. Data Requirements: Identify data needed to improve customer retention, such as demographics, purchase history, website engagement, and feedback.
2. Data Collection: Gather data from sources like databases, website analytics, and surveys. Ensure data is accurate, complete, and relevant.
3. Data Processing: Clean and analyze the data to remove errors, duplicates, and missing values. Look for patterns and trends you could use for feature engineering.
4. Modeling: Create predictive models to find factors that impact customer retention using machine learning algorithms based on historical data.
5. Evaluation: Compare the model's predictions to actual customer behavior, checking for accuracy, interpretability, and scalability.
6. Deployment: Implement the model in the online store's retention strategies. This could include targeted marketing campaigns, personalized recommendations, or loyalty programs based on the model's predictions. If you're working on your own, ensure you showcase your projects and results in the best possible way.
7. Feedback: Keep an eye on the model's performance and gather customer feedback to refine it. Update the model's algorithms or adjust retention strategies based on its predictions. Continuously assess and improve the model to maintain its effectiveness.[32]

IV. CONCLUSIONS

Rules of the analytical method

- Before undertaking the examination and resolution of a question, it is necessary to realize its nature. In the same object you can examine and try to discover different elements such as its essence, or its properties and attributes, or also its special relationships with other beings.
- It is convenient decompose the event or object taking into account that a meticulous examination of its parts, elements or principles will be carried out. This decomposition can be real and physical, or rational and ideal, depending on the object in question. It is also favorable to take care that this decomposition is verified by keeping the rules of the division, to avoid confusion.
- When examining the elements or parts of an object, It must be done in such a way that they do not lose sight of their relationships with each other and there is a connection between everything so that there is a union. If an individual considered the parts of an object in isolation, without taking into account or considering the relationships with each other and with the whole, it would undoubtedly be highly probable that inaccurate and erroneous ideas would be formed about that object.

Description

In this phase the essential thing is to define something giving a general idea of what has already been observed. The description is important as it provides useful information about what is being investigated, with as much detail as possible.

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Critical examination

It is the process of see objectively what is being analyzed providing logical proposals in order to achieve a result that must be understandable in order to be interpreted clearly and concisely.

Segmentation of the phenomenon

It tries to decompose the parts of what is being analyzed in order to be able to visualize it from various points of view and angles that reveals in a certain way the possible problems that without the analysis it would not have been possible to realize.

Enumeration of the parties

It consists of the chronological and ordered exposition of the parts that make up the information.

Sorting and Classification

Organization of information by classes. This phase also includes the analysis of the information obtained, which has a space to expand performance in a clearer and more concise way. It consists of the real separation of the component elements of a whole.

Other people condense all these stages into three steps:

- Experimentation: It is carried out with a specialist or researcher who sets conditions to discover the fundamental characteristics and their essential relationships.
- Comment: This step is carried out before, during and after the investigation, that is, at all times.
- Measurement or deductive method: In this it relies more on the numbers in statistics through surveys, questionnaires or other instruments.

Example of an analytical method

When an individual suffers from an organ disease, it is necessary to study its cells and tissues to arrive at an answer based on various theories that are related to the problem.

- If it is, for example, singular facts or phenomenaWe will have to make use of observation, experience and induction.
- If it's about more or less general truths, reasoning and deduction are the ordinary way to reach them.
- If it is about objects and truths related to the fine arts, we must take into account the functions of the imagination.

If, on the contrary, it is a question of purely spiritual and intelligible objects, it will be convenient to dispense with the representations of the imagination, and to attend to the conceptions of pure reason.[30,31,32]

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Similarities in synthetic and analytical method

Although the word "analysis" is the complete opposite of "synthesis"As previously mentioned, both the analytical and synthetic methods tend to have many similarities in practice, which, if they are not clear, can lead to slight confusion.

- It is convenient to present the question and object to be investigated with precision and clarity, and to declare or define the hidden words. Thus speed up and the way is prepared to get to the knowledge of the object, and above all, questions of name are avoided.
- Attention should be fixed on the object to be known, setting it aside as much as possible from the other objects. The plurality of objects greatly weakens the intensity of attention with regard to each one in particular.
- The examination of a matter and the investigation of reality must begin with the most basic or the easiest things and known in advance. The natural procedure of the understanding in the investigation and discovery of the truth, it is a gradual and continuous process that naturally requires you to sequence from the easy to the difficult, from the known to the unknown.
- The instruments to get to know a fact must be in relation to the nature and conditions of the object to be known. This is the most important rule in this matter: the means and the ways to reach the truth are different, as are the classes of objects and situations.[33]

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