Special Journal of Engineering, Physics & Math's /Statistics

Research Design Innovations in Engineering, Physics, Mathematics and Statistics Investigations

Scientific and Technical Advisory Council (STAC), of the Special Journals Publisher (SJP)

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Citation:
Scientific and Technical Advisory Council (STAC) of the Special Journals Publisher (SJP): Research design innovations in Engineering, Physics, Mathematics, and Statistics Investigations. Special Journal of Engineering, Physics, Mathematics, and Statistics [SJ-EPM], 2020; 1 (1):1-21

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Background

The rapid microevolution of the world and everything about it and in it can be associated with all the observable changes that have made the world a relatively better society today compared to decades ago when it was backward in social, economic, and environmental issues. Our curiosity and instinct are driven by the need to adapt for survival and continued existence on earth. This instinct-driven curiosity is again determined by research questions, designed to get answers to daily challenges that borders on all aspects of human endeavors. These questions posed by daily challenges need multidisciplinary answers that require distinct groundbreaking skills to translate and implement its outcomes in the best interest of all stakeholders. The novelty in the research design, analysis, translation, and intervention is key to significantly positive social development and a vote of sustained innovative research.

Research design innovations in any discipline such as Engineering, Physics, Mathematics, and Statistics are the outline of research methods and procedures chosen by researchers to answer Engineering, Physics, Mathematics, and Statistics research questions (1). The innovative design allows researchers to improve on Engineering, Physics, Mathematics, and Statistics research methods tailored towards the achievement of the set objectives of the research. The design of Engineering, Physics, Mathematics, and Statistics research. describes the type and subtypes of innovative research (2). Research design may be divided broadly into 3 categories, that include data collection, measurement, and analysis (3)

Elements research design

A good Engineering, Physics, Mathematics, and Statistics research design creates a minimum bias in data generated and increases the trust of readers or stakeholders, in the accuracy, specificity, sensitivity, reliability, reproducibility, of collected data for an investigation (4). The vital elements of the Engineering, Physics, Mathematics, and Statistics research design are an accurate statement of purpose, techniques to be implemented for collecting and analyzing research, the method applied for analyzing collected details, type of research methodology, probable objections for research, settings for the research study, timeline and measurement of analysis. So, it is not enough to mention the Engineering, Physics, Mathematics, and Statistics research design but efforts must be made to articulate in brief, the methods, and procedures chosen by the researcher to provide answers to research questions (5).

The value of correct research design

Appropriate Engineering, Physics, Mathematics, and Statistics research design is the key to research success and provides insights that are accurate and unbiased characterized by neutrality, reliability, validity, and bias (6). Bias is ambiguity, and this is not good in Engineering, Physics, Mathematics, and Statistics research where the communication about the research is not clear and concise because biased reports are difficult to understand and hard to read (7). Unbiased Engineering, Physics, Mathematics, and Statistics results have some elements of neutrality not tilting to the left or right but remained in the center.

Research consistency and questions

Research reliability is the quality of getting relatively stable Engineering, Physics, Mathematics, and Statistics research results when a particular procedure is repeated many times and reliability protocol uses a defined standard method to confirm the results of speculations (8). Engineering, Physics, Mathematics, and Statistics researchers usually will have one or more hypotheses in a particular research concept (9) before scaling down to one hypothesis for one project. On the other hand, good research questions are the questions that the

Engineering, Physics, Mathematics, and Statistics researchers want to address which include predictions about possible relationships between the things the researcher wants to investigate (variables). To find answers to these questions, the researchers will also have various instruments and materials and a clearly defined plan of action (10). There appears to be a clear relationship between research questions and research design. The right question illuminates the research horizon that makes it easy to select and use the right design that ultimately gives the right answers

The relevance of innovative design in research

No matter how appropriate Engineering, Physics, Mathematics, and Statistics design may be, without innovation, that design will have limited worth as there will be little or no impact concerning the dynamic nature of our changing world. A design that leads to a routine outcome, will attract little or no attention and amounts to a waste of time (11). Innovation offers a new way of doing things as it will be hard to get a relevant, new, and valuable result by repeating a protocol many times over without innovation (12) to fit the dynamics of the changing needs of the society. The function of a research design is to ensure that the evidence obtained enables the researcher to effectively address the research problem as unambiguously as possible. In Engineering, Physics, Mathematics, and Statistics research, obtaining evidence relevant to the research problem generally entails specifying the type of evidence needed to test a theory, to evaluate a program, or to accurately describe a phenomenon.

Research design process

Researchers in the field of Engineering, Physics, Mathematics, and Statistics can often begin their investigations early before they have thought critically about what information is required to answer the Engineering, Physics, Mathematics, and Statistics research questions (13). Without attending to these Engineering, Physics, Mathematics, and Statistics design issues beforehand, the conclusions drawn may be seen as weak and unimpressive and, consequently, will fail to adequately address the overall research problem. Any sound Engineering, Physics, Mathematics, and Statistics design process will involve the following: identify the research problem clearly and justify its selection, review previously published literature associated with the problem area, clearly and explicitly specify hypotheses or research questions central to the problem selected, effectively describe the data which will be necessary for an adequate test of the hypotheses and explain how such data will be obtained, and describe the methods of analysis which will be applied to the data in determining whether or not the hypotheses are true or false (14).

Basis for innovative research

Since innovation is generally a new way of doing anything (15), it, therefore, implies that innovation in Engineering, Physics, Mathematics, and Statistics research is a process of reappraising, and renewing the standard operational procedures in Engineering, Physics, Mathematics, and Statistics research for a new and better outcome (16, 17). The complex and changing dynamics of social, economic, and environmental challenges warrant a paradigm shift with new research philosophy, design, and methodologies, to meet up with demanding problem containment in the 22nd

century (18). Research challenges are dynamic and so should the research designs. The ability to combine and/or utilize the research designs with a slight modification to suit the inherent challenge for effective outcome defines the innovativeness of the subject-specific research designs.

Value of research innovations

Adherence to standard operational routine procedures with no modification to show advancement may be deficient in providing results that will help contain the 22nd-century challenges since no one can repeat the same thing again and again over time and expect a new result, hence the need for new research with modern technologies. Therefore, innovation in research design is needed to produce research that will answer the questions associated with the social, economic, and environmental challenges (19) of both our current generation and for the next generation to come. This innovation is what will break the glass ceiling in containing the emerging and reemerging disease and pandemics that threatens the existence of life on planet earth (20). Innovation in research will also help change the existentialist threat to supremacy and dominance in our localities (21). This rationale will then allow for the following objective to be achieved with the ultimate goal of improving our competences in the design of research to face the 22nd-century challenges

Objective

The nature and significance of research design to research studies in scientific researches in the past 3 decades were reviewed for impact assessment of three-decade research on the ability to design and implement effective and innovative research in Engineering, Physics, Mathematics, and Statistics

Materials and Methods

In this retrospective cross-sectional innovative design in Engineering, Physics, Mathematics, and Statistics research, we downloaded and perused 486 published full-length original papers, published addendum, corrections, editorials, abstracts of meetings, conference proceedings, and review article, on the general concept of development and sustainability. This searching and corresponding download of relevant papers were made from a globally recognized research-based data repository that included but not limited to the Web of Science (WoS) (22) core collection database on the nineteens of July 2020 at about 10.25 GMT+2). The database of PubMed, Research Gate, and Google scholars was perused to be sure no new documents relevant and necessary for this study were missed out. However, the web of science formed the major and reference database for this study because our software was more compatible to recovered data encoded in the web of science database while other databases consulted served to provide other relevant articles, we considered imported but probably missing in the web of science.

Boolean topic search approach

The Boolean topic search approach (23) used included "(Innovations * AND Research design $) OR (Research design * AND Innovations$) to encompass all relevant and available documents (24) on the subject of Innovations and Research design between 1990 and 2019. At the time of this study, we judged that the Web of Science Core Collection database had enough user-friendly and accessible academic research databases relatively covering enough journals, books, conferences as well as millions of records from clarivate.libguides.com (references). To ensure the inclusion of abbreviated or shorten words, the wildcard * and $ were added to the end of the search algorithms. Thereafter, all documents that meet the eligibility criteria of sustainable development were retrieved and exported into BibTex file format and the authors, titles, abstracts mined in PDF file format.

Data analysis

All the bibliometric variables were retrieved filtered and normalized for quality control. The results were analyses in the bibliophagy plugin package of the 3.5.1 version of R-studio software, while the codes and commands were adopted from Https://www.bibliometrics.org to evaluate the bibliometrics indices. Tables and graph were made in Microsoft excel 16 version and network maps were visualized in 1,6 Vox-viewer software

Results

In this study of Innovations in Research design, 195 papers written by 454 authors over three decades were recovered, perused, and analyzed as shown in table 1 above. Sixty-one (61) documents were written by single authors while 394 authors wrote 394, multi-author documents giving 2.94 collaborative index and authors and co-authors per documents indexes of 2.33 and 2.46 respectively. One hundred and fourteen (114) proceedings papers, 5 meetings abstract, 5 editorial material, 47 articles, 15 articles that were originally a book chapter, 3 reviews, 5 editorial material, and 15 book chapters among others.

Description	Results
Documents	195
Sources (Journals, Books, etc.)	177
Keywords Plus (ID)	183
Author's Keywords (DE)	512
Period	1999 - 2019
Average citations per documents	6.564
Authors	454
Author Appearances	480
Authors of single-authored documents	60
Authors of multi-authored documents	394
Single-authored documents	61
Documents per Author	0.43
Authors per Document	2.33
Co-Authors per Documents	2.46
Collaboration Index	2.94
Document types	
ARTICLE	47
ARTICLE; BOOK CHAPTER	15
ARTICLE; PROCEEDINGS PAPER	2
BOOK	2
EDITORIAL MATERIAL	5
EDITORIAL MATERIAL; BOOK CHAPTER	2
MEETING ABSTRACT	5
PROCEEDINGS PAPER	114
REVIEW	3

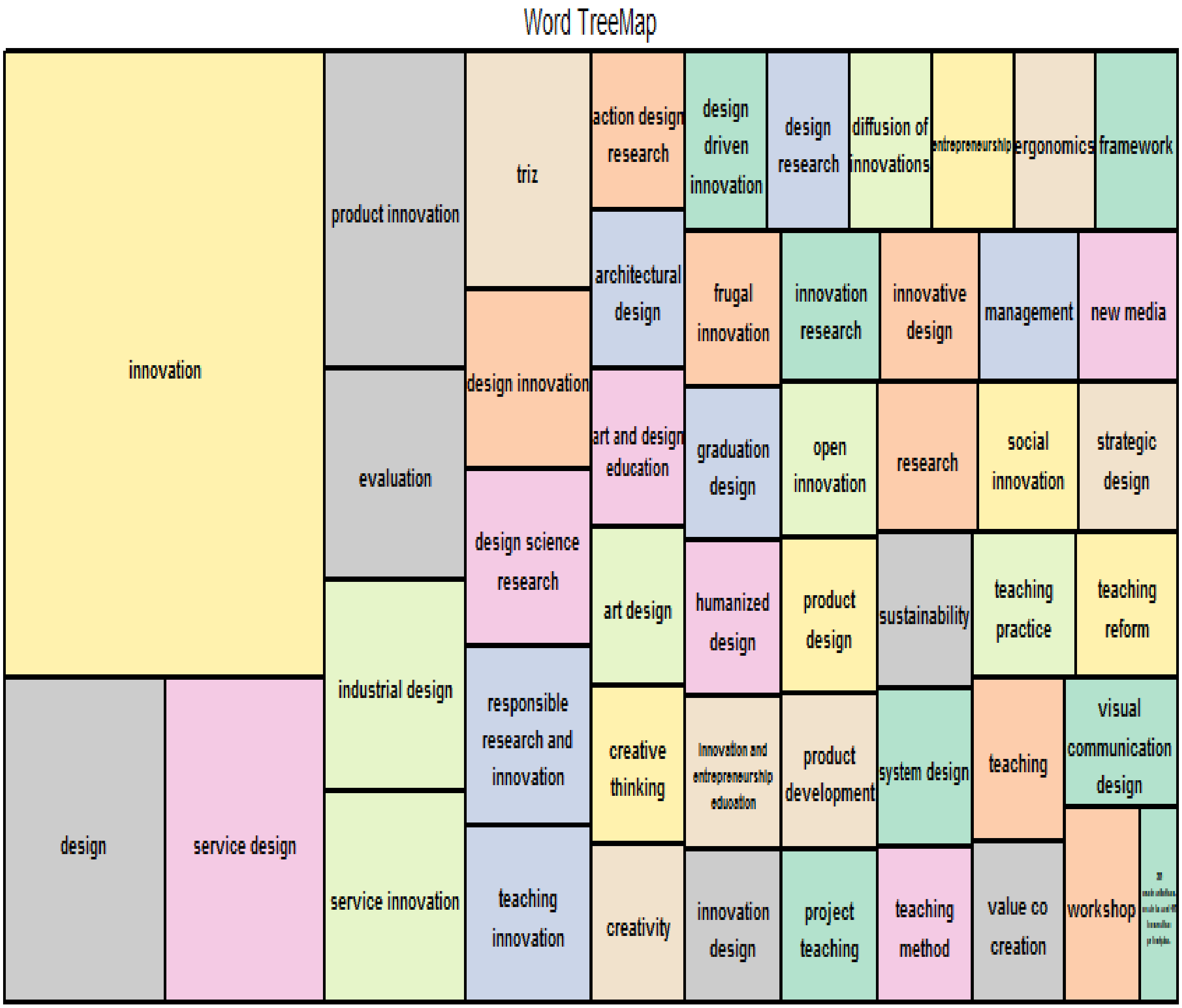

Figure 1: word treemap in Engineering, Physics, Mathematics and Statistics research

From figure1 above **Innovation** was the biggest cluster and subcategory associated with innovation include creative thinking, product design, social innovation, and teaching reform. **The design** was the next category associated with subcategories of product innovation, evaluation, innovation design, sustainability, and value co-creation. **Service design** was the next category and associated subcategories, of design science research, art, and design education, humanized design, teaching methods, and new media. Next is **industrial design and services innovation** and subcategories of the art design, open innovations, diffusion of innovations, and teaching practice.

The next is **responsible research and innovation** and teaching innovations are associated with subcategories of architectural design, graduation designs, and management. The next is to **try** and subcategories of creativity, innovations and entrepreneurship education, product development, ergonomics, and strategic design. The next is **design innovation** and subcategories of action design research, fungal innovations, innovative designs, research, teaching, and workshop

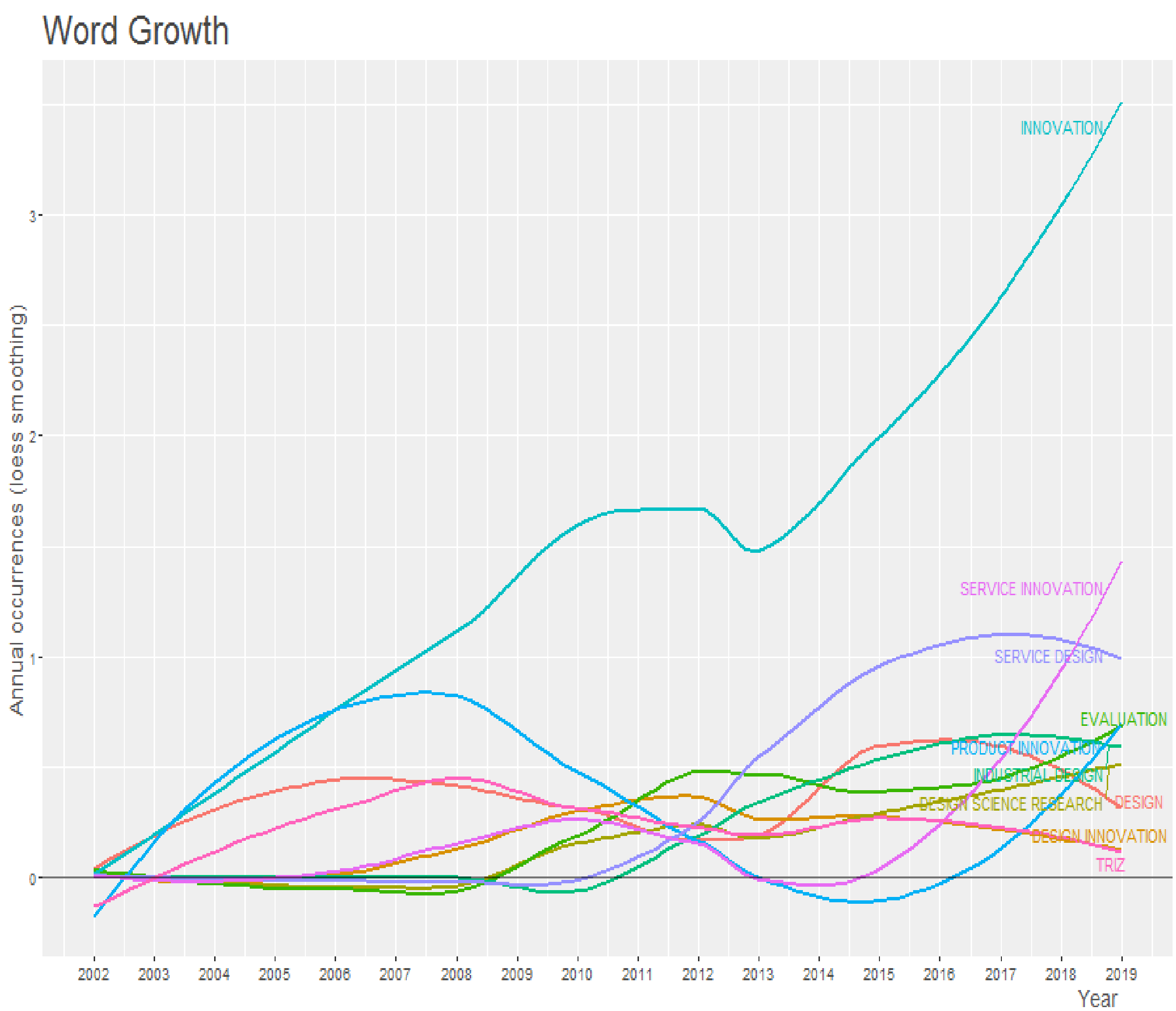

Figure 2: Word growth map in Engineering, Physics, Mathematics and Statistics research

The word tree graph fig 2, shows word usage in the studied period as relates to Innovations in Research design research. Innovation was the word that appeared most frequently from 2002 till 2018 while Product innovation usage had a steep rise from 2002 till 2007 and steadily decreased in Usage from 2008 till 2013, had a negative value between 2013 and 2016 before finally have another steep rise from 2017 till 2019. The rest of the words that appeared in the word growth all remained relatively stable from 2002 till 2014 before the word's usage dispersed with service innovation topping the list followed by service design, evaluation, institutional design, design science research, design innovation, and try.

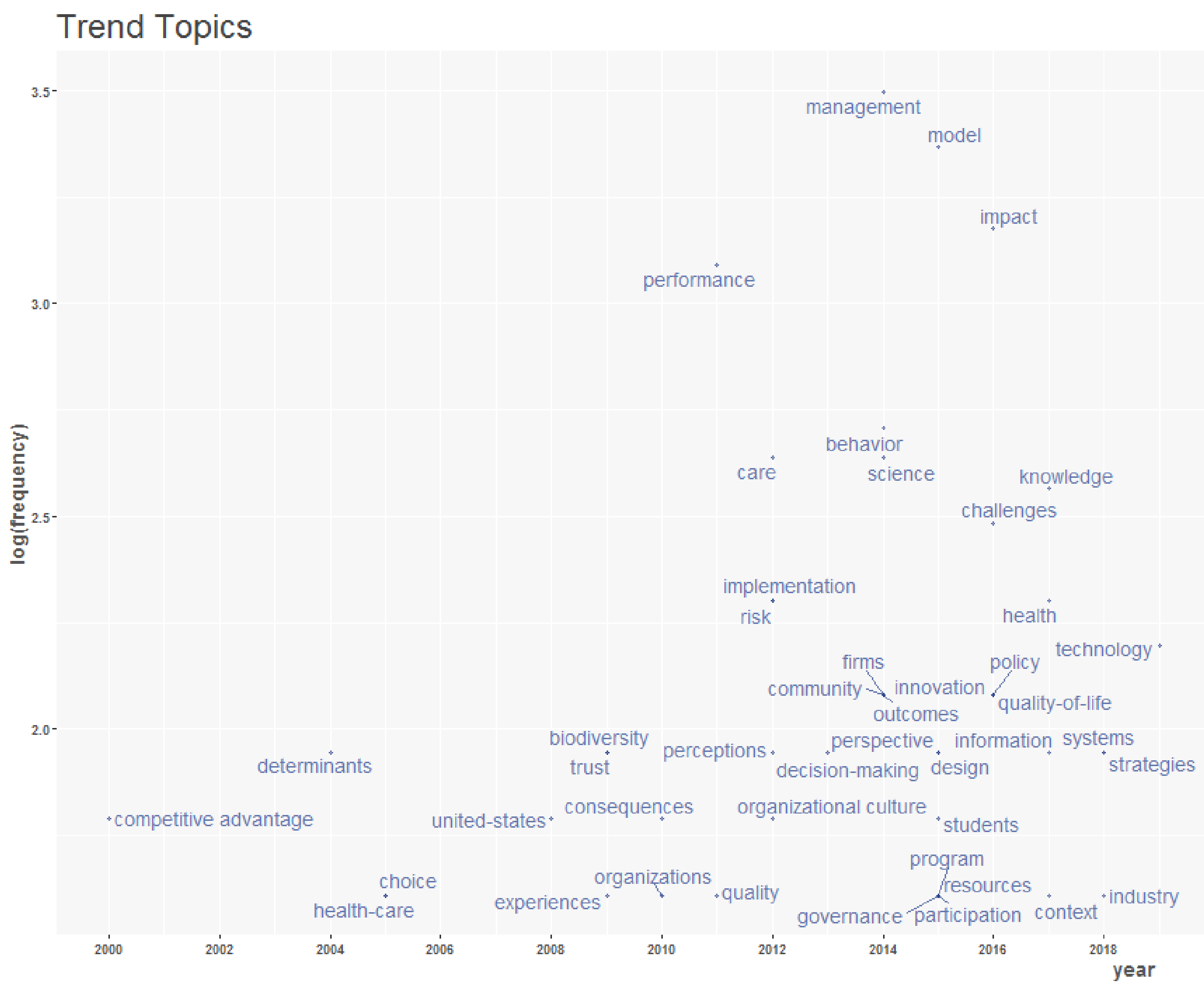

Figure 3 Trend topics in Engineering, Physics, Mathematics, and Statistics research

Figure 3, the trend of topics used in research involving innovation and research design shown in the above figure. The use of words in research experienced the greatest 4-fold logarithmic growth between 2014 and 2018 with governance, participation, and context being at the base of the topic trend while management, model, and impact were on top of the topic trend. Terminologies that saw a two-fold rise included information, systems, outcomes, policy, innovations, community, firms among others. Between 2008 and 2010, biodiversity, consequences', experiences, United states, experienced less than 2-fold log rise in occurrence.

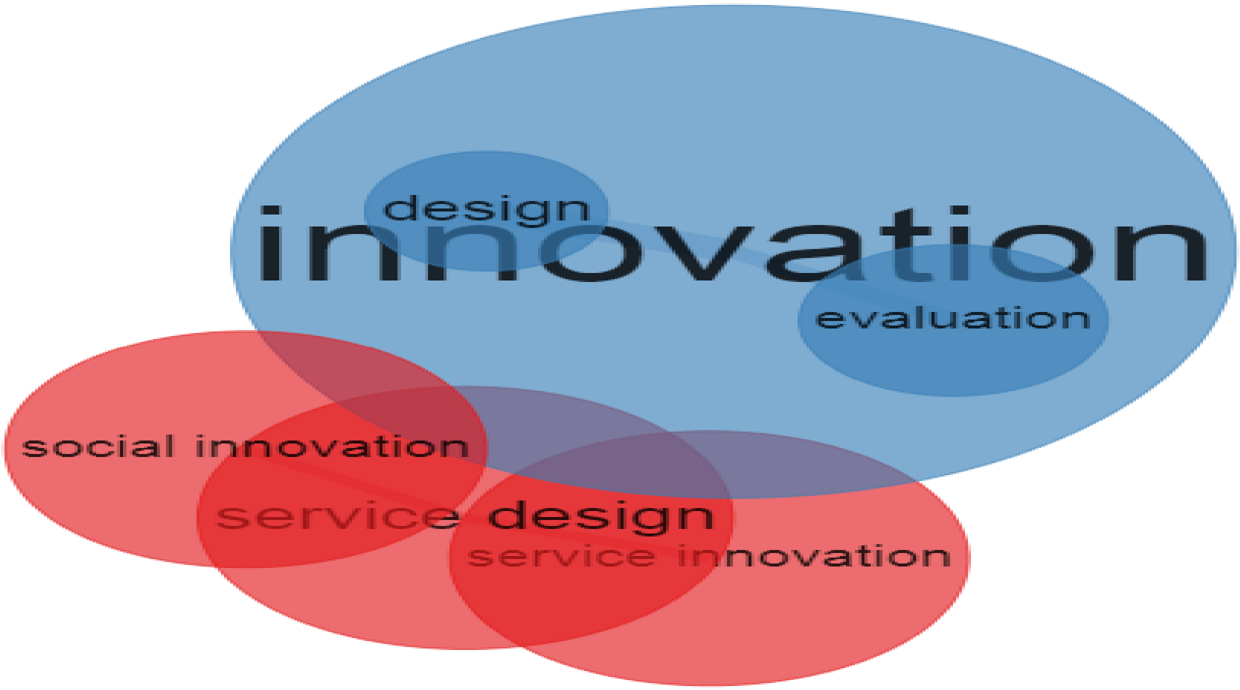

Figure 4, Co-occurrence of author keywords network in Engineering, Physics, Mathematics and Statistics research

Figure 4 above for Co-occurrence of author keywords network in innovation and research design study, and according to the size of the bubbles we have two clusters blue and red. The biggest word in the blue cluster was innovation followed by evaluation and design whereas the red cluster had similar magnitude and the words include service design, social innovations, and service innovations.

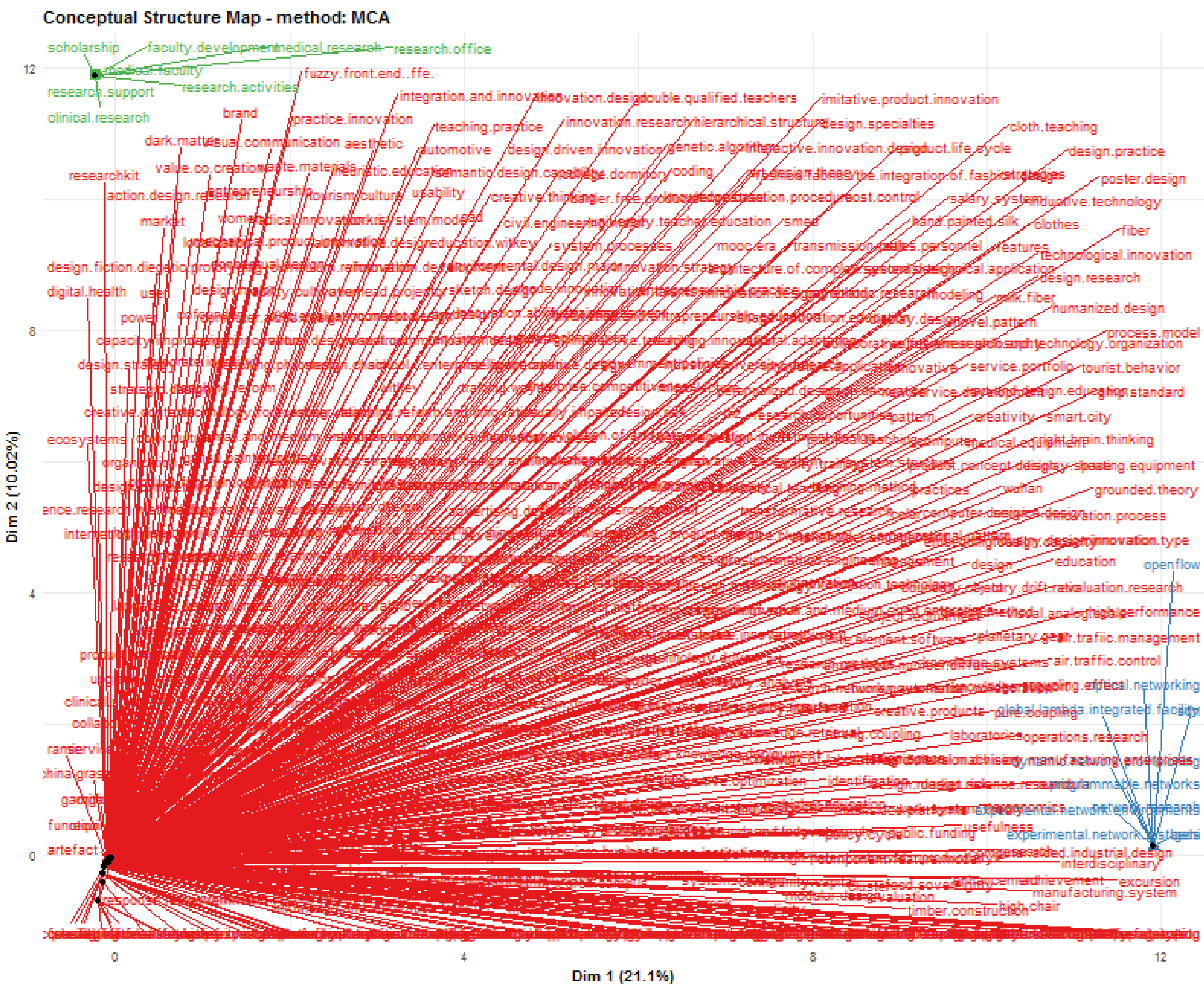

Figure 5, Conceptual structure map in Engineering, Physics, Mathematics and Statistics research

From figure 5 above, for the innovation and research design study the most obvious category is the red cluster in the northeast quadrant representing a cluster with a positively measurable category of innovations in research design that is strongly associated with its subcategories such as product innovations initiative teacher's qualification, brand, design practice, manufacturing systems, research kits end of life and more. The lines connect the subcategories and the major category which are innovations and research design. Those words closer to the category have a strong relationship while those seen far away were weakly related to the category

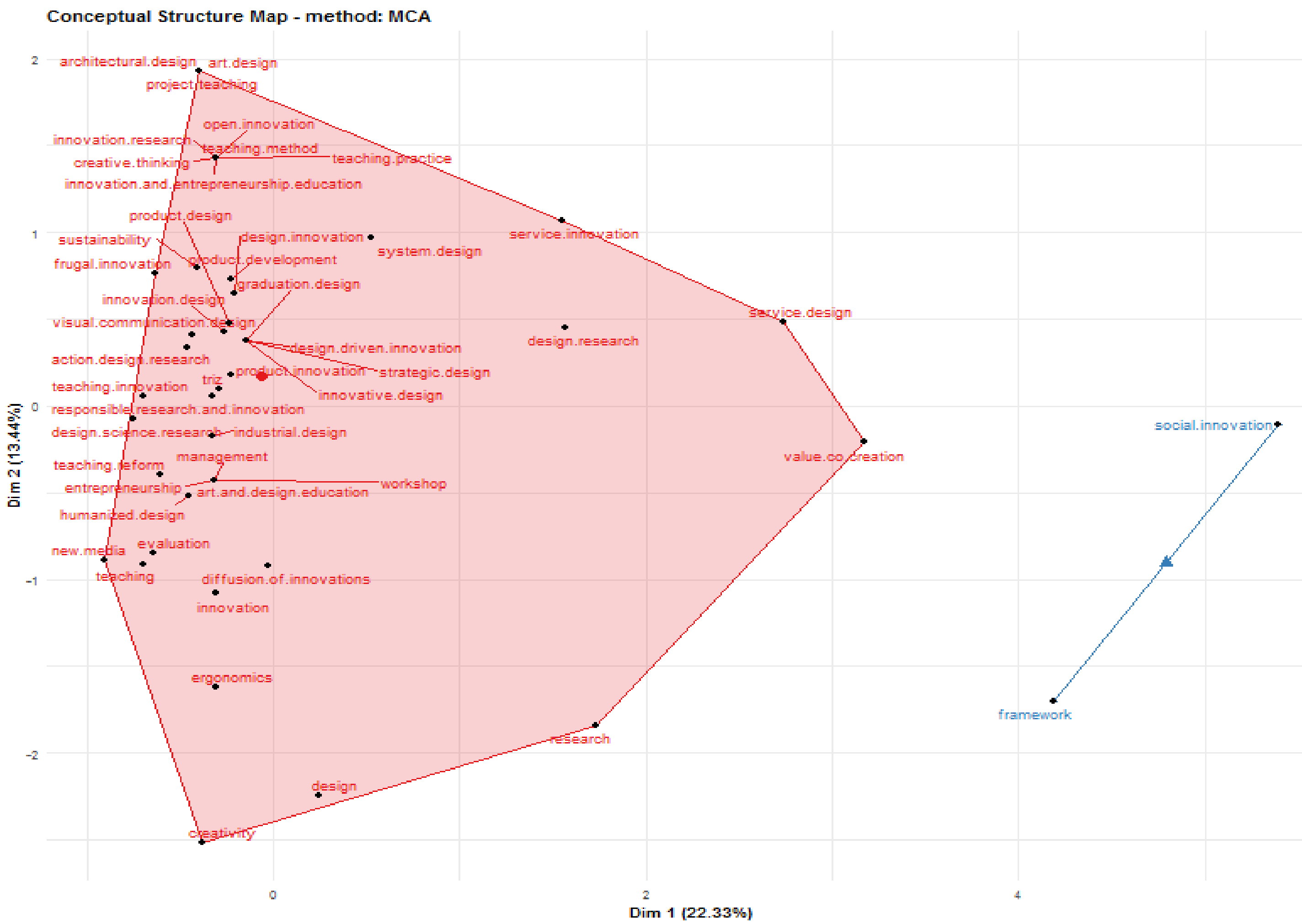

Figure 6: Conceptual structure map in Engineering, Physics, Mathematics and Statistics research

The above figure 6 represents the conceptual structure map in 4 quadrants. The category of innovations in research design is distantly discriminated among creativity, research, value co-creation, service design, service innovations, architectural design, and teaching. Produce innovation, triz, visual communication design, industrial design management, innovation design, and graduate design and strongly and closely discriminated against the category of innovation and while design, ergonomics, design research, innovations, and diffusion of innovations were distantly discriminated again innovations in research design

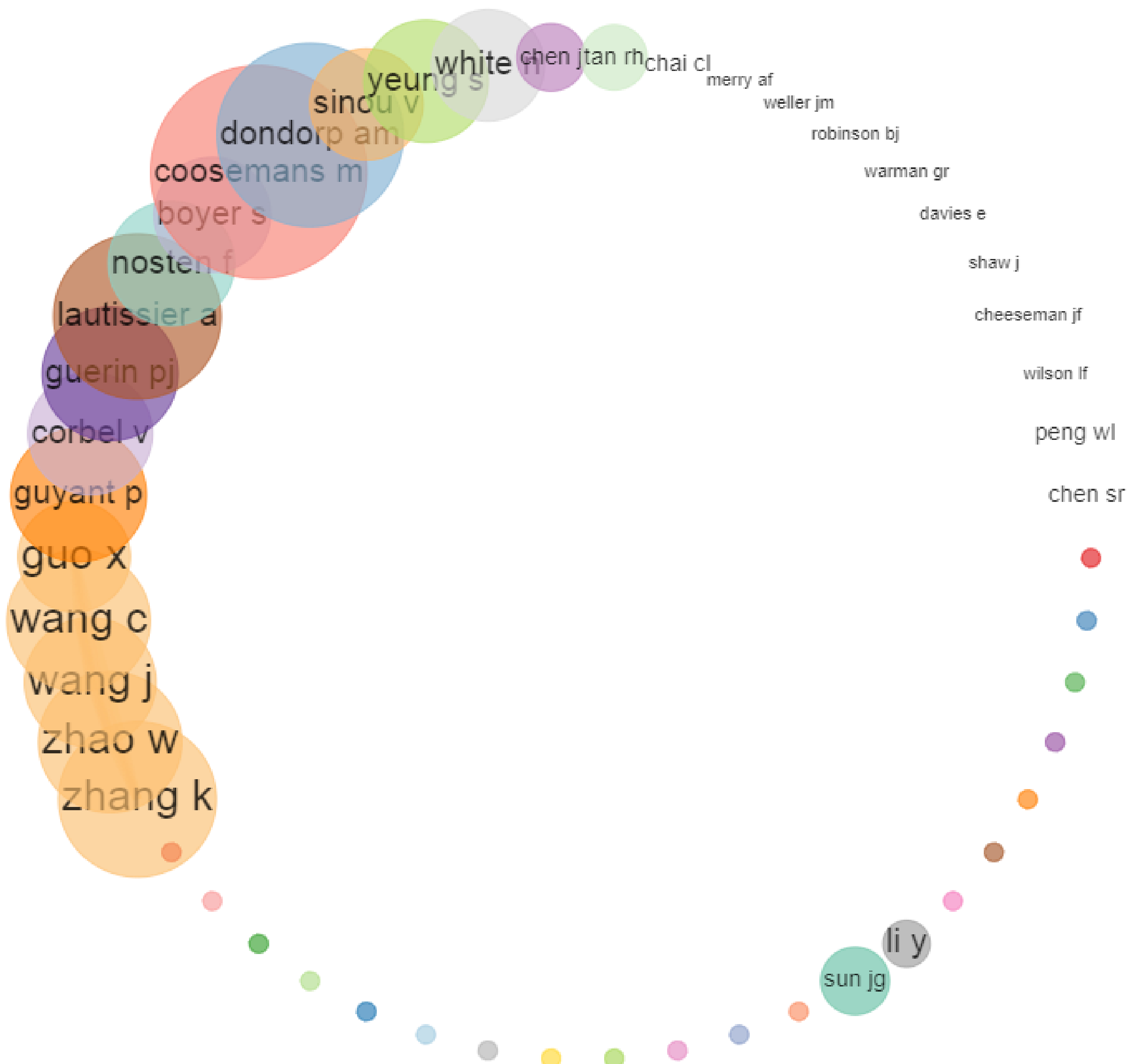

Figure 7 Author collaboration network in Engineering, Physics, Mathematics and Statistics research

In figure 7 above, there was no collaboration among the authors whose research featured in the search as there are no connecting lines between authors as shown in the figure above

Figure 8, Institutional collaboration network in Engineering, Physics, Mathematics and Statistics research

Institutions also did not collaborate except the USA, Germany, and Korea and in another cluster, United Kingdom collaborated with France.

Discussion

Engineering, Physics, Mathematics, and Statistics research design is a concept that is very critical and holds the key to good research (1-3). Therefore, the ability to choose the best Engineering, Physics, Mathematics, and Statistics research design defines the success of such research because a design serves as the foundation of the research, and the wrong choice from the beginning makes the entire set up wrong. The innovative aspect of research design in Engineering, Physics, Mathematics, and Statistics is defined by the collection of novels, carefully designed protocols that will yield good results, and has policy implications (25).

In fig 1, the use of innovation, design, service design, industrial design service innovation in different researches conducted in the past 3 decades shows the relevance of the topic. Figures 2 and 3 show the magnitude and trend of usage also emphasizing the significance of the word design in research over the past 3 decades. Figures 4 to 8 show the author's keywords used and collaboration network in the past 3 decades depicting trend, the magnitude of word usage, and the level of collaboration by authors, institutions concerning innovative research design. Thus, the different research designs available for researchers when designing a study are discussed below as a way of providing tools for innovations during research designs. This discussion is also premised on the universality of the innovativeness of research designs as it applies to all disciplines

Quantitative research in Engineering, Physics, Mathematics, and Statistics

Quantitative research in Engineering, Physics, Mathematics, and Statistics involves collecting and converting data into numerical form so that statistical calculations can be made and conclusions are drawn thereby enabling researchers to determine to what extent there is a relationship between two or more variables (26). This could be a simple association or a causal relationship. Complex causal relationships are discovered and to what extent one variable influences another is determined. The results are presented in the form of a "p-value" that measures the likelihood that a particular finding or observed difference is due to chance (27). The "p-value" is between 0 and 1. The closer the result is to 0, the less likely it is that the observed difference is due to chance. The closer the result is to 1, the greater the likelihood that the finding is due to chance and that there is no difference between the groups/variables.

Qualitative research in Engineering, Physics, Mathematics, and Statistics

Qualitative research in Engineering, Physics, Mathematics, and Statistics involves recording, analyzing, and attempting to reveal the deeper meaning, understanding, and significance of human Engineering, Physics, Mathematics, and Statistics research (28). Qualitative researchers tend to adopt inductive reasoning whereby they develop a theory or look for a pattern of meaning based on the data that they have collected (29). This involves a move from the specific to the general and may involve some degree of deductive reasoning. Qualitative Engineering, Physics, Mathematics, and Statistics researchers identify a researchable problem or topic and prefer to adopt methods that give participants some freedom rather than restricting them to the selection of choices from a set of pre-determined responses. Qualitative Engineering, Physics, Mathematics, and Statistics research involves a smaller number of participants because the methods used are time and labor-intensive, a large number of people are not needed for statistical analysis or to make generalizations from the results (30).

Descriptive research design (31) in Engineering, Physics, Mathematics, and Statistics

In Engineering, Physics, Mathematics, and Statistics descriptive design, a researcher is exclusively interested in telling the situation or case under their research study. It is a theory-based design method that is created by gathering, analyzing, and presenting collected data. This allows a researcher to provide insights into the why and how of research. Descriptive design helps others better understand the need for the research.

Experimental research design (32) in Engineering, Physics, Mathematics, and Statistics

Experimental research design in Engineering, Physics, Mathematics, and Statistics establishes a relationship between the cause and effect of a situation. It is a **causal design** where one observes the impact caused by the independent variable on the dependent variable. The independent variables are manipulated to monitor the change it has on the dependent variable. It is often used in social sciences to observe human behavior by analyzing two groups. Causal design is an outline of the procedure that enables the researcher to maintain control, determine or predict what may affect the result of an experiment with emphasis on time priority, consistency, and correlation. This type of study is used to measure what impact a specific change will have on existing norms and assumptions.

Correlational research design (33) in Engineering, Physics, Mathematics, and Statistics

Correlational research in Engineering, Physics, Mathematics, and Statistics is a non-experimental research design technique that helps researchers establish a relationship between two closely connected variables. This type of research requires two different groups. There is no assumption while evaluating a relationship between two different variables, and statistical analysis techniques calculate the relationship between them. A correlation coefficient determines the correlation between two variables, whose value ranges between -1 and +1. If the correlation coefficient is towards +1, it indicates a positive relationship between the variables and -1 means a negative relationship between the two variables.

Diagnostic research design (34) in Engineering, Physics, Mathematics, and Statistics

Diagnostic research design in Engineering, Physics, Mathematics, and Statistics is where the researcher is looking to evaluate the underlying cause of a specific topic or phenomenon. This method helps one learn more about the factors that create troublesome situations. This design has three parts of the research: Inception of the issue, Diagnosis of the issue, and solution for the issue

Explanatory research (35) design in Engineering, Physics, Mathematics, and Statistics

Explanatory design in Engineering, Physics, Mathematics, and Statistics uses a researcher's ideas and thoughts on a subject to further explore their theories. The research explains unexplored aspects of a subject and details about what, how, and why of research questions. Descriptive research designs help the researchers provide answers to the questions of who, what, when, where, and how associated with a particular research problem; a descriptive study cannot conclusively ascertain answers to why. Descriptive research is used to obtain information concerning the current status of the phenomena and to describe "what exists" concerning variables or conditions in a situation. It is often used to narrow down a very broad field of research into one or a few easily researchable examples.

Action research design (36) in Engineering, Physics, Mathematics, and Statistics

The essentials of Engineering, Physics, Mathematics, and Statistics action research design follow a characteristic cycle whereby initially an exploratory stance is adopted, where an understanding of a problem is developed and plans are made for some form of intervention strategy. Then the intervention is carried out during which time, pertinent observations are collected in various forms. The new interventional strategies are carried out, and the cyclic process repeats, continuing until a sufficient understanding of the problem is achieved. The protocol is iterative and is intended to foster a deeper understanding of a given situation, starting with conceptualizing and particularizing the problem and moving through several interventions and evaluations.

Cohort design (37) in Engineering, Physics, Mathematics, and Statistics

A cohort study generally refers to a study conducted over a period involving members of a population which the subject or representative member comes from, and who are united by some harmony or similarity. Using a quantitative framework, Engineering, Physics, Mathematics, and Statistics cohort study makes note of statistical occurrence within a specialized subgroup, united by same or similar characteristics that are relevant to the research problem being investigated, rather than studying statistical occurrence within the general population. Using a qualitative framework, cohort studies generally gather data using methods of observation. Engineering, Physics, Mathematics, and Statistics cohorts can be either "open" or "closed."

Engineering, Physics, Mathematics, and Statistics open Cohort Studies involve a population that is defined just by the state of being a part of the study in question. The date of entry and exit from the study is individually defined, therefore, the size of the study population is not constant. In open cohort studies, researchers can only calculate rate-based data, such as incidence rates and variants thereof. Engineering, Physics, Mathematics, and Statistics closed cohort studies involve participants who enter into the study at one defining point in time and where it is presumed that no new participants can enter the cohort. Given this, the number of study participants remains constant.

Cross-sectional design (38) in Engineering, Physics, Mathematics, and Statistics

Cross-sectional Engineering, Physics, Mathematics, and Statistics research designs have three distinctive features: no time dimension, reliance on existing differences rather than change following intervention; and, groups are selected based on existing differences rather than random allocation. The cross-sectional Engineering, Physics, Mathematics, and Statistics design can only measure differences between or from among a variety of people, subjects, or phenomena rather than change. As such, researchers using this design can only employ a relatively passive approach to making causal inferences based on findings.

Exploratory design (39) in Engineering, Physics, Mathematics, and Statistics

An exploratory Engineering, Physics, Mathematics, and Statistics design are conducted about a research problem when there are few or no earlier studies to refer to. The focus is on gaining insights and familiarity for later investigation or undertaken when problems are in a preliminary stage of the investigation. The goals of exploratory research are intended to produce the following possible insights: Familiarity with basic details, settings, and concerns; a good picture of the situation being developed; Generation of new ideas and assumption, development of tentative theories or hypotheses; Determination about whether a study is feasible in the future; Issues get refined for more systematic investigation and formulation of new research questions and Direction for future research and techniques get developed.

Longitudinal design (40) in Engineering, Physics, Mathematics, and Statistics

A longitudinal Engineering, Physics, Mathematics, and Statistics design follows the same sample over time and makes repeated observations. With longitudinal surveys, the same group of people is interviewed at regular intervals, enabling researchers to track changes over time and to relate them to variables that might explain why the changes occur. Longitudinal Engineering, Physics, Mathematics, and Statistics research designs describe patterns of change and help establish the direction and magnitude of causal relationships. Measurements are taken on each variable over two or more distinct periods. This allows the researcher to measure the change in variables over time. It is a type of observational study also referred to as a panel study.

Observational design (41) in Engineering, Physics, Mathematics, and Statistics

This type of Engineering, Physics, Mathematics, and Statistics research design concludes by comparing subjects against a control group, in cases where the researcher has no control over the experiment. There are two general types of observational designs. In direct observations, people know that you are watching them. Unobtrusive measures involve any method for studying behavior where individuals do not know they are being observed. An observational study allows a useful insight into a phenomenon and avoids the ethical and practical difficulties of setting up a large and cumbersome research project.

Philosophical design (42) in Engineering, Physics, Mathematics, and Statistics

This Engineering, Physics, Mathematics, and Statistics design is understood more as a broad approach to examining a research problem than a methodological design, philosophical analysis and argumentation are intended to challenge deeply embedded, often intractable, assumptions underpinning an area of study. This approach uses the tools of argumentation derived from philosophical traditions, concepts, models, and theories to critically explore and challenge, for example, the relevance of logic and evidence in academic debates, to analyze arguments about fundamental issues, or to discuss the root of existing discourse about a research problem. These overarching tools of analysis can be framed in three ways: Ontology -- the study of the nature of reality; Epistemology -- the study that explores the nature of knowledge; Axiology -- the study of values; what is the difference between fact and a matter of value?

Sequential design (43) in Engineering, Physics, Mathematics, and Statistics

Sequential research in Engineering, Physics, Mathematics and Statistics is that which is carried out in a deliberate, staged approach where one stage will be completed, followed by another, then another, and so on, with the aim that each stage will build upon the previous one until enough data is gathered over an interval of time to test your hypothesis. The sample size is not predetermined. After each sample is analyzed, the researcher can accept the null hypothesis, accept the alternative hypothesis, or select another pool of subjects and conduct the study once again. This means the Engineering, Physics, Mathematics, and Statistics researcher can obtain a limitless number of subjects before finally deciding whether to accept the null or alternative hypothesis. Using a quantitative framework, a sequential study generally utilizes sampling techniques to gather data and applying statistical methods to analyze the data. Using a qualitative framework, sequential studies generally utilize samples of individuals or groups of individuals [cohorts] and use qualitative methods, such as interviews or observations, to gather information from each sample.

A pragmatic approach to research (mixed methods) (44) in Engineering, Physics, Mathematics, and Statistics

The pragmatic approach to Engineering, Physics, Mathematics, and Statistics science involves using the method which appears best suited to the research problem and not getting caught up in philosophical debates about which is the best approach. Pragmatic Engineering, Physics, Mathematics, and Statistics researchers, therefore, grant themselves the freedom to use any of the methods, techniques, and procedures typically associated with quantitative or qualitative research. They may also use different techniques at the same time or one after the other. Being able to mix different approaches has the advantages of enabling data, investigator, theory, or methodology triangulation respectively. In some studies, qualitative and quantitative methods are used simultaneously. In others, the first approach is used and then the next, with the second part of the study perhaps expanding on the results of the first.

Historical research design (6) in Engineering, Physics, Mathematics, and Statistics

The purpose of a historical Engineering, Physics, Mathematics, and Statistics cohort research design is to collect, verify, and synthesize evidence from the past to establish facts that defend or refute your hypothesis. It uses secondary sources and a variety of primary documentary evidence, such as logs, diaries, official records, reports, archives, and non-textual information [maps, pictures, audio, and visual recordings]. The limitation is that the sources must be both authentic and valid.

Conclusions

There are many research designs already widely published and being used by different researchers under different experimental conditions. It appears these designs evolve depending on the prevailing challenges that require investigation. Therefore, new challenges, need new questions and new questions need new approaches to get answers and every new approach needs a new design. These are the realities necessary to face new challenges in the next couple of decades.

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