Accounting	**Accounting** is the systematic process of recording, summarizing, and reporting a company's financial transactions. It provides data to evaluate performance and decision-making. **Example:** After BPR, accounting data helps measure how much process cost and efficiency improved.
Accounts Payable (A/P)	**Accounts Payable** represents money a company owes to its suppliers for goods or services purchased on credit. Efficient management ensures timely payments and strong vendor relationships. **Example:** Ford's reengineered A/P process eliminated invoices by using database matching.
Accounts Receivable (A/R)	**Accounts Receivable** is the money customers owe a firm for delivered goods or services. Faster collection improves cash flow and liquidity. **Example:** Online billing systems after BPR shorten A/R cycles.
Assets	**Assets** are resources owned by a business that provide future economic benefits, such as cash, equipment, or patents. **Example:** In BPR, replacing manual machines with software creates longer-term digital assets.
Automation	**Automation** means using technology to perform tasks with minimal human input. It increases speed and accuracy but only counts as true reengineering if the underlying workflow changes. **Example:** Installing self-service kiosks automates ordering but becomes BPR when the workflow itself is redesigned.
Automation vs Digitization vs Digitalization	**Automation** lets machines do work automatically; **Digitization** converts analog data to digital; **Digitalization** redesigns processes using digital tools. **Example:** Scanning paper invoices (digitization) vs building an online approval system (digitalization).
Break-even Point	**Break-even Point** is where total revenue equals total cost, showing when a business starts to profit. Lowering fixed or variable costs moves it sooner. **Example:** BPR can reduce processing costs, lowering the break-even threshold.
Benchmarking	**Benchmarking** compares a company's processes or performance to industry best practices to spot improvement gaps. **Example:** Comparing IBA's fee-payment process with a fully automated university portal.
Bottleneck	**Bottleneck** refers to any stage that slows overall workflow due to limited capacity. Removing it increases throughput. **Example:** In BPR, automating a single approval step can remove a critical bottleneck.
Budgeting	**Budgeting** is planning future income and expenditures to control financial performance. **Example:** BPR outcomes are evaluated against planned budgets to ensure savings are realized.
Business Model	**Business Model** describes how a firm creates, delivers, and captures value from customers. **Example:** Moving from dine-in to mobile-ordering is a business-model innovation driven by BPR.
Business Process	A *business process* is a structured set of coordinated activities or tasks that an organization performs to deliver a specific product or service to customers or achieve an internal goal. It defines *how* work gets done across people, departments, and systems — converting inputs (like information, materials, or requests) into valuable outputs. A business process usually cuts across multiple functions (e.g., marketing, finance, operations) and can be measured, standardized, and redesigned through Business Process Reengineering (BPR) to improve cost, speed, and quality. **Examples:**

	1. **Order Fulfillment**: Receiving an order → Processing payment → Packaging → Shipping → Delivery. 2. **Recruitment Process**: Job posting → Candidate screening → Interviews → Offer → Onboarding. 3. **University Admission Process**: Application submission → Document verification → Fee payment → Enrollment confirmation.
Business Process Reengineering (BPR)	**Business Process Reengineering** is the fundamental rethinking and radical redesign of processes for dramatic gains in cost, quality, service, or speed. It means rebuilding workflows from scratch, not merely automating them. It uses information technology to radically redesign business processes, reject old rules and invent new ways of working. It's an all-or-nothing approach aimed at step-change results (not "a little better each quarter"). Outcomes are uncertain—by definition you are doing something new. No modest/gradual changes: if you only tweak, you're doing continuous improvement (TQM/Lean), not BPR. **Example:** Ford removed invoices entirely; Starbucks' app removed the POS step.
Buying Debt	A promise to repay; **buying debt** means purchasing someone else's receivable (you pay now, collect later with interest/discount). Faster, cleaner order-to-cash reduces how long your receivables behave like "mini debts." In Ford A/P To-Be, removing the vendor invoice and matching PO + receiving in a database accelerates payment eligibility and slashes clerical load.
Capital Expenditure (Capex)	**Capital Expenditure** is one-time spending on long-term assets such as machinery or software. Smart firms balance Capex (upfront) and Opex (recurring) when planning reengineering.
Cash Flow	**Cash Flow** tracks inflows and outflows of cash in a business, showing liquidity and operational health. **Example:** Shorter processing cycles after BPR speed up cash inflows.
Centralization vs Decentralization	**Centralization** keeps decision-making at the top; **Decentralization** distributes it to lower levels. **Example:** BPR often moves toward decentralization to empower cross-functional teams.
Change Management	**Change Management** is guiding and supporting people through organizational transitions so new processes are adopted successfully. **Example:** Training staff after reengineering ensures smooth implementation.
Competitive Advantage	**Competitive Advantage** is a unique strength that lets a company outperform rivals—through cost, quality, or innovation. **Example:** Starbucks' loyalty app is a competitive advantage created by digital reengineering.
Consistency	Same inputs under the same rules give the same outputs (quality + timing stability). Consistency ensures identical results for identical inputs, preserving brand trust and quality. Starbucks' digital order specs removed verbal variation; every drink matched standards. Consistency is the foundation for scaling operations. **Example:** Your To-Be design pushes the exact drink spec (size, milk, flavor) to the barista screen—less voice mis-communication → more consistent drinks and fewer remakes.
Core Competency	**Core Competency** is a firm's distinctive capability that provides sustained advantage. **Example:** Tesla's battery design or Starbucks' supply-chain reliability are core competencies BPR should strengthen.

Cost-Benefit Analysis	**Cost-Benefit Analysis** compares total expected costs with total expected benefits to judge if an investment is worthwhile. **Example:** Always performed before starting a reengineering project.
Customer Relationship Management	**Customer Relationship Management** involves managing interactions with existing and potential customers using data to improve satisfaction and loyalty. **Example:** Starbucks' loyalty app is a CRM tool integrated through digital BPR.
Data	Facts used by the process (order items, size, price, payment status).
Depreciation	**Depreciation** is the gradual loss of value of a fixed asset over time due to use or obsolescence. It spreads the asset's cost over its useful life. **Example:** A coffee machine's value decreases each year; BPR may replace such assets with durable software solutions.
Digital Transformation	**Digital Transformation** integrates digital technologies across all business areas to change operations and value delivery. It enables new business models and efficiency. **Example:** BPR provides the process redesign framework, while digital transformation supplies the technology.
Digitization	Converting paper/manual data into digital form.
Digitalization	Using digital tools to redesign *how* work happens.
"Don't automate, obliterate"	Hammer & Champy (1993). It means: do not computerize a bad process; remove the step altogether if it adds no value.
Elasticity	**Elasticity** measures how responsive demand or supply is to changes in price, income, or other factors. **Example:** Coffee demand is price-inelastic—people still buy it even after a small price rise—so BPR efforts may target cost control instead of pricing.
Equity	**Equity** is the owner's residual interest after liabilities are subtracted from assets. It shows how much of the firm truly belongs to shareholders. **Example:** Efficient BPR that increases profits boosts retained earnings, raising equity.
Expenses	**Expenses** are the costs incurred in running a business to earn revenue—such as rent, wages, or utilities. **Example:** Reducing unnecessary process steps through BPR directly cuts expenses.
Flattening Hierarchy	Reducing management layers to speed decision-making.
Firm	**Firm** is an organization that transforms inputs like labor and capital into outputs such as goods or services. **Example:** BPR focuses on optimizing this transformation for higher efficiency.
Fiscal Policy	**Fiscal Policy** involves government taxation and spending to influence the economy. **Example:** Tax incentives on automation encourage companies to reengineer production lines.
Gross Domestic Product	**GDP** is the total value of all goods and services produced in a country within one year. **Example:** Firms invest in reengineering when GDP growth signals expansion opportunities.
Hierarchy	**Hierarchy** refers to the arrangement of authority levels within an organization. **Example:** BPR often flattens hierarchies to speed up communication and decision-making.
Idea	An idea is formed from real elements and their attributes — something you can apply, not just imagine. *Understanding* an idea means being able to use it properly to solve real problems.

Industry	**Industry** is a collection of firms producing similar goods or services. **Example:** The coffee retail industry includes Starbucks and Dunkin'; BPR compares performance across such peers for benchmarking.
Inflation	**Inflation** is the sustained rise in the general price level of goods and services over time. **Example:** Rising wages and input costs push firms to reengineer workflows to maintain profitability.
Innovation	**Innovation** turns new ideas into useful products, services, or processes that add value. **Example:** BPR depends on innovation to achieve measurable breakthroughs.
Interest Rate	**Interest Rate** is the cost of borrowing money or the return on savings, set by markets or central banks. **Example:** High rates discourage capital-intensive reengineering such as kiosk deployment.
Inventory	Stuff waiting to be processed or sold (beans, milk, cups… or even paid invoices waiting to go out). **Why "ideal inventory ~ 0" for services:** Waiting ties up cash and makes forecasts harder. Every item (like coffee powder or student application) has a "residence time" inside the system.You want inventory time to be as close to zero as possible — because money tied in inventory doesn't earn value until sold. The faster the process, the quicker money moves. **Example:** Your To-Be app decrements ingredients as orders are accepted, enabling timely replenishment and avoiding "stock-out at the counter" delays.
KPI	**KPI** is a measurable value showing how effectively a process achieves its objectives. **Example:** Wait time, cost per order, and customer satisfaction are KPIs tracked after BPR.
Law of Demand	When price rises, quantity demanded falls, *ceteris paribus* (other factors constant).
Lean Management	**Lean Management** promotes continuous, incremental improvement by eliminating waste of time, effort, and materials. **Example:** Lean focuses on gradual change, while BPR delivers radical redesign.
Liabilities	**Liabilities** are obligations a business owes to others, such as loans or accounts payable. **Example:** Streamlined payment systems through BPR can reduce liabilities and delays.
Line of Visibility	What the customer sees vs. backstage updates (inventory writes, staff screens). **Example:** In your To-Be Starbucks model, the moment the app confirms payment, the barista station receives the spec and inventory auto-updates—customer sees "order in progress," backstage systems do the heavy lifting.
Little's Law	WIP (Work in progress) = Throughput × Lead time. The number of units in the system equals how many you complete per hour times how long each stays in the system. If lead time is long at the same throughput, your WIP must be big (things are stuck). in practice, when you reduce wait/cycle at a bottleneck, lead time falls and WIP follows. **Example:** If Starbucks completes 120 orders/hr (2 orders/min) and average lead time = 6 min: $WIP = 2 \times 6 = 12 orders$ So on average, 12 customers are "inside" the system (ordering, waiting, or picking up).
Macroeconomics	**Macroeconomics** studies entire economies—growth, inflation, employment, and fiscal or monetary policy. **Example:** During economic downturns, firms reengineer to lower costs and remain stable.

Market Structure	**Market Structure** describes how competition functions in an industry—perfect, monopolistic, oligopoly, or monopoly. **Example:** Coffee retail shows monopolistic competition; BPR helps differentiate through efficiency.
Merit Function	A single score that blends what you care about (e.g., α·Cost + β·Time − γ·Throughput + δ·Errors). Lower is better if you weight costs positively and benefits negatively (or vice-versa—just be consistent). **Example:** In your Starbucks case, you'd weight "cost per transaction," "total service time," and "automation ratio." Your doc already reframes KPIs toward cost/automation; a merit function just rolls them into one dial you can optimize.
Microeconomics	**Microeconomics** examines decision-making by individuals and firms within markets. **Example:** BPR acts at this micro level, improving a company's internal processes and resource allocation.
Mission	**Mission** defines why an organization exists—its purpose or reason for being. **Example:** "Deliver premium coffee experiences efficiently." BPR realigns workflows to fulfill the mission.
Monetary Policy	**Monetary Policy** is how central banks control money supply and interest rates to stabilize the economy. **Example:** Cheap credit encourages investment in automation and process redesign.
Opportunity Cost	**Opportunity Cost** is the value of the next best alternative forgone when a choice is made. **Example:** Spending on kiosks means losing the chance to train staff; BPR weighs such trade-offs.
Operating Expenses (Opex)	**Operating Expenses** are ongoing costs of daily operations—rent, salaries, utilities. **Example:** BPR cuts Opex through automation and workflow simplification.
Organizational Culture	**Organizational Culture** is the collective behavior and values within a firm. **Example:** A flexible culture encourages adoption of new BPR changes.
Parallel Processing	Sharing load across multiple resources to increase capacity.
Process	A *process* is a structured, repeatable sequence of interrelated activities or steps where inputs are transformed under defined rules into meaningful outputs. In simpler terms, it's the way work flows — how data, people, and resources interact to achieve a specific result. Every process has a clear start, end, and measurable outcome, and can be analyzed, improved, or automated through Business Process Reengineering (BPR). A series of **rules applied to data** that lead to a result. Every process can be broken into: the data it needs, the rules it applies, the output it creates. **Examples**: **1. Starbucks Order Flow**: *Order → Pay → Prepare → Pick-up* — the same process can be redesigned using a mobile app and real-time inventory updates to remove delays. **2. University Fee Payment**: *Student submits form → Accounts verify → Payment processed → Receipt issued* — reengineered into an online system to reduce manual approvals. **3. Loan Application Process**: *Apply → Verify → Approve → Disburse* — automated via workflow systems for faster turnaround.
Profit	**Profit** is the surplus remaining after expenses are subtracted from revenue. **Example:** Reengineered processes boost profit margins even without price increases.
Recession	**Recession** means two or more consecutive quarters of negative GDP growth. **Example:** During recessions, firms pursue BPR to cut costs and sustain operations.

Return on Investment (ROI)	**ROI** measures profit relative to the cost of an investment. =`incremental profit / capex` **Example:** Automation improving transaction volume increases ROI by using the same assets more efficiently.
Revenue	**Revenue** is income from a company's main operations. **Example:** Faster customer service after BPR leads to higher sales revenue.
Rules	If/then conditions that move work forward (e.g., "start drink only after payment OK").
Scarcity	**Scarcity** means limited resources versus unlimited wants, forcing choices. **Example:** Scarcity drives BPR to decide which processes deserve automation first.
Six Sigma	**Six Sigma** is a statistical method to minimize defects and variability in processes. **Example:** Used after BPR to maintain consistent quality.
Stakeholders	**Stakeholders** include everyone affected by business actions—employees, customers, suppliers, investors, and regulators. **Example:** All stakeholders gain from efficiency improvements under BPR.
Strategy	**Strategy** is a long-term action plan to achieve organizational goals using resources effectively. **Example:** BPR serves as a strategic initiative for transformative change.
Supply & Demand	**Supply and Demand** describe producer willingness to sell and consumer willingness to buy at given prices. **Example:** Rising demand for mobile orders triggers BPR toward digital, app-based systems.
Sustainability	**Sustainability** means meeting current needs without compromising future generations. **Example:** Eco-friendly BPR processes reduce waste and energy use.
Tactics	**Tactics** are short-term actions that execute a larger strategy. **Example:** Adding express pickup counters is a tactical step in reengineering.
Takt Time	Takt Time $= \frac{\text{Available Production Time (per shift)}}{\text{Customer Demand (per shift)}}$ It represents the pace you must maintain to meet demand without backlogs. If your process takes *longer* than takt time, customers queue; if it's *shorter*, resources sit idle. **Example**: Available barista time = 3600 s/hour, Demand = 150 orders/hour. Takt Time $= \frac{3600}{150} = 24s/order$. If each drink currently takes 40 s, you're behind demand and need more capacity or simplification.
Timestamps	Time markers at each step (`queued_at, ordered_at, paid_at, started_at, ready_at, picked_at`). They let you measure wait vs. work time and prove which step is the bottleneck. Timestamps reveal where time is lost—queue lengths, idle phases, rework loops. Analyzing them quantifies bottlenecks and guides resource allocation. Without data, improvements remain guesses; with data, they become measurable and defensible. **Example:** Your report compares total time (12–15 min As-Is) vs. ~6–7 min To-Be after removing cashier tasks and manual POS friction. Those numbers come from instrumenting steps with time data.
Total Quality Management (TQM)	**TQM** is a continuous, organization-wide effort to improve quality. **Example:** Unlike TQM's gradual approach, BPR creates one-time radical redesign.
Utility	**Utility** is the satisfaction or benefit gained from consuming a product or service. **Example:** Faster service increases customer utility and loyalty.

Value Added & Non Value Added	VA (Value Added) steps change the product or service in a way the customer would pay for (e.g., brewing coffee). NVA (Non Value Added) steps add no customer value but consume time/resources (waiting, re-entry, approvals). BPR aims to eliminate or automate NVA tasks.
Value Chain	**Value Chain** is the sequence of activities that add value from raw input to final delivery. **Example:** BPR examines each step to remove non-value-adding activities.
Variance Analysis	**Variance Analysis** compares planned results with actual outcomes to identify gaps. **Example:** Used post-BPR to evaluate improvement effectiveness.
Vision	**Vision** expresses where the organization aims to be in the long term. **Example:** BPR aligns redesigned processes with the vision, such as becoming "the fastest service chain."

Data-Driven Process Engineering

A process only moves forward if the required data for the next step exists. (No data → process stops.) Reengineering means tracing the process through its data flow instead of its departments. "Rules" are just the functions we optimize — deciding which data must be checked, changed, or skipped. **Example**: Instead of fixing the entire enrollment office, check what data each step needs (core courses taken, fees paid, ERP ID). Then show only valid course options.

Process	**Business Process**
is a repeatable sequence of steps or actions performed to achieve a specific result.	is a coordinated set of interrelated processes within an organization aimed at achieving a business goal or delivering value to customers.
Scope is narrow — focuses on a single function or activity.	Scope is broad — spans multiple departments or functions in the organization.
To complete a specific task efficiently.	To fulfill an organizational objective like serving customers, managing finances, or delivering products.
Typically owned by an individual, team, or department.	Owned at the organizational level and linked to business strategy.
Evaluated by task efficiency (time, accuracy, or output quality).	Evaluated by business outcomes (profit, customer satisfaction, market share).
BPR may automate or simplify a single process.	BPR redefines and integrates multiple processes for end-to-end transformation.
"Payment verification" — confirming if a fee is received correctly.	"Student fee payment" — includes verification, recording, receipt generation, and confirmation to student.

Efficiency	**Productivity**
Doing a task in the best possible way using minimum resources (time, cost, effort).	The overall output produced relative to the inputs used (a measure of quantity of work done).
Focuses on *how well* resources are utilized.	Focuses on *how much* output is generated.
Ratio of useful output to total input — emphasizes *quality and resource optimization*.	Ratio of total output to total input — emphasizes *volume and performance level*.
To reduce waste and minimize time, cost, or errors while maintaining output.	To increase the amount of goods or services produced.
BPR improves efficiency by redesigning workflows to use fewer steps and resources.	BPR improves productivity by enabling greater output through automation and faster processes.
Qualitative (how smoothly or effectively something is done).	Quantitative (how much is done within a given time or resource).
A barista serves the same number of customers using 20% less time after process redesign.	The same barista serves 30 more customers per hour after adding a self-ordering app.

Capex (Capital Expenditure)	**Opex (Operating Expenditure)**

One-time spending to buy or build long-term assets such as buildings, machines, or software.	Regular, recurring expenses needed to keep the business running daily.
Investment → creates an asset that provides benefit for years.	Consumption → cost incurred repeatedly to operate those assets.
Shown on the balance sheet and depreciated over time.	Shown on the income statement and deducted in the same year.
Buying self-order kiosks, developing a new POS app, constructing a store.	Paying staff wages, utility bills, payment-gateway fees, app maintenance.
Long-term strategic decision; requires budgeting approval.	Short-term operational decision; part of monthly expenses.
BPR introduces tech (Capex) only when it cuts Opex or increases throughput enough to recover cost quickly.	After BPR, reduced Opex proves that the Capex investment was worthwhile.
Instead of heavy Capex on kiosks, Starbucks adopted a lighter Capex mobile-app model that delivered similar HR savings and faster ROI.	Lower Opex followed—fewer cashiers, fewer paper slips, shorter queues.

Microeconomics	**Macroeconomics**
Works at firm level — how wealth is generated (efficiency, productivity, innovation).	Works at country level — how wealth is distributed (taxes, government spending).
Study of individual decision-makers—households, firms, and specific markets.	Study of the entire economy—national output, inflation, unemployment, policies.
Small scale ("micro")—how one store, product, or customer behaves.	*Large scale* ("macro")—how the whole country or sector performs.
What price should a café charge? How many workers should it hire?	What is Pakistan's inflation rate? How fast is GDP growing?
Prices, costs, supply–demand, profit, competition.	Fiscal policy, monetary policy, trade balance, interest rates.
Optimize resource use within a single business or market.	Maintain overall economic stability and growth.
- Starbucks adjusting coffee price when milk cost changes. - A firm deciding reorder points for inventory.	- SBP raising interest rates to control inflation. - Government increasing spending to fight unemployment.
Demand–supply curves, elasticity, cost–benefit, marginal analysis.	GDP, CPI, fiscal deficit, monetary supply.
BPR acts at the *micro* level—redesigning how one firm operates.	But micro changes must fit macro limits—tax laws, wage rates, inflation.
Reframing KPIs and cost-per-transaction are *micro* levers inside macro realities such as card-fee rates or economic inflation.	

Micro creates wealth, pays taxes, macro redistributes wealth through society. If micro dies, there's no wealth to distribute.

Production Sector	**Financial Sector**
Creates tangible goods or direct services.	Creates value by moving and allocating capital efficiently.
Direct — something you can use or consume.	*Indirect* — enables others to produce or consume.
Physical or digital products (coffee, cars, software).	Money, credit, investment instruments.
Satisfaction from using the product/service.	Liquidity, convenience, access to credit or returns.
Starbucks brewing and serving coffee → direct value.	A bank approving a loan or processing a payment → financial facilitation.
Production needs finance to fund raw materials, pay staff, or scale operations.	Finance depends on production to generate demand for money flow.
Production creates consumables	enables production and consumption through capital
process optimization lies in production/service	real-time payment flow touches the finance side
factories and service providers generate it.	Banks redistribute existing wealth;

- Finance gives *access* to money but doesn't create goods you can consume.

- 2008 crash showed financial value can be artificially inflated; real economies depend on production.
- Firms or people create value by producing what society needs or wants.
- Example: Teachers create skill value; IBA creates value by bringing teachers and students together.
- Real value comes from **production** (goods/services), not financial trading alone

As-Is Process	To-Be Process
The *current* way a process operates, showing all existing steps, delays, and manual work.	The *redesigned* future state after applying BPR—simpler, faster, tech-enabled.
To document reality and identify bottlenecks.	To visualize and plan improvements for implementation.
What happens *now*.	What *should* happen after reengineering.
Often manual, paper-based, with redundancies.	Streamlined, automated, data-driven.
Owned by current departments following traditional roles.	Cross-functional ownership encouraging collaboration.
Customer orders at counter → Cashier enters in POS → Payment → Name called for pickup → Manual inventory update.	Customer orders & pays via mobile app → System auto-pushes order to barista → Real-time inventory → Queue shortens; cashier mostly removed.
Identify inefficiencies and pain points.	Design radical improvements for cost, speed, and customer satisfaction.

Full Form	Core Responsibility	Example (Starbucks / BPR Context)
CEO *Chief Executive Officer*	Sets overall vision, strategy, and direction for the organization; makes final decisions balancing long-term growth vs. short-term costs.	Approves whether to invest in a new mobile app (Capex) now or delay to preserve cash; signs off on BPR goals.
COO *Chief Operating Officer*	Oversees daily operations, workflow efficiency, staffing, and process performance.	Ensures smoother order flow, reduced queue time, and higher throughput per store after BPR.
CTO *Chief Technology Officer*	Manages technology strategy—platform selection, system integration, and technical reliability.	Chooses whether to build kiosks, mobile apps, or hybrid systems; ensures data integration and uptime.
CFO *Chief Financial Officer*	Handles financial planning, Capex/Opex allocation, ROI, and profitability metrics.	Evaluates the payback period of automation, monitors cost per transaction, and funds reengineering initiatives.
CHRO *Chief Human Resources Officer*	Manages people strategy—recruitment, reskilling, morale, and organizational culture. Focuses on training, redeployment and morale	Designs training programs to reskill cashiers for digital roles after the mobile-order rollout.
CMO *Chief Marketing Officer*	Leads marketing, brand, and customer demand generation; connects promotions to operational capacity.	Plans loyalty-app campaigns and promotions based on store readiness and production capacity post-BPR.

Wait time	at a step `= start_at − queued_at`	time i was idle in line before anyone touched my work.
Service time	(a.k.a. cycle time for the step) `= finish_at − start_at`	hands-on time.
Lead time	(end-to-end for the unit) `= final_finish − first_queued`	door-to-door time the customer experiences. The shorter it is, the happier the customer.
Throughput	`= units completed per hour` (or per minute) `= orders / hour`	how fast the belt spits out finished units (capacity to grow revenue)
Utilization	`= Arrival rate / Capacity`	Load on station
Incremental profit per period	`= (Δthroughput × margin) − Δopex`	
Payback	= `capex / incremental monthly profit`	In months

Automation	= % of steps done by system	(maintainability, scalability)
Errors	= remakes/100 orders	(quality, waste)
COST_TXN	= total cost per order	(wages + payment fees + shrinkage…)

Problem Type	Reengineering Action	Result Metric to Show
Long Waits	Timestamp + app pre-order	Lead Time ↓
Manual Errors	Encode rules + validation	Error Rate ↓
High Cost	Automation / layout change	Cost / Txn ↓
Slow Throughput	Remove bottleneck / parallelize	Orders / hr ↑
Staff Resistance	Training + redeployment	Adoption ↑
Low Visibility	Dashboards + data capture	Decision Speed ↑

Starbucks Reflection Criteria:

- `order_id` (1..N)
- `arrival_time` (in seconds from opening; or just 0,30,60,… for every 30s)
- `service_cashier` (sec)
- `service_barista` (sec)
- `start_cashier = MAX(arrival_time, finish_cashier_of_prev)`
- `finish_cashier = start_cashier + service_cashier`
- `start_barista = MAX(finish_cashier, finish_barista_of_prev)`
- `finish_barista = start_barista + service_barista`
- `lead_time = finish_barista − arrival_time`
- `wait_cashier = start_cashier − arrival_time`
- `wait_barista = start_barista − finish_cashier`

To-Be Scenarios:

- **App pay**: set `service_cashier = 0` (or 2–3s if you want a quick ID check).
- **Parallel barista**: create `barista_A` and `barista_B` columns and assign every other job to A/B (or “shortest queue first”).
- **ETA staggering**: increase the spacing in `arrival_time` for app orders to reduce clumps.

Case Study – Starbucks:

- measurement = timestamps for order/pay/start/finish/pickup
- bottleneck = barista; app reduces cashier time, smooths arrivals, pushes clean specs
- spreadsheet = two stations with MAX() logic; scenario: app pay (cashier ~0), ETA staggering, add 2nd barista at peaks
- merit = weights on cost/lead/throughput/errors/automation → To-Be wins
- ROI = extra orders/hour × margin – opex change, divided by app capex → payback in months

Reengineering Ideas:

1. Add QR code ordering — view menu & pay digitally.
2. Separate counters for Dine-in and Takeaway.
3. Start drink prep immediately after digital order confirmation.
4. Use a digital screen to show order status.
5. Optional: Geolocation-based app predicts when you’ll arrive and times the drink accordingly.
6. Loyalty cards (wallets) collect behavioral data and give pre-paid value — useful for analytics and cash flow.

Constraints Discussed:

- Adding staff or machines increases CAPEX (capital cost).
- Tech also increases CAPEX but lowers OPEX (operating cost).
- Growth must repay the added cost: BPR = 3+1 objectives → Cost, Efficiency, Productivity + Growth.

Two Merit Functions (for Starbucks example):

1. Minimize waiting time.
2. Minimize total time spent inside Starbucks.

Wallet concept: Customers preload money → Starbucks already gets cash before sale. This improves cash flow and builds loyalty.
Data: Knowing customer habits allows predictive preparation and personalized offers.

Case Study - University fees / enrollment:

- units = student-course selections and fee status updates
- bottlenecks = manual verification and exception handling
- reengineering = *rules first* (eligibility by completed pre-reqs + due fees must be "OK") so bad choices never enter the system
- spreadsheet = treat each "approval step" like a station; remove the ones the rules eliminated
- merit = error rate weight higher (registrar cares), lead time for student schedule, staff-hour cost; To-Be scores lower merit by eliminating exceptions

Case Study - Reading:

- Don't "automate" an outdated process — obliterate it if the world has changed.
  (E.g., Ford's old invoice-matching system was fine in its time, but redundant after databases.)
- A good process should:
  a. Produce the same output every time (consistency).
  b. Clearly define what happens next (no ambiguity).
  c. Use data and timestamps for tracking.

Merit Function (1)

The merit function helps compare multiple process designs (e.g., As-Is vs To-Be) on a single numeric scale that blends time, cost, quality, and automation. A weighted merit function combining cost, lead time, throughput, and error rates was developed. The To-Be process produced a merit score nearly half that of the current system, confirming measurable improvement across all key criteria. $M = \sum_{i=1}^{n} \quad (w_i \times N_i)$

- w_i= Weight for criterion i (the importance you assign).
- N_i= Normalized score for that criterion (0 = best, 1 = worst).

1. **Select criteria:** Pick 3–6 measurable factors.
   - Cost / transaction
   - Average service (lead) time
   - Throughput (orders/hour)
   - Error rate / remakes
   - Automation / digitization level
2. **Normalize values:** Convert everything to a 0–1 scale.
   - For "Lower is Better" (cost, lead, errors):
     $$N = \frac{Value - Best}{Worst - Best}$$
   - For "Higher is Better" (throughput, automation):
     $$N = \frac{Best - Value}{Best - Worst}$$

   this way, all criteria are "bad when large". easy to sum with weights. 0 means best, 1 means worst.
3. **Assign weights (sum = 1):** ex cost is 0.35 etc.
4. **Compute Merit:**
   Multiply each normalized score by its weight and add them up.
   The smaller the final value M, the better the design. The smaller To-Be means it provides higher throughput and lower cost for almost the same investment

Merit Function (2)

$$F_i = E_i + C_i + P_i$$

- E= Efficiency
- C= Cost
- P= Productivity

We want lower total F, meaning better performance.
Example target:

$$C_1 = 0.9\,C_0,\ E_1 = E_0 \pm 0.01E_0,\ P_1 = P_0$$

So, cost down 10 %, efficiency roughly same, productivity maintained.
The Merit Function is used to compare As-Is vs To-Be — whichever gives lower F (aggregate value) is the better process.

- It's not about minimizing everything blindly — the goal is an optimal balance.
- Some processes can only reduce cost; others can also increase efficiency.
- BPR is always relative — you measure improvement in at least one of cost, efficiency, or productivity.

TESLA / MANUFACTURING PROCESS ANALOGY

Electric-vehicle (EV) manufacturing requires synchronized operations — design, battery assembly, and quality testing. Any delay on one station halts the entire production line.
As-Is Process

- Separate work cells for body, battery, and electronics assembly.
- Manual material movement using forklifts.
- Delayed quality checks after full assembly → high rework cost.

Bottlenecks

- Battery module alignment and final inspection queues.
- Cycle Time: 14 min/unit; Demand requires 10 min/unit.

To-Be Process (Reengineered)

1. Introduce Automated Guided Vehicles (AGVs) for parts movement.
2. Inline quality sensors perform continuous checks instead of post-assembly inspection.
3. Parallel sub-assembly for battery modules.
4. Real-time dashboards monitor throughput per station.

Quantitative Effects

Metric	As-Is	To-Be
Cycle Time	14 min	9 min
Defect Rate	5 %	1.5 %
Utilization	95 %	82 % (healthy)
Throughput	4 units/hr	6.5 units/hr

Key Learnings

- Vertical integration (owning battery production) improves control.
- Real-time data reduces decision lag.
- Investment heavy but amortized through higher throughput.

By embedding sensors and automating material flow, Tesla achieved real-time visibility and eliminated waiting between assembly and inspection. Average cycle time fell 35 %, defect rates dropped by 70 %, and overall productivity improved. The To-Be design demonstrates how industrial reengineering balances capital investment with sustained operational savings.

Ford Accounts Payable (the classic case)

As-Is (North America)

- A/P had ~500 people.
- Management first planned a 20% reduction by "rationalizing" and adding computers (e.g., scanning paper invoices to email them). That's automation, not reengineering.
- Benchmarking: Mazda did the same function with a tiny team—Ford realized the problem wasn't "people quality" or random causes; the process design was wrong.

The old 3-document match:

1. Purchasing issues a Purchase Order (PO)
2. Receiving creates a receiving document when goods arrive
3. Vendor sends an invoice
4. A/P matches all three (up to 14 data fields). If anything mismatched, payment went on hold, a clerk investigated, and documents got regenerated. Huge delay, huge labor.

To-Be (the reengineered design)

- Prevent mismatches instead of fixing them later.
- Invoiceless processing. Eliminate the supplier invoice entirely.
- Purchasing enters the order in an online database.
- Receiving looks up the outstanding PO in the same database and posts the receipt.
- The system performs a simple automatic match on just three keys (e.g., part number, unit of measure, supplier code). If it matches, the computer prepares the check automatically.

Result: ~75% staff reduction in A/P and much faster, cleaner payments. Ford didn't "scan invoices faster." They abolished the invoice. That's the difference between automation and reengineering.

<u>MBL Insurance (application processing)</u>

As-Is

- An application went through ~30 steps, 5 departments, 19 people.
- Minimum time ~24 hours; typical turnaround 5–25 days.
- Actual hands-on time ~17 minutes (everything else was waiting/hand-offs).
- Each department did a thin slice of work; no one owned the whole outcome.

To-Be

- Give one person all the information needed to finish most cases end-to-end.
- Use expert systems and knowledge bases to support less-experienced staff.
- Create a Case Manager role—one person owns the application and pulls help only for tough cases (senior underwriter, specialist) when needed.

Result: ~4 hours processing (typical 2–5 days turnaround), and twice as many applications processed.

What this means

Organize around the outcome (approved policy), not around departmental tasks. IT supplies the knowledge; the case manager supplies ownership.

Why is Reengineering considered "radical" and not "incremental"?

Because it challenges the very existence of each step rather than optimizing it. Ford's A/P example didn't automate invoice typing—it abolished the invoice. BPR asks "If we were designing this today, from scratch, what would we do?"

Why is identifying a bottleneck crucial before automation?

Because improving a non-bottleneck step does not raise total system output. If a barista can make only 60 drinks/hour, no level of cashier speed will exceed 60 drinks/hour. Bottleneck identification ensures investment targets the true constraint, maximizing ROI.

What economic concepts justify the need for process reengineering?

- Scarcity: Limited resources demand better allocation.
- Opportunity Cost: Time wasted on redundant work could be used for growth tasks.
- Productivity & Efficiency: Central goals of microeconomics, achieved through smarter processes.
- Economies of Scale: Reengineering often standardizes operations, reducing cost per unit.

Why Reengineer a Process?

Because processes get outdated over time. They were designed for the conditions of the past, but when society, technology, or customer needs change, old methods stop being efficient. So, BPR aims to find a way to do the same job better, faster, and cheaper.

- High error rates. Work bounces around, data is re-entered, so mistakes creep in.
- Unanswered customer queries. Customers can't see status; staff don't have one source of truth.

- Slow product development cycles. Work moves department-to-department; coordination delays pile up.
- Traditional automation hasn't delivered big wins. Firms "computerize" old steps instead of changing the steps.
- Old job designs and org structures (pre-computer era) still exist. They were built for paper and hierarchy, not for networks and databases.
- The old mindset optimizes efficiency and control at the department level, not end-to-end outcomes.

Seven Principles of Reengineering (with simple examples)

1. Organize around outcomes, not tasks.
   Have one person/team own the full outcome.
2. *Example:* A "case manager" handles the entire insurance application end-to-end instead of 19 people each doing 2 minutes.
3. Let the people who use the output perform the process.
   Push work to where the value is consumed.
   Examples:
   - Equip frontline teams with expert systems so they can do checks themselves (fewer approvals).
   - Let customers perform some tasks (self-service repair status, returns).
4. Subsume information processing into the real work.
   Don't have a separate "data entry" step; the person doing the work records it in real time.
   Example: The receiving clerk posts receipt data directly into the shared system—no later retyping.
5. Treat geographically dispersed resources as if centralized.
   Use networks and shared databases to act like one virtual team: coordination and scale without bureaucracy.
6. Link parallel activities instead of integrating their results later.
   Coordinate related work while it is happening, not after.
   Example: Engineering and manufacturing collaborate during design, not after hand-off.
7. Put decision points where the work is performed; build controls into the process.
   Flatten hierarchies. Give doers the rules + authority so they don't escalate everything upward.
8. Capture information once—at the source.
   No duplicate data entry. Enter it once, share it everywhere. Reduces delay, errors, and overhead.

"Think Big" (what changes when you reengineer)

When you redesign a process, many other things must change with it:

- Job designs (from narrow tasks to end-to-end roles),
- Organization structure (fewer layers, cross-functional teams),
- Management systems and metrics (process KPIs, not departmental tallies),
- Responsibilities and skills (training, new career paths),
- Recruitment and promotion (hire for ownership and systems thinking),
- Leadership is critical: vision, strong backing, and willingness to face resistance.
- Expect discomfort—people dislike big change; you need commitment, consistency, and (the doc's words) a touch of "fanaticism."
- Imagination must guide the tech—do not let the tool dictate the process; let the desired process pull the right tool.