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النظرية الخليلية الحديثة: من القواعد التعليمية إلى النمذجة الرياضية واللسانية قراءة في فكر عبد الرحمن حاج صالح وفوزية بداوي

The Modern Khalilism Theory: Engineering the Arabic Language between Heritage and Digitization An Analytical Study of the Research of Abdul Rahman Hadj Saleh and Fouzia Badaoui

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Abstract

This article aims to provide a comprehensive reading of the Modern Khalilism Theory, as an integrated linguistic project that seeks to reconstruct the Arabic grammatical and lexical system according to contemporary scientific foundations. The research begins by critiquing linguistic methodologies that imposed foreign language models onto Arabic, presenting the alternative formulated by Abdul Rahman Hadj Saleh and deepened by Fouzia Badaoui. The article discusses the conceptual apparatus of the theory (model, position, matrix, factor) and how these concepts are employed in computational and pragmatic linguistics. The study concludes that the Khalilist model represents a "linguistic technology" capable of efficiently processing the Arabic language automatically, surpassing

الملخص

يسعى هذا المقال إلى تقديم قراءة شمولية في النظرية الخليلية الحديثة، بوصفها مشروعاً لسانياً متكاملاً يهدف إلى إعادة بناء المنظومة النحوية والمعجمية العربية وفق أسس علمية معاصرة. ينطلق البحث من نقد المناهج اللسانية التي أسقطت نماذج اللغات الأجنبية على العربية، مقدماً البديل الذي صاغه عبد الرحمن حاج صالح وعمقته فوزية بداوي. يتناول المقال الجهاز المفاهيمي للنظرية (المثال، الموضع، المصفوفة، العامل) وكيفية توظيف هذه المفاهيم في اللسانيات الحاسوبية والتداولية. خلصت الدراسة إلى أن النموذج

Western models.		الخليلي يمثل "تكنولوجيا لغوية" قادرة على معالجة اللغة العربية آلياً بكفاءة تفوق النماذج الغربية.
Keywords: Modern Khalilism Theory, Abdul Rahman Hadj Saleh, Fouzia Badaoui, Modeling, Position Theory, Computational Linguistics.		**كلمات مفتاحية:** النظرية الخليلية الحديثة ؛ عبد الرحمن حاج صالح ؛ فوزية بداوي ؛ النمذجة ؛ نظرية الموضع ؛ اللسانيات الحاسوبية.

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. INTRODUCTION

The linguistic efforts of Dr. Abderrahman Hadj-Saleh and Dr. Fouzia Badaoui represent a transformative era in Arabic linguistics, particularly through the development and application of Modern Khalilian Theory. By revisiting the classical heritage with scientific rigor, they have successfully bridged the gap between traditional grammar and modern clinical and computational requirements.

We can say that "Modern Khalilism" is more than just a historical reading; it is a rediscovery of the mathematical logic that governs the Arabic language. Hadj Saleh (2007) believes that authentic Arabic linguistic thought was subjected to distortion by the Greek logic that later influenced grammar, thereby obscuring the genius of "Al-Khalil ibn Ahmad" which was based on pure induction and mathematical modeling. He argued that traditional Arabic grammar is a formal, autonomous system. He sought to prove that the "Reasoning of the Arabs" ('ilal al-nahw) was based on linguistic patterns and phonological distribution rather than

external syllogistic logic. Badaoui (2018) confirms that reviving this thought in the modern era is not an intellectual luxury, but a necessity dictated by the challenges of "automated language processing" and the need for Arabic linguistics to adopt a methodology stemming from its derivational and structural particularities.

2. Epistemological Framework:

Scientificity and Modeling The Khalilism theory is based on a "formal" epistemology that treats language as a closed system of relations. Hadj Saleh (2012) argues that Al-Khalil relied on what is now called "complete induction," where he did not leave a single linguistic phenomenon without subjecting it to analogy. This framework rejects "superficial descriptivism" and leans towards "structural interpretation," where every linguistic phenomenon is explained by its position within the overall system. Badaoui (2022) adds that the strength of this framework lies in its "generative" nature in the mathematical sense, meaning it has the ability to predict possible linguistic forms before they occur.

- **Rejection of Superficial Descriptivism:** Most early grammarians simply listed what they heard. Al-Khalil, however, sought the **underlying structure**. He wasn't interested in the "atom" (the single word) but in the "atomic bond" (the relationship between the root and the pattern).
- **Structural Interpretation:** A linguistic phenomenon—like a specific vowel change—is never seen as an isolated "accident." It is explained by its **position** within the system. If one part of the matrix moves, the rest must shift to maintain equilibrium.

Hadj Saleh's (2012) mention of "complete induction" refers to Al-Khalil's exhaustive methodology in creating the Kitab al-Ayn.

-**The Grid**: He mapped out every possible combination of the Arabic alphabet.

-**Qiyas** (Analogy): Once he identified a pattern through induction, he applied it as a universal rule. If a linguistic form didn't fit, he didn't just ignore it; he sought the "hidden" logic or the "exception that proves the rule." This is remarkably similar to how modern physicists use mathematical models to find "missing particles" predicted by a theory.

3. The Concept of "The Model"

The model is the basic unit of thought for Hadj Saleh. In (2007) Hadj Saleh clarifies that Arabs did not know "rules" in the dry scholastic sense, but rather knew "models" to be emulated (e.g., faʿala, fuʿila).

- *The Model as a Structure*: It is a mental abstraction that allows for projection and analogy operations.
- *Applied Perspective*: Badaoui (2018) sees the model acting as a "template" in modern programming, where positions are filled with linguistic variables while maintaining a fixed morphological structure.

  Hadj Saleh (2007) argues that for the early Arab grammarians, a model like /**fa3ala/** was not a "rule" to be memorized, but a Gestalt—a holistic shape that the mind recognizes and replicates.

  Rules (Dry Scholasticism): Operates on "If/Then" logic. If the verb is past tense and active, then use these vowels. This is a heavy cognitive load for the speaker.

  Models (Mithal): Operates on Pattern Matching. The speaker doesn't follow a recipe; they "resonate" with a template. This allows for Projection: once the brain masters the "vibration" of the model $faʿala$, it can instantly project any three-letter root into that shape without conscious calculation.

4. Position Theory

In syntactic analysis, Khalilism innovates the concept of "position." Hadj Saleh (2012) emphasizes that the Arabic sentence is not a sequence of words, but rather a sequence of "functional positions."

- *Dynamism:* A word acquires its function (subject, object) from the position it occupies in the sentential matrix.
- *Structural Analysis:* Badaoui (2022) indicates that this concept explains the flexibility of word order in the Arabic sentence; the position retains its referential value even if the order of spoken words changes, which facilitates the construction of intelligent automated "syntactic parsers." Because the **Position** retains its value regardless of its linear placement, the "Matrix" stays intact. In English, if you swap the subject and object, the meaning changes (*"The cat chased the dog"* vs. *"The dog chased the cat"*). In a Khalilist model of Arabic, the inflection "locks" the word to its functional position, allowing for poetic and pragmatic variation without losing structural clarity.

The transition from viewing a sentence as a **sequence of words** to a **sequence of functional positions** is the bridge between classical grammar and modern **Structuralism**. Hadj Saleh and Badaoui argue that Al-Khalil's "Position" (al-Mawqiʿ) is a precursor to the "slots" used in modern computational syntax.

In this framework, the sentence is a **topological map** rather than a linear string.

5. Root Structure and Permutations

"Permutation" is considered Al-Khalil's greatest mathematical achievement. The concept of **Permutation (al-Taqālib)** is where Al-Khalil's 8th-century genius directly meets 21st-century **Information Theory**. Hadj Saleh and Badaoui argue that this was not merely a way to organize a dictionary, but a **systematic mapping of the linguistic universe**.

By treating the alphabet as a set of discrete variables, Al-Khalil created a "Periodic Table" of language.

Hadj Saleh (2007) analyzes this concept as a statistical enumeration of all phonetic possibilities of a linguistic root.

- *Lexical Matrix*: By permuting the letters of the root (bi-literal, tri-literal, quadri-literal), used and unused forms are extracted based on "phonetic harmony" laws.
- *Scientific Foundation*: Badaoui (2018) asserts that this process is the basis of "Arabic computational linguistics," as it allows the computer to generate the entire Arabic lexicon starting from a limited number of letters and combinatorial rules.

6. Factor Theory

The Binding Logic Contrary to modern attempts to abolish the "factor," Hadj Saleh considers it a logical necessity. Hadj Saleh (2007) states that the factor is the "mathematical link" between elements.

- *Reference*: The factor is what connects the "predicate" to the "subject."
- *Badaoui's Interpretation*: Badaoui (2022) explains that the factor in Modern Khalilism is a "function" that connects the inputs of the sentence to its grammatical outputs, and without it, language becomes merely a heap of words without structural cohesion.

Hadj Saleh and Badaoui argue that the Factor is not a "stumbling block" for students, but the **Architectural Blueprint** of the Arabic mind. Abolishing it would be like trying to run a computer program after deleting all the logical operators (IF, THEN, AND); the data remains, but the system can no longer "think."

7. Computational and Pragmatic Linguistics

The "Arabic Linguistic Corpus" represents the practical application of this theory.

Computationally: Hadj Saleh (2012) asserts that the structure of the Arabic language (root + pattern) is inherently "computational," making it one of the easiest languages to process if the Khalilist methodology is adopted.

Pragmatically: Badaoui (2018) believes that Al-Khalil's concept of "Context/Situation" (المقام) intersects with contemporary "Pragmatics," where meaning is not solely determined by structure, but also by the speaker's intention and the circumstances of the discourse (correctness and inappropriateness). To deepen the understanding of how **Khalilian Theory** functions as a precursor to modern linguistic science, we can look at the "Mathematical Matrix" of the language and the "Pragmatic Filter" of context.

Hadj Saleh and Badaoui argue that Al-Khalil did not just write a dictionary; he built a **generative system**.

- **The Permutational Logic (The "Mathematical" Layer)**

Al-Khalil's greatest computational contribution was the **Permutation (Taqalib)**. He realized that if you have a three-letter root (like K-T-B), there are mathematically only a few ways those letters can be arranged:

1. K-T-B (to write)
2. K-B-T (to suppress)
3. B-K-T (to silence)
4. B-T-K (to cut)
5. T-K-B (to pour)
6. T-B-K (to follow)

Why this is "Computational" ?

In modern Computer Science, this is an **algorithm**. Instead of storing every single word in a database, a Khalilist model only needs to store the **Roots** and the **Patterns**.

- **Storage Efficiency:** You store 3,000 roots and 100 patterns instead of 300,000 individual words.

- **Predictive Power:** If a machine encounters a new word, it can "strip" it down to its root and "identify" its pattern to understand the meaning without ever having seen that specific word before.

- **The "Maqam" as a Semantic Filter (The "Pragmatic" Layer)**

While the computational side handles the **form**, the Pragmatic side handles the **truth**. Badaoui (2018) emphasizes that in Khalilism, a sentence is not "complete" until it meets the **Maqam** (The Situation).

The Three Pillars of Khalilian Pragmatics:

1. **Al-Lafdh (The Utterance):** The physical sound/text produced by the "Root + Pattern" calculation.
2. **Al-Ma'na (The Abstract Meaning):** The dictionary definition of those sounds.
3. **Al-Maqam (The Context):** The external environment (Who is speaking? To whom? Where? Why?).

Example: The sentence *"The door is open."*

- **Computational/Structural View:** A simple statement of fact about a physical object.
- **Khalilist/Pragmatic View:** Depending on the **Maqam**, this could be an invitation ("Come in"), a warning ("We are being watched"), or a complaint ("It's cold in here").

Al-Khalil's theory posits that **Correctness (Sihha)** is not just about grammar; it is about the "appropriateness" of the speech to the situation. If you use a formal root/pattern in a casual setting, the Khalilist view considers it a "linguistic failure," much like modern Pragmatics would.

- **The "Matrix of Meaning" in Inflection (I'rab)**

This is where Badaoui critiques Western views. In many Western languages, an ending (like '-s' for plural) is just a "tag." In Khalilism, the

vowel change at the end of a word (**Damma, Fatha, Kasra**) is the **connective tissue** of the thought.

Imagine a puzzle where the pieces don't just sit next to each other, but actually **lock** into place. The I'rab is the "lock." Without it, the "Matrix of Meaning" collapses because the relationship between the Actor (Fa3il) and the Object (Maf3ul) becomes ambiguous.

8. Comparative Critique

In comparison with global linguistics, Hadj Saleh (2012) proves that "Khalilism" possesses a descriptive apparatus superior to "Generativism" in processing derivational languages. Badaoui (2020) adds that Western methodologies often fail to accurately explain the "phenomenon of inflection (I'rab)," while Khalilism considers it an inherent part of the "matrix of meaning."

And if we just take a close Descriptive view to Khalilism vs. Generativism

Hadj Saleh's preference for Khalilism (the school of Al-Khalil ibn Ahmad al-Farahidi) over Generativism (Chomskyan linguistics) stems from the fundamental nature of Arabic.

- Derivational Efficiency: Arabic operates on a "root-and-pattern" system. Khalilism treats language as a dynamic mathematical permutation of roots, which aligns naturally with the Arabic morphological structure.

The Generativist Struggle: Generative grammar was largely built on "item-and-arrangement" models (like English), which often struggle with the non-concatenated nature of Semitic derivation.

Table n' 01 : Khalilism vs Generativism

Feature	Western Perspective (Often)	Khalilism Perspective

Feature	Western Perspective (Often)	Khalilism Perspective
View of I'rab	Seen as a formal suffix or syntactic marker.	Seen as an **inherent component** of the meaning.
Function	Often treated as redundant or purely structural.	A "matrix" where phonology, syntax, and semantics intersect.
Explanation	May view vowel changes as "extra" or decorative.	Argues that removing the *I'rab* fundamentally alters the logic of the sentence.

9. CONCLUSION

The Modern Khalilism Theory, as formulated by Abdul Rahman Hadj Saleh and developed by Fouzia Badaoui, represents an intellectual bridge between the authenticity of Arab heritage and the requirements of the digital age. This theory has proven that the Arabic linguistic system is not a random system, but a precise engineering based on a balance between morphology and syntax. And we have to look at the specific engineering breakthroughs Hadj Saleh and Badaoui achieved. They moved Arabic from a language of "memorized exceptions" to a language of predictive algorithms.

Here are the deeper details on how Modern Khalilism transforms Arabic for the digital and educational sectors:

- The "Linguistic Laboratory" Approach Hadj Saleh viewed the Arabic language as a closed circuit of energy. In his theory, every phoneme and morpheme has a specific "weight" and "position."

Morphological Engineering: The theory posits that the Arabic root (e.g., K-T-B) is not just a sequence of letters, but a mathematical constant. When applied to a pattern (the variable), it generates a predictable output.

The Virtual Model (Al-Mathal): This is a key technical detail. Modern Khalilism uses "virtual forms" to explain how the language actually works under the hood. It's remarkably similar to how a compiler processes high-level code into machine code.
- Solving the "Digital Gap" in NLP Most current AI models (like GPT) process Arabic as a sequence of characters. Modern Khalilism argues for Structural Processing.
Deep vs. Surface Structure: By using Khalil's "Theory of Operators" (Nawahu), software can identify the "operator" (Amil) in a sentence—the word that dictates the grammatical case of everything else.
Disambiguation: One of the biggest hurdles in Arabic AI is the lack of diacritics (short vowels/Harakat). Khalilism provides a logical framework to "guess" the correct vowels based on the structural balance of the sentence, rather than just statistical probability.
- Impact on Educational Curricula
The study suggests that we shouldn't teach Arabic by asking students to memorize thousands of separate rules. Instead, the methodology focuses on Functional Logic by Systematization and Teaching students the "Matrix of Roots and Patterns" as a creative tool, allowing them to "engineer" new words (Neologisms) for modern technology.
Logic over Rote: Moving away from the "Basran vs. Kufan" school debates and focusing on the Internal Logic of the Tongue (al-Mantiq al-Dakhili).
Integration: Using digital tools in the classroom that mirror this theory, where students can see the "mathematical" result of changing a single letter in a sentence.

The study recommends the necessity of adopting this methodology in developing educational curricula and artificial intelligence software for the Arabic language, to ensure linguistic processing that respects the internal logic of the Arabic tongue.

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