Lincoln Global Postdoctoral and Research Associate Programme:
A Survival Guide by
LGPR Steering Committee

Embarking on a research journey can often feel overwhelming, particularly for those who have not received formal training in conducting research. This **Survival Guide** is designed to bridge that gap, offering practical, actionable advice tailored for research associates of the LGPR. Far from being a tedious reiteration of PhD lessons, this guide provides a structured framework to help you navigate your research effectively and confidently. At LGPR, the path to successful research is punctuated by four key conferences, each serving as a milestone in your academic and professional growth. This guide outlines the expectations for each stage to ensure clarity and preparation:

1. **First Conference**: Begin by laying a strong foundation. This involves conducting a comprehensive literature review, identifying knowledge gaps, and formulating clear, testable hypotheses. These steps are critical in defining the scope and purpose of your research.
2. **Second Conference**: Shift your focus to methodology. Here, you will present the research methods and experimental designs that underpin your study. This stage is about demonstrating rigour and the ability to translate your hypotheses into measurable outcomes.
3. **Third Conference**: As feedback plays a pivotal role in refining research, this stage involves repeating select experiments as recommended by reviewers and the steering committee. It is an opportunity to validate your findings and ensure their reliability.
4. **Fourth Conference**: Culminate your efforts in a comprehensive final research report. This report will integrate the progress and insights gained through the previous conferences, providing a cohesive narrative of your research journey.

This guide is a resource for navigating each of these stages with confidence and clarity. It is crafted to support you in meeting the high standards expected at LGPR, ensuring your work contributes meaningfully to your field. Remember, this journey is not just about completing tasks but about growing as a researcher, thinker, and contributor to knowledge.

LGPR Steering Committee

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Steps to Formulating a Research Question

1. ## Select a Broad and Engaging Topic

Start by identifying a general subject area that genuinely piques your interest. Researchers often excel when exploring topics they are passionate about. For instance, a broad subject could be :

Field of Research	*Examples of Problem statements*
Humanities & Related Fields	• Slavery in the Southern United States • The Psychological Impact of Time Loss on Learning Efficiency
Management & Related Fields	• Determinants of Satisfaction and Brand Loyalty in Smartphone Systems: A Perspective on Perceived Benefits. • Post-Pandemic Patterns of Stock Ownership, Market Fluctuations, and Their Impact on Consumption
Engineering	• A maximum efficiency point-tracking control scheme for wireless power transfer systems using magnetic resonant coupling. • Enhancing Impedance Bandwidth of a Planar Antenna Using a Metamaterial-Inspired T-Matching Network. • Evaluation of the Performance of Fibre-Reinforced Geopolymer Composites through Experimental and Simulation Analysis
Sciences	• Room Temperature Exfoliation of defect-free graphene. • Chitosan-Based Nanodrug Delivery System for Lung Cancer Therapy. • Impact of Graphene Doping on Shape Stabilisation, Thermal Energy Storage, and Thermal Conductivity of PolyHIPE/PEG Composites

2. ## Conduct Initial Exploration

Perform preliminary searches in journals and periodicals to understand what has already been studied within your chosen topic. This will help refine your focus and highlight existing debates or gaps in the field. Reflect on any questions or ideas that arise while reviewing these sources.

Humanities, Management & Related fields

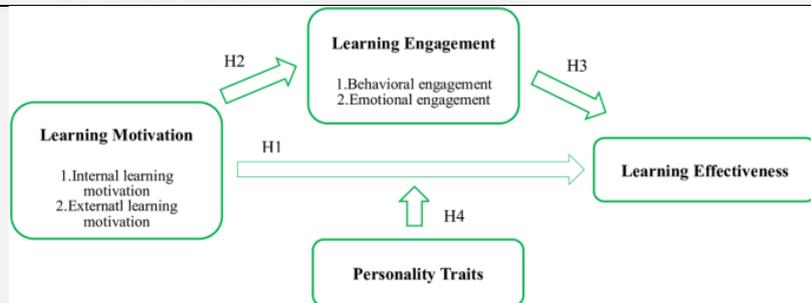| **Example**: The Psychological Impact of Time Loss on Learning Efficiency	**Methods, Framework, Hypothesis and Findings**
Lei, H., Chen, C. & Luo, L. **The examination of the relationship between learning motivation and learning effectiveness: a mediation model of learning engagement**. Humanit Soc Sci Commun 11, 137 (2024). https://doi.org/10.1057/s41599-024-02666-6	• Defined Hypothesis around independent and dependent variables such as Learning Motivation and Learning Effectiveness. • Analyzed by using Pearson product-moment correlation method. • Effects among independent variables, mediation variables, and dependent variables was analyzed by multiple regression methods such as stepwise regression and hierarchical regression.

Research framework

The model comprises four components: the independent variable, **learning motivation** (divided into internal and external motivation); the dependent variable, **learning effectiveness**; the mediating variable, **learning engagement** (comprising behavioural and emotional engagement); and the moderating variable, **personality traits**, which influences the relationship between learning motivation and learning effectiveness.

Hypothesis 1 (H1): Learning motivation in terms of (a) (Hypothesis 1.1, H1.1) internal learning motivation, and (b) (Hypothesis 1.2, H1.2) external learning motivation has a significant positive impact on learning effectiveness.

Hypothesis 2 (H2): Learning motivation in terms of (a) (Hypothesis 2.1, H2.1) internal learning motivation, and (b) (Hypothesis 2.2, H2.2) external learning motivation has a significant positive impact on learning engagement.

Hypothesis 3 (H3): Learning engagement in terms of (a) behavioral engagement (Hypothesis 3.1, H3.1), and (b) emotional engagement (Hypothesis 3.2, H3.2) has a significant positive impact on learning effectiveness.

Hypothesis 4 (H4): Personality traits have a significant positive moderation effect on the relationship between learning motivation in terms of (a) (Hypothesis 4.1, H4.1) internal learning motivation, and (b) (Hypothesis 4.2, H4.2) external learning motivation and learning effectiveness.

Hypothesis 5 (H5): Learning engagement has a significant positive mediation effect on the relationship between learning motivation and learning effectiveness.

Engineering & Sciences

Example: A maximum efficiency point-tracking control scheme for wireless power transfer systems using magnetic resonant coupling	**Methods, Findings and contributions**
Nie, Z., Chen, K., Song, Y., & Pan, J. (2024). Fast Maximum Efficiency Point Determination for Multiple Transmitters Wireless Power Transfer Systems With Unknown Receivers. IEEE Transactions on Power Electronics. https://doi.org/10.1109/TPEL.2024.3510742	1. **Identifiable Rx-Side Load Resistance**: A model is developed to determine the Rx load resistance in multi-Tx WPT systems under varying charging conditions. Primary-side data is used to monitor resistance changes effectively. 2. **Fast, Communication-Free MEPD Method**: The proposed Maximum Efficiency Point Detection (MEPD) method identifies the optimal efficiency point at any position around the Tx without needing a communication unit or solving complex equations. 3. **Load-Independent Constant Power Output**: The system ensures stable constant power output by real-time determination of Rx load resistance.

Proposed System Modelling

The series-series (SS) compensated WPT system with two transmitters (Txs) operates as follows:

1. **Inverter and Switching Control**: A full-bridge inverter converts DC voltage (U_{dc}) into an AC square wave voltage (v_p)The Tx DC voltage switches (S_{on}) and MOSFETs ($S_{i1}-S_{i4}$) are managed by a digital signal processor (DSP).
2. **Rectification and Filtering**: The full-bridge rectifier converts AC input into DC output. Diodes (D_1-D_4) and a filter capacitor (C_{fC}) smooth the DC output.
3. **Resonant Circuit**: Series-connected compensation capacitors (C_p and C_s) and inductors (L_p and L_s) form the resonant circuits. Resistances (R_p and R_s) account for copper and equivalent series resistance (ESR). Mutual inductance between Tx and Rx is denoted as M_i.
4. **Simplifications**: The rectifier and load resistance (R_L) are represented by an equivalent resistance (R_{eq}), and mutual inductance between primary coils is neglected for simplicity.
5. **Performance Monitoring and Optimization**: Tx winding switches monitor coil currents and voltages under various states. These measurements are used to estimate ratio parameters and calculate the optimal voltage input for maximum efficiency control.
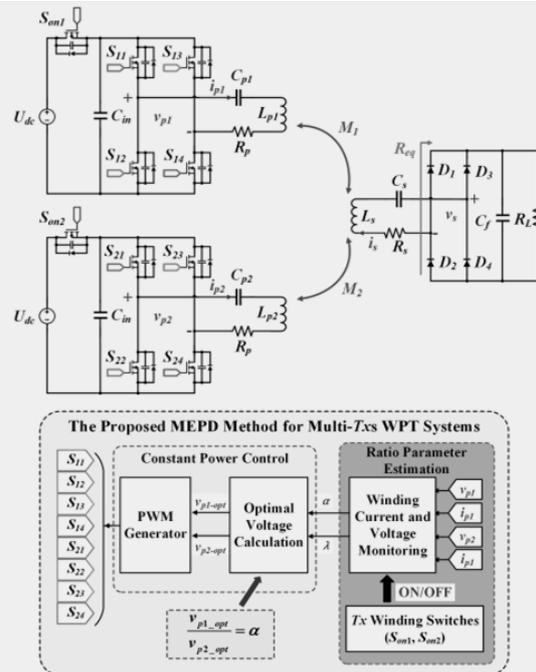

Fig. 1. Circuitry diagram of SS-compensated WPT system with two *Txs*.

3. **Consider Your Target Audience**

Tailor your topic and research question to your intended audience. For academic writing, your audience is typically scholarly, so consider whether your question would captivate their interest and align with their expectations.

4. **Pose Open-Ended Questions**
Develop "how" and "why" questions about your topic. These questions should prompt deeper investigation. For example, "How did slave narratives contribute to the abolition movement?" or "Why did 1930s films reflect societal challenges of the Great Depression?"

5. **Assess Your Question**
Review and refine your questions to ensure they are suitable for research. Consider these aspects:

o **Clarity**: Is your question/Problem statement/objective well-defined and straightforward? Precision helps focus your investigation.

o **Focus**: Is the question specific enough to explore comprehensively within the available scope?

o **Complexity**: Does the question require in-depth research and analysis rather than a simple factual answer? Effective research questions often begin with "how" or "why."

6. **Start the Research Process**
With a well-formulated question, determine the best sources and methods for gathering information. Plan to consult diverse materials and consider multiple perspectives to ensure a thorough exploration of the topic.

Inclusion/Exclusion criteria

This component is relevant only to the fields of Humanities, Management, Education, Psychology, Pharmacy, Medical Study or any field that has to do with Human factors.

Initial Exploration of research topic-

Humanities, Management & Related fields

Example: Advancing multimodal teaching: a bibliometric and content analysis of trends, influences, and future directions	**Inclusion Criteria**
Guo, X., Chen, S. & Guo, Y. **Advancing multimodal teaching: a bibliometric and content analysis of trends, influences, and future directions**. Humanit Soc Sci Commun 11, 1718 (2024). https://doi.org/10.1057/s41599-024-04254-0	The inclusion criteria for the study were: • Literature sourced exclusively from WoSCC. • Publications from 1 January 1995 to 6 December 2023, yielding 6704 articles. • English-language publications only, excluding 416 non-English articles. • Document types limited to "Article" and "Review," excluding 1062 non-qualifying documents like conference papers and editorials. • Focus on topics explicitly related to multimodal teaching, pedagogy, education, or instruction. These criteria reduced the initial 6704 records to 5226 articles.
	Exclusion Criteria
Guo, X., Chen, S. & Guo, Y. **Advancing multimodal teaching: a bibliometric and content analysis of trends, influences, and future directions**. Humanit Soc Sci Commun 11, 1718 (2024). https://doi.org/10.1057/s41599-024-04254-0	The exclusion criteria were as follows: (1) Publications that mention "multimodal" or "teaching" but do not significantly address multimodal teaching practices or pedagogy. (2) Non-academic or non-peer-reviewed documents, such as conference proceedings, editorials, commentaries, or book chapters. (3) Papers focusing on general teaching methodologies but are unrelated to the topic of multimodal teaching.
	Manual Screening
Guo, X., Chen, S. & Guo, Y. **Advancing multimodal teaching: a bibliometric and content analysis of trends, influences, and future directions**. Humanit Soc Sci Commun 11, 1718 (2024). https://doi.org/10.1057/s41599-024-04254-0	The manual screening process involved three researchers independently reviewing publications based on the inclusion and exclusion criteria. Titles and abstracts were initially screened, with full-text reviews conducted for uncertain cases. Inter-rater reliability was assessed using Cohen's kappa coefficient, achieving a strong agreement of 0.86. Discrepancies were resolved through discussion and consensus, or by majority vote if disagreement persisted. Adhering to systematic review principles, including PRISMA guidelines, the process was carefully documented to ensure transparency and replicability. This approach resulted in the selection of 689 high-quality articles for detailed analysis, maintaining consistency and objectivity throughout.

Databases for conducting search

1. Multidisciplinary Databases

- **Web of Science (WoS):** Comprehensive coverage of multiple disciplines with citation indexing.
- **Scopus:** Offers extensive citation and abstract data for peer-reviewed literature and quality web sources.
- **PubMed:** Focuses on life sciences, biomedical topics, and related fields.
- **Google Scholar:** Broad access to scholarly articles, theses, books, and patents across various fields.
- **ProQuest:** Includes databases for dissertations, scholarly articles, and newspapers.

2. Discipline-Specific Databases

- **Medicine and Life Sciences:**
    - **Embase:** Biomedical and pharmacological research, including drug studies.
    - **Cochrane Library:** Systematic reviews and clinical trials for evidence-based medicine.
    - **ClinicalTrials.gov:** Registry of clinical trials worldwide.
    - **MEDLINE:** Covers medical literature, available through PubMed.
- **Science, Technology, Engineering, and Mathematics (STEM):**
    - **IEEE Xplore:** Engineering, computer science, and technology research.
    - **SpringerLink:** Scientific research in natural and applied sciences.
    - **ScienceDirect:** Full-text access to science, technology, and health research.
    - **arXiv:** Open-access repository for physics, computer science, and mathematics preprints.
- **Social Sciences and Humanities:**
    - **PsycINFO:** Psychology and behavioural sciences.
    - **JSTOR:** Broad access to humanities, social sciences, and historical research.
    - **Sociological Abstracts:** Sociology and related social science fields.
    - **Project MUSE:** Humanities and social sciences, including arts and history.
- **Business and Economics:**
    - **EconLit:** Economics literature, including journal articles and working papers.
    - **Business Source Complete:** Business and management studies.
- **Law and Legal Studies:**
    - **HeinOnline:** Legal history, government documents, and law-related periodicals.
    - **Westlaw:** Comprehensive legal research platform.

3. Regional and Subject-Specific Repositories

- **ERIC (Education):** Educational research, including articles, reports, and conference papers.
- **AGRIS (Agriculture):** Global agricultural science and technology data.
- **CINAHL (Nursing):** Nursing and allied health literature.

4. Open Access Databases

- **DOAJ (Directory of Open Access Journals):** High-quality, peer-reviewed open-access journals.
- **PubMed Central (PMC):** Free access to full-text biomedical and life sciences articles.
- **CORE:** Open-access repository for research outputs.

5. Data Repositories

- **Figshare:** Repository for sharing datasets and research outputs.
- **Dryad:** Data repository for scientific publications.
- **ICPSR:** Social science research data.
- **Dimensions.AI**

6. Conducting Effective Searches

Researchers can enhance their search process by:

1. **Using Boolean Operators:** Combine keywords with AND, OR, and NOT to refine search results.
2. **Applying Filters:** Filter results by year, document type, language, and more.
3. **Keyword Selection:** Use subject-specific keywords and synonyms.
4. **Citation Chaining:** Explore cited references and citing articles.
5. **Alerts and Saved Searches:** Receive updates on new publications matching search criteria.

Selecting the right database and employing advanced search techniques ensures efficient and comprehensive access to relevant literature.

Review and Analyse Results

This step involves thoroughly examining the data collected during a study or literature review. Key aspects include:

Organising Data: Categorise and summarise the findings to highlight patterns, trends, or relationships.

1. For empirical studies, this might involve statistical analysis, charts, or tables.
2. For literature reviews, it involves clustering similar themes or concepts.

Interpreting Results: Understand what the data means in the context of the research objectives. This includes:

1. Identifying key findings and their significance.
2. Comparing results with previous studies to see alignment or divergence.

Drawing Conclusions: Based on the results, determine the implications for the field, whether they support or challenge existing theories, and how they answer the research question.

Synthesise: Strengths and Limitations

This stage assesses the research's overall quality and relevance, highlighting its contributions and constraints:

Strengths

- Discuss the study's robustness, such as a large sample size, novel methodologies, or new insights.
- Highlight any aspects that strengthen the validity, reliability, or applicability of the findings.

Limitations

- Identify factors that may have impacted the results, such as small sample sizes, biases, or methodological constraints.
- Mention areas where the data was inconclusive or where further research is needed.

Integration

- Synthesize the strengths and limitations to provide a balanced evaluation of the research.
- Discuss how the strengths outweigh the limitations or how the limitations can inform future studies.

Research Gaps

Components of Research Gaps refer to the specific aspects where existing knowledge, data, or methodologies are insufficient, incomplete, or inconsistent. Identifying these components helps in framing meaningful research questions and guiding future studies. Below are the primary components:

Example: Humanities & Management	
Example Publication	Knowledge Gap Mentioned in the Publication
Xie, Z., Li, Y., Yuan, S. et al. Why expert leaders matter: a study on the mechanism of team value creation in knowledge-intensive teams. Humanit Soc Sci Commun 11, 1707 (2024). https://doi.org/10.1057/s41599-024-04267-9	The **knowledge gap** in this research includes the following: 1. **Mechanisms of Value Creation**: Although expert leaders are known to enhance team performance, there is limited understanding of how they achieve results that exceed the sum of individual contributions (e.g., 1 + 1 > 2). The process by which these synergies are created remains unclear. 2. **Key Components of Leadership**: There is insufficient research on how specific aspects of expert leadership, such as role modeling, professional authority, and guidance, contribute to team success and value creation. 3. **Research Approaches**: Existing studies predominantly use qualitative methods, with limited use of theoretical models or empirical data to analyse the effectiveness of expert-led teams. 4. **Dynamic Changes in Team Efforts and Skills**: Most research assumes that team members' abilities remain static, failing to account for how expert leaders influence team members' evolving efforts and skills over time. This study addresses these gaps by applying an **evolutionary game model** to explore how expert leaders influence team value creation and testing these insights through simulations.
Wang, C., Zhu, S. & Dai, Y. Exploring the impact of self-regulation on vocabulary learning strategies and knowledge in CSL: A structural equation modeling approach. Humanit Soc Sci Commun 12, 3 (2025). https://doi.org/10.1057/s41599-024-04322-5	The **knowledge gap** identified in this document includes the following: 1. **Limited Exploration of Self-Regulation (SR) in CSL Contexts**: Although self-regulation is known to influence vocabulary learning strategies (VLSs) and vocabulary knowledge (VK), its role as a mediator in the context of Chinese as a Second Language (CSL) learning remains underexplored. Prior research has not fully examined how SR interacts with VLSs to impact vocabulary breadth and depth. 2. **Impact of Academic Factors on SR and VK**: The effect of academic efforts, such as time management and achievement, on the relationship between SR, VLSs, and VK has not been thoroughly studied in CSL settings. While some research has focused on these variables independently, their combined impact on vocabulary learning remains unclear. 3. **Focus on Breadth over Depth**: The findings indicate that SR significantly affects vocabulary breadth but has minimal impact on vocabulary depth. This suggests a lack of understanding of how SR can influence the deeper aspects of vocabulary learning, such as meaning and usage. 4. **Methodological Gaps**: Existing studies primarily utilise qualitative methods or simple analytical techniques. The document highlights the need for quantitative methods, such

as Structural Equation Modelling (SEM), to provide a more robust analysis of the relationships between SR, VLSs, and VK.

5. **Generalisation Across Learning Contexts**: Most prior research has focused on English as a Second Language (ESL) or Foreign Language (EFL) learners, with limited application to CSL learners, particularly in the Vietnamese educational context. The unique challenges and dynamics of CSL learning require further investigation.

These gaps underscore the need for further research to clarify the interplay between SR, VLSs, and VK, with particular attention to the influence of academic factors and the application of quantitative models for better generalisation and understanding.

Example:
Engineering & Sciences

Example Publication	Knowledge Gap Mentioned in the Publication

Z. Nie, K. Chen, Y. Song and J. Pan, "Fast Maximum Efficiency Point Determination for Multiple Transmitters Wireless Power Transfer Systems With Unknown Receivers," in IEEE Transactions on Power Electronics. https://doi.org/10.1109/TPEL.2024.3510742

TABLE I
COMPARISION WITH PRIOR WORKS

Reference	Method	Operating Frequency	coupling coefficient	Maximum efficiency	Response time	Wireless communication link	Parameters needed for MEPD
[23]	P&O	85 kHz	0.19	above 85%	33 ms	yes	mutual inductance
[9]	Mutual inductance estimation	85 kHz	0.162-0.189	90%	200 ms	yes	secondary current and voltage
[12]		100 kHz	0.168	85%	300 ms	yes	
[26]		305 kHz	0.137	76%	170 ms	yes	
[19]		100 kHz	0.11	75%-79%	30-520 ms	no	primary current
This paper		85 kHz	0.063-0.215	above 80.05%	12 ms	no	primary current

S. K. Oruganti, A. Khosla and T. G. Thundat, "Wireless Power-Data Transmission for Industrial Internet of Things: Simulations and Experiments," in IEEE Access, vol. 8, pp. 187965-187974, 2020. https://doi.org/10.1109/ACCESS.2020.3030658

TABLE 1. Background.

Reference	Method	Frequency	Application	Limitation	Alignment sensitive
[9]	Ultrasonic Lamb-waves	10-30 KHz	Sensors across Pipelines	Low power 0.47 W; low Frequency Low distance $0.204m$	Partial/ unknown
[10]	Acoustic	440KHz	Through perfect enclosures	Costly transducer	Yes
[12]	SEPAP	$1MHz$	Through metal	Costly	Yes
[13]	Ultrasonic	$4MHz$	Through metal	one metal wall at a time	Yes
[14]	Piezoelectric	$1\,MHz$	Through metal	Maximum 6.35 W	Yes
[15]	EMAT	$1\,MHz$	Through metal	4% efficiency	Yes
[16]	Capacitive/Inductive coupling	$479KHz$	Metal barrier	14% efficiency	Yes
[17]	Inductive	$100Hz$	through metal walls	Low bit rate	Yes
[18]	3 coil	$1MHz$	Power through slot coil	Low power, Coil embedding	Yes
This study	Zenneck Type non radiative Interface Wave	13-36MHz UHF,VHF,SHF	Power and Communication for Industry	Operates in proximity to metal	No

Methods and Experiments

Experiments and methods in research vary significantly across disciplines such as Humanities, Management, Sciences, and Engineering, reflecting the distinct objectives, epistemologies, and practices of each field.

Humanities

- **Nature of Research**: Focuses on understanding human culture, behaviour, and historical contexts through qualitative methods.
- **Methods**:
  - **Textual Analysis**: Close reading and interpretation of texts, such as literature, historical documents, and cultural artefacts.
  - **Ethnography**: Immersive fieldwork to study human practices and beliefs.
  - **Comparative Studies**: Cross-cultural or cross-temporal analyses of artistic, literary, or social phenomena.
  - **Archival Research**: Examination of historical records and primary sources.
  - **Critical Theory Application**: Employing frameworks like feminism, postcolonialism, or psychoanalysis to interpret texts or phenomena.
- **Experiments**:
  - Rarely conducted in the traditional sense.
  - Experimental methods may involve virtual simulations (e.g., historical reconstructions) or creative processes in digital humanities.

Variation: Experiments in the Humanities are less structured and focus on subjective interpretation rather than empirical measurement.

Management

- **Nature of Research**: Seeks to understand and improve organisational behaviour, decision-making, and market dynamics.
- **Methods**:
  - **Quantitative Studies**: Surveys, experiments, and data analysis to measure performance metrics, employee satisfaction, or consumer behaviour.
  - **Qualitative Studies**: Case studies, interviews, and focus groups to explore organisational culture or leadership styles.
  - **Mixed Methods**: Combining quantitative and qualitative approaches to capture nuanced insights.
  - **Simulation and Modelling**: Agent-based simulations to understand market trends or organisational workflows.
- **Experiments**:
  - **Field Experiments**: Testing strategies like incentive programs or training methods in a real organisational setting.
  - **Lab Experiments**: Controlled settings to study behaviour, such as decision-making under risk.
  - **Behavioural Economics Experiments**: Exploring how psychological factors influence economic decisions.

Variation: Management experiments often balance between controlled environments and real-world applications, focusing on both measurable outcomes and human behaviour.

Sciences

- **Nature of Research**: Investigates natural phenomena using systematic observation, experimentation, and hypothesis testing.
- **Methods**:
  - o **Experimental Studies**: Controlled experiments in laboratories to test hypotheses.
  - o **Observational Studies**: Collecting data from natural settings without intervention.
  - o **Fieldwork**: On-site data collection, such as in environmental studies or wildlife research.
  - o **Theoretical Modelling**: Using mathematical frameworks to predict and explain phenomena.
  - o **Meta-Analysis**: Systematic review of existing studies to draw broader conclusions.
- **Experiments**:
  - o **Controlled Experiments**: Manipulating one or more variables while keeping others constant to determine causal relationships.
  - o **Longitudinal Studies**: Observing subjects over extended periods to assess changes or trends.
  - o **Simulation Studies**: Using computational models to replicate complex systems, such as climate models or biochemical processes.

Variation: Experiments in Sciences are highly structured, focusing on reproducibility and empirical validation.

Engineering

- **Nature of Research**: Applies scientific principles to design, innovate, and solve practical problems.
- **Methods**:
  - o **Prototype Development**: Creating and testing models of new designs or technologies.
  - o **Simulation and Computational Modelling**: Using software tools to analyse systems, such as fluid dynamics or structural integrity.
  - o **Experimental Validation**: Testing materials, components, or systems under controlled conditions.
  - o **System Optimisation**: Analysing and improving efficiency, reliability, or performance.
  - o **Failure Analysis**: Investigating why and how systems fail to improve future designs.
- **Experiments**:

- o **Bench-Scale Experiments**: Small-scale tests to validate concepts before scaling up.
- o **Stress Testing**: Evaluating the performance of systems under extreme conditions.
- o **Integration Testing**: Ensuring that different system components work together.
- o **Pilot Studies**: Deploying solutions in a limited setting to assess feasibility and performance.

Variation: Engineering experiments are goal-oriented, focusing on practical implementation, optimisation, and real-world applicability.

Key Differences Across Disciplines

1. **Objective**:
   - o Humanities focus on interpretation and understanding.
   - o Management balances human behaviour with measurable outcomes.
   - o Sciences aim to uncover universal principles.
   - o Engineering prioritises problem-solving and innovation.
2. **Nature of Data**:
   - o Humanities: Qualitative and interpretive.
   - o Management: Mixed (qualitative and quantitative).
   - o Sciences: Quantitative and empirical.
   - o Engineering: Quantitative, practical, and often application-specific.
3. **Experimental Control**:
   - o Humanities: Minimal control, subjective exploration.
   - o Management: Medium control, balancing theory with practice.
   - o Sciences: High control, seeking reproducibility.
   - o Engineering: Medium to high control, focused on scalability and functionality.
4. **Outcome**:
   - o Humanities: New interpretations or theoretical frameworks.
   - o Management: Improved organisational practices or policies.
   - o Sciences: Validated theories or empirical evidence.
   - o Engineering: Functional prototypes, systems, or optimised designs.

Initial Exploration of research topic-

Humanities, Management & Related fields

Example: The Psychological Impact of Time Loss on Learning Efficiency	Experiments & Data collection
Lei, H., Chen, C. & Luo, L. **The examination of the relationship between learning motivation and learning effectiveness: a mediation model of learning engagement**. Humanit Soc Sci Commun 11, 137 (2024). https://doi.org/10.1057/s41599-024-02666-6	The questionnaire design comprised five sections: 1. **Personal Information**: Included questions on gender, grade, major, and place of origin (4 questions). 2. **Learning Motivation Scale**: Measured internal and external learning motivation (10 questions). 3. **Learning Engagement Scale**: Assessed behavioural and emotional engagement (8 questions).

4. **Personality Traits**: Utilised a short form with 10 items.
5. **Learning Effectiveness Scale**: Consisted of 9 questions.

The questionnaire employed a five-point Likert scale and was distributed online via the **Questionnaire Star platform**, targeting undergraduate students from various colleges and universities. Of the 280 questionnaires collected, 251 were valid, achieving an effective response rate of 89.6%. The data were analysed using **SPSS21** and **AMOS24**.

Results

Table 1 Reliability analysis of measurement scale.

Dimension	Cronbach's Alpha value	Question items
Internal learning motivation	0.835	5
External learning motivation	0.791	5
Behavioral engagement	0.766	3
Emotional engagement	0.824	5
Personality traits	0.944	10
Learning effectiveness	0.932	9

Table 2 KMO and Bartlett tests for learning motivation scales.

The Kaiser-Meyer-Olkin metric of sample adequacy		0.841
Bartlett's sphericity test	Approximate Chi-Square	1006.72
	df	45
	Sig.	0.000

Table 3 Extraction of the principal components of the Learning Motivation Scale.

Factor	Initial eigenvalue			Extracted square loadings			Rotated square loadings	
	Total	Variance %	Accumulate %	Total	Variance %	Accumulate %	Total	Variance %
1	4.443	44.431	44.431	44.431	44.431	44.431	3.107	31.074
2	1.383	13.829	58.259	13.829	13.829	58.259	2.719	27.186
3	0.969	9.690	67.950					
4	0.748	7.484	75.434					
5	0.611	6.105	81.539					
6	0.472	4.724	86.264					
7	0.424	4.238	90.502					
8	0.373	3.733	94.235					
9	0.323	3.228	97.463					
10	0.254	2.537	100.000					

Table 4 Learning motivation rotation component matrix.

Question items	Factor	
	1	2
ILM[a]1	0.744	
ILM2	0.705	
ILM3	0.734	
ILM4	0.715	
ILM5	0.844	
ELM[a]1		0.717
ELM2		0.790
ELM3		0.665
ELM4		0.602
ELM5		0.738

Note: ILM, Internal learning motivation; ELM, External learning motivation.

Initial Exploration of research topic-

Engineering & Sciences

Example: **Experiments & Results**

S. K. Oruganti, A. Khosla and T. G. Thundat, "Wireless Power-Data Transmission for Industrial Internet of Things: Simulations and Experiments," in IEEE Access, vol. 8, pp. 187965-187974, 2020.
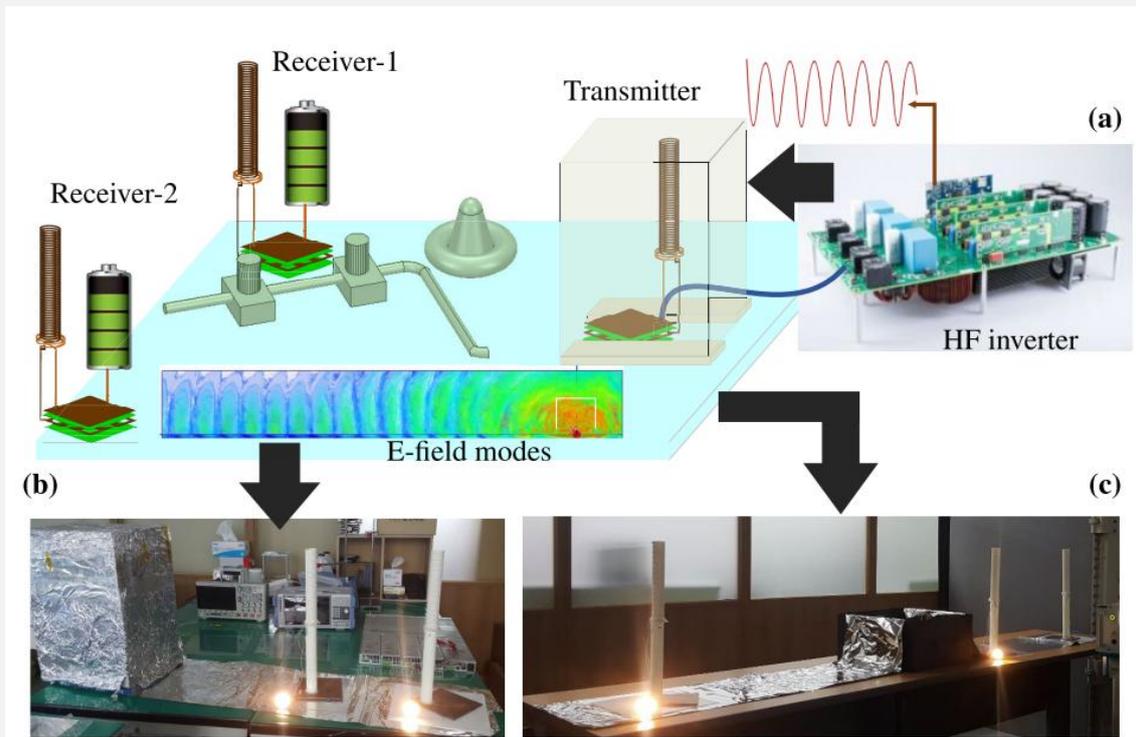https://doi.org/10.1109/ACCESS.2020.3030658

FIGURE 2. Zenneck Wave transmission system, (a) excited localized field modes on the metal surfaces (b) Across Partial Faraday shields, outperforms coupling based WPT systems (c) Power transfer across metal obstacles.
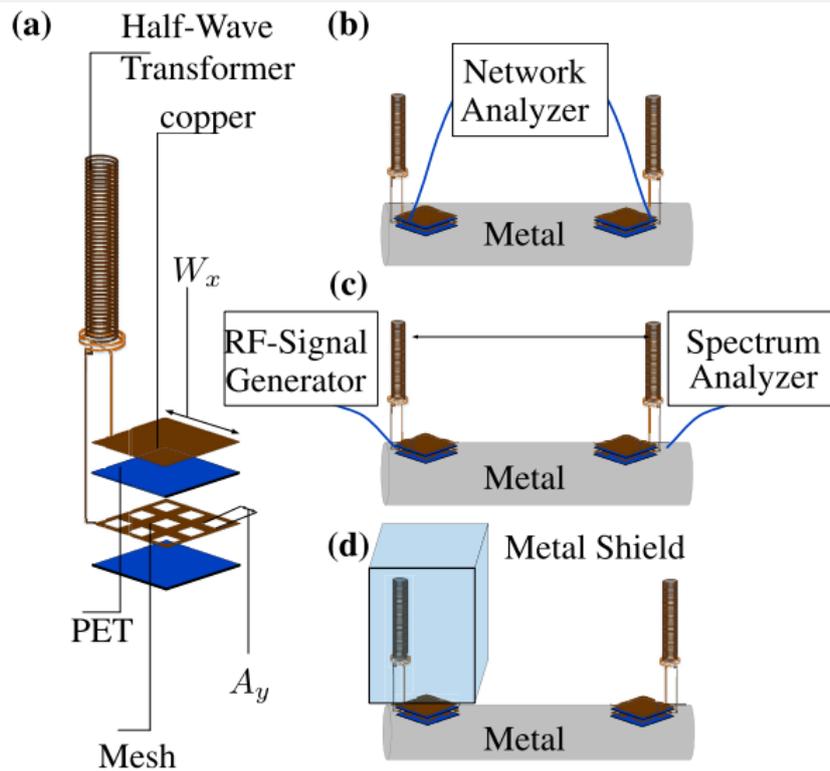
FIGURE 4. System and Experimental Setup (a) Exploded view of the transceiver, $W_x = 150$ mm, $A_x = 30$mm. (b)S-parameter measurement (c)Received Power and E-field measurement (d) Shielded conditions measurement.
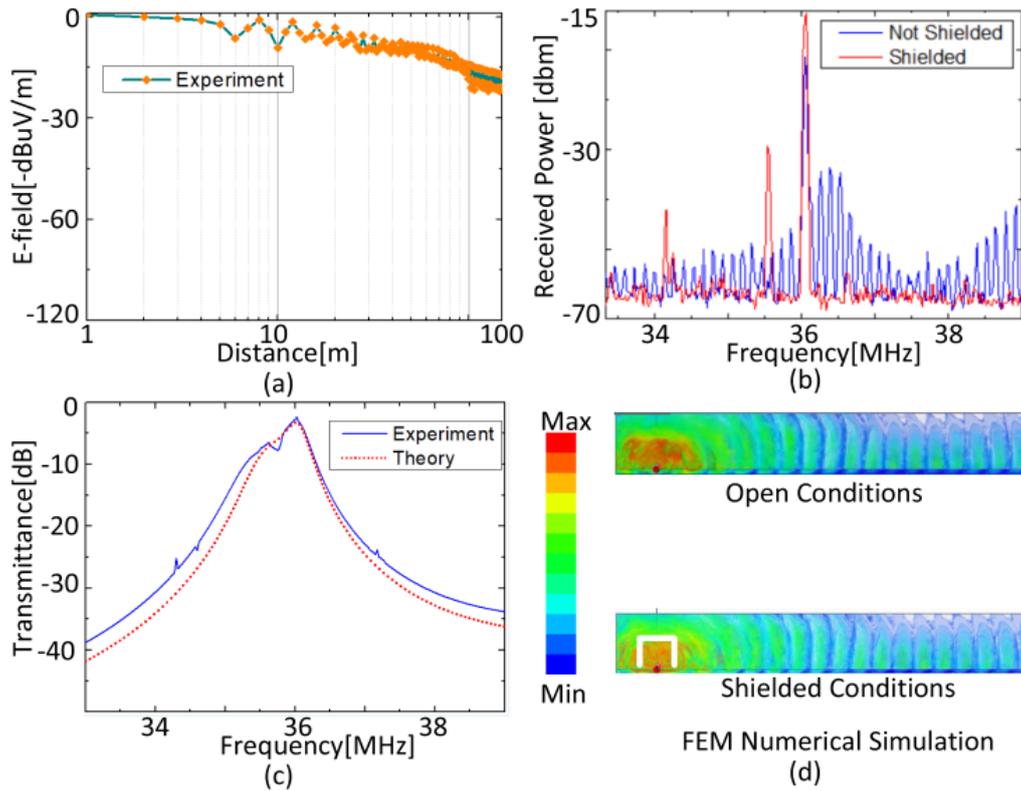
FIGURE 6. Experimental and simulation results (a)E-field attenuation along the $70m$ pipeline (b)Received power under open and shielded conditions on a 14.83 m long container(c) S-21 parameter(d) FEM E-field simulation under open and shielded conditions.
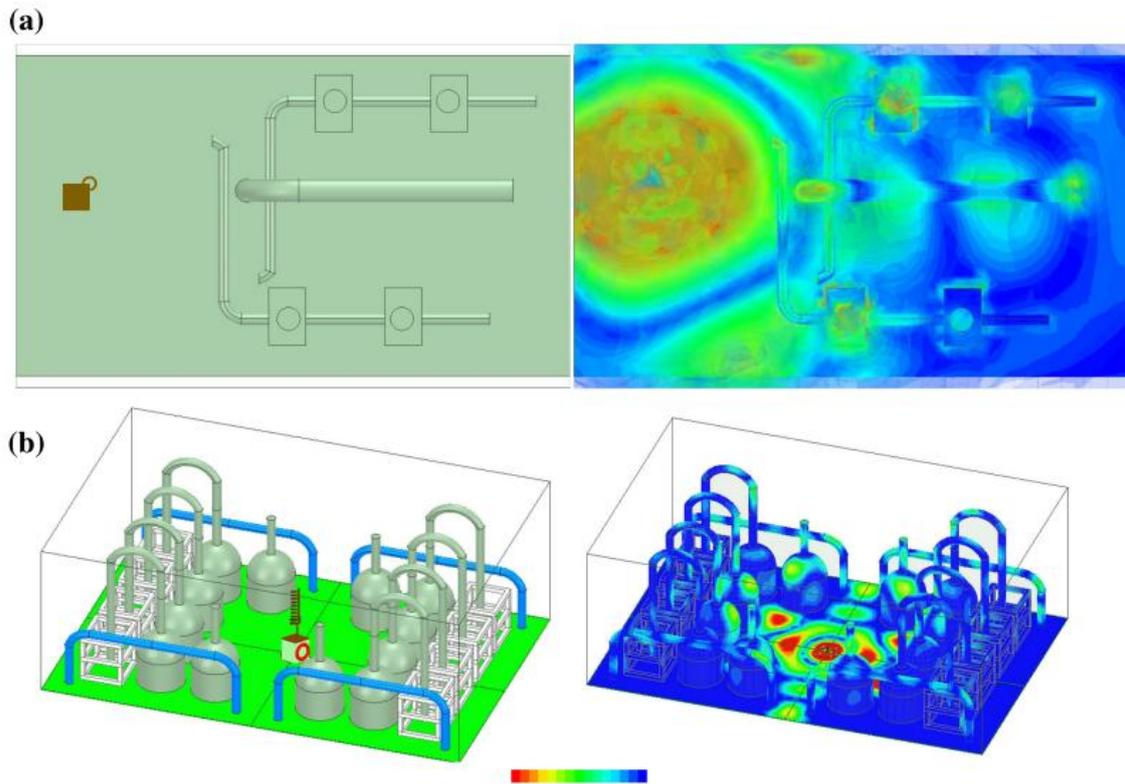
FIGURE 7. Finite Element Method simulation of the proposed ZW system (a) Pipelines with sharp obstacles (b) LNG carrier ship storage tank system.
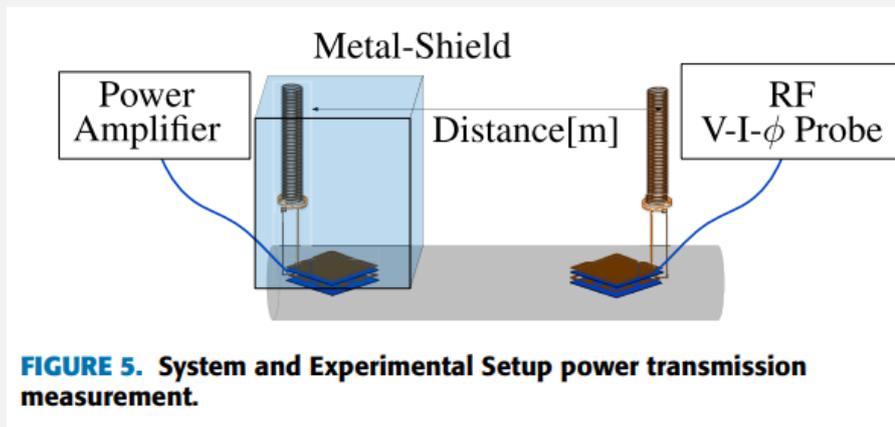

FIGURE 5. System and Experimental Setup power transmission measurement.
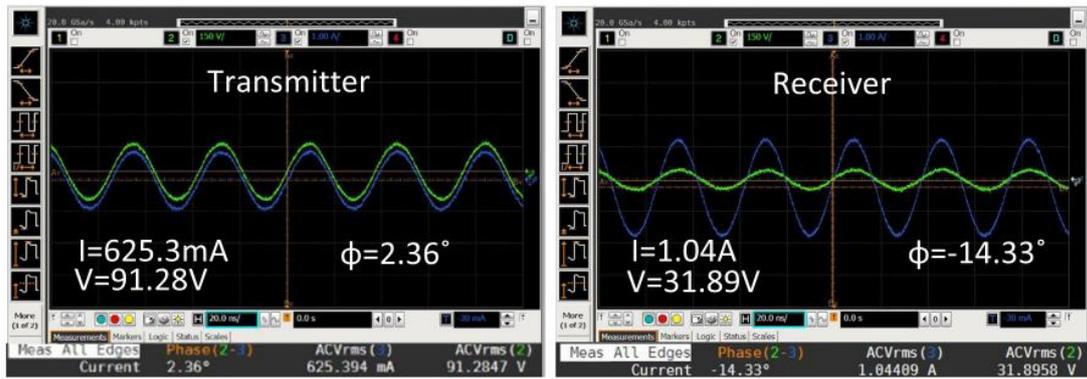
FIGURE 9. Measured current, voltage and phase using a HF V-I probe for a 27 MHz Resonator system.

Conclusions

Humanities

- **Focus**: Interpretation, analysis, and implications of findings within cultural, historical, or social contexts.
- **Key Elements**:
    - **Restate the Thesis**: Summarise how the research addressed the central question or argument.
    - **Key Insights**: Highlight the critical interpretations or perspectives developed during the study.
    - **Broader Implications**: Discuss the relevance of findings to broader cultural, societal, or historical issues.
    - **Limitations and Future Research**: Acknowledge gaps and suggest areas for further inquiry.
    - **Closing Reflection**: Provide a reflective or thought-provoking statement to leave a lasting impression.

Example: A study on Shakespeare's works might conclude by emphasising how his portrayal of ambition resonates with modern political dynamics, while suggesting further exploration of similar themes in contemporary literature.

Management

- **Focus**: Practical applications, theoretical contributions, and recommendations for organisations or industries.
- **Key Elements**:
  - **Summarise Findings**: Recap the main outcomes and how they address the research objectives.
  - **Practical Implications**: Highlight actionable insights for organisations, policymakers, or practitioners.
  - **Theoretical Contributions**: Outline how the findings contribute to existing management theories or frameworks.
  - **Limitations**: Mention constraints, such as sample size or regional focus, and their impact on generalisability.
  - **Future Directions**: Suggest practical and theoretical avenues for further research or testing.

Example: A study on employee motivation might conclude by recommending specific incentive programs while discussing how future research could explore their long-term impact across diverse industries.

Engineering

- **Focus**: Solutions, optimisation, and real-world applications of designs or systems.
- **Key Elements**:
  - **Recap Achievements**: Summarise the objectives met, such as improved efficiency, cost reduction, or innovative designs.
  - **Validation of Findings**: Highlight results from experiments, prototypes, or simulations that support the research.
  - **Practical Applications**: Emphasise how the findings can be implemented in real-world engineering problems.
  - **Limitations and Improvements**: Address challenges faced during the study, such as scalability or resource constraints, and suggest ways to refine the design or approach.
  - **Future Work**: Propose enhancements or alternative methods for further optimisation or application.

Example: A study on a new bridge design might conclude by showing how the design reduces costs and improves safety, while suggesting additional testing under extreme weather conditions.

Sciences

- **Focus**: Validation of hypotheses, contribution to scientific knowledge, and implications for the field.
- **Key Elements**:
  - **Restate Key Findings**: Highlight how the research supports, refutes, or modifies existing theories.
  - **Scientific Contribution**: Discuss how the study advances understanding in the field or resolves existing gaps.
  - **Practical or Theoretical Implications**: Explain the broader significance of the findings, such as applications in healthcare, technology, or the environment.
  - **Limitations**: Address issues like sample size, methodological constraints, or experimental errors.
  - **Future Research**: Suggest experiments, models, or observations that could build on the current study.

Example: A study on climate change might conclude by validating a new predictive model, explaining its implications for environmental policy, and proposing further research into regional climate phenomena.

Key Differences Across Disciplines

Aspect	Humanities	Management	Engineering	Sciences
Primary Goal	Interpretation and reflection	Practical and theoretical solutions	Innovative designs or optimisation	Validation of hypotheses
Focus on Application	Broader societal implications	Organisational practices	Real-world systems	Practical and theoretical significance
Future Directions	Theoretical exploration	Strategy development	Technological enhancements	Further experimentation

Tailoring the conclusion to the specific discipline ensures the research is effectively summarised, its significance is clearly articulated, and avenues for future work are thoughtfully proposed.

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