challenging circumstances. At the same time, it highlights the importance of continued investment in technological infrastructure and human capital.

In conclusion, innovative technologies are a powerful driver of economic growth in the modern world. They enhance productivity, stimulate business development, transform labor markets, and contribute to sustainable development. However, their effective implementation requires addressing challenges related to digital inequality, cybersecurity, and ethical concerns. A balanced approach that combines technological innovation with appropriate policies and institutional support is essential for ensuring inclusive and sustainable economic growth.

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## CHALLENGES OF UNDERSTANDING TECHNICAL ENGLISH

Technical English is now an essential part of higher education and professional communication across engineering, information technology, economics, logistics, and related fields. Students encounter it in manuals, standards, research papers, software documentation, technical reports, and presentations. For this reason, understanding technical English is not an optional skill but a practical requirement for study and employment. Yet many learners find technical texts far more demanding than general

English materials. The problem is not due to a single factor. It stems from a combination of specialised vocabulary, compressed grammar, discipline-specific logic, visual information, and insufficient background knowledge. Research on English-medium education also shows that students' success depends not only on general proficiency but also on the support available for working with subject-specific materials (Galloway & Ruegg, 2020).

The first and most obvious obstacle is terminology. Technical texts use words for precision, not for convenience, so even a short paragraph may contain several central terms that cannot be guessed from everyday language. In addition, some words seem familiar but carry a narrower or different meaning in a professional context. A learner may understand the grammar of a sentence and still miss its message because the key term has been interpreted too broadly or too literally. This is why direct translation is often unreliable. Students need to understand how terms function inside a field, how they combine with other words, and how one concept is distinguished from another. In ESP research, this close link between vocabulary and disciplinary purpose is considered fundamental to successful comprehension (Hyland, 2022).

A second difficulty is the grammatical and rhetorical density of technical discourse. Such texts often rely on passive constructions, nominalisation, long noun groups, and participial phrases. These features make communication concise and objective, but they also reduce transparency for inexperienced readers. Technical writing is also strongly dependent. Specifications, abstracts, manual instructions, and lab reports organise information differently and expect readers to know where to look for definitions, procedures, warnings, results, or limitations. When students do not recognise the genre, they often read every sentence with the same level of attention and fail to see the message's structure. As a result, they may understand isolated statements but lose the logic that connects them.

Another challenge is information density. Technical English often condenses large amounts of meaning into short passages. A single sentence may define a process,

indicate sequence, identify conditions, and imply practical consequences. This compactness makes reading cognitively demanding. Students often try to decode each word in order, but this strategy is too slow and often ineffective. They need to distinguish between core information and detail, between definition and example, and between requirement and comment. Without such reading control, even a short technical text can feel overwhelming. The difficulty increases when textual information is combined with diagrams, tables, graphs, formulae, or screenshots. In such cases, comprehension depends on the ability to connect verbal explanation with visual representation, rather than treating them as separate sources of meaning.

Digitalisation has made technical reading both easier and more complex. On the one hand, students have immediate access to glossaries, online corpora, software help systems, videos, and AI-supported search tools. On the other hand, digital reading often encourages fragmented attention. Hyperlinks interrupt linear reading, copied fragments lose context, and machine translation may flatten distinctions that are important in professional communication. Students can therefore obtain quick answers without building a deep understanding. At the same time, digital environments expose them to authentic technical language much earlier and more frequently than before. This means that reading technical English today requires not only linguistic competence but also digital discipline: the ability to select reliable sources, verify interpretations, and follow a text's internal logic rather than jumping from fragment to fragment.

Background knowledge is equally important. Technical English is difficult not simply because it uses unfamiliar language, but because language constantly interacts with concepts. If students do not understand the process, device, or system described in the text, they cannot fully interpret the words used to describe it. For this reason, vocabulary teaching is most effective when it is linked to authentic professional contexts. Corpus-based ESP research demonstrates that specialized vocabulary should be taught in relation to real communicative tasks and disciplinary usage rather than as

isolated lists for memorization (Otto, 2021). When language learning and subject learning support each other, comprehension becomes more stable and less dependent on guesswork.

To overcome these difficulties, students need a strategic approach to reading. They should work regularly with authentic but carefully selected materials, beginning with shorter texts and gradually moving to more complex ones. Useful classroom practices include predicting content from headings, identifying key terms before reading, paraphrasing dense sentences, tracing cause-and-effect relations, and building small thematic glossaries with examples and collocations. It is also helpful to compare several genres within one field so that students learn how information is organised differently in definitions, reports, instructions, and recommendations. Such training develops not only vocabulary but also confidence. Instead of seeing technical English as an inaccessible code, learners begin to approach it as a structured form of professional communication that can be analysed and mastered.

In conclusion, the challenges of understanding technical English are interconnected rather than isolated. Specialized vocabulary, contextual shifts in meaning, dense grammar, genre conventions, multimodal presentation, digital reading habits, and limited background knowledge all influence comprehension at the same time. However, these obstacles are not insurmountable. With systematic vocabulary work, genre awareness, strategy training, and close integration of language with disciplinary content, students can learn to read technical texts more accurately and independently. This is especially important in modern higher education, where access to knowledge, participation in international academic exchange, and future professional development increasingly depend on confident work with English-language technical sources (Macaro, 2022).

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## ARTIFICIAL INTELLIGENCE IN OPTIMIZATION OF PHARMACEUTICAL DEVELOPMENT AND PREDICTION OF DRUG STABILITY

Ensuring the stability of medicines is a critical stage of development that guarantees their safety and efficacy. Traditional tests according to ICH guidelines are long and resource-intensive, but the industry's digital transformation and the concept of "Smart Pharma" offer a transition to predictive *in silico modeling*. The use of artificial intelligence (AI) and machine learning enables us to detect nonlinear dependencies among the API structure, excipients, and external factors. The creation of "digital twins" of stability enables scientists to predict drug degradation at early stages, minimizing the number of experiments, optimizing costs, and implementing the Quality by Design (QbD) strategy, thereby significantly accelerating the market entry of innovative medicines.

The modern pharmaceutical industry is in the midst of a digital transformation. 2025 will be a watershed year for global medicine and pharmacy, with the integration