Implementing Digital Tools in Higher Education - Opportunities, Challenges, and Ethical Issues

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Materials Multiscale Modeling and Si… MD Simulation

TITLE	CITED BY	YEAR
cemff: A force field database for cementitious materials including validations, applications and opportunities RK Mishra, AK Mohamed, D Geissbühler, H Manzano, T Jamil, ... Cement and Concrete Research 102, 68-89	189	2017
Insight into induced charges at metal surfaces and biointerfaces using a polarizable Lennard–Jones potential IL Geada, H Ramezani-Dakhel, T Jamil, M Sulpizi, H Heinz Nature communications 9 (1), 716	148	2018
Microstructure and mechanical properties of sustainable cementitious materials with ultra-high substitution level of calcined clay and limestone powder Y Ruan, T Jamil, C Hu, BP Gautam, J Yu Construction and Building Materials 314, 125416	54	2022
Mechanism of molecular interaction of acrylate-polyethylene glycol acrylate copolymers with calcium silicate hydrate surfaces T Jamil, A Javadi, H Heinz Green Chemistry 22 (5), 1577-1593	51	2020
Working mechanisms and design principles of comb-like polycarboxylate ether superplasticizers in cement hydration: quantitative insights for a series of well-defined copolymers A Javadi, T Jamil, E Abouzari-Lotf, MD Soucek, H Heinz ACS Sustainable Chemistry & Engineering 9 (25), 8354-8371	38	2021

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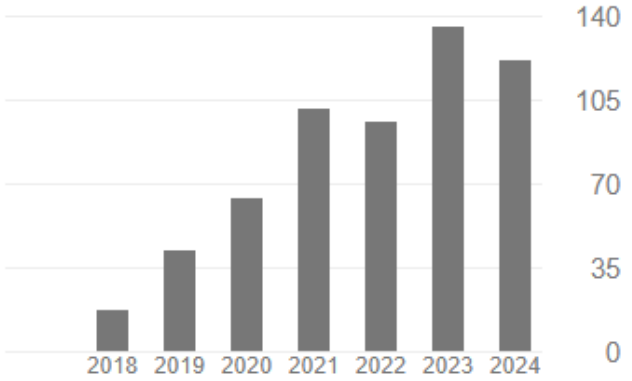

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0 articles	8 articles
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Based on funding mandates

Brief about the Speaker

Co-authors EDIT

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History of Modern Education

Education 1.0

- Teacher-centric
- Remembrance

- **Method:** Textbook and curricula
- Little room for personalized learning

- **Technology:** Blackboard and printed material

Education 2.0

- Student-centric
- Collaborative learning

- **Method:** group work,
- Critical thinking,
- Problem Solving skills

- **Technology:** Online resources (websites), interactive learning tools (software)

Education 3.0

- Individual learning
- Diverse learning needs

- **Method:** customized career path
- Multi-disciplinary
- Micro-credentials

- **Technology:** Simulations, tracking progress, data analysis

Education 4.0

- Skill of creativity
- Global citizenship
- Sustainability

- **Method:** project-based learning
- Inter-disciplinary

- **Technology:** AR, VR, MR, big data analytics, Generative AI etc.

Ref - perplexity.ai (prompt: describe the evolution of education 1.0 to education 4.0 with method and technologies used), Images: Copilot

Opportunities - Enhanced Learning Experience

Personalized Learning: Digital tools such as Learning Management Systems/Platforms (LMS) allow for tailored educational experiences, accommodating different learning styles and paces. These included for example:

- **Moodle**
- Blackboard
- Canvas
- Brightspace
- SAP Litmos
- Schoology
- **Google Classroom**

https://www.goodfirms.co/learning-management-system-software/blog/cost-feature-comparison-guide-top-learning-management-systems

https://moodle.com/functionality-with-moodle/moodle-and-virtual-classrooms/

Choosing the Right LMS Platform

Ease of use: Ensure it's user-friendly for both teachers and students.

Functionality: Look for interactive whiteboards, video conferencing, screen sharing, file sharing, and messaging features.

Customization: The platform should allow branding and integration with other tools to match specific needs.

Security: Prioritize robust security to protect data and prevent unauthorized access.

Scalability: Ensure the platform can easily add or remove users, courses, or features as needed.

Support: Seek reliable technical support for resolving any issues during virtual classroom sessions.

Cost-effectiveness: Look for a platform with transparent pricing that aligns with the organization's budget.

Integration: Verify the platform's compatibility with other teaching and learning tools, like learning management systems or student information systems.

Top Features of Learning Management System

- Course creation
- Virtual classroom
- Online exam and test evaluation
- Group collaboration
- Synchronous and Asynchronous communication
- Reports and data analytics
- Gamification
- Multilingual support
- Data tracking
- Parent engagement
- Text-to-speech
- Online annotation
- Mobile support
- Payment gateway
- Digital certificates and badges
- Third-party tool integration
- Customization
- Customer support
- Robust security and backup
- Cross-platform accessibility
- Compliance tracking

https://www.goodfirms.co/learning-management-system-software/blog/cost-feature-comparison-guide-top-learning-management-systems

Payment Gateways

These have become essential tools in higher education, significantly enhancing the efficiency of financial transactions and improving the overall payment experience for students and institutions.

- Streamlined Payment Processes
- Enhanced Accessibility and Flexibility
- Improved Cash Flow Management
- Enhanced Security
- Parent Portal Access
- Data-Driven Insights

Gelato. (n.d.). *Top 5 international payment gateways for global businesses*. Gelato. https://www.gelato.com/blog/international-payment-gateways

Ref: *Five ways payment optimization helps Higher Education Institutions compete.* https://www.checkout.com/blog/five-ways-payment-optimization-helps-higher-education-institutions-compete

Opportunities - Enhanced Learning Experience

Access to Resources: Online resources expand access to knowledge.

Students can tap into a vast pool of materials, including but not limited to

- Lectures
- Journals
- Simulations etc.

The Top List of Academic Research Databases

1. **PubMed**
2. JSTOR
3. **Scopus**
4. **Web of Science**
5. **Google Scholar**
6. IEEE Xplore
7. PsycINFO
8. ScienceDirect
9. SpringerLink
10. BioMed Central
11. PubMed Central
12. ERIC
13. **ProQuest**
14. EconLit
15. CINAHL
16. PsycARTICLES
17. EconBiz
18. IEEE Transactions
19. Agricola
20. Business Source Complete
21. Sociological Abstracts
22. **Directory of Open Access Journals (DOAJ)**

https://paperpile.com/g/academic-research-databases/#num-3-pubmed
https://otio.ai/blog/best-databases-for-research

Reference Management Tools

Reference management tools help you organize and manage references, such as journal articles, books, websites, and conference papers. Some popular options include:

- **EndNote:** A subscription-based software that's often used in universities
- **Zotero:** A free, open-source option
- **Mendeley:** A free option that requires a university login to create an account
- **RefWorks:** A subscription-based software

etc.

Dissertation and Thesis Repositories

ProQuest Dissertations & Theses Global

A database with over 5 million citations and 3 million full-text works from thousands of universities.

Open Access Theses and Dissertations OATD.org

A resource for finding open access graduate theses and dissertations from over 1100 colleges, universities, and research institutions.

Pakistan Research Repository (https://prr.hec.gov.pk/jspui/)

A repository for PhD theses from all public and private sector universities in Pakistan.

eCommons@AKU (https://ecommons.aku.edu/)

A repository for theses and dissertations from Aga Khan University.

Universities also have their own repositories for completed theses and dissertations, which are often available for free.

Data Analysis and Coding Resources

- **GitHub & GitLab**
  - Code repositories that allow students to share, collaborate on, and manage research code and data analysis scripts.

- **R, Python, and MATLAB resources**
  - Many tutorials, courses, and libraries are available online for statistical analysis, data visualization, and more.

- **Kaggle**
  - Provides data science and machine learning competitions with public datasets and notebooks to learn from.

Open Courseware and MOOCs

- **Coursera, edX, and MIT OpenCourseWare**
  - Offer free or low-cost courses from top universities on advanced topics relevant to PhD research, such as data analysis, machine learning, writing skills, and specific subject matter.

- **Stanford Online & Harvard Online**
  - High-quality courses, often free, covering specialized topics in various disciplines.

Writing and Citation Resources

- **Purdue OWL**
  - An online writing lab providing guidelines on academic writing, citations, and style guides (APA, MLA, Chicago).

- **Grammarly and Hemingway Editor**
  - Tools to improve grammar, readability, and style.

- **Turnitin**
  - A plagiarism detection service that some institutions offer free of charge to students.

Research Community Platforms

- **LinkedIn Groups, Reddit, researchgate**
  - Academic and research groups where PhD students discuss ideas, seek advice, and find support from a global community.

- **PhD on Track**:
  - Offers guidance for PhD students on conducting literature reviews, research design, and publishing.

- **Slack & Discord Academic Channels**
  - Often have specific groups for researchers and PhD students to collaborate, share resources, and discuss challenges.

Funding and Grant Resources

- **Grants.gov & Research Professional**: Databases for finding grants, scholarships, and funding opportunities.
- **EURAXESS**: For international students, especially in Europe, offering information on job opportunities, funding, and networking.

Survey and Data Collection Tools

- **Qualtrics, Google Forms, SurveyMonkey**: Survey tools to help gather and analyze research data.

- **Amazon Mechanical Turk & Prolific**: Platforms that allow researchers to gather responses for behavioral and social science studies.

Productivity and Project Management Tools

Trello, Asana, Notion: Help with organizing tasks, managing projects, and keeping track of research milestones.

Toggl & RescueTime: Time-tracking apps that can improve productivity by monitoring time spent on tasks.

Opportunities - Enhanced Learning Experience

Collaboration and Engagement: Tools like discussion forums, video conferencing, and collaborative platforms foster a more interactive and engaging learning environment.

How Cloud Technologies Boost Collaboration

1. **Access Anywhere, Anytime**: With cloud technologies, team members can access work-related data and applications from anywhere, anytime. This accessibility is especially beneficial for remote teams or organizations across different locations.
2. **Real-Time Collaboration**: Cloud-based collaboration tools allow multiple team members to work on a document or project simultaneously. These tools also offer features like chat, comments, and track changes, which improve communication and teamwork.
3. **Streamlined Workflows**: Cloud technologies streamline workflows by automating repetitive tasks and integrating various business applications. This efficiency allows teams to focus on core tasks, boosting productivity.
4. **Enhanced Communication**: Cloud-based communication tools such as video conferencing and instant messaging facilitate seamless communication among team members, improving collaboration and enhancing team dynamics.
5. **Secure Sharing**: Cloud technologies provide safe platforms for sharing files and data, maintaining the privacy and security of sensitive information.
6. **Scalability**: Cloud solutions are scalable, allowing teams to expand or reduce resources. This flexibility supports the team's growth or changes in project requirements.

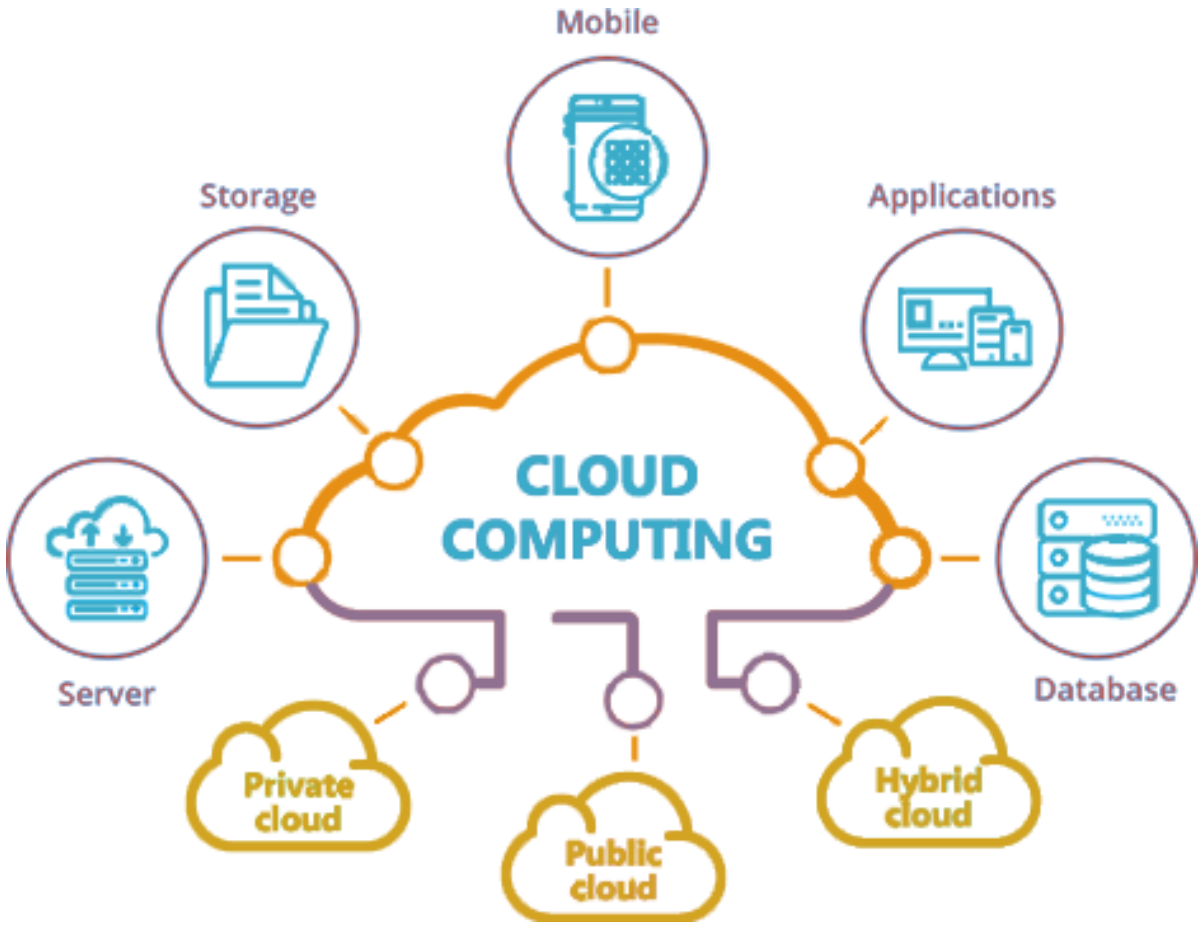
https://linkedin.com/pulse/enhancing-team-collaboration-through-cloud-detailed-analysis-doss/

Impact of Cloud Technologies on Productivity

1. **Automated Updates**: Cloud service providers handle software updates and maintenance, reducing downtime and ensuring teams can always access the latest features and security enhancements.
2. **Resource Optimization**: Cloud technologies optimize the use of resources, reducing the time and effort teams spend managing hardware or software issues.
3. **Better Decision-Making**: Cloud-based analytics tools provide insights that help teams make informed decisions quickly, improving outcomes and productivity.
4. **Reduced Costs**: Cloud solutions reduce the need for physical infrastructure and associated costs, allowing businesses to invest more in their teams and projects.
5. **Improved Work-Life Balance**: As cloud technologies facilitate remote working and flexible hours, they can contribute to a better work-life balance for team members, leading to higher job satisfaction and productivity.

https://linkedin.com/pulse/enhancing-team-collaboration-through-cloud-detailed-analysis-doss/

Cloud Computing



Generative AI

Generative AI belongs to the category of Narrow AI but is distinguished by its capability to generate content such as text, images, audio, and even code.

It uses machine learning models, especially deep learning and transformers, to create outputs based on patterns learned from training data.

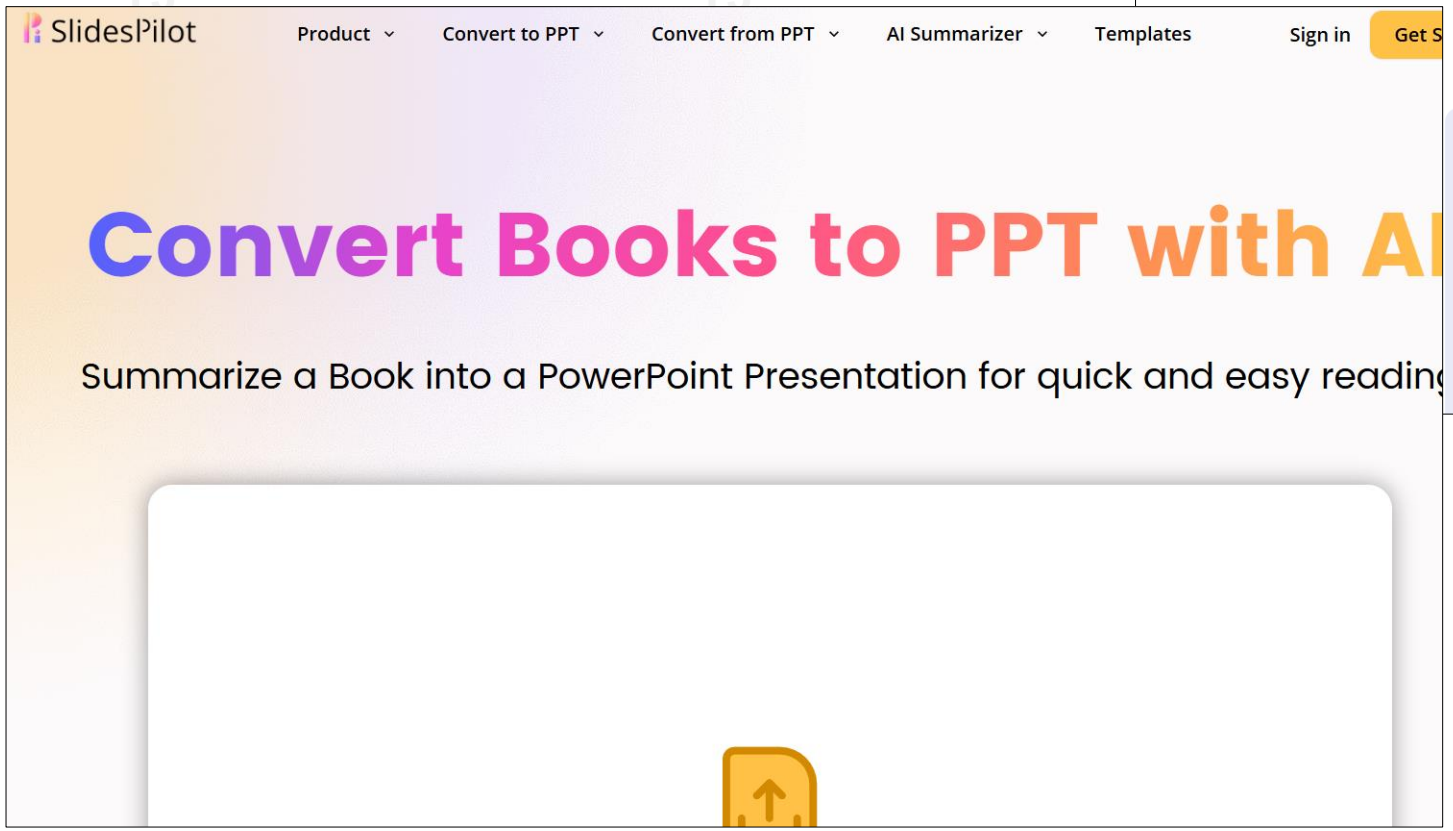
Key Examples of Gen AI:

- **Text:** ChatGPT, Bard
- **Images:** DALL-E, Midjourney
- **Code:** GitHub Copilot
- **Audio:** AI music generators, text-to-speech tools

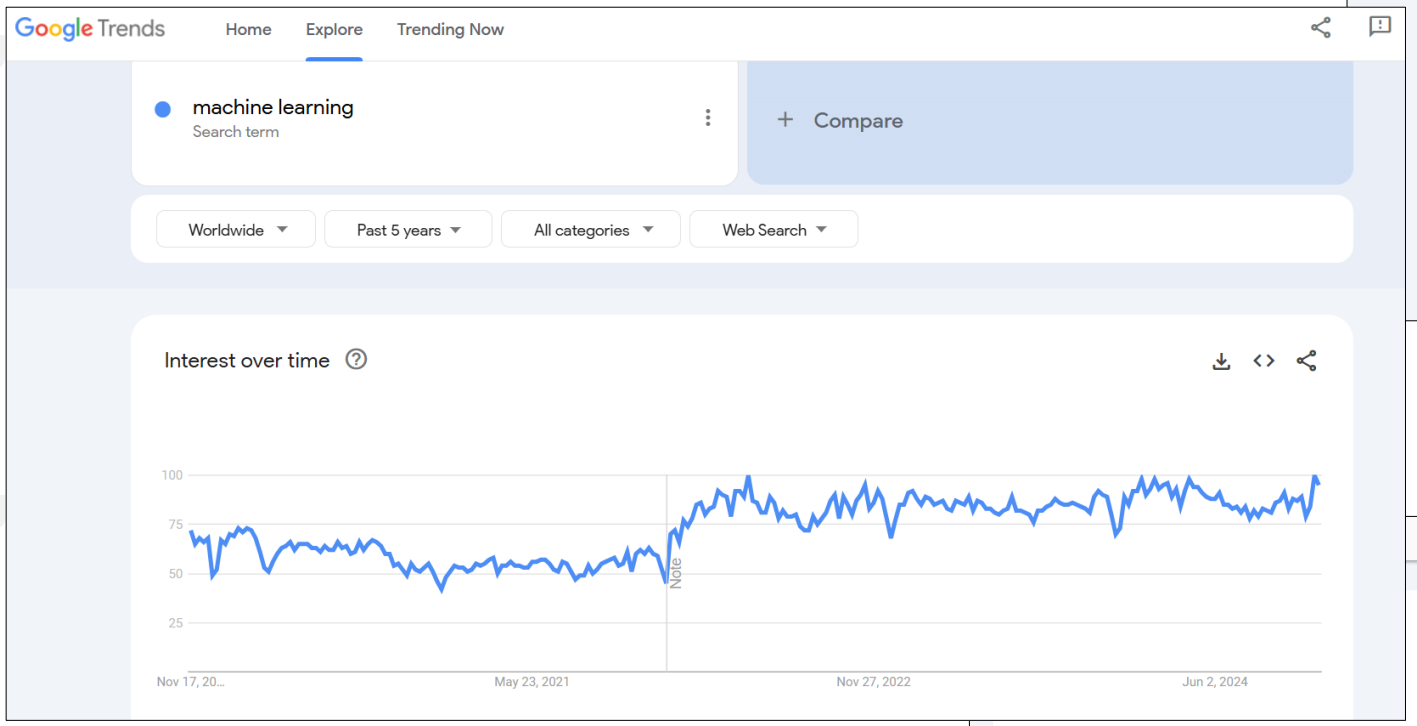
AI generated Image through Copilot

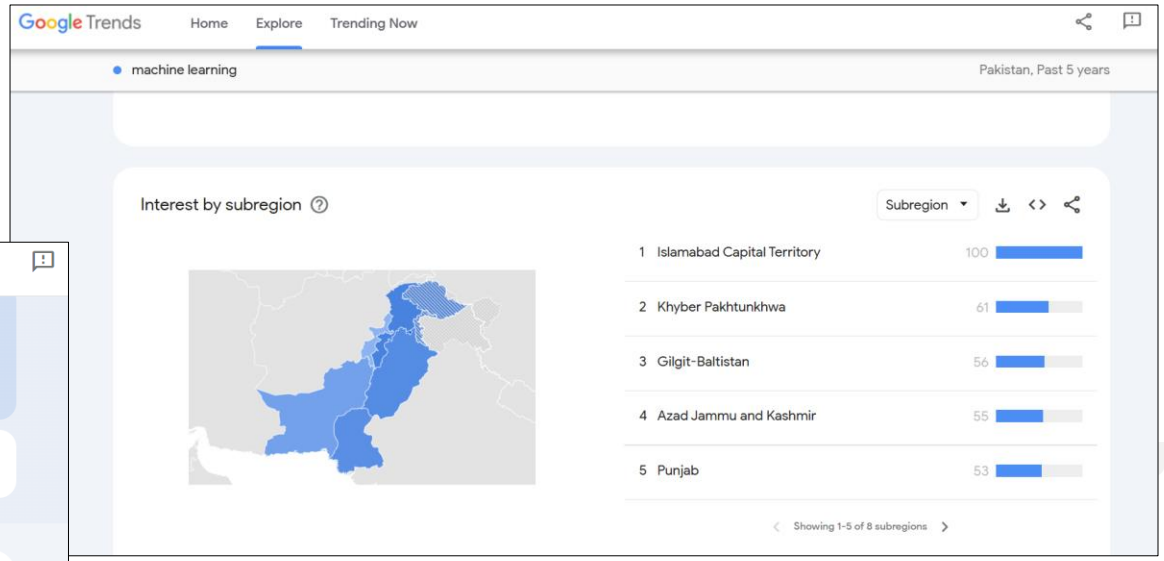
Klingler, N. (2024, October 11). The 3 types of artificial intelligence: ANI, AGI, and ASI. viso.ai. https://viso.ai/deep-learning/artificial-intelligence-types/

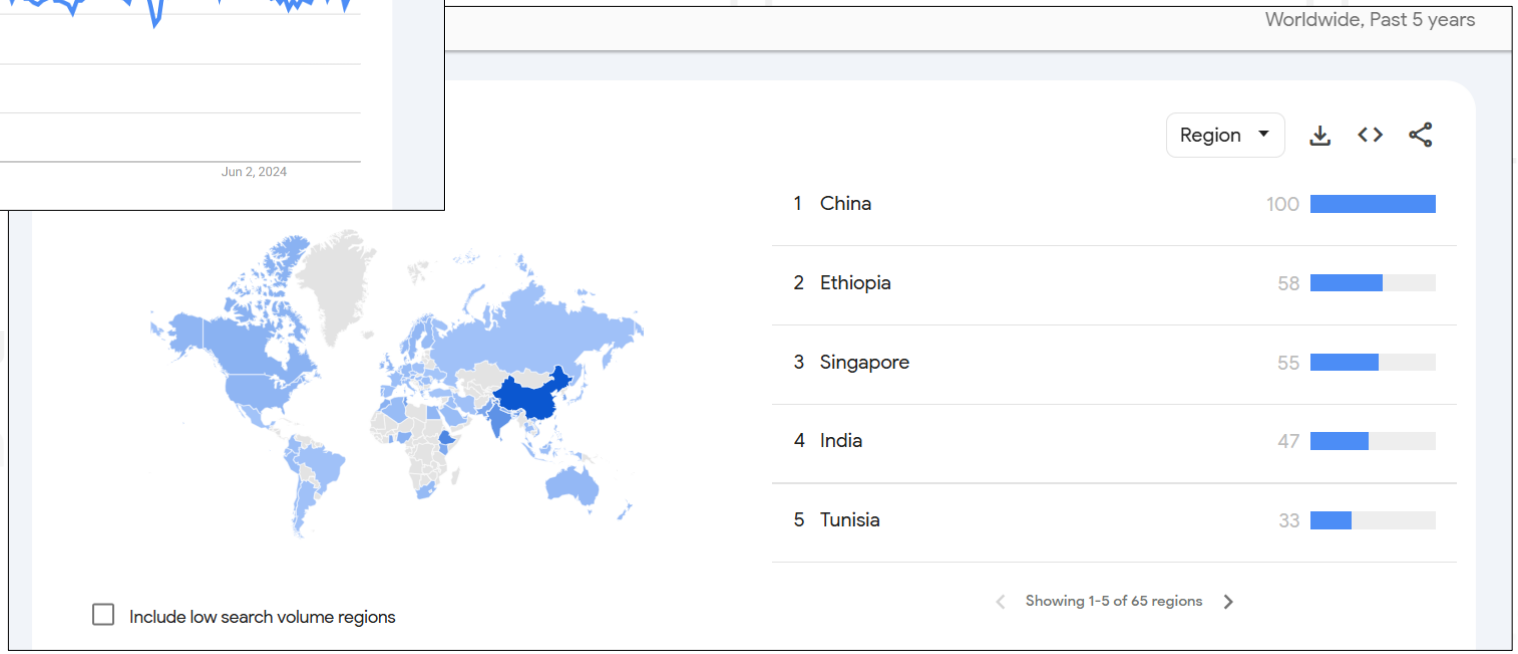
Generating PPTs



Online Trends







Top Trend Tracking Tools

- Exploding Topics – Best Overall
- **Google Trends – Best Lightweight Trend Analyzer**
- Semrush Trends – Best Competitive Marketing Trend Tracker
- Buzzsumo – Best Social Media Trend Tracker
- TrendWatchers – Best YouTube Trend Tracker
- Google News – Best News Trend Tracker
- Trends.Co – Best Trend Reports
- Podcast Notes – Best Podcast Trend Tracker
- SparkToro – Best Audience Trend Tracker
- Twitter Trending – Best Free Twitter Trend Tracker
- Pinterest Trends – Best Free Pinterest Trend Tracker

Opportunities - Flexibility and Accessibility

Remote Learning Options: Digital tools enable institutions to offer courses that can be accessed from anywhere, removing geographical barriers.

Time Management: Asynchronous learning allows students to manage their schedules more effectively, catering to those balancing work, family, and studies.

Opportunities - Data and Analytics

Performance Tracking: Institutions can use analytics to monitor student performance and identify at-risk students, allowing for timely interventions.

Curriculum Development: Data-driven insights help educators refine and enhance course offerings based on student engagement and outcomes.

Challenges

Resistance to Change

Cultural Barriers: Faculty and staff may resist adopting new technologies due to comfort with traditional methods or fear of inadequate training.

Institutional Inertia: Legacy systems and established processes can hinder the integration of new tools.

Challenges

Technical Issues

Infrastructure Limitations: Not all institutions have the tech infrastructure needed to support advanced digital tools, particularly in underfunded areas.

Cybersecurity Risks: Increased reliance on digital tools raises concerns about data breaches and the protection of sensitive student information.

Challenges

Training and Support

Skill Gaps: Both faculty and students may lack the necessary skills to utilize digital tools effectively, necessitating ongoing training and support.

Time Constraints: Educators often face time pressure, making it challenging to embrace new teaching methods or technologies.

Ethical Issues

Data Privacy and Security

Student Data Protection: The collection and storage of student data raise ethical questions regarding consent and confidentiality.

Surveillance Concerns: Monitoring tools used to track student engagement can lead to perceptions of surveillance, potentially harming trust and morale.

Equity and Accessibility

Digital Divide: There is a risk of widening the gap between students who have access to technology and those who do not, exacerbating issues of inequality in education.

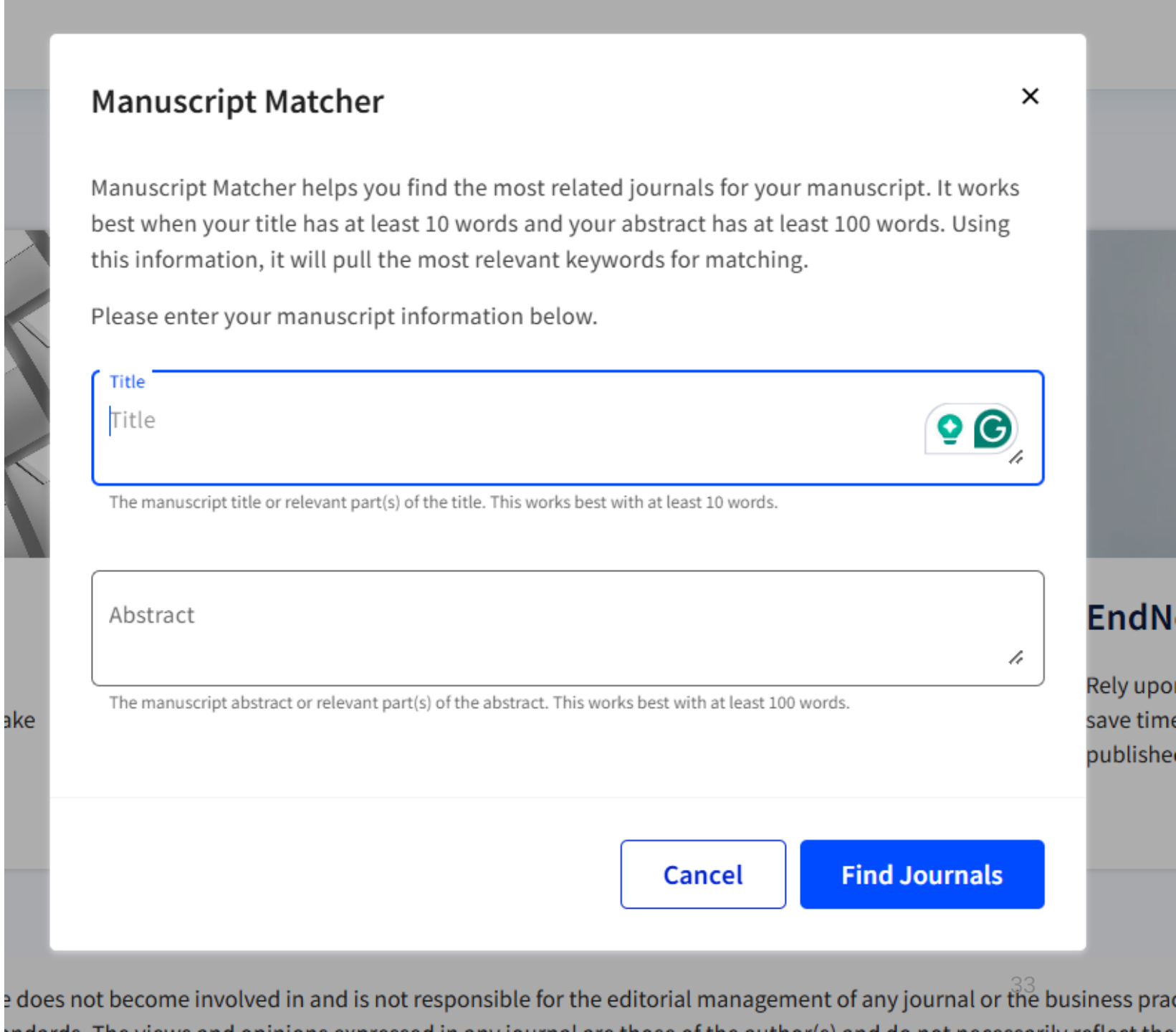
Inclusive Design: Digital tools must be designed to accommodate diverse learners, including those with disabilities.

Academic Integrity

The Rise of Plagiarism and Cheating: Online assessments have made it easier for students to engage in dishonest behaviors, raising concerns about academic integrity.

Ethically Using AI and Automation: With the increasing use of AI in education, questions arise about the ethical implications surrounding authorship, creativity, and the validity of student work.

Manuscript Matcher



Enhancing Team Collaboration through Cloud Technologies - Understanding Cloud Technologies

Cloud technologies provide a flexible, scalable, and secure infrastructure for businesses to manage and store data. They deliver computing services over the Internet, eliminating the need for local servers or personal devices for data storage and management. Cloud technologies can be transformative, offering businesses a wealth of benefits.

Generally, in Research

70% (Existing Research) + 30% (Value addition)

- Building a knowledge foundation and identifying research gap is really important.
- Understanding the work of others is essential for developing a well-informed, original, and impactful PhD research project. Do not make random attempts and/or duplicating existing studies.
- Understanding others work is super essential. It will help in writing scholarly dialogue and critique.
- One question that is often overlooked is: why haven't others pursued the research work that I/my PhD student are considering?

Ethical Integrity

- Ethical integrity in research is fundamental to ensuring that the knowledge produced is trustworthy, transparent, and beneficial to society.

- This includes practices such as honesty in reporting/manipulating data, ensuring the safety and well-being of human and animal subjects, avoiding plagiarism, Inadequately discussed hazards or dual-use concerns and managing conflicts of interest, potential for the reported work to be misused in such a way as poses a threat to public health or safety

Scientific Misconduct

Scientific misconduct in publishing includes but is not limited to:

- **Fraud:** data fabrication or falsification/manipulation of data in such a way as to misrepresents the findings, including omitting information that would affect the interpretation or conclusions.
- **Duplicate submission:** submission of the same research findings (complete or in part) for consideration at different journals simultaneously. Also, duplicate publication: publication of the same research findings in different journals without proper referencing and permission.
- **Inadequate citation:** submission of closely related papers without appropriate cross-referencing; failure to give due credit to prior work; deliberately neglecting to cite/discuss related work (including one's own) to increase the apparent novelty of the results.

Scientific Misconduct

- **Plagiarism:** presenting material, including results, ideas, and text, from someone else′s work as one′s own. Also, self-plagiarism: copying significant content from one′s own previous publications. Some reuse of text from the authors′ own (cited) work may be appropriate in an introduction or experimental section, but there should not be substantial overlap in the main discussion.
- **Authorship misconduct:** Omission from the author list of someone who made a substantial intellectual contribution or inclusion of someone who did not; listing of anyone as an author without their consent and approval of the submitted draft.

Ethical Guidelines for the Publication

- The publication of scientific research in peer-reviewed journals is essential for scientific progress since it enables the dissemination of research results (which represent an investment of time and money) for others in the research community to build on.
- Scientific publications also act as a record of merit and precedence, which can have important implications for the career development of researchers as they compete for recognition and funding.
- Scientific integrity is thus of utmost importance: scientific misconduct harms researchers and society In the context of academic publishing, editors, authors, and reviewers have a responsibility to maintain high ethical standards by following good scientific practice.

https://chemistry-europe.onlinelibrary.wiley.com/hub/ethical-guidelines12

Responsibilities of Authors

- The precise criteria for authorship may vary by field, but authors should at minimum be individuals who have made a substantial intellectual contribution to the work, which should include contributions to the conception, design, analysis, and/or manuscript preparation.

- All authors are accountable for the content of the manuscript.

- An administrative role (e.g., providing laboratory space or funding) or language polishing/proofreading do not in themselves confer authorship, and guest/gift authorship is not appropriate.

Responsibilities of Authors

- To ensure that all information provided in a submitted manuscript is true and accurately represented. This includes author and affiliation information, discussed research and data, and cited reference sources.
- To gather and interpret data in an honest way. Data and image manipulation, as well as any other misrepresentation of the results, is unacceptable.
- To provide sufficient data and methodological details that the work can be critically evaluated, **reproduced**, and extended by other researchers. Authors are encouraged to provide access to unique materials and applied software, with an appropriate material transfer agreement (MTA) to protect their own interests, to other researchers on request.
- To make primary datasets available according to community data-sharing best practice, for example, through deposition in publicly available databases or community repositories such as the Cambridge Crystallographic Data Centre (CCDC) or the Protein Data Bank (PDB) archive.

Responsibilities of Authors

- To give due acknowledgement to all contributors and obtain their consent for publication:
- Only those who have contributed significantly to the research should be listed as authors.
- Contributions that fall short of the criteria for authorship may be listed in the Acknowledgements section. Authors should ensure that individuals agree to be acknowledged.
- The corresponding author is responsible for ensuring that all those who contributed substantially are named as co-authors and that they have seen and approved the manuscript before submission. All authors must also have the opportunity to approve the final version (after revision and/or proofing) prior to final publication.

Responsibilities of Authors

- Deceased or incapacitated persons who qualify for co-authorship, as attested by the corresponding author. Deceased persons can be indicated with a † symbol and a footnote with the (approximate) date of death. Generally, the corresponding author signs a copyright license on behalf of all of the authors.
- Any change to the author list (addition, deletion, or rearrangement of the order of authors) or any change of the designated corresponding authors, after the first submission to a journal, must be declared and explained in writing to the editor and approved by all authors (see our Authorship Change Form).

Responsibilities of Authors

- To place their results in context and give due recognition to published work through appropriate referencing and citation. If any result/statement is not cited, it would be considered as the original work from authors, if it is not than it must be properly cited.
- Authors must not present the work of others as their own (plagiarism).
- Citations should be based solely on relevance to the presented work. Superfluous citation of only loosely connected work, especially from the authors′ own group, should be avoided.
- Common selective criteria that introduce bias can include, but are not limited to, individual researchers, corresponding author gender, specific countries/regions or publication sources.
- Relevant work from all sources should be acknowledged, including preprints, patents, books, websites, and personal communication.

Responsibilities of Authors

- Do not submit your work to more than one journal at a time. Research results under consideration or revision at one journal may only be submitted to another journal after the manuscript is rejected or withdrawn.
- A submitted manuscript should not share hypotheses, data, discussion points, or conclusions with other published or submitted papers to a substantial degree. Full disclosure and cross-referencing are essential if there is any overlap.
- Versions of the same work previously submitted to the journal and rejected (with or without review). If the submission is a revised or extended version of a previously submitted manuscript, the changes must be explained, and a response must be provided to any reviewer comments.

Responsibilities of Authors

- Authors should avoid **undue fragmentation** of their work, that is, unnecessarily splitting a body of work into several shorter papers.
- Previous publication on a community preprint server such as ChemRxiv, bioRxiv, and arXiv, or as part of a thesis prepared toward completion of a graduate degree does not preclude subsequent publication in a journal, but full disclosure must be made at the time of submission. Check the preprint guidelines of the respective journal.
- Re-publication of a paper in another language may be acceptable, provided that there is full and prominent disclosure of its original source at the time of submission.
- To declare all sources of funding for the reported work (including the funding from the NED Univeristy for the PhD work)

Responsibilities of Authors

- **Declare any potential conflicts of interest**, including any financial stake in the outcome of the research, e.g., financial rewards, patent or stock ownership, upon submission. Authors should also take perceived conflicts of interest into account when submitting their manuscript and preparing a conflict-of-interest statement.
- To clearly identify any unusual (potential) health or environmental hazards associated with the work or materials reported and discuss appropriate precautions if applicable.

Responsibilities of Authors

- To carry out any research involving animals in compliance with the ARRIVE guidelines and any applicable national regulations.
- A statement must be included in the manuscript confirming that the experiments were approved by the relevant local or national authority, including the name of the local or national authority and the approval or accreditation number of the laboratory, project, or investigator. If the authority does not provide such accreditation numbers, this must be mentioned in this statement.
- For research that is exempt from full ethical approval, the authority that granted the exemption, and the application or exemption reference number, if applicable, must be supplied and cited in the manuscript.

Responsibilities of Authors

- To carry out any research involving human subjects (including experiments with wearable technology and sensors) or biospecimens in accordance with the principles in the WMA Declaration of Helsinki – Ethical Principles for Medical Research Involving Human Subjects. Human biospecimens are defined as tissue samples from human subjects or derivatives of tissues, including, but not limited to, blood, urine, saliva, sweat, hair, and cell lines from human subjects.
- A statement must be included in the manuscript confirming that the experiments were approved by the relevant local or national authority, including the name of the local or national authority and the approval or accreditation number of the laboratory, project, or investigator, and that informed consent was obtained from study participants or their next of kin. If the authority does not provide such accreditation numbers, this must be mentioned in this statement.

Responsibilities of Authors

- Please note that consent to participate in research is separate from consent to publish. It is necessary to obtain consent to publish, and state that this has been given in the manuscript, if there is any possibility that information shared may identify an individual person.
- When reporting phase II and III clinical trials, tumor marker studies, or studies with human biospecimens, authors should refer to the CONSORT statement, REMARK recommendations, or BRISQ guidelines, respectively.

Responsibilities of Authors

- To avoid suggesting reviewers who are likely to be positively biased due to a personal or professional relationship with the author, for example, recent or frequent collaborators and former students or supervisors. The e-mail addresses provided for author-suggested reviewers should only be those of active institutional e-mail accounts.
- To ensure that all communication, including discussion in the manuscript, response to reviewer comments, and correspondence with the Editorial Office, remains professional. Critical discussion of other people′s work may be appropriate but personal criticism, insults, or defamatory statements are not acceptable. Offensive or discriminatory comments (against individuals or groups) will not be tolerated.

Ethical Considerations - Conducting Survey-based Research

When conducting survey-based research, ethical considerations are crucial to protect participants' rights and ensure the validity of the study.

- Informed Consent
- Confidentiality
- Minimizing harm
- Respect for persons
- Transparency and honesty
- Debriefing
- Ethical Approval
- Compensation
- Data Management

Ethical considerations - Conducting Online Survey-based Research

- As with any other research, you should provide respondents with a description of the study and include as a minimum, the possible risks to the respondent, a privacy statement, and an indication of what type of questions are going to be asked and if any are particularly sensitive. If your research is on a particularly sensitive issue, you should include an appropriate helpline number for participants.
- Respondents may be unfamiliar with the computer-based methods you will use in your study, so you should explain in clear detail the procedures that will be used to track their responses and preserve their confidentiality.
- Some respondents may be concerned that their answers on an online survey could be traced back to them via their e-mail address, their IP address, or other information that you could attempt to capture. You should reassure respondents that you will not attempt to capture information that they do not voluntarily provide.