

When Does Automation Actually Eliminate the Operator?

Seventeen times a technology was supposed to remove a skilled worker. Six times it did. The difference between those groups is not what most people assume.

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THE MISTAKE

The usual model of automation is a subtraction. A machine takes over the work a person was doing, so the person is no longer needed. Count the tasks, subtract the ones a machine can do, and you have your answer.

History does not cooperate with this.

Consider three cases. In the first, banks installed more than 400,000 machines literally named after the job they were supposed to replace. Between 1988 and 2004 the number of tellers needed to run an average urban branch fell from twenty to thirteen. Teller employment did not fall. It rose, from roughly 500,000 to 550,000 across the three decades to 2010.

In the second, an occupation that employed two percent of all working American women simply ended. When a city's telephone exchange converted to automatic dial switching, hiring of young switchboard operators dropped by as much as eighty percent, effectively at the moment of the cutover.

In the third, a machine took over something far harder than either. Loan officers assessed character, circumstance and local conditions, and decided whether to lend. That is judgment, of the situated, relational, hard-to-write-down kind. It was automated anyway. Today, two credit-scoring model families sit inside more than ninety percent of mortgage, credit card and auto lending decisions.

Same era, same country, three completely different outcomes. Task difficulty does not explain the pattern. Something else does.

WHAT SEPARATES THEM

Across the cases, the operator was eliminated when three things became true at once.

- The system could tell whether it had succeeded.
 - The system had the information it needed in order to act.
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- The automation absorbed everything the customer was actually paying the operator for.

The first condition does most of the work. It is the strongest recurring pattern in the record, and it is not a law, because the sample is seventeen cases and history has a way of producing exceptions. But nothing else in the study explained as much.

Where the outcome of an action can be checked cheaply and soon, even judgment becomes much more exposed to automation. Where it cannot be checked, the human survives as the checker, no matter how good execution becomes.

Consumer credit underwriting is the clearest demonstration. Before automation, an application took days or weeks and cost something on the order of \$500 in labor. FICO released its first general-purpose credit score in 1989. Fannie Mae and Freddie Mac followed in the mid-1990s with automated underwriting systems, and told the entire mortgage origination market which scores to use. Cost per application fell to close to nothing. Decision time went to seconds. Human review survives for exceptions and the largest loans.

Why here and not elsewhere? Because a loan either repays or it does not, and you find out within a couple of years, across millions of cases. The loop closes. The industry could watch its own decisions being graded at enormous volume, which meant it could improve them. FICO's own description of what changed is the useful one: the algorithm let lenders decide consistently and also monitor how much better their decisions had become. Consistency and measurement.

It also helped that the necessary information already existed in standard form at three credit bureaus, and that two dominant buyers had the power to make everyone use it.

So the popular framing, that machines can execute but people must judge, does not survive the evidence. The line that actually predicts the outcome sits somewhere else. It runs between judgment whose results get scored and judgment whose results do not. What has proved durable is unscored judgment, meaning decisions whose consequences are diffuse, delayed, unattributable, or one of a kind.

WHY THE OPERATOR USUALLY SURVIVES

Three mechanisms account for most of the survivals.

The machine took only part of the job

The ATM automated cash handling superbly. Cash handling was one input to a product whose other input was proximity. Customers were also paying for a bank near their office. Making the first input cheaper let banks buy more of the second, so branches in urban areas rose forty-three percent, and the tellers came with them. The remaining work was refilled with sales and relationship tasks, which paid better.

Then the smartphone arrived and absorbed proximity. Once the branch itself became optional, branch networks contracted and teller employment entered the decline that had been predicted forty years earlier. The technology that finished the job came from an unrelated industry that nobody in banking was tracking as an automation threat.

The practical lesson is a change of question. Do not count how many of a person's tasks have been automated. Write down everything the customer is still paying that person to provide, and check which items remain uncovered.

The human still holds information the machine cannot get

Computer-aided design did reduce the drafter. It did not do so by replacing drafting with software alone. It did so by letting engineers and architects perform the work themselves, which is the Bureau of Labor Statistics' own explanation for the occupation's long decline. The task moved upstream, into the person who already held the specification.

The same shape appears in machining, where the cut became automatic while setup, fixturing and programming became a higher-skilled specialism, and in translation, where the first draft became free and a post-editing role absorbed the work. In each case, the operator function survived even where the operator title did not. The person who supplies the specification is doing the part that was always hardest.

This outcome is not benign for the people in it. Translators kept their headcount and lost much of their rate. Survival in employment statistics and survival in income are different things, and the first is measured far more often than the second.

The automation produced more actions than anyone could supervise

Programmatic advertising automated the media buy completely. Price discovery, placement and execution all went to machines. Employment in the buying chain did not collapse, because automating the buy multiplied the number of auctions, formats, exchanges, fraud vectors and attribution problems, and every one of those needed somebody watching it. Ad operations, trading desks, verification and measurement specialists all appeared where a buyer used to sit.

This is worth holding onto, because it is the default outcome for any technology that raises throughput by orders of magnitude. Automation that dramatically increases the volume of action tends to increase the demand for verification of action.

WHAT REAL ELIMINATION LOOKS LIKE

Six roles in the study genuinely ended. Switchboard operators. The hot-metal and prepress trades. Photographic process workers. Elevator operators. The standard-case consumer lending decision.

The prepress numbers are worth seeing, because they show an entire craft ecosystem going down at once. Across the decade after desktop publishing matured, paste-up workers fell about seventy-five percent. Film strippers fell about seventy-five percent. Precision compositors and typesetters fell about fifty percent. One adjacent role, desktop publishing specialist, grew by roughly seventy-four percent and absorbed a fraction of the displaced.

≈90%

Decline in photographic process workers over a single decade, the fastest-declining occupation in the United States during that period. Meanwhile the number of photographs taken rose beyond counting. The volume exploded and the processing step ceased to exist.

What the eliminated cases had in common:

- The outcome was verifiable immediately. The call connects. The plate is correct. The print is developed. The loan repays.
- The decisive input was held by somebody else and could be handed straight to the machine. The subscriber already knew the number. The designer already had the file. The credit bureau already had the file.
- Nobody was buying a relationship or an accountability layer alongside the work.

There is a fourth feature, and it is the one that should make executives uncomfortable. In several of these cases the operator had mistaken access to expensive equipment for expertise. Trade typesetters owned hundreds of thousands of dollars of hot metal and font libraries. Photo labs owned chemical processing lines. Both believed they were selling craft. They were selling access to capital equipment, and when the equipment commoditized there was very little underneath the price.

One more accelerant shows up in the fastest cases. A single party controlled the switchover. AT&T decided. The print shop owner decided. Fannie Mae and Freddie Mac decided on behalf of an entire market. Where the decision belongs to one organization, the transition is abrupt. Where it requires millions of customers to change their habits, it takes a generation, and the intervening calm is long enough for a great deal of reassuring commentary to be written inside it.

THE PLATEAU TRAP

Which brings us to the most useful idea in the study.

In 1964, an executive vice president of AT&T was on record saying that despite nearly universal dial telephones and rising customer self-dialing, the company would still need about as many operators as it had, perhaps more. In the same period, a respected labor scholar wrote that the decline in telephone operators might be nearing its end, on the reasoning that no machine would ever handle person-to-person calls, collect calls, emergency calls, information calls, conference calls and coin-box long distance.

Every item on that list was eventually automated or made obsolete. But the observation underneath was not wrong. Operator employment really had plateaued. The forecast failed because nobody asked what was holding the plateau up.

A plateau in an automating occupation is not evidence of safety. It is a structure, and something is carrying the load. The useful question is always which single beam that is.

The teller plateau lasted thirty years and was carried by one beam, proximity. When the smartphone removed it, the decline arrived quickly and looked, from outside, like it had come from nowhere.

Load-bearing beams in the cases studied included customer habit, trust, liability, private information, exception handling, physical distribution, and simply an adjacent task the automation had not reached yet. Each of those can be removed by something other than the technology you are watching. In the travel agency case, the beam that broke first was not technological at all. Airlines began cutting agent commissions in the early 1990s, several years before Expedia existed. The revenue model was dismantled ahead of the substitute product, and the technology then arrived to a role that had already lost its funding.

FIVE QUESTIONS

These are the questions that would have produced the right answer in most of the historical cases. They apply to a role, a workflow, or a piece of software you are considering buying.

1 Can the system see whether its action worked?

If success is fast, numeric and attributable to the specific action that caused it, the human role is exposed, including the judgment parts. If the result arrives in five years, or cannot be traced back to a decision, expect a durable human verifier.

2 Does the system have the information required to decide?

If the decisive context still lives in an employee's head, a customer relationship, or an unwritten organizational norm, automation stalls at that boundary. The job then contracts to supplying the input, which is a real job and a smaller one.

3 What is the customer actually paying the human for?

List every component, not the obvious one. Separate the visible task from trust, accountability, advice, distribution, relationships and exception handling. The operator survives while any component stays uncovered and scarce.

4 What happens when the automation fails?

Frequent or expensive exceptions create durable human roles. But check the trend rather than the level. As the standard path automates, the definition of standard expands, and refuges built on today's exception rate have a poor track record.

5 What is protecting the role right now, and could something else remove it?

This is the plateau question, and it is the one people skip. Name the beam. Then ask which unrelated technology, pricing decision or regulatory change could take it out.

WHAT THIS MEANS FOR AI AGENTS

Run current autonomous systems through the same five questions and the picture is fairly legible.

Agents are already strong where they act against a clear specification and get fast feedback. Provisioning infrastructure. Running tests. Optimizing a campaign against a conversion number. Fraud detection. Pricing. Trading. These are the domains with a scoreboard, and the historical pattern says the scoreboard is what matters. Consumer underwriting became automatable in the 1990s for precisely this reason, and it was not a simpler problem than most of what agents are asked to do now.

Agents are weaker where the loop does not close. An agent can send a thousand emails and know only that they were delivered. It can ship code and know that the tests passed, which is a proxy for correctness rather than correctness. It can execute a strategy flawlessly without any way of learning whether the strategy was right. Where success depends on private context, ambiguous objectives, delayed or unattributable results, relationships, or somebody being liable for the outcome, the historical record predicts that a human stays in the loop as the verifier.

The wrong conclusion to draw is that these areas are permanently safe. The underwriting case exists specifically to rule that out. Loan officer judgment was the textbook example of expertise that could not be written down, and it went anyway once somebody found a way to score it.

The better question is not whether a machine can do the work. It is what would have to become observable, standardized or measurable before the human could leave the loop.

Sometimes that thing is technical. More often, in this study, it was not. It was a dominant buyer forcing everyone onto a standard input format. It was a regulator. It was a change in what customers were willing to accept. Fannie Mae and Freddie Mac did more to end manual mortgage underwriting than any algorithm did, and at the time it did not look like a technology story.

THE TAKEAWAY

The question worth asking is not whether a system can perform someone's tasks. It is whether the system can complete the entire loop those tasks sit inside.

If it can act, observe the result, learn from what it sees, reach the context it needs, and cover everything the customer was paying for, the operator is in real danger of disappearing. If any one of those pieces is missing, the operator usually moves rather than vanishes, and the useful work is figuring out where they move to and what that position is worth.

And when a role looks surprisingly resilient, treat that as a question rather than an answer. Find the load-bearing structure keeping the human there. Then ask how durable it really is.

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Drawn from seventeen cases, 1878 to 2026, including telephone switching, prepress and typesetting, photographic processing, bank tellers, travel agencies, drafting, machining, tax preparation, bookkeeping, translation, web development, media buying, book publishing, retail checkout and consumer credit underwriting. Employment figures from the US Bureau of Labor Statistics, the Federal Reserve, the IMF, and peer-reviewed research on the mechanization of telephone operation.

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