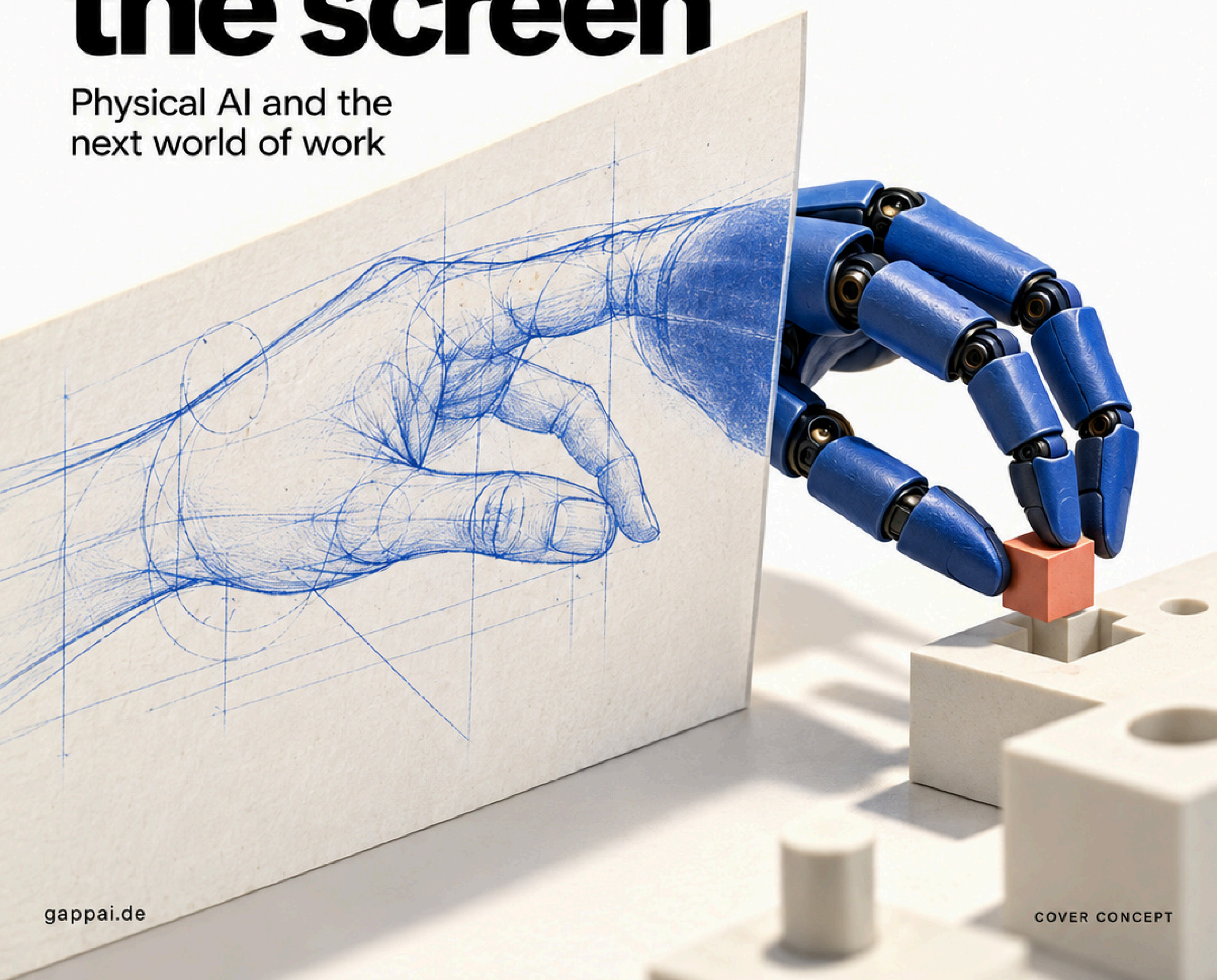
ISSUE 01
2026

GappAI Review

Physical AI, Robotics & the Future of Work

Beyond the screen

Physical AI and the next world of work



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COVER CONCEPT

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Our ambition: grow from engineering projects into licensing
and managed operations across robots, sites and sectors.

Strategic capital. Research funding. Industrial partnerships.

Concept visual

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BEFORE WE BEGIN

Before intelligence can act.

The future of work begins with what people know.

An opening perspective for our first issue.

Before a robot can do useful work, there is a task to understand, an environment to navigate and a person who knows what good work looks like. That is where we choose to begin.

Welcome to the first issue of GappAI Review. This publication brings questions from research into conversation with the people who build technology, run organisations and shape public life. Its focus is Physical AI: intelligence that must perceive, decide and act in the world we share.

Beyond the Screen asks what it takes to turn human expertise into reliable robotic capability. What can a demonstration teach? Which skills can transfer between machines? How should an operation measure usefulness? And who takes responsibility when the unexpected happens?

We want to examine these questions through research perspectives, operational experience and thoughtful disagreement. We will make room for what remains unresolved, distinguish proposals from demonstrated results, and identify GappAI's own perspective clearly.

Our interest is in work as people experience it: the judgement in a practiced gesture, the routines that keep a building running, the constraints on a factory floor, and the expectations attached to a public service. Technical capability matters alongside trust, economics and the people affected.

We begin with a conviction, and an invitation. Human expertise belongs at the centre of the discussion about intelligent machines. Help us ask better questions about what those machines should learn to do.

GappAI Review
Editorial Team

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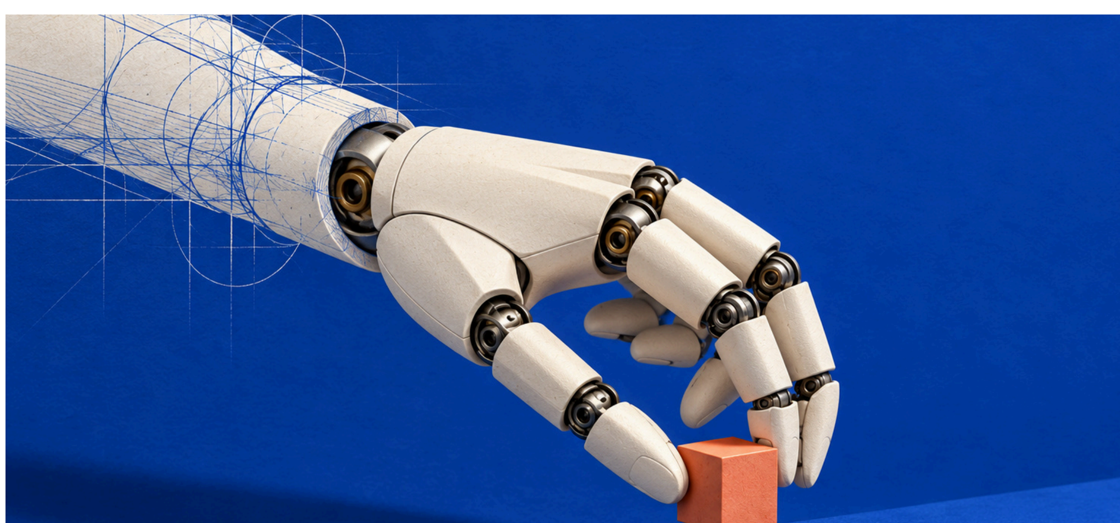

Tap an article to read. Concept illustrations.

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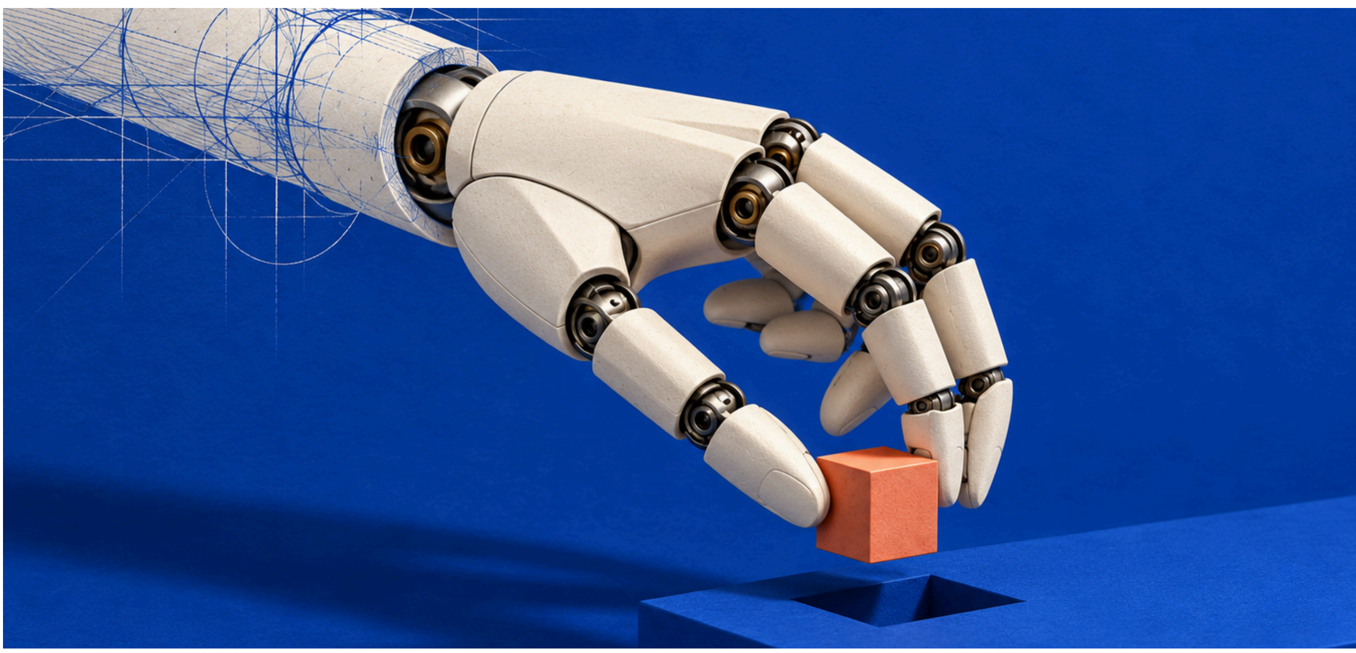
01 / THE BIG QUESTION

What makes a robot useful?

As AI moves beyond the screen, how should we judge success? A robot's real value appears in the difference it makes to the people around it.

GAPPAI REVIEW EDITORIAL TEAM



Concept illustration.

A robot lifts a glass from a table and places it on a tray. The movement is fluid; the demonstration is impressive. Now change the scene. Make the glass wet. Move the tray a few centimetres. Let someone walk past the table. Then ask a more demanding question: by the end of the day, has this job actually become easier?

This small thought experiment exposes a central question in robotics. There is considerable distance between completing a movement and taking responsibility for a task within defined boundaries. Perception, control, software connections, maintenance and human experience all help close that distance.

This is where the first issue of GappAI Review looks when it ventures beyond the screen. Physical AI, intelligence that perceives and acts in the physical world, opens possibilities from factories to hotels. To understand their value, we must examine what a robot can do alongside what the work actually requires.

Begin by defining the work

An organisation's wish to acquire robots can start a conversation. A better starting question is specific: which task, under what conditions, will reduce whose burden? Moving materials between two points sounds straightforward. Preparing the material, loading it at the right time,

THE IDEA IN FOCUS

A movement becomes useful when it changes the working day around it.

keeping the route available and confirming delivery are also parts of that job.

Before selecting a robot, define where the task begins and ends. Moving a box and delivering the correct box, undamaged and on time, to the station that needs it are different definitions of success. The second connects motion to an operational result. The same reasoning applies to hospital logistics or hotel linen flows, with the conditions of each setting assessed separately.

The people who do the work every day hold essential knowledge. They know which door sticks, when demand intensifies and which packaging tears easily. Reading a workflow only through management dashboards can leave out details that will matter greatly to automation.

Measure with a common yardstick

The US National Institute of Standards and Technology provides a practical illustration through its robotic assembly task boards. Defined activities include inserting parts, making connections, and routing belts and cables. Shared test arrangements help compare systems under more consistent conditions. They are not proof that a robot can complete an entire shift in any business. [1]

In an operational setting, this approach becomes an evaluation process that reaches beyond a single demonstration. How many attempts are needed? Does the result pass quality control? How often does a person intervene? How quickly does work resume? Must nearby employees stop their own tasks to let the robot continue?

Two systems can finish the same task in similar times while placing very different demands on their surroundings. If one needs frequent repositioning, employees' time becomes an invisible input. Robot runtime alone is therefore an incomplete measure. Preparation, waiting, intervention and rework belong in the calculation too.

A valuable skill: making limits clear

Uncertainty is ordinary in the physical world. An object may be missing; a corridor may be temporarily blocked. How a system behaves then matters as much as its performance when everything goes well. Reporting a problem clearly, stopping when appropriate and handing responsibility to an authorised person are behaviours that must be designed into the operation.

A delivery robot failing to reach its destination need not mean that the whole process has failed. If it alerts the right person, keeps the material traceable and avoids obstructing other work, the exception may be manageable. A delivery marked complete on a screen but never received, by contrast, can mislead every decision that follows.

Autonomy is a matter of degree. Completing certain tasks independently does not establish independence in every situation. Procurement

BEYOND THE SCREEN / CONTINUED

and pilot discussions should make clear which steps are automatic, remotely supported or dependent on someone being present.

The calendar matters as much as the calculator

Economic assessment extends beyond a device's price tag. Installation, changes to a building or production line, software connections, training, maintenance and fallback operations belong in the same account. Frequency matters as well. A task needed briefly each day has a different investment logic from a continuously repeated flow.

Turning saved time into business value requires a plan. Removing short waits scattered through a shift does not automatically create a usable hour. Time has practical value when it relieves a bottleneck, reduces late deliveries or creates room for more careful quality checks. Such benefits should be observed in a pilot, not presented as achievements at its outset.

A good pilot records the current operation first. Comparisons should involve the same task, similar demand and the same quality expectations. Success and stopping criteria agreed in advance make the final decision more honest. The right outcome may be wider deployment, a redesigned workflow or a different technical approach.

What changes in a person's day?

The European Agency for Safety and Health at Work, EU-OSHA, describes opportunities for advanced robotics to remove people from heavy or hazardous tasks, alongside challenges involving interaction, overreliance and work organisation. The technology's effect on employees must be considered together with how it is used. [2]

We therefore propose including employee experience in any assessment of usefulness. Is the physical load lighter? Are responsibilities clear? Does an employee know what to do when a system fails? Can a customer or guest reach a person when needed? These questions shape the service itself.

Some effective robots of the future may attract less attention. Materials arrive when needed. A workflow is interrupted less often. An employee can turn back to a customer during a busy moment. These are ways robotics could touch everyday life. They depend on thoughtful work organisation as well as technical capability.

Return to the glass on the table. Lifting it is an engineering achievement. Turning that movement into a dependable daily service requires a wider collaboration. What makes a robot useful is how much that collaboration improves what people can accomplish.

GAPPAI PERSPECTIVE

PUBLISHER'S VIEW

We believe robots should be assessed by the results of their work within a real operation. Our approach begins with employees' expertise, translates a task into robot capabilities that can be developed, and tests those capabilities under measurable conditions. Which task in your organisation could make the most meaningful contribution to people and service quality if it were automated well?

If you have a task to evaluate, let us discuss a suitable pilot scope. →

Numbered references link to sources. Reading guide: pp. 52–54.

02 / PEOPLE & WORK

Could a robot do my job?

A job title cannot tell us everything about a profession's future. Follow a hotel housekeeper's day, from moving supplies to making judgements and responding to people.

GAPPAI REVIEW EDITORIAL TEAM

Concept illustration. Fictional people and setting.

The hotel day below is an illustrative scenario, not an interview with a real employee or a report of a field observation. Research and historical examples are identified separately.

Early morning. A housekeeping trolley is being prepared with clean sheets, towels and cleaning supplies. The day's departures are known, and early arrivals are expected. One room needs preparing; a guest in another would like to sleep a little longer. A decision about priorities is needed before the working day has properly begun.

Could a robot do this job? The scene contains several questions. Moving the trolley, placing a towel, assessing a room and responding appropriately to a guest belong to one profession. Their technical requirements and human significance differ.

The US Department of Labor-sponsored O*NET occupational database lists tasks including moving supplies, cleaning rooms, replenishing stock, reporting found belongings and requesting repairs. We use this American classification to illustrate the variety inside a job title, not to measure employment in Germany. [1]

Morning: the time spent in corridors

In our example, the first need is to get clean supplies to the correct floor. Repeated transport between defined points may be suitable for

THE IDEA IN FOCUS

A job is a collection of tasks, relationships and judgements.

robotic support. Yet transport itself has several stages. Who prepares the supplies? Who loads them? How is the lift accessed? What happens if the recipient is in the middle of another task?

These answers matter as much as the robot's travelling time. If an employee has to stop work to locate or recover the system at every delivery, time saved in transport may disappear elsewhere. A useful implementation considers the whole flow, from preparation to confirmation of receipt.

Robot deliveries in hotels are not a new idea. In a 2018 company publication, Millennium Hotels & Resorts described AURA delivering water, towels and toiletries at M Social in Singapore. This dated account illustrates a particular service task assigned to a robot. It does not independently establish staffing effects, current use or net productivity gains. [2]

Before lunch: a hundred small differences

Enter our example room. A chair is out of place. A bedspread has fallen to the floor. A guest's possession lies on the bedside table. A maintenance problem is visible in the bathroom. Preparing the room involves noticing these differences as well as performing movements in sequence.

For robotics, tasks are not equally difficult. Planned cleaning on an open floor and handling a sheet whose shape changes with every touch are different problems. Recognising an object through a camera does not by itself determine the force needed to grasp it or where to put it. Handling a guest's belongings also requires explicit hotel rules.

The statement that a robot can clean a room therefore needs qualification. Which surfaces? What preparation? How much human support? Who verifies the quality? Automating one part does not establish that the whole room is ready for a guest. Final inspection and unexpected situations require their own arrangements.

Here, experience becomes visible. A skill acquired over years may not be expressed in a lengthy explanation: noticing a mark, remembering a missing item or passing the right information to maintenance. Making that knowledge explicit with employees can improve both automation preparation and training.

Afternoon: when service changes direction

In our scenario, a guest asks for help in the corridor. A flight has been delayed and they need a later checkout. Resolving the request connects room availability, a reception decision and the cleaning schedule. Another guest does not want to use a device and simply wishes to explain a problem to a member of staff.

BEYOND THE SCREEN / CONTINUED

How a future hotel handles such encounters is a service decision. Robot delivery and digital communication may be available, while a clear route to a person remains essential. Technology choices should account for guests of different ages and with different needs.

The employee's role may change too. Starting a task, reading system status, reporting an exception and explaining a process to guests can become new responsibilities. Introducing robots without allowing time for training risks adding another, less visible job to the existing one.

The real account at the end of a shift

EU-OSHA's work calls for examining psychosocial and organisational effects alongside opportunities to improve physical workloads. Less carrying or fewer repetitive movements may help; the new way of working may also create different pressures. [3]

In our example hotel, asking whether staff like a device would be insufficient. How often did they interrupt their work? How did physical strain change? Was support available when problems arose? Did saved time allow more attentive service, or were more tasks fitted into the same shift? These are concrete questions for a pilot evaluation.

Employment has no single guaranteed outcome either. Automating a task does not by itself show that a position will disappear. Work volume, service standards, hours and organisational decisions affect the result. Nor does claiming that every robot creates better jobs answer employees' reasonable questions.

Employees and their representatives, where present, should be involved before the implementation is complete. Which tasks will transfer, how new responsibilities will be recognised, and how training will work belong in the initial plan.

Reframing the question together

Look closely at one hotel employee's day and the future becomes more concrete. Certain tasks may be assigned to robots, other capabilities are still being developed, and people continue to make decisions. The boundaries depend on the system and its working environment.

Could a robot do my job should open the conversation. A further question for staff and management follows: which part of this work could technology take on so that we can do the rest of the day better?

At the end of the shift, the answer will be found in the employee's experience: how tired they feel going home, the attention they could give a guest, and how well they understand tomorrow's work.

GAPPAI PERSPECTIVE PUBLISHER'S VIEW

We believe hotel automation should begin by listening to employees' daily experience. Examining repeated transport, interruptions and failures in information handover together can reveal where robots and the digital steps supporting their work might help. A useful implementation aims to clarify responsibilities, reduce employees' burden and strengthen attention to guests. Whether these aims are met must be measured in practice.

Tell us which repeated task takes the most time in your hotel. →

Numbered references link to sources. Reading guide: pp. 52–54.

Your next breakthrough is already in your business.

The expertise in your people. The potential in your operations.

GappAI captures human know-how and engineers robot skills around the work your business knows best.

Let’s put your expertise to work.

Concept visual

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03 / INSIDE TECHNOLOGY

What are universities teaching robots?

Opening a drawer, putting away a pan, repeating a task in a different room: robot learning is full of everyday details. The difficult examination is transferring a skill into changing conditions.

GAPPAI REVIEW EDITORIAL TEAM

Concept illustration. Fictional people and setting.

Ask someone to pick up a glass and you need not specify the angle of their hand. They see the object, adjust their grip and correct the movement along the way. For a robot, that short request requires a chain of connections between perception and action.

This explains why everyday movements are subjects of university research. Robot learning does not mean reproducing human understanding or muscle memory. Researchers develop methods that generate appropriate actions from sensor information, then test and compare them on particular tasks within defined limits.

Three questions help navigate the field. What does the robot learn from? How does it generate successful behaviour? What happens in a situation it has never encountered? Learning experiments, European test environments and data collected across continents address different parts of these questions.

Lesson one: learn from a demonstration

One approach collects examples of people performing tasks. When a researcher remotely controls a robot, the camera observations and the robot's movements can be recorded together. A learning system uses these examples to learn actions for similar observations. This is imitation learning. [1]

THE IDEA IN FOCUS

A demonstration is a starting point. Transfer has to be tested.

The 2024 Mobile ALOHA project by Stanford researchers explored this approach with a mobile base and two robot arms. Human-controlled demonstrations supported work on tasks combining movement with object manipulation. Demonstrated activities included putting a pot in a cabinet, calling and entering a lift, and lightly rinsing a used pan. The project page separates autonomous capabilities from teleoperated demonstrations. [2]

That distinction matters whenever we watch a robot video. Real-time human control can be valuable for collecting learning data or testing hardware. It does not show the robot performing independently. Evaluating a result requires knowing how the movement was produced.

For businesses, this opens a path to recording expertise more systematically. What makes an example useful? How is task success defined? How are unusual situations handled? Experienced employees are an important source of knowledge for defining the work that a robot should learn.

Lesson two: more than one way to move

We might reach for a glass from the right or the left. A successful task can have several movement paths. Representing that variety helps a learning method generate suitable behaviour.

Diffusion Policy uses diffusion models to produce robot behaviour. Conditioned on the observed scene, it progressively generates an action sequence and updates its plan as new observations arrive. In this context, a policy is a learned rule connecting observations to actions. The work includes real-robot experiments as well as simulation. [3]

In everyday terms, the system calculates a short sequence of movements rather than committing to one motor command at the start. It can revise what comes next as it receives new information. This describes a computational relationship between observation and action, not human-like thought. [3]

Performance in a research test and the ability to provide a service all day require separate assessments. Speed, hardware limits, unexpected contact and events beyond the intended task need further examination in real use. Academic success can provide a strong starting point.

Lesson three: do it in another room

In robotics, generalisation includes whether a movement learned in a laboratory works in a different kitchen. Worktop height, camera angle, lighting and object shape can change. Differences that seem minor to a person can expose the limits of learned behaviour.

Introduced in 2024, DROID is a collaborative research dataset intended to increase the diversity of training examples. The project includes about 76,000 robot demonstrations across 564 scenes and 86 tasks, collected in North America, Asia and Europe. The team reports improved robustness to scene changes and task performance in its own experiments.

Data, training code and a hardware setup guide are shared. [4]

These figures do not mean robots can work everywhere. They illustrate the role of diverse data in research. Our practical question is how closely a system's training world resembles the place where it will work. One value of a pilot is making that distance visible.

Businesses may contribute to future research through more than purchasing equipment. Task examples with clear permissions and conditions of use, test scenarios and failure records can also help. Collaboration should address collection costs, employees' roles and what information may be shared from the start.

Europe's contribution: bring the test closer to reality

Another route to robot learning improves behaviour through feedback on results. In reinforcement learning, the system seeks to improve relative to a defined objective. Simulation offers a place to try different conditions, but transferring learned behaviour to a physical robot requires testing. ETH Zurich's Robot Learning course addresses imitation and reinforcement learning alongside simulation and real-robot applications. [1]

Launched in Germany in 2024, Robotics Institute Germany connects universities and non-university research institutions. Its founding announcement describes a network led by the Technical University of Munich that combines research, infrastructure, education and technology transfer. DFKI's contributions include test environments in Bremen and production-research infrastructure in Kaiserslautern. [5]

Such a network allows connected problems to be tested together. An algorithm's performance, a sensor's information and a machine's physical behaviour are interdependent. Taking research into a business adds maintenance arrangements, user training and links to existing processes. A practical expression of scientific method is turning these connections into measurable trials.

The examination beyond the laboratory

The next time a robot makes the news, consider three questions. Which task was actually demonstrated? How was human support used? Under which changing conditions and within what limits was success measured? These questions help us understand the innovation more clearly.

Universities are teaching capabilities close to daily life: reaching, placing, finding a route and reassessing a situation. Much of the research ahead will concern connecting these capabilities and using them reliably in different environments. Its pace and reach cannot yet be reduced to a single timetable.

A robot knowing where to begin when asked to help would be significant progress. Equally valuable is making clear what it can do when conditions change, and where it needs assistance. The road from the laboratory to our lives passes through the details of ordinary work.

GAPPAI PERSPECTIVE PUBLISHER'S VIEW

We see the translation of human expertise into task examples that robots can learn from as an important connection between research and operations. Potential university collaborations should bring together task definition, data quality, skill learning and evaluation under changing conditions. A shared question for researchers and businesses is how to demonstrate that a capability learned in a laboratory is useful in the field.

We welcome conversations with teams developing joint research and application scenarios. →

Numbered references link to sources. Reading guide: pp. 52–54.

04 / EVERYDAY LIFE

The invisible day of a hotel

For a guest, a good stay feels effortless. Behind that ease is a system that brings rooms, people, materials and information into rhythm. The future of the intelligent hotel lies in how that invisible system works.

GAPPAI REVIEW EDITORIAL TEAM

Concept illustration. Fictional people and setting.

You enter a hotel room and put down your suitcase. The towels are in place, the lights work, the room is ready. Someone else may have been staying there only hours earlier. The work completed and decisions made before your arrival are invisible. Good service has a curious quality: as the effort behind it grows, the effort a guest feels can diminish.

Here we look at a hotel through its connected processes. The room and delivery examples are illustrative, rather than observations from a particular property. To understand what technology might contribute, we need to examine the connections that usually remain out of sight.

When is a room really ready?

Cleaning a room, resolving a maintenance problem and releasing it to the next guest are connected but distinct activities. Cleaning may be complete while a technician has yet to assess a fault. Reception may be looking at information that is already a few minutes old. In that situation, a delay can reflect the way information travels as much as the speed at which people work.

Hotel management software gives these distinctions a technical form. Oracle's OPERA Cloud documentation treats housekeeping status as a separate piece of information that changes

THE IDEA IN FOCUS

A hotel moves information as continuously as it moves materials.

during a stay. “Clean” identifies a cleaned room; the optional “Inspected” status records that a supervisor has checked it. Cleaning and inspection can therefore be tracked as separate stages. [1]

The operational lesson is simple: establish who changes a status, when they change it and what conditions must first be met. If “completed” means different things to different teams, automation inherits that ambiguity. Agree on the vocabulary before automating the handover: clean, inspected, awaiting maintenance, delivered.

A hotel has two circulation systems

Materials continually move through a hotel: clean and used linen, food, maintenance equipment and waste. At the same time, a second circulation system carries room status, guest requests, stock information, fault reports and work orders. Where physical movement and information fail to meet, employees bridge the gap with phone calls and conversations in corridors.

Imagine extra towels being delivered to a floor. If the delivery happens but the record is not updated, another team may set off unnecessarily. If the request is marked complete but the towels were left in the wrong place, the guest still waits. Both examples show why movement and information need to be verified together.

A physical robot might be suitable for the transport task. A digital system might put the request into the right queue or communicate its status. Connecting them requires a task identifier, delivery point, permissions and a clear completion condition. Preventing the same request from being processed twice is part of the design. A useful connection makes the outcome of a message visible as well as sending it.

Peak hours have their own logic

Total daily workload does not, by itself, describe the pressure a hotel experiences. Many departures, early arrivals and preparations for an event can converge in the same time window. A system that works comfortably during a quiet hour may create queues under those conditions. Evaluation must therefore consider how work is distributed across the day.

A transport solution that occupies a service lift for too long may accelerate its own task while delaying another team. Software that starts more jobs can multiply notifications without increasing the capacity to fulfil them. Local gains in speed need to be measured alongside service quality across the hotel.

BEYOND THE SCREEN / CONTINUED

The first step need not involve placing sensors or robots everywhere. Understanding the time between a request, the start of work and a verified result in one selected flow may reveal the bottleneck. The appropriate intervention can then be discussed: task allocation, software integration, stock location or physical automation.

How early does a problem become visible?

Spotting a problem before a guest reports it can create more time to respond. But opening a fault report and resolving the fault are different things. Someone must receive the report, set its priority and authorise the room's return to use.

In a future system, building data could be linked to work orders. The benefit would lie in verified interventions completed on time, rather than in the number of alerts generated. Unnecessary warnings consume attention and can bury significant signals. Attention, too, is a resource that hotel management needs to plan.

The European Agency for Safety and Health at Work, EU-OSHA, examines opportunities for digitalisation and advanced automation to improve work alongside their organisational and psychosocial effects. That is a strong reason to put employees' experience of their working day at the centre of system design. [2]

Technology the guest need never see

Guests prefer different ways to obtain service. One wants to send a request from a phone; another wants to speak to someone at reception. If the operation behind those channels connects them to the same chain of responsibility, technology can make service easier to understand. A guest need not learn which systems their request passes through.

The same principle applies to data. The information needed for a delivery is different from a guest's entire profile. Decide during implementation which system needs access to which information, and why. Collecting more data does not invariably produce better service.

A city hotel in Berlin and a resort on another continent do not run identical operations. Their buildings, service expectations, working practices and software differ. A common approach is to make those differences visible and build around the actual flow of work. We will not recognise tomorrow's good hotel solely by the devices in its lobby. Sometimes its clearest innovation will be something we expected happening exactly on time.

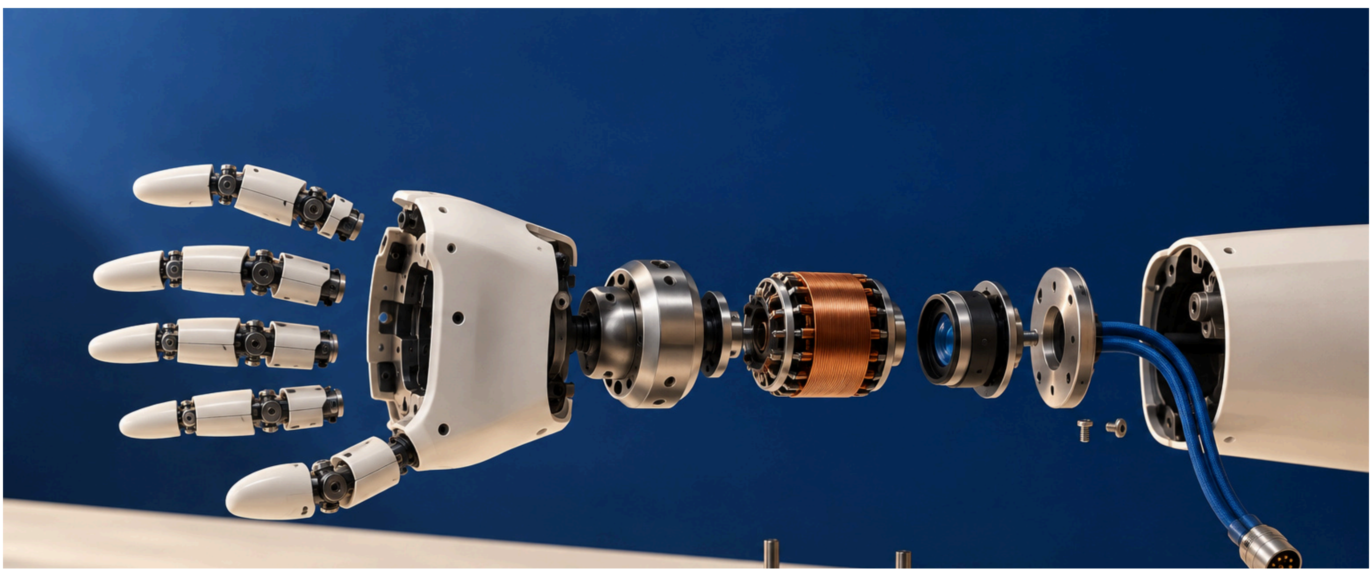
Numbered references link to sources. Reading guide: pp. 52–54.

05 / VOICES FROM THE FIELD

Before you buy a robot

Many decisions separate a robot's delivery from its first useful day at work. What should an operator, manufacturer and integrator ask when they sit around the same table? A good purchase begins with a shared definition of the system that will actually work.

GAPPAI REVIEW EDITORIAL TEAM



Concept illustration.

The proposal has arrived. There is a product photograph, a specification and a price. Perhaps a demonstration video, too. Now add one more page: the first Monday after delivery. Who commissions the robot? Which task will it perform? Who gets the call when something goes wrong?

These questions clarify the investment. Hardware, task software, business-system connections and daily support complement one another. Assuming every proposal includes them all can lead parties to sign with different expectations.

This editorial framework helps operators, manufacturers and integrators discuss their responsibilities. It is not a product review or an account of an interview.

The operator: what outcome am I buying?

Define the task before specifying the device. Which objects will it handle? Where does the task begin and end? At what times of day is it needed? What quality condition defines success? Write down what is outside the task, too, so that everyone is working towards the same result.

Consider supplying a production station. Beyond payload capacity, part preparation, loading, shift intensity and the response to a stopped line affect the outcome. Include any additional

THE IDEA IN FOCUS

A good purchasing file should explain the first Monday after delivery.

preparation employees must do to make transport possible.

Understand the starting point: task duration, conditions causing delay and where errors occur. Consistent observations and records for one selected task can support comparable proposals without becoming an expensive research exercise.

The manufacturer: which robot, exactly?

Models in the same product family may have different hardware and software access. Are the hands, sensors, processor and accessories seen in the demonstration included in the standard delivery? Is an advertised function available in the current release or on a development roadmap? Naming the exact model and configuration in the proposal preserves this distinction.

If development is required, examine the scope of the software development kit, or SDK. Which sensor data are accessible? Which movements can be programmed? What are the commercial-use terms? How will support work if an update affects the application? The word “programmable” does not answer all these questions.

Discuss spare parts, maintenance and fault recovery. A part available for supply may not arrive when needed. Shipping, service locations and support hours matter especially across borders. Ask which test conditions produced advertised maximum performance.

The integrator: who connects the pieces?

An integrator addresses the technical work that connects a robot to a real business task. This may involve adapting objects and surroundings, developing task software, connecting other systems, handling errors and commissioning the application. Scope varies, so identify which elements are actually being offered.

Handovers between parties are easily overlooked. When a robot accepts a work order, which system records that event? If the network fails, does the task restart or wait? When remote assistance is needed, who must be available on site? Answering these questions keeps responsibility from falling into a gap.

The operator's role in a demonstration must also be explicit. The robot may be remotely controlled, assisted at particular steps or completing a defined task autonomously. Each may be a valuable mode of use. The proposal and acceptance test should be based on the same level of autonomy.

Read the documents alongside the use case

The European Union's Your Europe guidance explains CE marking as the manufacturer's declaration that a product complies with the

BEYOND THE SCREEN / CONTINUED

applicable EU product requirements. Conformity assessment, technical documentation and a declaration of conformity are elements of that process. The assessment route depends on the rules that apply to the product. [1]

A mark visible in a product photograph is therefore an insufficient basis for a purchasing review. Consider the exact model, configuration, declared intended use and relevant documents together. The implications of planned integration or modification also need assessment. A product's conformity for placement on the market does not answer every question about a particular task in a particular facility.

This is why technical teams, operators and relevant specialists should examine the same use case. The workspace, interaction with people, loads, stopping behaviour and operating processes need to be considered together. The scope of that work depends on the product and location; one general checklist cannot cover every project.

Compare acceptance conditions as well as price

Purchase, rental and robotics-as-a-service can create different payment and responsibility arrangements. Suitability depends on usage, uncertainty, maintenance obligations and what the contract actually includes. Software, support and performance commitments should not be assumed to be part of a monthly fee.

An acceptance test makes comparison more concrete. Which tasks will be tested, under which conditions, with what quality requirements and limits on intervention? The robotics programme at the US National Institute of Standards and Technology, NIST, treats performance metrics and test methods in areas such as grasping, perception and motion as distinct research topics. That measurement mindset can help turn broad purchasing claims into specific questions. [2]

Agreement on acceptance before a contract is signed makes test results easier to interpret. Discuss how corrective work, additional development, scope changes or termination will be handled if the goal is not reached. Buying a robot also establishes the terms of a future working relationship.

Return to that first Monday. Unpacking the robot may be exciting. What allows work to begin is having the tasks, access permissions, support route and definition of success ready. A good purchasing file should explain how that Monday will unfold.

Numbered references link to sources. Reading guide: pp. 52–54.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engineered around your operation.
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06 / VOICES FROM THE FIELD

The first 100 hours

What should a field pilot record to support a sound decision? Think of the first 100 hours as an observation window that makes tasks, human intervention and lessons visible.

GAPPAI REVIEW EDITORIAL TEAM

Concept illustration.

On the first day of a pilot, everyone watches the robot. After a while, something more interesting happens: people begin returning to their own work. That is when the real test comes into focus. We can see how the work around the system continues, as well as what the system itself does.

“The first 100 hours” is an observation framework proposed by GappAI Review. It is not a standard, a safety certification or a sufficient test duration for every application. Nor does this article report results from a completed GappAI pilot. Its purpose is to turn a field trial into a record that supports decisions, extending evaluation beyond its most impressive moments.

Before the clock starts: what will we observe?

Define what the clock counts. We suggest tracking the total time during preselected operating windows in which the robot is expected to perform its task. Waiting and interruptions within that window remain in the record; active task time is recorded separately. Counting only the minutes that run smoothly gives an incomplete picture of the operation.

Record setup, training and development time separately as well. Distinguishing them from operating performance should not make the effort an investment requires invisible. Task

THE IDEA IN FOCUS

Count the help, the waiting and the conditions — as well as success.

definitions, test conditions, safe operating limits and authority to stop the system must be clear before the trial begins. A field pilot does not replace that preparation.

Observe the task without the robot under conditions that are as comparable as possible. Another shift, a different product group or much lower demand can create a misleading baseline. If the baseline has known gaps, disclose them when interpreting results.

Hours 0–20: meet the real task

The first observation period asks how the system meets its task and environment. Does material arrive in the expected form? Do employees know how to start a job? Is there enough space at the delivery point? Problems may arise from layout or task sequence as well as from the learning model.

Giving every attempt a task identifier helps connect the records. Link starting conditions, software version, start and finish times, outcome and any intervention to the same task. If video is used, define its purpose, access permissions and retention conditions. Selecting the information needed for a decision can be more manageable than recording everything.

Record changes to the task definition explicitly. Switching to lighter boxes or a shorter route may be the right engineering choice. Combining results under those new conditions with an earlier success rate, however, makes it harder to tell what improved.

Hours 20–60: count success and assistance separately

We suggest that the record answer at least three questions. Was the task completed to the required quality? Did completion require human intervention? Did the system remain within its defined operating limits? A task can succeed with help. That useful result belongs in a different category from unassisted completion.

The kind of help matters. A brief employee confirmation, a remote operator taking over a movement and a technician restarting the system create different workloads. Recording duration and reason alongside the number of interventions makes the next improvement easier to target.

For example, a robot that repeatedly waits for a recipient may not need more advanced grasping software. Delivery timing or the task queue may need to change. This illustrative case shows why an error record should help select the right problem, as well as count failures.

NIST's robotics programme addresses performance measurement across capabilities including grasping, perception, motion and

BEYOND THE SCREEN / CONTINUED

working with people. Separating capabilities reminds us that a single overall score can conceal which skill or connection needs development. The 100-hour framework presented here is not a NIST test protocol. [1]

Hours 60–100: does improvement survive variation?

Retest the same task after the initial problems have been addressed. Then examine variations within operating limits that have already been assessed: permitted object positions, ordinary changes in demand or work with different authorised users. Improvising a dangerous situation to challenge the system is not a sound field experiment.

Track software versions separately rather than pooling every measurement into one average after each change. This makes it easier to see whether a new release solves one problem while introducing another. Preserve selected, repeatable tasks for comparison.

Ask employees about their experience again. As first-day novelty gives way to ordinary use, the clarity of notifications, training needs and support arrangements may become more apparent. EU-OSHA's work on digitalisation points to the importance of considering technology together with work organisation and human interaction. [2]

What belongs on the table at hour 100?

A short, traceable review file can show the operating conditions observed, tasks attempted, outcomes meeting the quality requirement, unassisted completions, intervention time and reasons for downtime. Show long waits alongside average duration; service-disrupting events can disappear inside an average.

Do not infer high certainty from limited observations. Seeing no problem during 100 hours does not prove that a rare event cannot occur. Even hundreds of attempts may cover only a narrow set of conditions. The report should explain what remains untested as clearly as what was observed.

The decision may be to continue, change the scope or stop the trial. If expansion is being considered, identify which conditions will remain the same and which must be verified at a new site. A result in one location is not an automatic guarantee for another building or shift.

At the end of the first 100 hours, the most valuable output may be a more capable robot or a better-defined task. Either can allow the next decision to rest on fewer assumptions. A pilot earns its value by showing the people around it what they now know.

Numbered references link to sources. Reading guide: pp. 52–54.

07 / WORLD VIEW

Who is building the robotic future?

We ask the same question of Germany, Europe, the United States and China: who can connect research, manufacturing and real use? The map of robotics is more layered than any single ranking can show.

GAPPAI REVIEW EDITORIAL TEAM

WHERE INDUSTRIAL ROBOTS WERE INSTALLED

2024 installations · selected markets and regional total

Europe includes Germany; rows are not additive. Approximate values except Germany.
Source: IFR, World Robotics 2025 reporting. Industrial robots, not humanoids.

A robot may carry one brand, yet its processor, sensors, mechanical parts and learning methods may originate in different countries. Experience acquired in the facility where it works adds another link. Looking only at where the machine was manufactured leaves much of that collective effort out of view.

The race has several lanes: making hardware, developing behaviour that can learn, installing systems reliably and creating economic value in a customer's operation. A country installing many robots is not necessarily leading every emerging area of robotics. Keeping that distinction visible can help businesses and researchers build better collaborations.

China: what manufacturing scale reveals

According to the International Federation of Robotics' World Robotics 2025 reporting, China installed approximately 295,000 industrial robots in 2024, representing 54% of the global total. Chinese manufacturers reached a 57% share of their domestic market. These are industrial robot statistics, not counts of humanoid installations or measures of general intelligence. [1]

Manufacturing at that scale raises important questions about component supply, installation experience and the variety of applications. How does technology move from a laboratory into production? How do costs fall? How does field feedback return to the product? High production

THE IDEA IN FOCUS

Follow the people solving problems together, across borders.

capacity alone, however, does not resolve service, integration or suitability for use in another country.

Germany: from factory to research network

The same IFR reporting records 26,982 industrial robot installations in Germany in 2024, making it Europe's largest market by this measure. Europe's total was approximately 85,000, while the United States installed around 34,200. These numbers compare installations across different economic structures; they do not measure the value of entire robotics ecosystems. [1]

On the research side, Robotics Institute Germany, launched in 2024, is an important example of organisation. Led by the Technical University of Munich, the network brings universities and non-university research institutions together. DFKI's launch announcement discusses test infrastructure, education and technology transfer together. [2]

Who can turn a difficult factory task into a research problem, then turn the result into an application a business can use? Production managers' process knowledge, researchers' methods and integrators' field experience need one another in that transition. Access to this connection matters for small and medium-sized enterprises, too.

The United States: methods and shared infrastructure

Robot-learning research associated with US universities has made data and code available for other teams to use. DROID provides an international example: it brings demonstrations collected in North America, Asia and Europe into a common robot dataset and publishes training code and a hardware setup guide. Research cannot always be understood within national borders. [3]

A connected research and technology landscape. Concept illustration.

BEYOND THE SCREEN / CONTINUED

An open dataset does not solve every problem. The robot, environment and task used to collect it still matter. But allowing teams to begin from a shared starting point can make methods easier to compare. A research group's contribution can extend beyond the performance of its own robot.

Europe: shared markets, shared questions

Describing Europe only as a rule-making region is incomplete. Manufacturing infrastructure, universities, facility operators and public services also generate application questions. Using a robot in different buildings, working languages and service cultures requires technical design and organisation to be considered together.

These geographical distinctions do not create hard boundaries. A European pilot might use hardware made in Asia and an open learning method developed in the United States. The challenge is to combine those elements in a system with defined responsibilities and operating conditions. International collaboration requires more than placing components beside one another.

What should the next conversation ask?

Ask a manufacturer about production plans, a researcher about tested conditions and an operator about daily support. Apply the same discipline when comparing countries. Which tasks are actually in use? Who can access new solutions? How do lessons travel to the next application?

Answers from different parts of the world need not be identical. A port, a hotel and a factory have different priorities. GappAI Review wants to open a global conversation that makes those differences visible. To understand where the robotic future is being built, follow the people solving problems together.

RESEARCH	MANUFACTURING	APPLICATION
Which conditions were tested?	How is scale supported?	What works in daily use?

GAPPAI PERSPECTIVE PUBLISHER'S VIEW

At GappAI, we value an engineering approach based in Berlin and open to international research and technology. The fit between a robot platform, a learning method and an application environment needs to be assessed at task level. We see the value of relationships with manufacturers, researchers and application teams across countries in clear responsibilities, shareable technical knowledge and measurable working goals.

Share an application or research question that we could explore together in your country. →

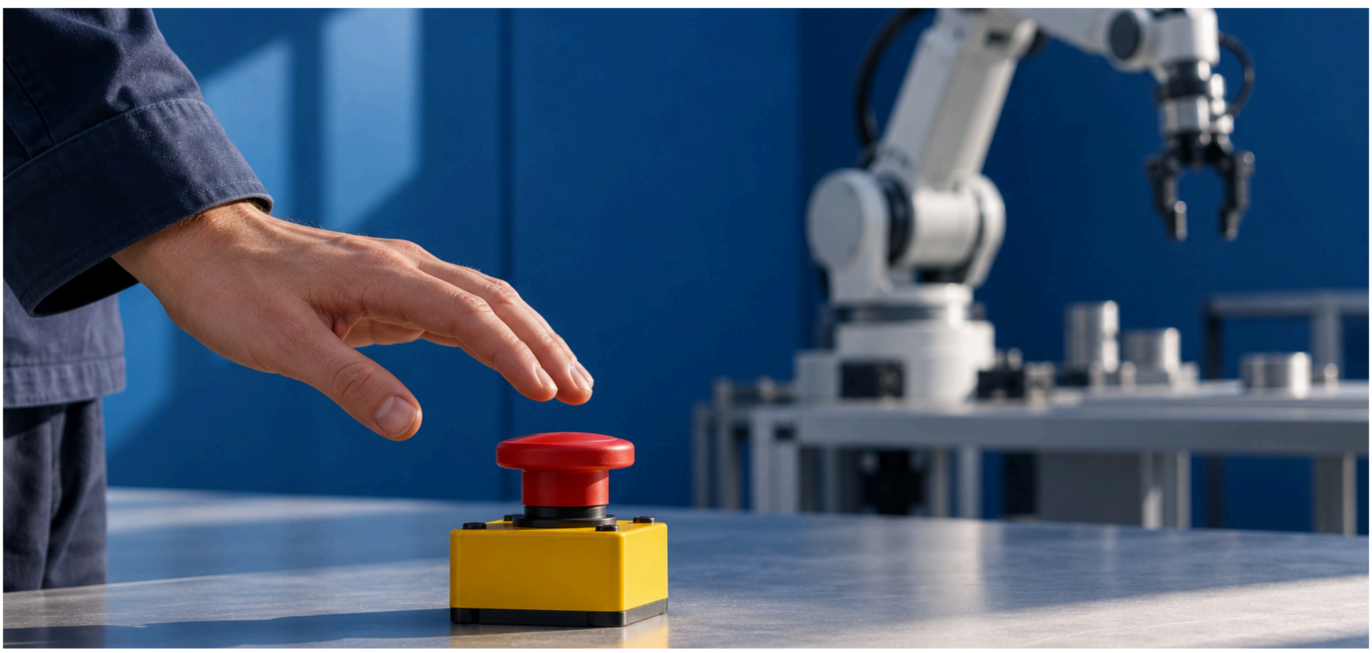
Numbered references link to sources. Reading guide: pp. 52–54.

08 / TRUST & SOCIETY

When a robot makes a mistake

Trust looks easy when everything is going well. When a robot behaves incorrectly, the value of oversight, responsibility and records becomes clear. As technology advances, society's questions become more concrete.

GAPPAI REVIEW EDITORIAL TEAM



Concept illustration. Fictional people and setting.

Imagine a robot placing an object in the wrong location. It might be a minor inconvenience. In another setting, the same movement could block someone's path or damage a delicate component. Context determines what an error means.

“The robot made a mistake” is therefore the beginning of an investigation. What task had it received? What had it perceived? Which software version was running? How was human assistance defined? A sound responsibility framework considers these questions before an event. The examples here are illustrative scenarios, not reports of an actual accident.

First, return to a safe state

When something goes wrong, the immediate need is to protect people and prevent escalation. The response should be defined in advance for the system and its environment. Who can stop the task, how support is reached and who authorises a restart belong in ordinary operating arrangements.

Human oversight requires more than having someone nearby. That person needs to understand the system's state, access intervention controls and have enough time to make a decision. If the assigned role and actual

THE IDEA IN FOCUS

Human oversight requires more than having someone nearby.

working conditions do not support one another, oversight that exists on paper may be weak in practice.

Three questions of responsibility

The first is operational: who does what when a problem occurs? The second is technical: which team investigates, using which records? The third is legal: what obligations do the parties have in relation to harm? These questions are connected, but they are different assessments.

Manufacturers, software suppliers, integrators and operators may have distinct roles. Contractual allocation of work matters; it should not be assumed to remove every legal responsibility. A specific case depends on product characteristics, modifications, use and applicable law.

The EU AI Act framework addresses AI systems through use context and risk. Its requirements for high-risk systems include areas such as records, documentation, human oversight and robustness. A robot's use of AI does not automatically put every application in the same risk category. [1]

Why does the law also discuss software?

A robot's behaviour may change after delivery. Software updates, new tasks and hardware modifications can affect the system. It should be possible to trace who made a change and under which conditions it was validated.

The EU's 2024 Product Liability Directive expressly covers software and AI systems and addresses matters including access to evidence for people harmed by defective products. Transition to the new regime needs separate consideration of national implementation and the date a product was placed on the market. At this issue's September 2026 editorial cutoff, that transition is still under way. The new provisions should not be read as applying identically to every older product. [2]

The engineering lesson is the importance of being able to explain the past. Without a record of the configuration and task at the time,

OVERSIGHT IN PRACTICE

01 **Understand the system**

02 **Have time and tools to intervene**

03 **Know who authorises restart**

BEYOND THE SCREEN / CONTINUED

understanding an event becomes harder. Unlimited recording is unnecessary; meaningful traceability requires defined purposes, access and retention periods for the data that are needed.

Records should support learning

If an employee intervened, an investigation focused only on the last person to press a button would be incomplete. Was the display understandable? Was training adequate? Did the system communicate its expected behaviour? Did workload affect the intervention? Error analysis should identify connections that can reduce recurrence.

EU-OSHA recommends considering organisational and psychosocial effects alongside technical risks in advanced robotics. Its approach provides a useful framework for understanding safety as more than a property of a device. [3]

Employees who report faults or near misses can offer valuable experience. Whether they see what happens after a report also affects trust. If a problem recurs and nobody receives feedback, the recording process is failing to support organisational learning.

An answer society can understand

A hotel guest or a visitor to a public building need not understand the technical architecture. When a problem occurs, they want a person they can reach, an understandable explanation and a clear route forward. Robots entering shared spaces bring this communication responsibility with them.

Trust cannot rest on a claim of perfection. Honest operating limits, the ability to investigate errors and the authority to stop use when needed provide a stronger foundation. When a robot makes a mistake, responsibility must not disappear into a gap between organisations.

OPERATIONAL	TECHNICAL	LEGAL
Who responds?	Who investigates?	Which obligations apply?

GAPPAI PERSPECTIVE

PUBLISHER'S VIEW

At GappAI, we believe responsible robotic applications should define stopping, support, records and change management alongside the task itself. A system needs to explain what happens at its limits as clearly as the conditions in which it can operate. We value working arrangements with customers and technical partners that define authority, human assistance and evaluation responsibilities from the outset.

Share technical or academic collaboration proposals on human oversight, safe application or responsibility design. →

Numbered references link to sources. Reading guide: pp. 52–54.

09 / ECONOMY & CAPITAL

What will robots change in the economy?

How does producing more translate into living better? We examine robotics through productivity, wages, service costs and the way gains are shared.

GAPPAI REVIEW EDITORIAL TEAM

Concept illustration. Fictional people and setting.

Imagine a business completing more work in the same time. The gain might become a lower price for a customer, better conditions for an employee or higher profit for the business. Technology alone does not determine which outcome follows.

This distinction is a useful starting point for understanding the economic effects of robots. Technical capability creates a possibility. Turning it into income, time and quality of life depends on business decisions and market conditions. This article examines those mechanisms rather than forecasting the finances of a particular company.

Where does productivity begin?

More consistent performance of a repeated task may reduce rework. Better material flow may reduce machine waiting time. Relieving employees of lengthy transport tasks may create room for other work. Each is a distinct economic mechanism whose effect needs to be measured in the field.

When looking at total output, ask whether quality has been maintained. If completing more work also produces more errors or requires more human support, the apparent improvement may overstate the real gain. Energy, maintenance, installation and additional human time belong in the calculation.

THE IDEA IN FOCUS

Economic value emerges in the details of the workflow.

Georg Graetz and Guy Michaels' research, “Robots at Work,” links historical industrial robot adoption with increases in productivity and wages, while reporting different effects for lower-skilled workers. These historical findings are not a ready-made forecast for today's humanoids. They remind us that the same technological change can affect groups of workers differently. [1]

Can a saved hour actually be used?

Automation projects often promise to free employees' time. Explain how that will happen. Brief gaps scattered through a day do not necessarily create a usable block of time for another task.

Consider an employee relieved of moving materials who must now wait for the robot at each delivery. The new arrangement may replace one activity with another kind of waiting. Correctly timed deliveries, by contrast, could let work continue uninterrupted. Economic value emerges in the details of the workflow.

An economic evaluation may therefore need more than engineering and procurement teams. The people planning and doing the work should help decide how time gained will be used. Measurement becomes more meaningful when the expected source of benefit is clear from the beginning.

Wages and jobs may move differently

Automating a task does not mean that the entire occupation containing it disappears. Work allocation may change, new oversight and support roles may emerge, and demand for some tasks may decline. Outcomes can differ by business and region.

Taking on new responsibilities does not automatically bring an employee higher pay or better conditions. Training, role definitions, bargaining power and organisational choices influence the transition. Robotics' economic future concerns how skills are recognised as well as which skills people develop.

WHERE A GAIN MAY TRAVEL

01 More capacity

02 Better working conditions

03 More accessible service

BEYOND THE SCREEN / CONTINUED

EU-OSHA's examination of digitalisation considers opportunities to reduce physical strain alongside work organisation and effects on people. This wider perspective helps keep productivity discussions connected to employees' experience. [2]

Will services become cheaper?

A reduction in particular business costs does not guarantee that all savings reach customers. Competition, demand, investment recovery and service standards affect prices. Some applications may create value through more consistent delivery or more accessible service rather than a lower price.

Where human contact matters, reducing labour should not be the only question. Technology that gives employees room to provide more attentive service can change customer experience. The business must make a deliberate choice about how to use the gain.

Large businesses and small ones

A high-volume, frequently repeated task can spread an investment's fixed costs across more use. Installation and support may weigh more heavily per task in a small business. Shared services, rental or robotics-as-a-service under suitable conditions might narrow that difference. Each model's contractual scope and total cost still need examination.

Who can access innovation is an economic question in its own right. Solutions available only to large businesses will have different effects from those reaching a wider group. Training and implementation support may matter as much as the price of the device in determining adoption.

The results in people's lives should sit alongside installed-machine counts when judging robotic transformation. More reliable service, better working conditions and new production possibilities may become achievable. Realising them requires an open discussion of who creates the gains and how those gains are shared.

CAPABILITY	WORKFLOW	CHOICE
Measure the actual gain.	Make saved time usable.	Decide how gains are shared.

GAPPAI PERSPECTIVE

PUBLISHER'S VIEW

At GappAI, we value evidence of economic benefit at task level, assessed against the full costs of an operation. What matters to a customer is the selected application's measurable contribution to quality, capacity or the organisation of work. We believe a pilot should identify the expected source of that contribution at the start, then interpret results alongside employee experience and sustainable support conditions.

Tell us which cost, delay or quality problem you expect automation to change in your operation. →

Numbered references link to sources. Reading guide: pp. 52–54.

10 / ECONOMY & CAPITAL

What does big capital see in robotics?

Banks' large market forecasts attract attention. The more useful questions concern their assumptions and where economic value may arise. We read the robotics investment narrative through the questions behind its numbers.

GAPPAI REVIEW EDITORIAL TEAM

2035	2050
$38bn	**$5tn**
Goldman Sachs Research · 2024	**Morgan Stanley Research · 2025**
Humanoid total addressable market forecast.	Broader humanoid ecosystem, including supply and support.

Different time horizons and market scopes. These are forecasts, not realised sales.

A robotics investment presentation can describe the future in enormous figures. Yet the possibility of a growing market does not mean every company in it will succeed. A research forecast, a financing decision and revenue earned from customers are different indicators.

Here we examine banks' published research and a thematic investment vehicle offered by an asset manager. These are not accounts of interviews with those institutions. The purpose is to understand the capital narrative around robotics, rather than recommend a security.

Two large numbers, two different horizons

Goldman Sachs Research's 2024 assessment forecasts that the total addressable market for humanoid robots could reach $38 billion in 2035. Falling costs and technological developments were among its reasons for raising the estimate. This figure is a forecast, not realised sales. [1]

Morgan Stanley Research's 2025 assessment looks further ahead, to 2050. It describes a potential market of approximately $5 trillion for a broad humanoid ecosystem including supply chains and maintenance and support networks. Its outlook anticipates adoption accelerating particularly in the late 2030s and the 2040s. [2]

Placing these numbers side by side and calculating how much the banks disagree would be misleading. Their time horizons and market definitions differ. Before interpreting a forecast, establish which revenue is counted, which year it describes and what pace of adoption it assumes.

THE IDEA IN FOCUS

A forecast, a financing decision and customer revenue are different indicators.

What would make the market grow?

Lower hardware costs may be important to the economic adoption of humanoids. Task success, operating time, support requirements and installation effort also affect the result. Cheaper hardware alone does not make an application needing frequent intervention a good business proposition.

Follow customer behaviour alongside market forecasts. Are trials becoming repeat orders? How do support costs change as use expands? Can the same solution move to a new site with less engineering? These are questions for evaluating a sector's development, rather than unverified claims about particular companies.

Is value confined to the robot's body?

Robotics forms a value chain: mechanical components, sensors, processors, platforms, software, integration and operating support. Growth can create different revenue and competitive conditions in each layer. A hardware manufacturer and a company providing ongoing support have different cost structures.

Another distinction separates one-off engineering from a reusable product. Rebuilding a solution for every customer can generate revenue, but expansion may continually require new teams. Reusable capabilities have the potential to reduce adaptation. Assessing how much of that potential has been realised requires clear descriptions of supported tasks and environments.

From a capital perspective, the question is where a company creates a meaningful difference. Data access, hardware knowledge, customer relationships and application experience may be valuable. Their commercial value becomes tangible when connected to an outcome a customer pays for.

THE VALUE CHAIN

01 **Hardware & sensing**

02 **Software & integration**

03 **Operation & support**

BEYOND THE SCREEN / CONTINUED

Different businesses under one market label

Listed exposure to robotics extends beyond robot manufacturers. BlackRock's iShares Automation & Robotics UCITS ETF seeks to track an index of developed- and emerging-market companies generating significant revenue from specified sectors associated with automation and robotics technologies. Such a fund illustrates how broadly the investment theme can span companies. [3]

A “robotics stock” or “AI fund” label is therefore not a complete description of the underlying business. Examine how much revenue comes from the relevant activity, which index a fund tracks and how that index selects companies. Hardware, software and automation revenues may sit under one theme while carrying different risks.

Market growth and investment return are also different calculations. Strong expectations for a company's future may already be reflected in its price. A persuasive sector narrative does not, by itself, establish an attractive price or an investment decision. This section does not offer investment advice.

From high expectations to real work

Bank research helps reveal the assumptions attracting capital's attention. Actual use will test the pace of adoption. Accepted factory tasks, support that can be sustained and recurring customer demand are where a broad market narrative meets operating reality.

Financing robotics' future means understanding which experiment can reduce which uncertainty. Compelling company stories may come from those able to explain the concrete work they will do better to earn a place in the market, as well as the size of that market.

SCOPE	HORIZON	ADOPTION
Which revenues are counted?	Which year is described?	Which assumptions drive it?

GAPPAI PERSPECTIVE PUBLISHER'S VIEW

At GappAI, we believe company value strengthens as customer benefit and reusable technical knowledge develop together. Lessons from one application become meaningful for subsequent tasks and sites only when their limits and adaptation needs are clear. Developing that knowledge is our long-term direction. We do not present market forecasts as realised company revenue or evidence of our success.

Start a corporate conversation if you see scope for collaboration in technology, strategic capital or application delivery. →

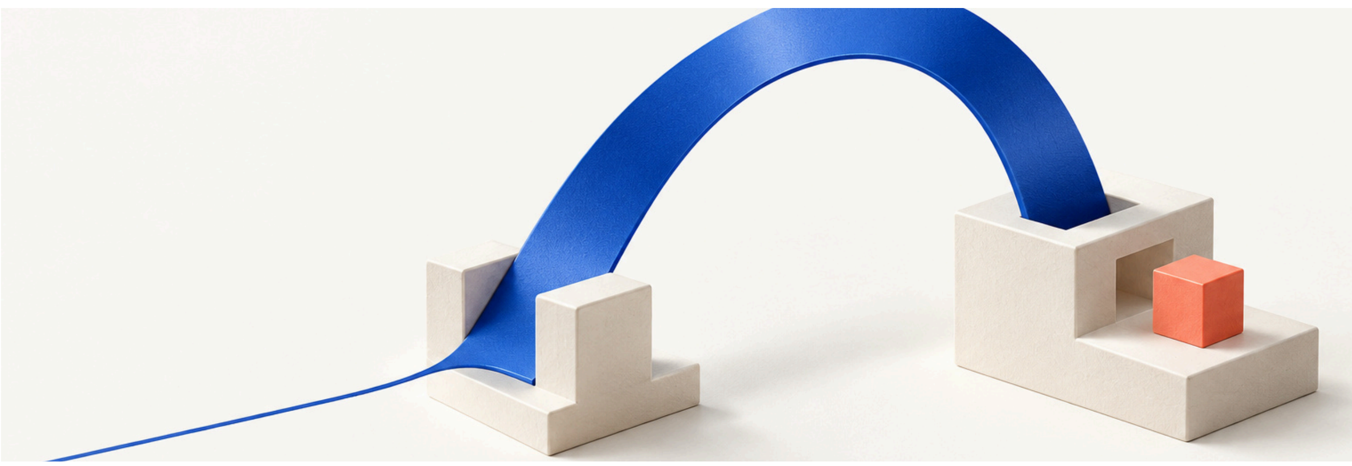
Numbered references link to sources. Reading guide: pp. 52–54.

11 / GAPPAI PERSPECTIVE

A body is only the beginning

A robot has a body. Who will teach it the work? GappAI focuses on the space between human expertise and a robot's physical capacity.

GAPPAI / COMPANY PERSPECTIVE



Concept illustration.

The reach and payload of a robot arm can be measured. Understanding which component an experienced worker picks up first, when they wait and how they recognise a correctly completed task requires a different kind of work. At GappAI, our attention is on the connection between physical capacity and this knowledge of a task.

This is a company perspective signed by GappAI. The approach described is not presented as the result of completed customer deployments. Its purpose is to explain where we aim to create value.

Where does the knowledge of work live?

Human expertise does not always fit into a procedure document. An experienced employee notices an object's orientation, changes a movement in response to slight resistance and distinguishes an ordinary situation from an exception. Transferring that knowledge to robots begins with understanding the task and how a good result is recognised.

For us, this puts the person who knows the work at the centre. The quality of demonstrations collected for robot learning should be defined with those people. Knowing when to stop or request assistance belongs to the task as much as knowing which behaviour to repeat.

A capability includes its limits

GappAI Skills aims to turn task knowledge into reusable robot capabilities. Describing the hardware, environment and conditions in which a capability has been evaluated is part of that approach. The Skill Library is a long-term product direction, rather than a claim that ready-made products already exist for every task. [1]

BEYOND THE SCREEN / CONTINUED

Consider placing a component. Reach, grippers and sensors differ between robots. Using a shared learned behaviour on a new system may require adaptation and renewed evaluation. The goal of reuse does not make physical differences disappear.

The engineering between a body and a job

A business needs to connect a robot's movement to a wider working system. The work order, physical action, result check and any human assistance are parts of one flow. In GappAI's application approach, digital steps complete that flow where the physical operation requires them. [2]

Success involves more than teaching a new movement. The movement needs to happen at the right time, connect to the right result and remain understandable to the people around it. A pilot should show how far that connection has been established.

Knowledge that can travel to the next task

If everything learned stays within its original project, the same problems may be solved repeatedly. Our long-term aim is to identify what tasks share while clearly separating site-specific conditions. Data, evaluation methods and application knowledge can then develop together.

The value of that knowledge cannot be measured by the size of a claim. A supportable task must be offered to a customer with a comprehensible scope. Our direction combines this working discipline with the goal of developing reusable products.

A robot's body is visible. The work that gives it a useful task is often less so. At GappAI, we want to make that work visible, measurable and capable of further development.

HUMAN EXPERTISE	TASK KNOWLEDGE	ROBOT CAPABILITY
Understand the work.	Define what can be learned.	Evaluate use and limits.

GAPPAI PERSPECTIVE

PUBLISHER'S VIEW

Our central view is that transforming human expertise into task knowledge a robot can learn is a strategic field in preparing robots for real work. Creating value in that field requires well-defined tasks, responsible data use, strong engineering and applications whose results have been tested.

Share a physical task you would like robots to learn in your business. →

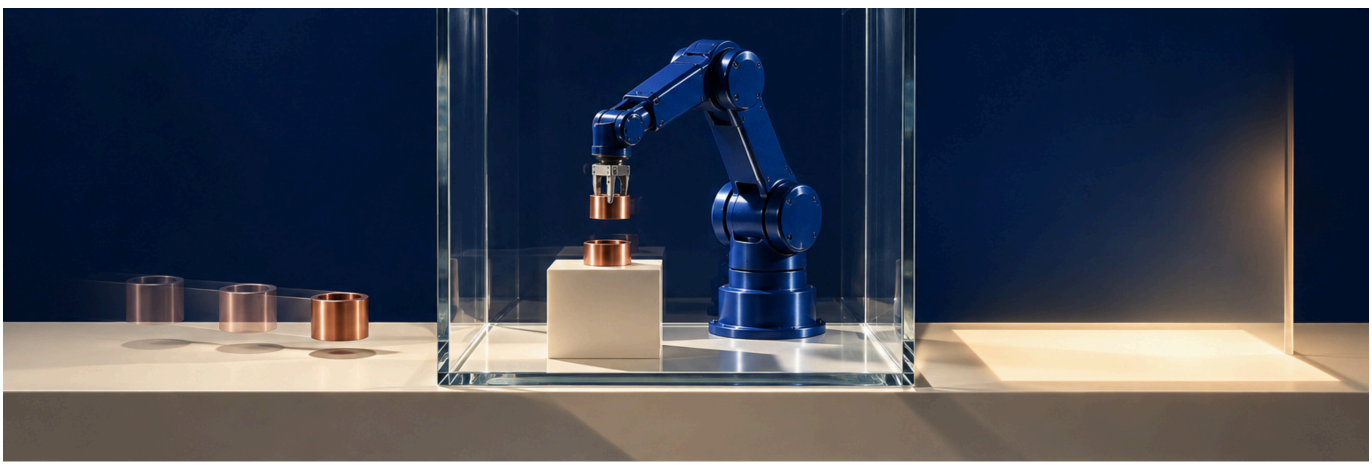
Numbered references link to sources. Reading guide: pp. 52–54.

12 / INSIDE GAPPAI

The journey of one operation

How do Capture, Skills, Workforce and Labs connect? Follow one physical task through GappAI's approach to work.

GAPPAI / COMPANY PERSPECTIVE



Concept illustration.

A business wants a robot to place a selected component at a specified location. The request is short; the work it requires has many layers. How does the part arrive? How will a correct result be recognised? What should happen when something goes wrong?

This scenario illustrates GappAI's approach. It does not describe a real customer, a completed project or an existing product. We explore Capture → Skills → Workforce and the role of Labs through the different questions raised by the same task.

Capture: make the work understandable

Begin by examining the task's boundaries with the expert who performs it. Discuss component variation, tools, accepted outcomes and exceptions. Determine which data are necessary at this stage. A large volume of recordings is not the same as data that represent the right task.

Images, movement sequences or contact information might be useful in this example. Their necessity depends on the application. Data use, access and rights also belong within the scope of work. This is the starting logic of GappAI's approach to connecting data with capability development. [1]

Skills: develop and test the behaviour

The question then changes: how will the collected information help a robot produce the right behaviour? An existing capability whose suitability has been verified may be adapted, or new development may be required. The method depends on the task and hardware.

Releasing the part at the destination is insufficient by itself; the position and result must meet acceptance conditions. Evaluation should include failed attempts and human support.

BEYOND THE SCREEN / CONTINUED

GappAI Skills calls for capabilities to be defined with their supported configurations and limits. [1]

Workforce: connect the task to the operation

Once a robot can perform a defined movement, further operating questions emerge. How is the task started? Can a new job arrive before the previous operation has finished? Which system receives the result? Who provides support? These connections turn a movement into an operational task.

GappAI Workforce is described as the company's deployment and operations layer. It addresses integration, monitoring, human support and improvement under supported conditions. Subsequent service scope is determined by verified application conditions and a written agreement. [2]

Labs: turn new questions into research

If the robot struggles with some component positions, the answer may involve more than collecting additional data. Perception, the gripper, contact information and the learning method can each be investigated. GappAI Labs is the research and applied robotics structure for addressing such questions through controlled experiments. [3]

A research question and a customer delivery may have different levels of maturity. A promising laboratory method can still need further evaluation before real use. Preserving that distinction supports scientific collaboration and clearer customer expectations.

Why is the flow a loop?

A problem observed in the field can reveal a need for new data, an additional evaluation test or a change to the task definition. Operating experience feeds back to the beginning. Every new record should not, however, automatically change a system; the effect of an update needs assessment.

GappAI's public approach does not claim an established large-scale fleet or a ready-made library covering every task. Its commercial starting point is a paid Physical AI pilot with a defined scope. The evidence obtained informs the next step. [4]

An operation's journey should be more than a sequence of department names. Each stage should produce information that helps the next make a better decision. GappAI aims to connect the work people know with tasks a robot can responsibly undertake.

GAPPAI PERSPECTIVE

PUBLISHER'S VIEW

At GappAI, we see Capture, Skills, Workforce and Labs as mutually supporting areas of work around the same problem. We believe data collection, capability development, field application and research need a traceable connection. Its purpose is to make the outcome a customer might achieve, and the conditions required, clearer while giving the next development a firmer basis.

Tell us where you are considering robotic support in your operation. We can identify a suitable starting point together. →

Numbered references link to sources. Reading guide: pp. 52–54.


Build your robotic workforce with GappAI.
Purchase • Rental • Robot-as-a-Service
From platform selection to robot skills and integration, we shape the solution around your operation.
Tell us about your operation. Let’s plan what comes next.
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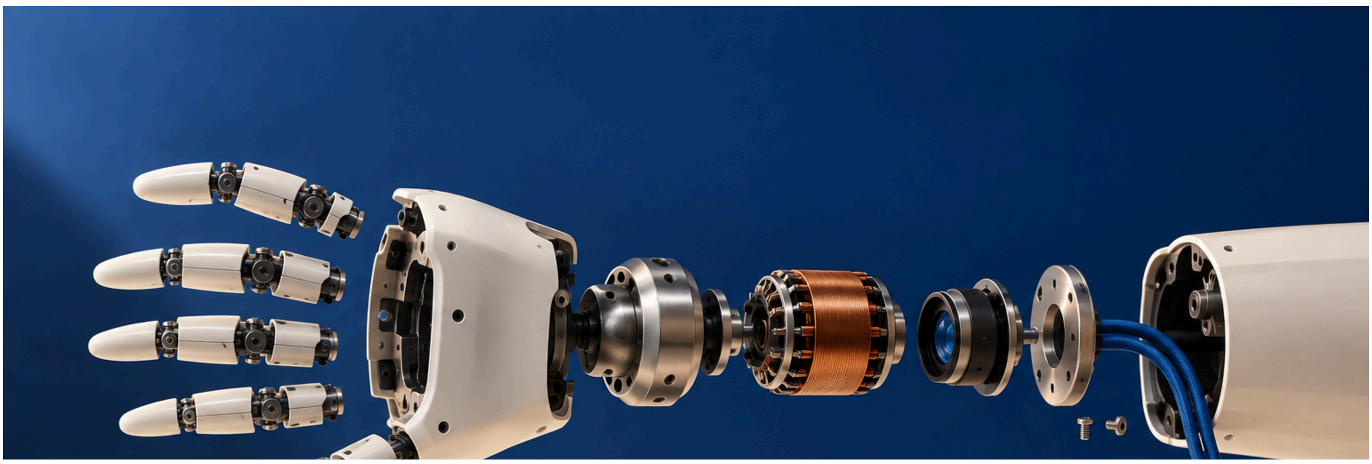
13 / WORK WITH GAPPAI

Tell us about your operation

A useful conversation starts with a clear account of real work. We invite businesses, technology teams and researchers to meet around a concrete task.

GAPPAI / COMPANY PERSPECTIVE



Concept illustration.

Materials that continually wait at the end of a factory line, a repeated inspection in a facility, a transport task that interrupts hotel employees: the starting point for robotics may already be part of daily life. You do not need to know the entire technical solution before beginning a conversation.

GappAI's invitation is to clarify that need together. The routes described here are for discussion and proposal assessment; they do not constitute automatic project acceptance, a free pilot or a guaranteed technical result.

Businesses: choose one task

For an initial discussion, describe your sector and working environment, how the task starts and what outcome completes it. How often does it recur? Where is the most time lost today? Which quality or capacity problem would you like to change?

If you have a robot, identify its model and configuration. If not, describe your access needs. Who knows the task and who owns the process? What connections do the existing software and facility require? This information helps assess scope. Personal data, confidential production details and customer information are unnecessary in an initial message; suitable arrangements for further sharing can be agreed separately.

GappAI's Physical AI Pilot is offered as a paid engineering engagement with a defined scope. After the task, environment, access and expected result have been assessed, the work plan and commercial terms are clarified in a written proposal. [1]

BEYOND THE SCREEN / CONTINUED

Technology teams: specify your contribution

Robot manufacturers, sensor and technology suppliers, data-collection and teleoperation teams, and field engineering specialists can contribute at different stages. Explain which technical work you can undertake, where you operate and which interfaces you have experience with.

GappAI's corporate enquiry page accepts approaches from technology and operating partners, suitable specialist teams and potential subcontractors. It describes a working model in which customer relationships, architecture, quality and delivery management remain with GappAI. [2]

A useful opening message can therefore explain which task type you can support, with which infrastructure and under which access conditions. Verifiable experience and a clear description of capacity make an assessment easier than a general statement of interest alone.

Researchers: choose a shared question

For universities and research groups, a starting point might be learning from human demonstrations, adaptation across robots, contact information, recovery after errors or evaluation methods. These topics relate to GappAI Labs' public research directions. [3]

Share a method, a comparative experiment or an application question. Conditions for data, publication, intellectual property and infrastructure use should be agreed together. Contributing research or a view to the magazine does not, by itself, establish a commercial partnership or institutional endorsement.

What should the first discussion clarify?

An initial assessment should let both sides understand the next step. Is the task sufficiently clear? Can the necessary access be provided? What information is missing? Does the situation call for engineering, a research conversation or further preparation? Requests need not all follow the same route.

This invitation is open to organisations around the world. Application location and service scope are assessed with access and support conditions. A good beginning can be a concrete question that both sides are able to answer together.

OPERATORS	TECHNOLOGY TEAMS	RESEARCHERS
Bring a physical task.	Define your contribution.	Explore a shared question.

GAPPAI PERSPECTIVE

PUBLISHER'S VIEW

At GappAI, we believe future collaborations can grow from small, concrete beginnings with clear mutual expectations. An operator's actual need, a manufacturer's technical capacity and a researcher's method can meet around the same task. Our priority is to turn that meeting into a work proposal with defined scope and responsibilities.

Send a pilot enquiry for a physical task, or use our corporate channel for other collaborations. →

Numbered references link to sources. Reading guide: pp. 52–54.

The next chapter is about us.

Who will work beside us? How will we live with robots?

WORK. LIFE. THE CHOICES AHEAD.

Working together. Living together.

A free digital magazine. A new perspective.

COMING TO

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Issue in preparation / Cover preview

Illustrative magazine mockup

14 / NEXT HORIZON

An ordinary day in 2035

Take the future off the demonstration stage and place it inside an ordinary day. What might living with robots make easier, and what new questions might it raise? This is a scenario for discussion, rather than a prediction.

GAPPAI REVIEW EDITORIAL TEAM

Illustrative 2035 scenario. Fictional people and setting.

Editorial note: The people and events in this 2035 scenario are fictional. It does not claim that the services described will exist by that date or be accessible to everyone. Current research examples and assumptions about the future are discussed separately at the end.

Morning: before leaving home

Before leaving home, Deniz calls her father. He lives independently in the same neighbourhood. Their conversation is short: they will have dinner together. A home assistance system has moved specified objects to an accessible shelf. It has left an unfamiliar item alone and posted a brief question instead.

In this scenario, the resident has helped define the robot's boundaries. It does not enter every room or record every conversation. It can be stopped when unwanted. What matters to Deniz's father is being able to manage some daily activities more comfortably without having to become interested in the technology. Having a say in when and how help arrives is part of that benefit.

Such a home life will depend on more than a robot's ability to grasp objects. Cost, breakdown support, personal space and trust must also be

THE IDEA IN FOCUS

The question is what we choose to do with the time technology creates.

addressed. These requirements are conditions on which the scenario depends, rather than invisible problems assumed away.

At work: knowledge from the previous shift

The production facility where Deniz works holds a short morning meeting. Robots handling selected transport and placement tasks have reported their status from the previous shift to the team's display. One stopped when it encountered a new packaging format. The technical team does not release that version of the task again until it has been reassessed.

For the production manager in this scenario, the useful news is being able to see which task encountered a problem and under what conditions. An employee explains the packaging change; another proposes a different material-preparation sequence. The robot's work remains connected to people's knowledge of the process.

The meeting considers work allocation as well as productivity. The team reviews whose responsibilities have increased, what training is needed and how time gained will be used. Technology does not inevitably create this arrangement. In the scenario, it is a management choice the organisation has made.

Midday: an encounter in public space

At lunchtime, Deniz visits a municipal building. A guidance system helps visitors at the entrance. Anyone who prefers not to speak to a machine can reach a member of staff. A robot carrying out a defined logistics task waits in a designated area when the corridor becomes busy.

Successful public service is visible in whether visitors understand the process and complete what they came to do. An older person, a visitor speaking a different language and someone with restricted mobility share the space. The arrangement in this scenario has considered their different needs from the start.

We cannot assume every institution will work this way. Another might offer a more limited service because of cost or organisational constraints.

A DAY BUILT ON CHOICES

01 **Home: control over help**

02 **Work: knowledge shared**

03 **Public life: access for everyone**

Who can access new possibilities, and under what conditions, may become one of the future's sources of inequality.

Evening: what remains of the time?

After work, Deniz visits her father. Robots are not the subject of a long conversation at the dinner table. They talk about the weekend. Making some routine tasks easier has created space for time together. In this scenario, people have also chosen to use that space.

The same technology could be used elsewhere to fit more work into the day. Less physical strain does not always mean less time pressure. Our question about the future therefore concerns how we will live with the possibilities created, as well as what machines will do.

What exists today, and what did we assume?

Research such as Mobile ALOHA studies mobile robot behaviours learned from human demonstrations in defined tasks. Projects such as DROID make robot data collected across different environments available to researchers. These are examples of research progress; they do not establish that reliable, economical assistance is ready for every home. [1][2]

This scenario assumes substantial improvements in the reliability of domestic assistance, maintenance and support networks, affordability and user control. It also assumes well-organised human oversight, accessibility and training in workplaces and public services. All require institutional and social choices alongside technical work.

How many robots will we see in 2035? That is a meaningful question, but it belongs beside another: will an ordinary day with them be more understandable, more accessible and more humane? The future will be shaped by whom we include in that conversation today, and how we have it.

TODAY	ASSUMPTIONS	CHOICES
Research in defined tasks.	Reliability, cost and support.	Access, control and time.

GAPPAI PERSPECTIVE PUBLISHER'S VIEW

At GappAI, we believe a vision of the future should connect with people's everyday lives. Discussing long-term possibilities while being clear about the limits of current capabilities supports more trustworthy development. Our field is the connection between human knowledge and needs, and tasks robots might undertake. We want to discuss together what kind of life technology should support.

Which task would you want a robot to take on in your future life? Share your view with GappAI Review. →

Numbered references link to sources. Reading guide: pp. 52–54.

Reading further

RESEARCH & EVERYDAY WORK

Follow the evidence.

Numbered references restart within each article. Tap a source title to open the original publication.

Research demonstrates capabilities under defined conditions; it does not establish readiness for every workplace.

08 / What makes a robot useful?

[1] NIST — Assembly Performance Metrics and Test Methods ↗

[2] EU-OSHA — Digitalisation of Work ↗

11 / Could a robot do my job?

[1] O*NET OnLine — Maids and Housekeeping Cleaners, 37-2012.00 ↗

[2] Millennium Hotels & Resorts — Stay on Trend with M Social (2018) ↗

[3] EU-OSHA — Digitalisation of Work ↗

15 / What are universities teaching robots?

[1] ETH Zürich — Robot Learning: course and learning objectives ↗

[2] Fu, Zhao & Finn — Mobile ALOHA (2024) ↗

[3] Diffusion Policy — Visuomotor Policy Learning via Action Diffusion ↗

[4] DROID — A Large-Scale In-the-Wild Robot Manipulation Dataset (2024) ↗

[5] DFKI — Launch of the Robotics Institute Germany (2024) ↗

18 / The invisible day of a hotel

[1] Oracle Hospitality — Housekeeping Room Status ↗

[2] EU-OSHA — Digitalisation of Work ↗

21 / Before you buy a robot

[1] Your Europe — CE Marking and Conformity Assessment ↗

[2] NIST — Robotics: performance measurement and test methods ↗

Reading further

FIELD EVIDENCE, POLICY & CAPITAL

Read the scope.

Industrial robot statistics do not measure the humanoid market. Forecasts describe assumptions about the future, not realised sales.

The first 100 hours is an editorial observation framework, not a universal test standard.

25 / The first 100 hours

[1] NIST — Robotics: performance measurement and test methods

[2] EU-OSHA — Digitalisation of Work

28 / Who is building the robotic future?

[1] IFR — World Robotics 2025: industrial installations in 2024

[2] DFKI — Launch of the Robotics Institute Germany (2024)

[3] DROID — A Large-Scale In-the-Wild Robot Manipulation Dataset (2024)

31 / When a robot makes a mistake

[1] European Commission — AI Act: regulatory framework

[2] European Commission — Liability for Defective Products

[3] EU-OSHA — Digitalisation of Work

34 / What will robots change in the economy?

[1] Graetz & Michaels — Robots at Work, CEP Discussion Paper 1335 (2015)

[2] EU-OSHA — Digitalisation of Work

38 / What does big capital see in robotics?

[1] Goldman Sachs Research — Humanoid market outlook to 2035 (2024)

[2] Morgan Stanley Research — Humanoids: A $5 Trillion Market (2025)

[3] iShares — Automation & Robotics UCITS ETF: investment objective

Reading further

GAPPAI & THE NEXT HORIZON

Know the voice.

GappAI's own pages explain the publisher's approach and contact routes. They are not independent performance evaluations.

The 2035 feature is a fictional scenario. Its future assumptions are separate from the research it cites.

41 / A body is only the beginning

[1] GappAI Skills — capability development and product direction
[2] GappAI Workforce — deployment and operations approach

43 / The journey of one operation

[1] GappAI Skills — capability development and product direction
[2] GappAI Workforce — deployment and operations approach
[3] GappAI Labs — research and applied robotics
[4] GappAI Physical AI Pilot — scope and proposal process

46 / Tell us about your operation

[1] GappAI Physical AI Pilot — scope and proposal process
[2] GappAI — Corporate Enquiries and Partnerships
[3] GappAI Labs — research and applied robotics

49 / An ordinary day in 2035

[1] Fu, Zhao & Finn — Mobile ALOHA (2024)
[2] DROID — A Large-Scale In-the-Wild Robot Manipulation Dataset (2024)

Choose a reading path

For robot learning, begin with ETH Zürich, Mobile ALOHA, Diffusion Policy and DROID. For workplace evaluation, combine NIST's measurement work with EU-OSHA's perspective on people and work. Consult current official texts for European rules.

Behind the issue

ISSUE 01 / BEYOND THE SCREEN / ENGLISH EDITION

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GappAI Review

THE CONVERSATION CONTINUES

What should robots learn next?

The most useful questions begin
with the work people know.

Share a task. Challenge an assumption.
Bring a perspective from your part of the world.

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