Operations & Business Process Management

Prof. Apurva Jain
MSIS 503

1. Identify Flow
   1.1 Elements of Flow
   1.2 Performance of Flow
   1.3 Process Discovery

Session 2

2. Automate Workflow
   2.1 Characteristics for automation

   2.2 Value and Waste

   2.3 RPA

Next
The discussion board post due

3. Forecast Demand
4. Balance Capacity

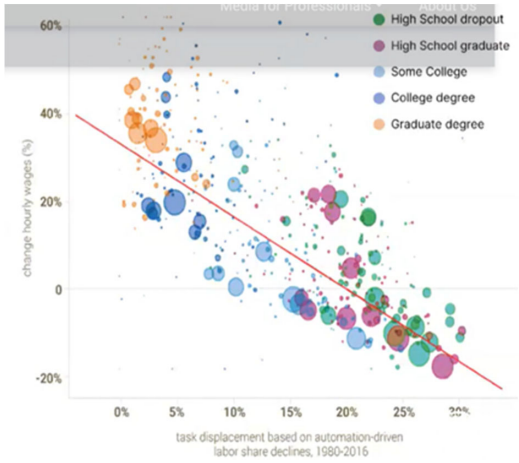
Where are we…(flow of the class)

What is the flow?: Flow-units, Resources, Activities,

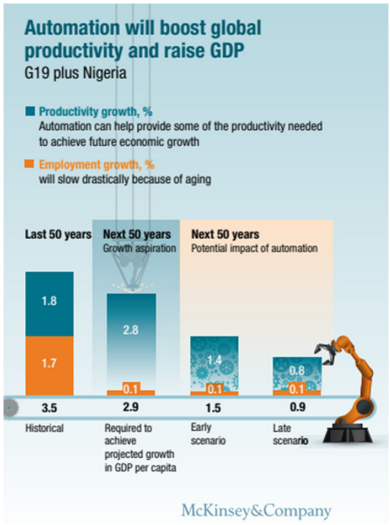
What are the symptoms?: Cost, Time, Quality

Activities	Flow-units	Resources
Which tasks to automate? Which activities add value?	How many flow-units? How to manage a variety of units?	What type of resources? How many resources?

Automation's Impact



Acemoglu & Restrepo, 2022



Automation in Call Centers

Call/Contact centers provide a useful example to consider automation of activities.

1960s-70s: Automatic Call Distributors, automated toll-free numbers

1980s: Interactive Voice Response (IVR) Systems

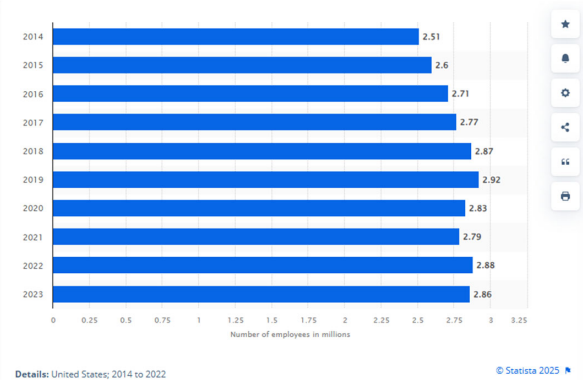
1990s: Email responses, Early chatbots

2000s-10s: Data-Driven Forecasting, Workforce Planning
Intelligent Chatbots (NLP), Real-Time Agent Assistance

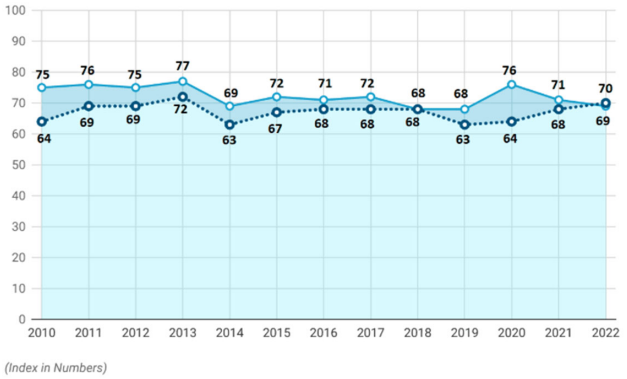
Now: LLM-powered bots, Speech and Sentiment analysis,
Omnichannel support, Predictive routing

How has it changed employment and performance?

Performance over the Years



Number of contact center employees in the United States from 2014 to 2023
(in millions)

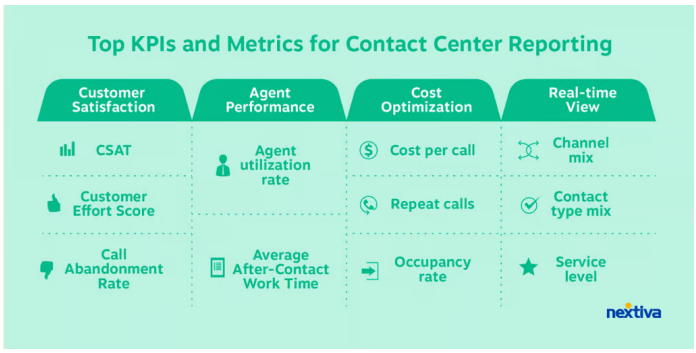


Global Contact Center Satisfaction Index

Satisfaction Index in Numbers

— Private sector
··· Government

Performance Metrics



Call Center Metric	Industry Standard
Average Handle Time (AHT)	6 minutes and 3 seconds
Average Speed of Answer (ASA)	80% of calls within 20 seconds
First Contact Resolution (FCR)	70% to 75%
Call Abandonment Rate	12% to 20%
Service Level	80% of calls answered in 20 seconds
Occupancy Rate	85% to 90%
Net Promoter Score (NPS)	Above 20%
Customer Satisfaction Score (CSAT)	75% to 85%
Agent Turnover Rate	30% to 45%

How was your recent call center interaction?

They had disabled “press 0 for operator”

After being on hold for long, “You are in the wrong place, I will need to transfer you.”

Could you please repeat your information?

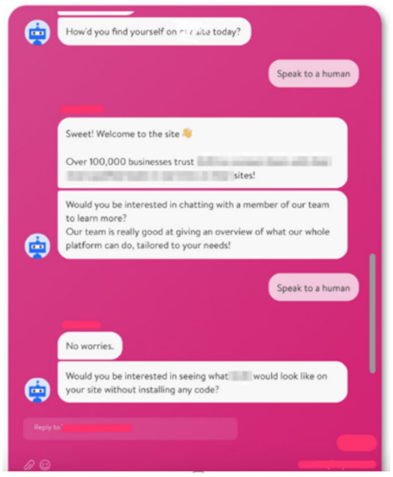
I have already rebooted. “Could you reboot again?”

I would like to cancel.

Channel-pivoting: call later or email.

Chatbot swears at the customer.

Chatbot offers a car for a dollar.



Why is it still not fully automated?

Types of Activities

Activity or Task Design.
a task is “the unit of a work activity that produces an output”

In our work, can we identify different types of tasks we do and judge if they are good candidates for automation?

Classification of Activities from the perspective of Automation

Activity or Task Design.
a task is “the unit of a work activity that produces an output”

A basic classification:
Manual, Coordination, Information gathering, Decision-Making

Based on the capabilities required:
Sensory perception: Low….to…High degree

Cognitive capabilities:
Retrieving Information….optimization….creativity…….Coordination with multiple agents

Language processing: Reading……Editing…..Writing

Social and Emotional Capabilities: Sensing…..Understanding…..Influencing

Physical capabilities: Motor skills……Mobility

Characteristics Needed for Automation

A scorecard for selecting candidate tasks for automation

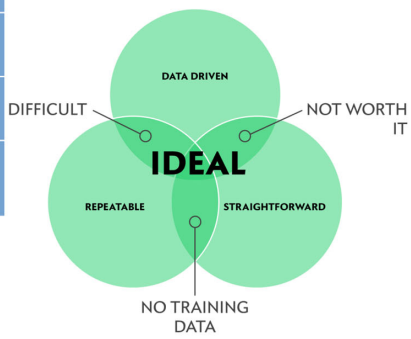
Automation Fit		**Level of Effort**		**Value Created**	
Feature	*Score*	*Feature*	*Score*	*Feature*	*Score*
Consistency		Development hours		Hours Saved	
Complexity		Development Cost		Dollars Saved	
Documentation				Revenue Impact	
Discretion/ Expertise Required				Other value	
Homogeneity of data required					

Ref: MIT Sloan Journal

Characteristics Needed for Automation

	SUITABILITY OF RPA	LOW	MEDIUM	HIGH
DATA	Nature of inputs	Physical	Digital Manual entry	Digital Automatic entry
	Volume of processed data	Low	Medium	High
COMPLEXITY	Number of software used by the process	Low	Medium	High
	Frequency of exceptions	High	Medium	Low
STABILITY	Repetitiveness of the process	Low	Medium	High
	Frequency of changes in the process	High	Medium	Low
HUMAN FACTOR	Frequency of human errors in the process	Low	Medium	High

https://newcomp.com/blog/robotic-process-automation-for-data-science/



Other perspectives on Task Automation

Vulnerability to AI-based automation

High vulnerability	Low vulnerability
Short time-horizon tasks (minutes to hours)	Long time-horizon tasks (days to months)
Abundant, accessible training data	Limited or difficult-to-acquire training data
Low employee bargaining power	High employee bargaining power
Limited inherent value to human performance	High inherent value to human performance
Tasks can be done entirely remotely	Tasks require physical presence or dexterity

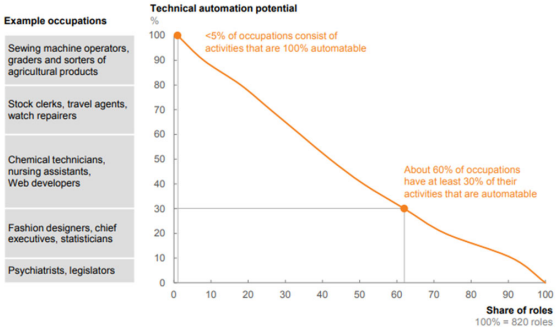
Ref: Commonplace.org

Partial Automation

Exhibit E2

While few occupations are fully automatable, 60 percent of all occupations have at least 30 percent technically automatable activities

Automation potential based on demonstrated technology of occupation titles in the United States (cumulative)[1]



1 We define automation potential according to the work activities that can be automated by adapting currently demonstrated technology.

SOURCE: US Bureau of Labor Statistics; McKinsey Global Institute analysis

Ref: McKinsey

What do you think about the impact of AI on the availability of jobs in the next 5 years?

Frontiers of Automation: Human-AI Collaboration

..For example, AI alone proved to be the most successful at detecting fake hotel reviews, with an accuracy rate of 73%, compared with 69% for humans and AI together and 55% for humans alone. …for example, classifying images of birds — a task that requires specialized expertise. Humans alone achieved 81% accuracy, and AI alone achieved 73% accuracy, but the combination hit 90% accuracy.

Redefining processes is better than reassigning tasks: “We found humans excel at subtasks involving contextual understanding and emotional intelligence, while AI systems excel at subtasks that are repetitive, high-volume, or data-driven.”

Humans on Human-AI teams sent 23% fewer social messages, creating 60% greater productivity per worker and higher-quality ad copy. In contrast, human-human teams produced higher-quality images, suggesting that AI agents require fine-tuning for multimodal workflows.

This study found no significant performance differences between groups that received AI-generated adaptive feedback or static expert feedback during structured statistical tasks in a higher education field setting.

Our findings indicate that LLM assistance enhances employees’ creativity by providing cognitive job resources, especially for employees with high (vs. low) levels of metacognitive strategies.

Jagged Frontier: AI only sometimes improves performance, and when it does, the improvement is more for people at the lower end of the skills spectrum.

Humans' decision to accept or reject suggestions from AI can lead to severe consequences in high-stakes AI-assisted decision-making scenarios. Results show that human self-confidence, not their confidence in AI, directs the decision to accept or reject AI suggestions.

Who is fearful? Sector-wise, entry-level employees perceive the least risk, whereas manufacturing professionals and senior service sector employees are more apprehensive.

Engagement: A quantitative study involving surveys from organizations using ChatGPT reveals positive correlations between AI use and employee engagement and productivity.

Intelligence: Across the board, the AI users exhibited markedly lower neural activity in parts of the brain associated with creative functions and attention. Students who wrote with the chatbot’s help also found it much harder to provide an accurate quote from the paper that they had just produced.

Frontiers of Automation: Physical-Digital Integration

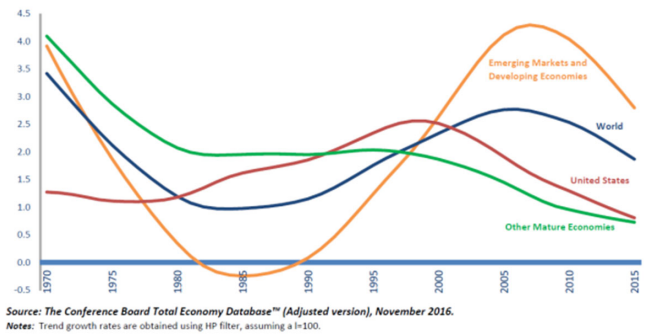
Current Examples:





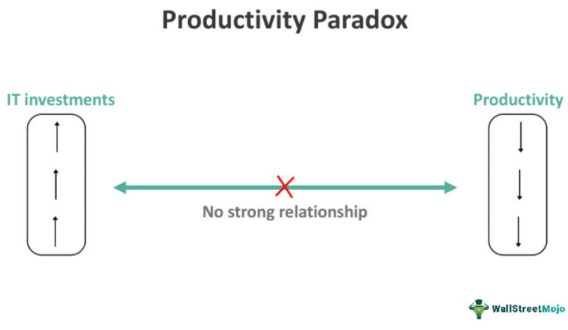

Productivity Paradox: Will it Repeat?

A



Source: The Conference Board Total Economy Database™ (Adjusted version), November 2016.
Notes: Trend growth rates are obtained using HP filter, assuming a l=100.

Figure 2. Smoothed Average Annual Labor Productivity Growth (Percent) by Region



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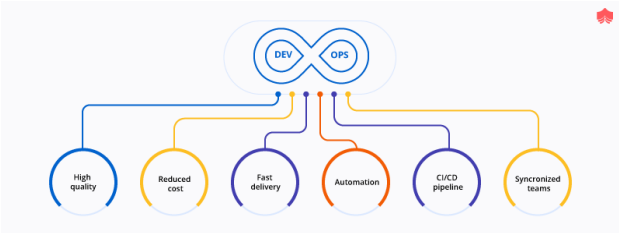
Bill Gates, once famously put it: “The first rule in any technology used in a business is that automation applied to an efficient operation will magnify the efficiency. The second is that automation applied to an inefficient operation will magnify the inefficiency”.

In process improvement, a time-tested way to think about the efficiency in task times is through the lens of Value/Waste.
This is based on Lean ideas.

Lean in Different Contexts

BOEING

"Virginia Mason's president Mike Rona found himself on an airplane seated next to John Black who had brought TPS to Boeing. Rona was intrigued by Black's description of TPS and believed it was just the tool VMMC needed."……an HBS report



Virginia Mason

Lean is Continuous Improvement ***of the Flow of Value through all activities.***

For each activity: Does it add value or is it waste?

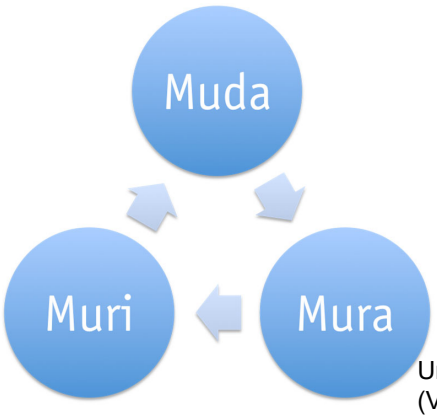
Value Added Activity
- Transforms or shapes material or information or people
- And it's done right the first time
- And the customer wants it

Non-Value Added Activity – Necessary Waste
- No value is created, but cannot be eliminated based on current technology, policy, or thinking
- Examples: project coordination, regulatory, company mandate, law

Non-Value Added Activity - Pure Waste
- Consumes resources, but creates no value in the eyes of the customer
- Examples: idle/wait time, inventory, rework, excess checkoffs

Lean recognizes three different sources of waste

Wastefulness
(non-value-adding activities)



Overburden
(Bottlenecks)

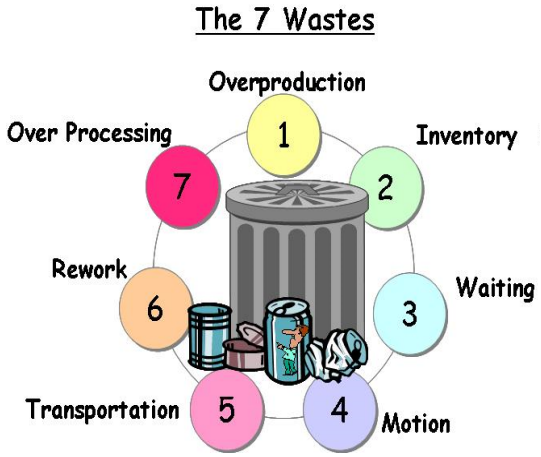
Unevenness
(Variability)

GEMBA ACADEMY Catalog Solutions Pricing Enterprise Resources Search Gemba Academy

The 7 Deadly Wastes

For details, watch:
https://www.gembaacademy.com/school-of-lean/seven-deadly-wastes/seven-deadly-wastes-2016/seven-wastes-overview-1

Identify Seven Types of Wastes (Muda)



Identifying Seven Types of Wastes

Remembering seven wastes:
TIMWOOD WORMPIT

In an office, re-entering data, extra copies, excessive reporting. _____

In an office, walking to/from copiers, filing, fax. _____

In an office, a report requires extensive re-writing before a meeting. _____

In an office, order entry errors, design errors, change orders, invoice errors _____

Identifying Seven Types of Wastes

Remembering seven wastes:
TIMWOOD WORMPIT

In software development, programming bugs. _____

In software development, extra features. _____

In healthcare, moving patients between different labs. _____

In healthcare, searching for relevant patient history. _____

Key word mapping
Capability description hover text
3-5 sentences project detail collection
Budget validation
Timeline information
Stakeholder (decision maker) information
Additional document upload
desire characteristic / diversity certification selection
Preference supplier selection
Specific information requirement
Custom question adding field
Auto-reminders to suppliers and buyers
Request help from the sourcing team
Supplier proposal template
Pre-bid Q&A board
Flowchart pop-up button
Step-by-step guidance and instruction
Mobile device application
Historical buying record analysis and suggestion
Audio or video instruction
Type-in content analysis and auto-suggestion

Proposal	Impact	Sourcing TAT	Process Efficiency	Cost	Customer Experience
Incorporate **spending limit** <=$40K	Automate PR - PO process – Skip approval process	↓	↑	↓	↑
Approval Chain - Delegation	Improves speed, Quality and accountability	↓	↑	↓	↑
AI powered – **Historical data** used by the requester	Accelerates time to fill & Sourcing receives accurate info.	↓	↑	↓	↑
AI powered **smart sample templates** per services selected	Accelerates time to fill & Sourcing **receives accurate info.**	↓	↑	↓	↑
Live Chat option to seek assistance from a sourcing POC depending on budget, project etc.	Accelerates time to fill & **less churn b/w customer and sourcing team**	↓	↑	↓	↑
Incorporate **budget validation** as a compliance check to ensure right budget is utilized	Convenient for future sourcing, finance & spend analysis	↓	↑	↓	↑
Service **Start and end date, total spend** selection	Accelerates time to fill, **feeds into PR-PO line**, reduces the overall churn and decreases TAT	↓	↑	↓	↑
Supplier compliance validation	Directs the customer to choose a compliant supplier upfront.	↓	↑	↓	↑
Alternative supplier options – combination of **small/women** owned business along with 2 large suppliers	Diverse supplier options and Accelerates sourcing time to fill	↓	↑	↓	↑
Inhouse ERP system to manage risk and avoid external applications	Improved efficiency, more control	↓	↑	↓	↑
Incorporate catalog pricing list - locked for 90 days	Customer could view the pricing info upfront during supplier selection	↓	↑	↓	↑
Enable sourcing automation for >$1M spend	Accelerates time to fill and sourcing TAT	↓	↑	↓	↑

A Moment of Reflection

Please share a quick story about a waste and how it can be improved with your neighbor / team.

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   Lean thinking: Value
   Seven Wastes
   2.3 RPA
   Intro. to UiPath

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Robotic Process Automation (RPA)

Robotic process automation (RPA) is a software technology that makes it easy to build, deploy, and manage software robots that emulate humans actions interacting with digital systems and software. Just like people, software robots can do things like understand what's on a screen, complete the right keystrokes, navigate systems, identify and extract data, and perform a wide range of defined actions.

https://www.uipath.com/rpa/robotic-process-automation

Gartner

Emerging Tools/Terminology

Computer Use (CU):
Anthropic and OpenAI, computer use (CU) tools interact with the user interface in a manner similar to RPA.

Agentic Automation:
Major RPA providers have released AI agent builder capabilities and are discussing how their broader automation platforms can assist the orchestration and choreography of AI agents.

Business Orchestration and Automation Technologies (BOAT):
RPA packaged with other technologies like IDP, LCAP, iPaaS and BPA into their broader automation platforms.

Ref: Garner.com

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Process automation is a long-running goal;
There is always more to automate.

It is better to be the one to know what to automate and how to do it than the one whose work is being automated.

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