Personalized Service via Recommender Engines

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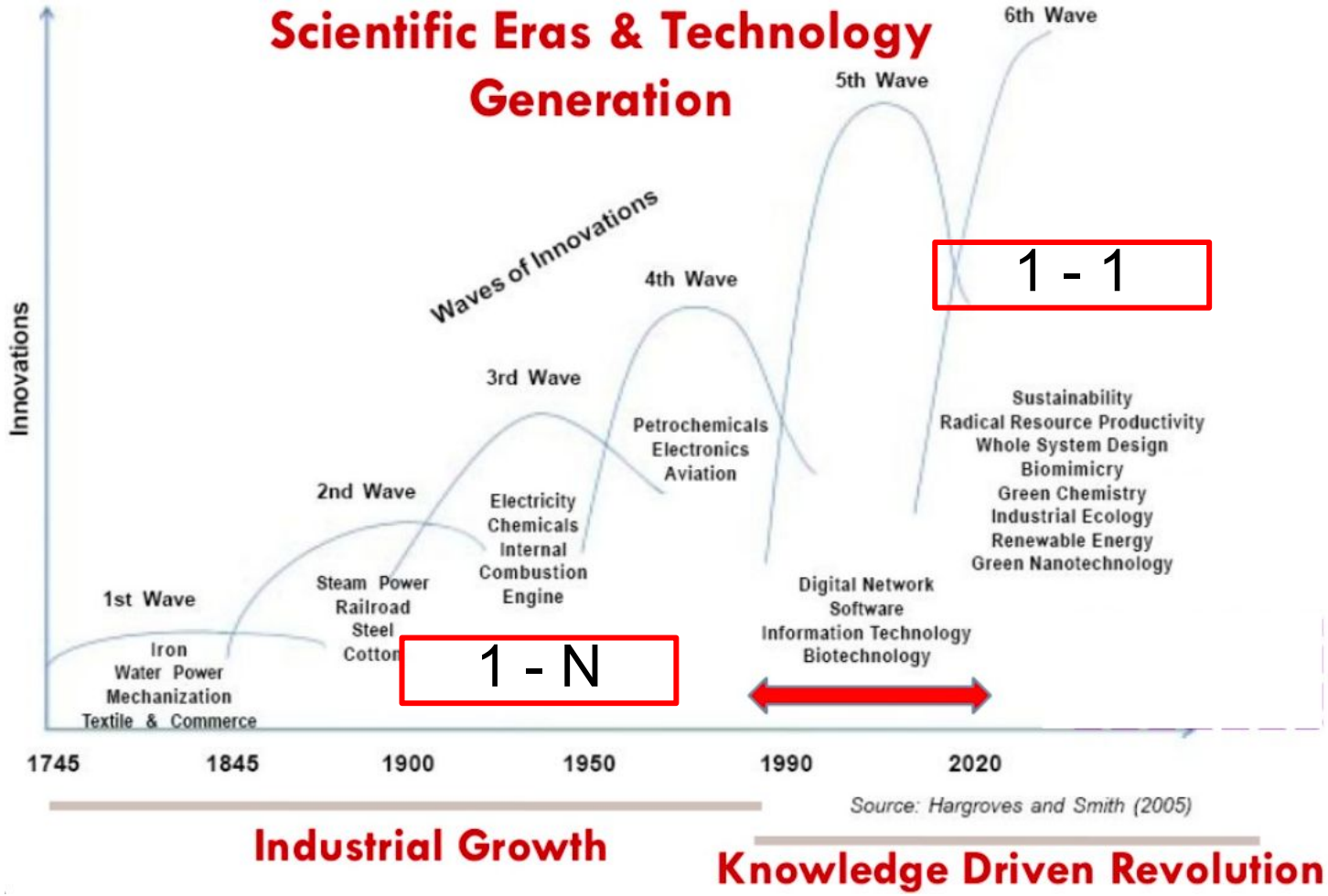
GMIC, Beijing 2017

Personalized Service

Give right **products** to right **consumers** at the right **context** (time and location)!

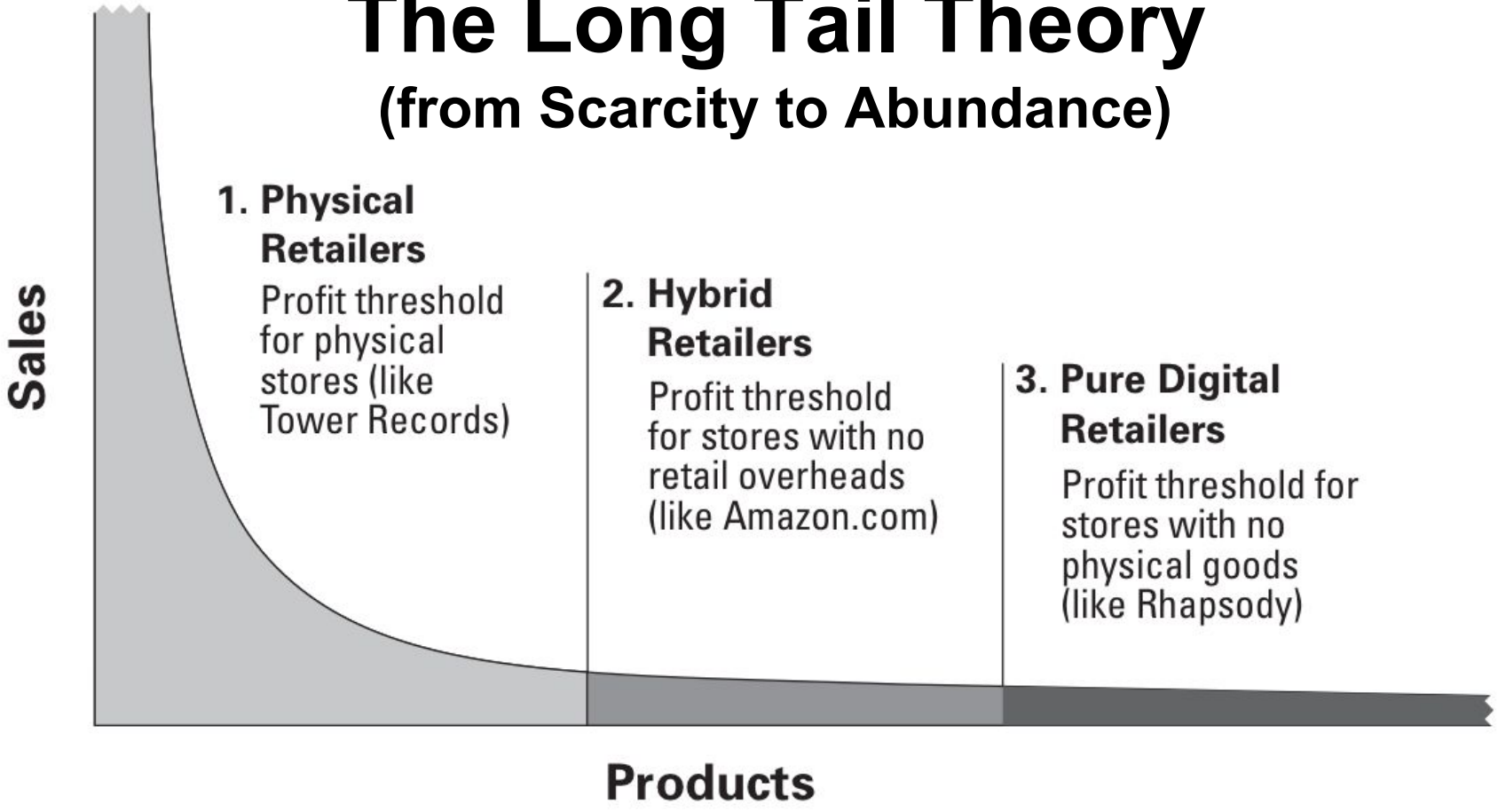
In **2-sided Marketplace** (buyer-seller)

- Gwynnie Bee: Personalized Fashion
- Simply Hired: Personalized Music
- Smule: Personalized Jobs
- Bayessoft: Personalized Medicine


Scientific Eras & Technology Generation
6th Wave
5th Wave
Waves of Innovations
4th Wave
1 - 1
3rd Wave
Innovations
Sustainability
Radical Resource Productivity
Whole System Design
Biomimicry
Green Chemistry
Industrial Ecology
Renewable Energy
Green Nanotechnology
Petrochemicals
Electronics
Aviation
2nd Wave
Electricity
Chemicals
Internal
Combustion
Engine
1st Wave
Steam Power
Railroad
Steel
Cotton
Digital Network
Software
Information Technology
Biotechnology
1 - N
Iron
Water Power
Mechanization
Textile & Commerce
1745
1845
1900
1950
1990
2020
Source: Hargroves and Smith (2005)
Industrial Growth
Knowledge Driven Revolution

The Long Tail Theory

(from Scarcity to Abundance)



Personalized Service

Data + Analysis

Searching
(make it convenient to help customer find what they know they want)

Recommending
(enrich their experience by pushing new products to them)

Types of Recommenders

- Editorial and Hand Picked
  - Favorite List
  - Essential Items
- Popularity-based
  - Top-N
  - Recent Hot
- Tailored to Individual Users (This is our focus)

Formulation

- C = {Customers}
- S = {Items}
- Utility Function u: CxS -> R
  - R - set of ratings
  - Each rating is ordinal:

    e.g., 0-5 Stars, Acceptance Probability [0-1]

Utility Matrix

	Song 1	Song 2	Song 3	Song 4
User A	0.9	0.5	?	?
User B	0.8	0.6	0.9	0.3
User C	0.2		1.0	0.2
User D	0.2	1.0	0.9	

Key Steps

- Collect Known Ratings for Matric
  - Derive the ratings
  - Incorporate other data
- Predict unknown ratings from the known ones
  - Define a model and parameters
  - Choose the Utility function & Optimize it
  - Use the fitted model to make predictions
- Evaluate the Performance
  - Metrics to measure success

Utility Matrix

	Song 1	Song 2	Song 3	Song 4
User A	0.9	0.5	[0.8]	[0.2]
User B	0.8	0.6	0.9	0.3
User C	0.2	?	1.0	0.2
User D	0.2	1.0	0.9	?

Step 1. Gathering Data

- Explicit
  - Ask people to directly rate products
  - Hard or expensive
- Implicit
  - Learn ratings from user behaviors, e.g., purchase, likes, comments, added to shopping cart…
  - Structured or unstructured
  - Contexts (time and location)

Step 2. Make Predictions

- Challenges
  - Utility Matrix is sparse
  - Cold Start: (1) New Items; (2) New Users
- Main Approaches
  - Content - based
  - Collaborative Filtering
  - Latent Factor Models
  - Hybrid Solutions

Step 3. Evaluate Performance

- Goal
  - User Engagement & Satisfaction)
  - Revenue & Profit
- Metrics
  - Accuracy
  - Coverage
  - Novelty (Diversity)
  - Relevancy (Serendipity)

Schedule

1. **Content-based Recommenders**
2. **Collaborative Filtering Recommenders**
3. **Latent Factor Recommenders**
4. A Statistical Framework to Unify Them All
5. Recent Developments