Modern American Journal of Linguistics, Education, and Pedagogy
ISSN (E): 3067-7874
Volume 01, Issue 03, June, 2025
Website: usajournals.org

THE MODERN CLASSIFICATION OF UNITS OF MEASUREMENT: THEMATIC GROUPS AND THEIR ANALYTICAL CHARACTERISTICS

Zoirjanov Shakhbozbek Shavkatjon o'g'li
Doctoral Student, Namangan State University
+998903815000
zoirjanovshakhbozbek@gmail.com
ORCID ID 0009-0000-7169-2460

Abstract
In this paper we present the contemporary system of units with their thematic classification and consider its analytical properties in scientific and applied areas. Based on international standards, such as International Système (SI) of Units, this study categorizes units by disciplines and context of use. It demonstrates the interdisciplinary nature of units of measurement in science, engineering, economics, and linguists. The findings support a systematic framework for clinical categorization that can promote scientifically rigorous, cross-geographic research and standardization.

Keywords: Units of measurement, SI units, thematic classification, analytical characteristics, measurement systems, interdisciplinary metrics, standardization, metrology, quantitative analysis, derived units, physical units, abstract units, scientific measurement, data classification, measurement frameworks.

Introduction

Measurement units play a fundamental role in the representation of quantitative information, in scientific, industrial, and daily contexts. With the increasing difficulty of the field of science and the appearance of new technology, the classification of measuring units should also change to adapt to the new field and application. Although the International System of Units (SI) is well established, since the emergence of the cumulation of measurements in the field of sociology,

Modern American Journal of Linguistics, Education, and Pedagogy
ISSN (E): 3067-7874
Volume 01, Issue 03, June, 2025
Website: usajournals.org

economic science and linguistic, there has been a call for more thematically based overview.

The purpose of this work is to present an up-to-date thematic classification of measurement units and discuss analytical aspects differentiating various groups thereof. In this way, we aim at a more operational and trans-disciplinary view, inline with the present scientific and pragmatic requirements.

Literature Review and Methodology

1. Systematic Review: A comprehensive review of international standards, including the *International System of Units (SI)* documentation by the Bureau International des Poids et Mesures (BIPM), relevant ISO 80000 series guidelines, and key publications from national metrology institutes, was conducted. Additionally, peer-reviewed academic literature in fields such as physics, economics, linguistics, and informatics was analyzed to identify core frameworks of unit classification [10].

Thematic Categorization: Measurement units were grouped into thematic categories according to their primary domain of application. This included physical sciences (e.g., mechanics, thermodynamics, electromagnetism), social sciences (e.g., economics, demography), and information sciences (e.g., digital data units, computational linguistics). The categorization was guided by usage frequency, definitional clarity, and alignment with domain-specific standards [5].

Analytical Profiling: Each thematic group was evaluated for its structural definition, relevance within its field, and compatibility with existing standardized systems such as SI and ISO. Emphasis was placed on how units function within measurement frameworks and how their conceptual boundaries differ across disciplines [4].

Comparative Evaluation: Cross-disciplinary analysis was employed to assess the distribution and utility of measurement units across thematic domains. This allowed for the identification of overlaps, convergence points (e.g., time, energy), and areas lacking standardization or international harmonization. Particular attention was given to interdisciplinary units used in environmental studies, digital platforms, and socio-economic analyses.

Modern American Journal of Linguistics, Education, and Pedagogy
ISSN (E): 3067-7874
Volume 01, Issue 03, June, 2025
Website: usajournals.org

Results and Discussion

The study identified and organized measurement units into **nine major thematic groups,** based on their functional application, standardization status, and disciplinary relevance. These groups demonstrate the breadth of unit usage across both physical and non-physical sciences. The classification is summarized in the table below:

Thematic Classification of Measurement Units with Literature

Thematic Group	Representative Units	Primary Domains	Key Literature / Standards
Physical Base Units	**Meter** – Fr. *metre* < Gr. *metron* – measure. In the metric system of measurements: a unit of length equal to 100 centimeters [8]. **Kilogram** – Kilo... + gram. In the International System of Units (SI), a unit of weight equal to 1000 grams [7]. **Second** – Lat. *secundus* – second. A component of borrowed compound words, denoting a unit of time equal to one sixtieth of a minute: stopwatch (*secondometer*) [9]. **Kelvin** – In the International System of Units (SI), the unit of thermodynamic temperature. It is named in honor of W. Thomson (Lord Kelvin). It is defined as 1/273.16 of the thermodynamic temperature of the triple point of water (liquid, gas, ice). Denoted by *K*. Until 1968, it was referred to as the "degree Kelvin" (°K). *K* is used as the unit of the International Practical Temperature Scale [11]. **Ampere** – The ampere, named after the French physicist André-Marie Ampère, is the unit of electric current [6]. **Mole** – **Modda miqdori**ni o‘lchash uchun ishlatiladigan **xalqaro (SI) asosiy birlik**dir. 1 mol – bu tarkibida **6,02214076 × 10^{23} ta asosiy zarracha** (molekulalar, atomlar, ionlar yoki boshqa zarrachalar) mavjud bo‘lgan modda miqdoridir. Bu **Avogadro soni** deb ataladi [2]. **Candela** – Lat. *candela* – candle. One of the seven base units in the International System of Units (SI), representing luminous intensity; denoted as *cd*. Adopted in 1979. It is defined as	Physics, metrology, general science	These are the **seven SI base units** from which all other units are derived. They form the foundation of physics and metrology and are universally accepted for scientific measurement. Used across **physics**, **natural sciences**, and **engineering**.

Modern American Journal of Linguistics, Education, and Pedagogy
ISSN (E): 3067-7874
Volume 01, Issue 03, June, 2025
Website: usajournals.org

	the luminous intensity, in a given direction, of a source emitting monochromatic radiation at a frequency of 540 × 10^{12} Hz with a radiant intensity of 1/683 watt per steradian. The unit of luminous intensity has been known under various names throughout history. For example, since 1881, it was referred to as "candle." One candle was defined as the luminous intensity emitted from 1 cm^2 of pure platinum at its solidification temperature [12].		
Mechanical Units	**Newton** – derived unit of the International System of Units (SI), used to measure force [3]. **Watt** – The power unit in the SI system is 1 watt = 1 joule/second. It is used to express electrical power (the product of voltage and current) and any type of power (mechanical, thermal, etc.).	Engineering, mechanics, construction	These are **derived units** used to quantify force, work, pressure, power, and motion. Essential in **mechanical engineering, civil construction, dynamics,** and **material sciences**.
Thermodynamic Units	**Kelvin** – The unit of thermodynamic units in the International System of Units (SI). Named after W. Thomson (Lord Kelvin). The triple point of water (liquid, gas, ice) is equal to 1/273.16 of the thermodynamic temperature. It is denoted by K. Until 1968, it was called the Kelvin degree (°K). K is used as a unit of the International Practical Temperature Scale [11]. **Calorie** – this is a unit used to measure the amount of heat or energy. 1 calorie (1 cal) is the amount of heat required to raise the temperature of 1 gram of water by 1°C [1].	Thermal physics, energy systems	Units for measuring **temperature, heat energy, and thermodynamic quantities.** Widely used in **thermodynamic**, **energy transfer studies,** and **environmental sciences**.
Electrical Units	**Ohm** – The unit of electrical resistance in the International System of Units (SI). It is denoted by Ohms. At a constant current of 1 ampere and a voltage of 1 volt at the ends of a conductor, its resistance is equal to 1 Ohm, i.e., 1 Ohm = V/A. G.S. is named in honor of Ohm [14].	Electrical engineering, electronics	Units related to **electric current, resistance, charge, capacitance,** and **inductance.** Applied in **electrical engineering, electronics,** and **telecommunications.**
Optical/Photometric Units	**Candela** – Lat. candela - candle - one of the seven main units in the International System of Units (SI) - the unit of luminous intensity; It is denoted by K. Adopted in 1979. It is the luminous intensity of a source emitting monochromatic radiation with a frequency of 540-Yu12 Hz, the luminous intensity of which in the observed direction is 1/683 W/sr. The unit of luminous intensity has been called differently in different	Lighting design, photometer, optics	Measure **light intensity, luminous flux,** and **illuminance.** Crucial for **photometry, optical system design, vision science,** and **lighting engineering.**

Modern American Journal of Linguistics, Education, and Pedagogy
ISSN (E): 3067-7874
Volume 01, Issue 03, June, 2025
Website: usajournals.org

	periods. For example, from 1881, the unit of luminous intensity was called a candle. One candle is equal to the luminous intensity emitted from the surface area of 1 cm2 of pure platinum during hardening [12]. **Lux** – Lat. lux - light - a unit of illuminance in the International System of Units (SI); denoted by lk. Illuminance arising from a uniformly distributed luminous flux of 1 lumen on a surface of 1 m2 normal to the direction of the luminous flux [13].		
Radiological Units	Becquerel – this is a derived unit in the International System of Units (SI), used to measure radioactivity activity [2].	Nuclear medicine, radiation protection	Used in **nuclear physics, medical imaging,** and **radiation protection** to quantify radioactivity, absorbed dose, and biological effect of ionizing radiation.
Data/Information Units	Byte – is a standard unit used to measure the volume of information.	Computer science, information technology	Represent quantities of **digital data** and information storage. Foundational in **computer science, data processing, telecommunications,** and **cloud computing**.

Discussion

The findings of this study underscore the increasing relevance of adopting a thematic classification of units of measurement in modern scientific and applied contexts. Traditional metrological frameworks, such as the International System of Units (SI), provide a robust foundation for physical and natural sciences; however, the scope of measurement today extends well beyond this classical paradigm. The classification developed in this research highlights the evolution of measurement practices in response to interdisciplinary demands and technological innovation.

One of the key insights is that measurement is no longer confined to physical quantities. Units that quantify abstract or derived constructs such as economic indices, information metrics, and linguistic features are now integral to research in social sciences, humanities, and computational domains. For instance, the use of bits and bytes in information technology or frequency indices in linguistic

Modern American Journal of Linguistics, Education, and Pedagogy
ISSN (E): 3067-7874
Volume 01, Issue 03, June, 2025
Website: usajournals.org

analysis demonstrates that measurement has become a core methodological tool across diverse fields.

Furthermore, the emergence of such thematic groupings reveals important analytical characteristics:

1. Field-specific relevance: Each thematic group aligns with domain-specific epistemologies and research methodologies. For example, radiological units are indispensable in medical imaging and nuclear safety, while economic units underpin macroeconomic analysis and policymaking.
2. Interdisciplinary convergence: Certain units such as time, energy, and information serve as bridging metrics across disciplines. Environmental modeling, for instance, often integrates physical measurements (temperature, radiation), economic indicators (cost of mitigation), and information metrics (model uncertainty, data volume).
3. Standardization and gaps: While the first six thematic groups benefit from strong international standardization via SI, ISO, IEC, and other bodies, units in economics, linguistics, and data science often lack universally harmonized standards. This points to an important area for future development in global metrological practice.
4. Quantification of non-physical phenomena: The inclusion of linguistic and statistical units illustrates a broader trend: the drive to quantify and analyze traditionally qualitative domains. This shift aligns with the growing influence of computational methods and big data approaches in contemporary scholarship.
5. Adaptability and innovation: The ongoing digital transformation is introducing new measurement challenges, such as the need for standardized units for digital trust, cybersecurity metrics, or environmental sustainability indices. The thematic classification model must remain adaptable to incorporate such evolving units.

Conclusion

This study demonstrates that the modern classification of units of measurement must extend beyond traditional physical domains to fully reflect the diversity of contemporary scientific and applied practices. The proposed thematic grouping which includes physical, mechanical, thermodynamic, electrical, optical, radiological, information, economic, and linguistic units – provides a

Modern American Journal of Linguistics, Education, and Pedagogy
ISSN (E): 3067-7874
Volume 01, Issue 03, June, 2025
Website: usajournals.org

comprehensive and interdisciplinary framework for understanding how measurement is used across various fields.

Several key insights emerge from this analysis:

- Thematic groups help clarify both the conceptual foundations and practical applications of measurement units in their respective domains.
- Cross-disciplinary units (such as time, energy, and information) foster integration and interoperability between scientific fields.
- There is a growing need to standardize and harmonize non-physical and abstract units, particularly in areas such as economics, data science, and computational linguistics.
- The increasing quantification of non-traditional domains reflects an important shift toward computational thinking and data-driven research across the sciences and humanities.

As scientific inquiry continues to evolve particularly through digital transformation and interdisciplinary collaboration, there will be a growing need for flexible, adaptable measurement frameworks that can accommodate emerging forms of knowledge and new units of analysis. This study offers a foundation for such future efforts and encourages ongoing dialogue between metrology, data science, and domain-specific research communities.

References

1. “A dictionary of units of measurement”, 12.07.2001, URL: https://www.ibiblio.org/units/dictC.html
2. “A dictionary of units of measurement”, 20.10.2001, URL: https://www.ibiblio.org/units/dictM.html
3. “A dictionary of units of measurement”, 31.05.2001, URL: https://www.ibiblio.org/units/dictN.html
4. International Electrotechnical Commission (IEC). IEC 80000 (in collaboration with ISO) URL: https://www.iec.ch/home
5. International Organization for Standardization (ISO). ISO 80000 series, URL: https://www.iso.org/standard/31891.html

ISSN (E): 3067-7874
Volume 01, Issue 03, June, 2025
Website: usajournals.org

6. Oʻzbek Tilining Izohli Lugʻati, 1-jild. Tahrir hay'ati: E.Begmatov , A. Hojiyev , A.Madvaliyev va boshq. – T.: Gʻafur Gʻulom Nomidagi Nashriyot-Matbaa Ijodiy Uyi, 2023. ISBN 978-9943-8834-4-4. – 105-b.
7. Oʻzbek Tilining Izohli Lugʻati, 2-jild. Tahrir hay'ati: E.Begmatov , A. Hojiyev , A.Madvaliyev va boshq. – T.: Gʻafur Gʻulom Nomidagi Nashriyot-Matbaa Ijodiy Uyi, 2023. ISBN 978-9943-8834-5-1. – 837-b.
8. Oʻzbek Tilining Izohli Lugʻati, 3-jild. Tahrir hay'ati: E.Begmatov , A. Hojiyev , A.Madvaliyev va boshq. – T.: Gʻafur Gʻulom Nomidagi Nashriyot-Matbaa Ijodiy Uyi, 2023. ISBN 978-9943-8834-6-8. – 180-b.
9. Oʻzbek Tilining Izohli Lugʻati, 4-jild. Tahrir hay'ati: E.Begmatov , A. Hojiyev , A.Madvaliyev va boshq. – T.: Gʻafur Gʻulom Nomidagi Nashriyot-Matbaa Ijodiy Uyi, 2023. ISBN 978-9943-8834-5-1. – 587-b.
10. SI Brochure 9th edition: "The International System of Units" 02.05. 2019, URL: https://www.bipm.org/en/publications/si-brochure
11. Ўзбекистон Миллий Энциклопедия, 4-жилд. Таҳрир ҳайъати: М.Аминов, Т. Даминов, Т.Далимов ва бошқ. – Т.: «Ўзбекистон Миллий энциклопедияси», 2000. ISBN 5-89890-060-8. – Б. 540.
12. Ўзбекистон Миллий Энциклопедия, 4-жилд. Таҳрир ҳайъати: М.Аминов, Т. Даминов, Т.Далимов ва бошқ. – Т.: «Ўзбекистон Миллий энциклопедияси», 2000. ISBN 5-89890-060-8. – Б. 435.
13. Ўзбекистон Миллий Энциклопедия, 5-жилд. Таҳрир ҳайъати: М.Аминов, Т. Даминов, Т.Далимов ва бошқ. – Т.: «Ўзбекистон Миллий энциклопедияси», 2000. ISBN 5-89890-064-0. – Б. 333.
14. Ўзбекистон Миллий Энциклопедия, 6-жилд. Таҳрир ҳайъати: М.Аминов, Т. Даминов, Т.Далимов ва бошқ. – Т.: «Ўзбекистон Миллий энциклопедияси», 2000. ISBN 5-89890-076-4. – Б. 534.