ENGLISH FOR ENGINEERING AT DEFENCE INDUSTRY: A LINGUISTIC METAMORPHOSIS?
Bahasa Inggris untuk Bidang Teknik pada Industri Pertahanan: Sebuah Metamorfosis Linguistik?

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Abstract: Innumerable flock of engineers does not conceive English language adeptly. This research scrutinizes linguistic disciplinarian as regards English for Engineering. Numerous samples have been mustered from PT. PAL Indonesia (Persero), the >35-year state-owned warship-building industry in Surabaya. They, the respondents, are in Naskah Dikirim: 17 Desember 2021; Direvisi: 3 Maret 2022; Diterima: 3 Maret 2022

How to cite (in APA style):
https://doi/10.20473/etno.v4i2.32214


Kata Kunci: English for Engineering, ESP, Linguistic, Technical English
dilemma and hardship since General English (GE) poles apart from Technical English (TE). Exploratory Factor Analysis or EFA method transfigures the ‘English subject’ on to focal point, then; so does it reorients these clusters of English for Engineering as pioneer of: (i). Translations, (ii). Supply Chain, (iii). Operation Manual Documents, (iv). Standard Operation Procedures, and (v). Object-oriented Analysis and Design/ OOAD. Foregoing multivariate language’s scope in English intermittently mystifies the engineer whether the grammar, structure, meaning, or the principle is common or not; a specific-based linguistic (English for Engineering) can expedite both technicians’ advance English learning furtherance and broaden the significance of English for Specific Purpose (ESP), later on.

Keywords: English for Engineering, ESP, Linguistic, Technical English

INTRODUCTION

Medieval era, intensive English learning solely focused on ‘literature’ area—it thus bring forth conspicuous litterateur such as William Shakespeare, Fyodor Mikhailovich Dostoyevsky, Leo Tolstoy, Franz Kafka, Charles Dickens, Victor Hugo, Mark Twain, Miguel de Cervantes, et cetera. Nor is defeated; neither unspoken by late 5th – 15th centuries AD, meantime, the English language remains spoken amidst downtrodden Anglo-Saxon under authority of French Norman (Zare Behtash et al., 2017). Similar to that, Henry of Huntington revered to be renowned twelfth-century chronicler as he fought with delineating ‘English can differentiate the characteristic between humans contrasted to other animals’. English heavily transformed in both form and vocabulary against what it had been in 1066, afterward, its journey had not limited to the history of British Isles and of North America; however, it is globally encompasses: (i). Indian English, (ii). Caribbean English, (iii). West African English, and so forth. A quantifiable data measures English has uttered by >380 million people across the United Kingdom, the United States; followed by Chinese with 1.3 billion; Spanish, is in 330 million people; 180 million of Portugese; Russian by 175 million; German with 110 million; 80 million of French; others, Italian are 65 million.

Studying the annals of English language led people to be ‘history-savvy’. Regardless of breadth knowledge, biggest prosperity of English language is indicated by
its suitability to enter ‘cross-disciplinary’ realm. With carefully designed, post-medieval English language comprises ‘other fields’ attention. Notably in defence industry, where plentiful engineering-based science lies, dearth amount of professionals’ English proficiency is a wrrorriment. Trouble comes as technicians and/or engineers met the structure-homogeneity of General English (GE) and Technical English (TE) at odds. The ‘access-made’ driven by specialty of linguistic to link English for industrial needs thus far goes exceptional—per Michael Dressman (2007) via his ‘Cross-disciplinary Approach’ to linguistic, asserted that language usage ‘is what miscellaneous area’ inextricably bound up (engineering, history, economic, political, science, literature, and so on).

English for engineering at PT. PAL Indonesia (Persero) assists technicians understanding binary/ -dual complexities; research conveyed by Stavroulla (2021) brought critical literacy that Technical English (TE) as part of English for Engineering can flourish the English for Specific Purpose (ESP).

Albeit it would be effortful, ESP in English for Engineering wrought up engineers by shifting their ‘communicative landscape’ or, either forms both multimodal ability and human semiosis (Lim, 2020). Features overtness of English for Engineering is forthright ones than GE. Explicit systemic of English for engineering here is accentuated within Exploratory Factor Analysis (EFA) scheme. Subsequently, EFA can add English for Engineering (EFE) into latest group-of-subject of ESP as follows: (i). English for Engineering/ EFE, (ii). English for General Purposes/ EGP, (iii). English for Academic and Occupational Purposes/ EAOP, (iv). English for Academic Purposes/ EAP, (v). English for Occupational Purposes/ EOP, (vi). English for Science and Technology/ EST, et cetera. Besides them, ESP generally classified to: (i). English as Restricted Language/ ERL, (ii). English for Academic and Occupational Purposes/ EAOP, and (iii). English with Specific Topics/ EwST (Salmani-Nodoushan, 2020; Whyte, 2017).

English for Engineering allows practitioners obtaining field outcome within
linguistic-based in their daily in-site work; majority of scholars has actuate English for Specific Purpose as Modern Foreign Language/ MFL too; likewise, the English praxis (table. 1, table. 2) at PT. PAL Indonesia (Persero) has succeeded of transmitting technicians to understand TE’s speaking, reading, writing, and practical or SRWP skills.

**Table 1.** Martin Hewing’s (2002) skill format of ESP  

<table>
<thead>
<tr>
<th>Part(s)</th>
<th>Basic</th>
<th>Approval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speaking</td>
<td>Practice unfamiliar words;</td>
<td>+</td>
</tr>
<tr>
<td>Reading</td>
<td>Read both GE and TE;</td>
<td>+</td>
</tr>
<tr>
<td>Writing</td>
<td>Enhance and improve intrinsic context; provide factual data; and</td>
<td>+</td>
</tr>
<tr>
<td>Practical</td>
<td>Improve attention and reorient the utility.</td>
<td>+</td>
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</tbody>
</table>

**Table 2.** Integrated character of ESP by Tamas Kiss and Ken Mizusawa (2018)  

<table>
<thead>
<tr>
<th>Part(s)</th>
<th>Basic</th>
<th>Approval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extemporaneous</td>
<td>Practice advanced academic/ non-academic words;</td>
<td>+</td>
</tr>
<tr>
<td>Brevity</td>
<td>Concise and straightforward in writing;</td>
<td>+</td>
</tr>
<tr>
<td>Churning</td>
<td>Consistent in process of understanding different base of English studies; and</td>
<td>+</td>
</tr>
</tbody>
</table>
Importance of specified-technical-vocabulary building for example: Accelerating > Construct, Achieve > Construe, Benefit > Diagnostic, Build > Dialup, and others have to be done. The more specific the merrier, in other words, an observation of ‘English for Engineering’ for ‘Professional Development’ or PD shown by Eun Gyong Kim et al (2021) coined its final appliance at practical-mill (especially defence industry) that, no absolute Technical English ever exist, but ‘trial and error’ is.

THEORETICAL REVIEW

English for specific purpose, in essence, acquires initiative pathway to boost the swath of English itself onto limited critical and/ or attitude of science (O’Hallaron et al., 2015). In classroom, professionals are accustomed to earn both textual and non-textual General English—one aspect, ‘a practical job’, later maximizes their intuitive/ -cognitive to naturally reshape the genuine structure of General English to Specific English (specifically English for engineering in this case).

As where Selda Özer (2020) spotlight the end-of-task of the Foreign Language Learning Effort Scale (FLLES), technical English is used to ramifies studies’ substantive. It contains English for Engineering’s writing rule as preliminary fundamental:

*Sentences
Rule 1 : Short, concise, maximum 20 words each sentence, write instructional needs only (unless other actions are necessary);

*Verbs
Rule 1 : Write instruction as ‘imperative’ or command form;
*Statements*

Rule 1: Divide the form of command statement with comma;

This means, the critical genre analysis for technical English emphasizes ‘interdiscursive aspect’ for professionals (Xia, 2020). Moreover, a hundred-percent-use of mechanical/technical English would not relinquish possession of the origin of English. In Majed Ali’s (2015) notion, he considered that cognitive traits, cultural integration, multi-lingual, and ‘tolerance to ambiguity’ may bloom learning attitude in English for Engineering.

For the precise characteristics of Technical English, there are: (i). Attain specific needs in conditional, (ii). Underlining method and activities of the ‘disciplinary’ it serves, and (iii). Centralize language’s intrinsic components (grammar, lexis, and register), skills, discourse, and the genre. As its ‘taxonomy’ of technical English vocabularies, it would be organized too; the vocabulary of quality (reliable, low-cost, affordable, etc); for manuals (fasten, perform, supply, fit, etc).

**RESEARCH METHOD**

In *Exploratory Factor Analysis* or EFA, respondents collected from PT. PAL Indonesia (Persero) arrived from various backgrounds such as apprenticeships, temporal workers, permanent workers, and others. They are willing to be interviewed. Their concern pertaining to English for engineering needs has been processed via simple ‘numeric covariance determinant’ step. Data shows best deal revealed by informants; apprentices’ age range began with 19 y.o – 22 y.o, from 1 to 10, their answers are ≥7; followed by temporal worker, since most of them are not came by same major background but, they acknowledge that English for Engineering remains important, at the ages range of 24 – 27 y.o, their satisfaction range is ≥5; especially for permanent workers, one reason quoted by them express 80% of engineers are lack of English communication, from 27
to >30 y.o, their needs of technical English are ≥9.

To hasten the research methodology, within EFA, the strategy named *Non Probability Sampling* is used; means, entire element of respondent is limited (only whoever worked at PT. PAL Indonesia in this case). While the *Accident Sampling* is utilized too as defining ‘truer possibility’ of the aim of the research; below is the formula to work on it then:

\[ n = \frac{Z}{(moe)} \]

Detail:

\[ n \] = samples in total

\[ Z \] = level of English for Engineering needs by respondents (*max. 95% = 1.96*)

\[ \text{moe} = \text{Margin of Error} \] or stated the importance of respondents’ argument

Most of respondents are allocated for *premier data*. The questionnaire given is also restricted, so does informants’ answer would be focused on Question and Answer Section deliberating the English for engineering needs at PT. PAL Indonesia (Persero). The response of theirs has been systemized on to ‘variable principle’ checklist as follows: (i). \(X^1\) : EFE Needs, (ii). \(X_2\) : EFE prospects, (iii). \(X_3\) : EFE importance, (iv). \(Y\) : Further Sustainability, (v). \(Z\) : EGP as EFE, (vi). \(Z_1\) : EAOP as EFE, (vii). \(Z_2\) : EAP as EFE, (viii). \(Z_3\) : EOP as EFE, and (ix). \(Z_4\) : EST as EFE.

**Table 3. Exploratory Factor Analysis** or EFA on English for engineering needs conveyed by respondents

<table>
<thead>
<tr>
<th>PFA</th>
<th>RCC</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(X^1)</td>
<td>(X^2)</td>
<td>(X_3)</td>
<td>(Y)</td>
<td>(Z)</td>
<td>(Z_1)</td>
<td>(Z_2)</td>
<td>(Z_3)</td>
<td>(Z_4)</td>
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</table>

\[ n = \frac{1.96}{(0, 2)} \]
RESULT AND DISCUSSION

English is more than ‘knowledge’. Every ‘needs’ calls to bring English backward to reflect multi-relationship amidst subject English with a motley disciplinary. Praxis that is relevant to multiform science keenness confers English language the taste of core attention. At this point, I dealt with mutatis-mutandis principle, that, “all necessary changes having been made”. Not least of English importance be gauged by vis-à-vis or comparable significance such as English for engineering at Translation, English for engineering at Supply Chain, English for engineering at Operation Manual Document,
English for engineering at Standard Operation Procedures/ SOP, and English for engineering at Object-oriented Analysis and Design/ OOAD.

**English for Engineering at Translation**

Pei-Shu (2021) speculates the *Technology Acceptance Models/ TAM* usage is efficient, and there is international standardization in English for Engineering at translation named *Simplified Technical English* or STE (ASD, 2015). Below are the illustrations of STE and non-STE usage (from onboard and respondents):

<table>
<thead>
<tr>
<th>Action Needed</th>
<th>STE Vocab</th>
<th>Non-STE Vocab</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Translation</strong></td>
<td>Technical</td>
<td>English (for STE)</td>
</tr>
<tr>
<td><strong>Vs.</strong></td>
<td>General</td>
<td>English (for Non-STE)</td>
</tr>
<tr>
<td><strong>Stainless</strong></td>
<td>[3] Recognizable</td>
<td>[SUB]</td>
</tr>
<tr>
<td><strong>Vs.</strong></td>
<td>Besi Panjang</td>
<td></td>
</tr>
<tr>
<td><strong>Sambungan</strong></td>
<td>Yes.</td>
<td></td>
</tr>
<tr>
<td><strong>Besi</strong></td>
<td>Yes.</td>
<td></td>
</tr>
<tr>
<td><strong>Executions</strong></td>
<td>Pemeriksaan Inspeksi</td>
<td>[1], [3]</td>
</tr>
<tr>
<td><strong>Inspection</strong></td>
<td>Yes.</td>
<td></td>
</tr>
<tr>
<td><strong>Pin Assignments</strong></td>
<td>Himbauan Catatan</td>
<td>[2], [1]</td>
</tr>
<tr>
<td><strong>Note</strong></td>
<td>Yes.</td>
<td></td>
</tr>
<tr>
<td><strong>Power Enable</strong></td>
<td>Tuas Kecakapan</td>
<td>[2]</td>
</tr>
<tr>
<td><strong>Power Enable</strong></td>
<td>Yes.</td>
<td></td>
</tr>
<tr>
<td><strong>Panel Illumination</strong></td>
<td>Lampu Bias Lampu</td>
<td>[2]</td>
</tr>
<tr>
<td><strong>Lamp</strong></td>
<td>Yes.</td>
<td></td>
</tr>
</tbody>
</table>

*) Translation analysis

<table>
<thead>
<tr>
<th>“Technical English” Part of Speech</th>
<th>Similarity Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel/ -Illumination = Lamp**(noun)**</td>
<td>±</td>
</tr>
<tr>
<td>Power**(noun)** Enable**(verb)**</td>
<td>+</td>
</tr>
<tr>
<td>Pin**(noun)** = Note**(noun)**</td>
<td>+</td>
</tr>
</tbody>
</table>
**Execution**<sup>(noun)</sup> = **Inspection**<sup>(noun)</sup> +
**Male**<sup>(adj.)</sup> = **Straight**<sup>(adv.)</sup> -

**English for Engineering at Supply Chain**

Good industry performs good communication. At PT. PAL Indonesia (Persero) where supplier came across the globe, miss communication may lead ‘cost disarray’. English for Supply Chain synchronizes two-party communication in specific style-of-language. Dr. Dawei Lu (2011) dismantles English usage as its finest at Supply Chain has set ‘transactional commercial flow’ adequacy by persuading customer orientation.

**Figure 1.** Dr. Dawei Lu of Supply Chain Mapping Process

Success etiquette of descent English conversation has standardized within *Supply Chain Operations Reference* SCOR glossary (Branch & Branch, 2012), example: **Account Receivable** (A/R), it must be **Receivable Accounts** but, due to technical needs, it's inverted. **Accounts Payable** (A/ P), it must be **Payable Account** but, same as foregoing case.
English for Engineering at Operation Manual Document

This section focuses the language intrinsic aspect to make information well-delivered. Operational Manual Document juxtaposes real-work situation and written regulation on a firm. At PT. PAL Indonesia (Persero), mastering bilingual skill (or: Foreign language) is mandatory; since plenteous provided-information has tightly written in English but, remain heeds the Technical English (Kornieva & Vashchylo, 2021).

Engineering English, as Julius et al (2020) outlined it, recently has shifted on to ‘dominant status’ in English for International Language of Science/ EILS. Since engineering grouped as pure science, off so, the SOP existence within concise and clear conveyance must be procured. As succinct as possible, a manual document in Technical English must adhere to relevant engineering professional context. Manual document is tagged as linguistic acquisition. Below for the example, cited from warship equipment from PT. PAL Indonesia (Persero):

**Figure 2.** Warship Electrostatic Discharge (ESD) Console Manual
English for Engineering at Standard Operation Procedures/ SOP

A brief instructions totally close to Safety Induction protocol, procedurally, Standard Operation Procedures or SOP unified/ and or is integrated with Occupational Health and Safety preparedness. Nor authored as detail as it is, but the SOP (in technical English form) must comply definite task instruction and liken by ‘extratextual’ command—so does the instruction given must ‘verbalize’ the message undoubtly, example:

**Figure 3. Safety Definition**

- **DANGER**
  - When the DANGER notification is used, failure to comply with the described instructions may cause serious personnel injury or death, or severe and irreparable property damage.

- **WARNING**
  - When the WARNING notification is used, failure to comply with the described instructions may cause serious personnel injury or extensive and possibly irreparable property damage.

- **CAUTION**
  - When the CAUTION notification is used, failure to comply with the described instructions may result in moderate personnel injury or moderate property damage.

- **NOTICE**
  - The NOTICE notification is used for instructions of special importance that does not relate to potentially hazardous situation.

**Figure 4. Technical English for Safety Infographic**
English for Engineering at Object-oriented Analysis and Design/ OOAD

Among fifth advantageousness of English for Engineering, the OOAD serves a significant platform of ‘safety work’ enclosed with *Mutual Recognition Arrangements* / MRA significance; skilled workers have to seriously pay attention to work instruction by reading the guidance; hereby, the role of English for Engineering had to shed light on the guidance without any doubt. OOAD equals to object-direct assistance. Example:

**Figure 5.** Object-oriented Analysis and Design within Technical English usage
CONCLUSION

Using limited linguistic acceptance matures the significance of insight too; in essence, that is how the concept of Mutual Recognition Arrangements (MRA) meant to be (Kaowiwattanakul, 2020). English for engineering invites rigorous discussion where the origin rules of English seems to be ‘disobeyed’—in fact, the principle has grown ever since the variety of knowledge arrived. Standard of English for engineering, likewise, has been heightening within soulful ethic of engineering itself. She, Christy Peter (2017), assures since late eighties, English linguistic has intended for professional needs.

A handbook written by Kathleen Bogue (1978) criticizing ‘Teaching Technical English’ to professional warned noticeable TE difference of two: (i). Meaning-special-given to them are not basic anymore, (ii). General English is in dearth of use there. For some machinery terminology, technical English does not ‘extravagant’ in use of vocabularies; everything goes ‘forthright’, these are the ‘how-to’ of technical English:

**Rule I. Technical Verbs**

Using verbs as ‘technical verb’ category is acceptable

**Definition:** it specifies technical and operational contexts/ **Correct Example:**

Manufacturing Process e.g. Drill, Grind, Mill, Ream, Flame, Insulate, Remetal, Crimp,
Rivet, etc.

**Rule II. Noun Clusters**

Write noun clusters no more than three words

**Definition:** in TE, when words link up different ways, ambiguity occurs/ Correct

**Example:** Runaway light connection (3 words/ “connection” as the main noun)

**Rule III. Articles and Demonstrative Adjectives**

Use an article (the, a, an) or demonstrative adj. (this, these) before noun

**Definition:** in can show where the noun and noun phrase actually is/ Correct **Example:**

Turn the shaft assembly, This manual tells how to service the warship-maingun

**Rule IV. Verbs**

Use the “-ing” form of verb as modifier in a technical name only

**Definition:** Words end by “-ing” notifies different usage in a sentence (different parts of speech). They shall be part of verb to express a present activity/ Correct **Example:** An opening missile can be dangerous

**Rule V. Active Voice**
**Active Voice is mandated for procedural writing, use it as much as wisely.**

**Definition:** Use only Active Voice in technical English especially in procedural writing/
**Correct Example:** The side stay holds the main gear leg

*) **Note:** entire samples of technical English above based on the ASD-STE 100 (ASD, 2015; Etteplan, 2018) international standardization regulates the English use for military heavy-machine building e.g. Tank, Warship, Fighter Plane, etc.
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