

Zero-to-Product-theanh-b1

Tầng 1: DEFAULT HOMEPAGE RANKING (Khi không search, không filter)

Công thức Quality Score:

```
Quality Score =  
(0.25 × Conversion Rate) +  
(0.20 × Rating Score) +  
(0.15 × Sales Velocity) +  
(0.15 × Seller Quality) +  
(0.10 × Engagement Score) +  
(0.10 × Freshness Score) +  
(0.05 × Stock Health)
```

Chi tiết từng thành phần:

1. Conversion Rate (Tỷ lệ chuyển đổi - 25%)

```
conversionRate = (purchases / views) × 100  
score = min(conversionRate / 5, 1) // Normalize to 0-1, cap at 5%
```

2. Rating Score (Đánh giá - 20%)

```
ratingScore = (  
    (average_rating / 5) × 0.7 +  
    (review_count_factor) × 0.2 +  
    (1 - complaint_rate) × 0.1  
)  
  
review_count_factor = Math.log10(review_count + 1) / Math.log10(1000)  
// Products with 1000+ reviews get max score
```

3. Sales Velocity (Tốc độ bán - 15%)

```
last7Days = purchases in last 7 days  
last30Days = purchases in last 30 days  
velocity = (last7Days × 4) + last30Days  
score = Math.log10(velocity + 1) / Math.log10(1000) // Normalize
```

4. Seller Quality (Chất lượng người bán - 15%)

```
sellerScore = (  
  (is_verified ? 0.3 : 0) +  
  (seller_rating / 5) × 0.3 +  
  (response_rate / 100) × 0.2 +  
  (total_products > 10 ? 0.2 : total_products / 50)
```

5. Engagement Score (Tương tác - 10%)

```
engagement = (  
  (favorites_count × 2) +  
  (chat_initiated_count × 3) +  
  (product_views × 0.1)  
) / 100
```

```
score = Math.tanh(engagement) // Sigmoid to 0-1
```

6. Freshness Score (Độ mới - 10%)

```
daysSinceCreated = (now - created_at) / (1000 × 60 × 60 × 24)
```

```
7. freshness = Math.exp(-daysSinceCreated / 30) // Exponential decay  
    over 30 days
```

8. Stock Health (Sức khỏe kho - 5%)

```
9. stockScore = in_stock > 0 ? (in_stock > 50 ? 1 : in_stock / 50) : 0
```

Tầng 2: BUSINESS RULES BOOSTING

Áp dụng sau khi tính Quality Score:

```
finalScore = qualityScore × boostMultiplier
```

```
boostMultiplier =  
  (is_mall_product ? 1.3 : 1.0) ×  
  (is_verified_seller ? 1.2 : 1.0) ×  
  (has_free_shipping ? 1.1 : 1.0) ×  
  (is_on_flash_sale ? 1.5 : 1.0) ×  
  (seller_paid_promotion ? 1.4 : 1.0)
```

Tầng 3: DIVERSITY & PERSONALIZATION

A. Diversity (Đa dạng):

```
// Avoid showing 5 products from same seller consecutively
```

```

if (last_3_products.every(p => p.seller_id === current.seller_id)) {
  penaltyScore = finalScore × 0.7
}

// Ensure category diversity in top 20
if (top_20_products.filter(p => p.category === current.category).length >
8) {
  penaltyScore = finalScore × 0.8
}

```

B. Personalization (based on user history):

```

if (user.isAuthenticated) {
  // Boost categories user browsed
  if (user.viewed_categories.includes(product.category)) {
    personalizedScore = finalScore × 1.2
  }

  // Boost price range user typically buys
  if (product.price >= user.avg_purchase_price × 0.7 &&
    product.price <= user.avg_purchase_price × 1.5) {
    personalizedScore = finalScore × 1.15
  }

  // Boost sellers user previously bought from
  if (user.purchased_sellers.includes(product.seller_id)) {
    personalizedScore = finalScore × 1.3
  }
}

```

Tầng 4: SEARCH RANKING (Khi có searchTerm)

Override all above với Relevance Score:

```

relevanceScore =
  (0.40 × textMatchScore) +
  (0.30 × qualityScore) +
  (0.20 × popularityScore) +
  (0.10 × priceCompetitiveness)

textMatchScore = {
  exactTitleMatch: 1.0,
  titleContains: 0.8,
  descriptionContains: 0.5,
}

```

```
metaMatch: 0.6,  
sellerNameMatch: 0.3  
}
```

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