Transcript: AI Powered Robots Will Soon Be Everywhere.

Video ID: ck2oTYOZxj8

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**[00:00:00]** AI powered humanoid robots will end the

**[00:00:02]** need for humans to work

**[00:00:05]** forever this may sound shocking but

**[00:00:08]** after thousands of hours of research by

**[00:00:10]** a world-leading team of scientists and

**[00:00:13]** thinkers this video will show why this

**[00:00:16]** outcome is

**[00:00:18]** inevitable we will explain how AI

**[00:00:21]** powerered humanoid robots will

**[00:00:22]** profoundly impact the economy society

**[00:00:25]** and governments surpassing even the

**[00:00:27]** Industrial Revolution

**[00:00:31]** this new era will make work optional

**[00:00:34]** rather than necessary leading to immense

**[00:00:36]** abundance but also potential hardships

**[00:00:39]** if we're not prepared and shockingly

**[00:00:42]** this has happened before all we have to

**[00:00:44]** do is look at the last time the labor of

**[00:00:47]** an entire species was disrupted with the

**[00:00:50]** introduction of the automobile over 100

**[00:00:53]** years

**[00:00:54]** ago in the 15 years between 1907 and

**[00:00:58]** 1922 horses went from providing 95% of

**[00:01:01]** all private vehicle miles traveled on

**[00:01:04]** American roads to less than

**[00:01:06]** 20% in areas like New York City which

**[00:01:09]** led in the adoption of automobiles the

**[00:01:11]** disruption of Transportation was Swift

**[00:01:14]** and

**[00:01:15]** transformative in St Louis Missouri the

**[00:01:17]** registered number of automobiles

**[00:01:19]** exceeded the registered number of

**[00:01:21]** horsedrawn wagons by the year

**[00:01:24]** 196 but since cars travel a far greater

**[00:01:27]** distance per year than horsedrawn wagons

**[00:01:29]** for a fraction of the cost per mile the

**[00:01:32]** fate of the horse as a form of Transport

**[00:01:34]** was sealed from the first day that

**[00:01:36]** mass-produced automobiles rolled off the

**[00:01:38]** factory

**[00:01:39]** lines in the picture on the left we can

**[00:01:42]** see a single automobile on Fifth Avenue

**[00:01:45]** in New York surrounded by a sea of

**[00:01:47]** horsedrawn carriages in the year

**[00:01:50]** 1900 by 1913 the reverse was true in

**[00:01:55]** another picture of Fifth Avenue on the

**[00:01:57]** right we see a single horsedrawn

**[00:01:59]** Carriage surrounding rounded by a sea of

**[00:02:02]** automobiles the disruption of Horses by

**[00:02:04]** automobiles in the early 20th century

**[00:02:07]** followed a characteristic pattern that

**[00:02:09]** we have seen throughout history adoption

**[00:02:12]** of the new technology follows an

**[00:02:14]** s-shaped growth curve while abandonment

**[00:02:17]** of the older technology collapses

**[00:02:19]** accordingly together these form what

**[00:02:22]** rethink X calls A disruption X curve

**[00:02:26]** disruptions of all kinds follow this

**[00:02:28]** same pattern rethink X has charted the

**[00:02:31]** disruption X curves for many such

**[00:02:33]** historical examples including red fabric

**[00:02:36]** dyes insulin video rentals cameras corn

**[00:02:41]** nails coal car tires UK Power Generation

**[00:02:45]** TV screens us crystal meth production

**[00:02:49]** and so many more the disruption of

**[00:02:52]** horses was no different in the 30 years

**[00:02:55]** following 1900 automobiles rapidly

**[00:02:58]** displaced over 90% of all transport

**[00:03:01]** miles traveled now we are on the cusp of

**[00:03:05]** a new disruption physical labor

**[00:03:07]** performed by humanoid form robots except

**[00:03:11]** this time we are the

**[00:03:14]** horses computer hardware and software to

**[00:03:17]** process sensory data with powerful AI

**[00:03:21]** actuators to move and interact with

**[00:03:23]** objects in the

**[00:03:24]** environment batteries and Power

**[00:03:26]** Electronics to provide energy for hours

**[00:03:28]** of sensing Computing and

**[00:03:32]** moving each of these Technologies has

**[00:03:35]** gotten dramatically cheaper and more

**[00:03:36]** powerful in recent years setting the

**[00:03:39]** stage for the disruption of Labor over

**[00:03:42]** the next 15 to 20 years humanoid robots

**[00:03:45]** will disrupt human labor throughout

**[00:03:47]** hundreds of Industries across every

**[00:03:50]** major sector of the global economy the

**[00:03:53]** disruption of Labor will be among the

**[00:03:55]** most profound transformations in human

**[00:03:57]** history and therefore similar

**[00:03:59]** multaneously represents one of the

**[00:04:02]** greatest opportunities and greatest

**[00:04:04]** challenges our civilization has ever

**[00:04:06]** faced in this introductory post we

**[00:04:09]** present a highlevel overview of some of

**[00:04:11]** our key insights around the upcoming

**[00:04:14]** disruption of Labor future posts in this

**[00:04:17]** series will delve into the details of

**[00:04:19]** how and why the disruption of Labor is

**[00:04:21]** unfolding some of the extraordinary

**[00:04:24]** implications to expect and the critical

**[00:04:27]** choices societies will face as a result

**[00:04:30]** result Insight one the humanoid robot

**[00:04:33]** labor disruption is

**[00:04:35]** inevitable throughout history every time

**[00:04:39]** technology has enabled a 10x or greater

**[00:04:42]** cost reduction relative to the incumbent

**[00:04:44]** system A disruption has always followed

**[00:04:48]** each dollar spent on an automobile or an

**[00:04:50]** LED light bulb or a digital camera

**[00:04:52]** delivers more than 10 times the utility

**[00:04:55]** of each dollar spent on a horse

**[00:04:57]** incandescent bulb or film camera

**[00:05:00]** respectively for Millennia these and

**[00:05:03]** hundreds of other disruptive

**[00:05:04]** technologies have driven sweeping

**[00:05:06]** Transformations across every aspect of

**[00:05:09]** human life today we are on the cusp of

**[00:05:12]** the most profound disruption of human

**[00:05:14]** labor since the Advent of electricity

**[00:05:16]** and combustion engines over a century

**[00:05:19]** ago as in many markets there will be

**[00:05:22]** high-end and low-end humanoid robot

**[00:05:24]** offerings once deployment begins in

**[00:05:27]** Earnest for the purposes of illust ation

**[00:05:30]** consider a humanoid robot with a total

**[00:05:33]** lifetime cost of $200,000 that works

**[00:05:36]** 20,000 hours before decommissioning its

**[00:05:39]** labor would cost $10 per hour even at

**[00:05:42]** this relatively high cost Point humanoid

**[00:05:45]** robots are already competitive with

**[00:05:47]** human labor in a substantial fraction of

**[00:05:49]** the global economy in reality lifetime

**[00:05:52]** costs of humanoid robots are likely to

**[00:05:55]** be far less than

**[00:05:57]** $200,000 right from the start

**[00:06:00]** humanoid robots will enter the market at

**[00:06:03]** a cost capability of under $10 per hour

**[00:06:06]** for their labor on a trajectory to under

**[00:06:09]** $1 per hour before 2035 and under 10

**[00:06:12]** cents per hour before

**[00:06:15]** 2045 this alone makes the disruption of

**[00:06:18]** a substantial fraction of human labor

**[00:06:21]** inevitable humanoid robots will work

**[00:06:24]** more than three times as many hours per

**[00:06:26]** week as a person in any conditions

**[00:06:28]** without vac a or illness or complaint

**[00:06:31]** for a total of perhaps 7,000 hours per

**[00:06:34]** year but at the same time that cost is

**[00:06:38]** falling capability will also be

**[00:06:41]** growing at first humanoid robots will

**[00:06:44]** only be able to perform relatively

**[00:06:46]** simple tasks but with each day that

**[00:06:48]** passes their capabilities will grow

**[00:06:51]** until by the 2040s they will be able to

**[00:06:53]** do virtually anything a human can do and

**[00:06:56]** much more

**[00:06:58]** besides remember humanoid robots today

**[00:07:02]** are the most expensive and least capable

**[00:07:04]** they will ever

**[00:07:06]** be humanoid robots are what rethink X

**[00:07:10]** calls A disruption From Below initially

**[00:07:13]** they will be cheaper per hour than

**[00:07:15]** hiring a human worker in many regions

**[00:07:18]** but also less capable slower less

**[00:07:21]** competent less adaptable we have seen

**[00:07:24]** disruptions From Below many times before

**[00:07:27]** such as digital cameras and the response

**[00:07:30]** from incumbents is predictable they mock

**[00:07:33]** the new technology for being lower

**[00:07:35]** performing while ignoring the rate at

**[00:07:37]** which the new technology gets both

**[00:07:39]** better and cheaper until it is too late

**[00:07:42]** to respond and they face collapse

**[00:07:45]** Insight two the disruption will create

**[00:07:48]** an entirely new labor

**[00:07:51]** system this is what we call a phase

**[00:07:54]** change

**[00:07:55]** disruption phase change disruptions

**[00:07:58]** create entirely new and much larger

**[00:08:00]** systems with new properties new business

**[00:08:02]** models and new

**[00:08:04]** metrics electricity wasn't just cheaper

**[00:08:07]** whale oil automobiles weren't just

**[00:08:09]** Faster Horses farming wasn't just more

**[00:08:12]** productive hunting and Gathering and the

**[00:08:15]** internet wasn't just an easier way to

**[00:08:17]** send letters read newspapers or listen

**[00:08:20]** to music these disruptions created

**[00:08:23]** vastly larger and more capable systems

**[00:08:25]** of energy Transportation food and

**[00:08:28]** information

**[00:08:30]** delivering orders of magnitude more

**[00:08:32]** kilowatt hours passenger and Freight

**[00:08:35]** miles calories and pictures news stories

**[00:08:39]** songs shows and other content

**[00:08:42]** respectively the new systems had

**[00:08:45]** radically different properties that

**[00:08:46]** required new metrics to measure new

**[00:08:49]** business models to utilize and new

**[00:08:51]** institutions to govern today it's

**[00:08:54]** happening again solar wind and batteries

**[00:08:58]** won't just dis displace fossil fuels

**[00:09:01]** they will create an entirely new Energy

**[00:09:03]** System autonomous electric vehicles

**[00:09:06]** won't just displace combustion engine

**[00:09:09]** Vehicles they will create an entirely

**[00:09:11]** new transportation system Precision

**[00:09:14]** fermentation and cellular agriculture

**[00:09:16]** won't just replace animal agriculture

**[00:09:19]** they will create an entirely new food

**[00:09:22]** system and humanoid robots won't just

**[00:09:25]** displace human jobs instead they will

**[00:09:27]** create an entirely new and vastly larger

**[00:09:30]** and more capable labor system it is

**[00:09:33]** impossible to know in advance the full

**[00:09:35]** details of how the new labor system will

**[00:09:38]** differ from today but the key feature is

**[00:09:42]** the marginal cost of Labor will rapidly

**[00:09:45]** approach Zero from this many other new

**[00:09:49]** system properties and behaviors will

**[00:09:50]** follow just like when the internet and

**[00:09:53]** digital Technologies reduce the marginal

**[00:09:55]** cost of information and Communications

**[00:09:58]** to near zero

**[00:10:00]** Insight three the disruption of labor is

**[00:10:03]** about tasks not

**[00:10:06]** jobs history shows that disruptions

**[00:10:08]** require new metrics incandescent light

**[00:10:11]** bulbs used to be sold according to how

**[00:10:13]** much power they

**[00:10:15]** consumed bulbs typically used in homes

**[00:10:18]** might be rated 40 Watts for use in

**[00:10:20]** storage areas for example 60 watts for

**[00:10:24]** living areas where one might want to

**[00:10:25]** read or 100 Watts for large rooms that

**[00:10:29]** need need lots of

**[00:10:30]** Illumination but when the first LED

**[00:10:33]** light bulbs were introduced to the

**[00:10:35]** market people quickly realized that the

**[00:10:37]** old metrics were no longer useful LEDs

**[00:10:41]** consume so much less energy than

**[00:10:43]** incandescents that they could not easily

**[00:10:45]** be compared to the old bulbs based on

**[00:10:48]** their power consumption instead the new

**[00:10:51]** bulbs were simply rated according to how

**[00:10:53]** much light they emitted in lumens and

**[00:10:56]** the color of the light they produced on

**[00:10:58]** a scale called color temperature

**[00:11:00]** measured in deg kelvin in the case of

**[00:11:04]** humanoid robots the old and misleading

**[00:11:06]** metric is jobs most jobs involve much

**[00:11:10]** more than performing a single task they

**[00:11:12]** typically entail responsibility for a

**[00:11:15]** range of tasks Each of which requires a

**[00:11:17]** different amount of training experience

**[00:11:19]** and skill to perform they often come

**[00:11:22]** with complex contractual obligations on

**[00:11:24]** the part of both employer and employee

**[00:11:28]** and they are deeply intertwined Ed with

**[00:11:29]** an individual's career identity and even

**[00:11:33]** their community and culture so long as

**[00:11:36]** humanoid robots are not sentient they

**[00:11:39]** will not have jobs they will only

**[00:11:42]** perform

**[00:11:43]** tasks the disruption of Labor with all

**[00:11:46]** of its world changing implications can

**[00:11:49]** therefore only be understood with tasks

**[00:11:51]** as the correct unit of analysis and

**[00:11:53]** tasks per hour per dollar as the

**[00:11:55]** corresponding cost capability metric in

**[00:11:59]** the in the beginning of the disruption

**[00:12:00]** the tasks a robot can perform will be

**[00:12:03]** narrow the hours it can work in its

**[00:12:05]** useful operational life before

**[00:12:07]** decommissioning will be limited to just

**[00:12:10]** a few years worth and their upfront

**[00:12:12]** costs will be high but each of these

**[00:12:15]** elements of their key cost capability

**[00:12:17]** metric will improve rapidly and

**[00:12:20]** substantially over the next 10

**[00:12:23]** years Insight four all products and

**[00:12:27]** services will get cheaper labor is an

**[00:12:29]** essential input into every link of every

**[00:12:32]** supply chain of every product and

**[00:12:34]** service across the entire global

**[00:12:37]** economy that means as the cost of Labor

**[00:12:39]** Falls so will the cost of everything

**[00:12:42]** else this would hold true as humanoid

**[00:12:44]** robots are deployed at scale even if the

**[00:12:47]** cost capability of the robots themselves

**[00:12:50]** remains static but of course the cost

**[00:12:53]** capability of humanoid robots will also

**[00:12:56]** be improving at the same time and

**[00:12:58]** dramatically as deployment

**[00:13:00]** proceeds this will only amplify and

**[00:13:03]** accelerate the dynamic of universal cost

**[00:13:06]** reduction we must expect and plan for a

**[00:13:09]** sweeping tide of Supply driven not

**[00:13:12]** demand driven deflationary pressure

**[00:13:14]** across the entire global economy as a

**[00:13:17]** function of the disruption of Labor by

**[00:13:19]** humanoid

**[00:13:20]** [Music]

**[00:13:22]** robots Insight 5 all products will get

**[00:13:27]** better the quality quality of virtually

**[00:13:30]** all manufactured goods will tend to

**[00:13:32]** improve because the limits of skill and

**[00:13:34]** attention to detail that apply to humans

**[00:13:37]** do not apply to

**[00:13:39]** robots manufacturers will have far less

**[00:13:42]** incentive to cut Corners sacrifice

**[00:13:44]** Precision or fail to ensure that tasks

**[00:13:47]** and processes are performed with Maximum

**[00:13:50]** Care and thoughtfulness because in stark

**[00:13:53]** contrast to human workers there will be

**[00:13:55]** little to no cost savings obtainable

**[00:13:58]** from humanoid robots these ways every

**[00:14:01]** humanoid robot will perform every task

**[00:14:04]** it is capable of performing at the

**[00:14:06]** maximum quality it can perform it every

**[00:14:09]** single time moreover the absolute amount

**[00:14:13]** of savings attainable by Corner cutting

**[00:14:15]** will become less meaningful as the cost

**[00:14:18]** of Premium quality Goods plummets across

**[00:14:20]** the board along with everything else

**[00:14:23]** wholesale buyers and end customers will

**[00:14:26]** not hesitate to spend 99 Cents for a

**[00:14:28]** high quality product instead of 98 cents

**[00:14:32]** for a lowquality one and so markets for

**[00:14:34]** what are today considered lowend

**[00:14:37]** products will shrink

**[00:14:39]** dramatically the upshot from a consumer

**[00:14:41]** perspective is that quality will appear

**[00:14:43]** to be on the rise everywhere all at once

**[00:14:46]** with cheap junk quickly becoming a relic

**[00:14:48]** of a bygone era again this would hold

**[00:14:52]** even if the robots themselves never

**[00:14:54]** improved but they will themselves be

**[00:14:57]** improving as deployment proceeds s which

**[00:14:59]** will only amplify and accelerate the

**[00:15:01]** dynamic of universal quality improvement

**[00:15:04]** across the entire global

**[00:15:07]** economy Insight six productivity will

**[00:15:12]** Skyrocket improvements in technological

**[00:15:14]** capability and the accumulation of

**[00:15:16]** capital in its various forms equipment

**[00:15:19]** infrastructure knowledge social

**[00:15:20]** relationships have made Humanity more

**[00:15:23]** and more productive on a per capita

**[00:15:25]** basis throughout the ages and especially

**[00:15:29]** since the Industrial Revolution but

**[00:15:31]** labor has always remained a limiting

**[00:15:33]** factor of production and up until now

**[00:15:36]** the quantity of available labor has been

**[00:15:38]** a function of population and regions

**[00:15:42]** with more and cheaper labor have enjoyed

**[00:15:44]** a competitive Advantage as a

**[00:15:46]** result humanoid robots fundamentally

**[00:15:50]** change the equation instead of growing

**[00:15:53]** only as fast as a human population

**[00:15:55]** available labor can now grow as fast as

**[00:15:58]** humanoid robots can be built and

**[00:16:01]** deployed the difference is explosive

**[00:16:04]** like a damn bursting humanoid robots

**[00:16:07]** will unleash a torrent of productivity

**[00:16:09]** as countless tasks that could hitherto

**[00:16:12]** only be performed by the finite supply

**[00:16:14]** of adult humans start to be performed

**[00:16:17]** far more cheaply by humanoid robots this

**[00:16:20]** will affect not only all existing

**[00:16:22]** applications and industries but also

**[00:16:25]** enable entirely new applications and

**[00:16:27]** industries which were were not

**[00:16:29]** previously possible in the old

**[00:16:31]** human-based labor system due to the high

**[00:16:33]** cost danger or other limitations of

**[00:16:36]** human workers and the humanoid robot

**[00:16:39]** labor force can expand with little

**[00:16:41]** constraint in almost any region or

**[00:16:44]** country negating most of the regional

**[00:16:46]** competitive Advantage from lowcost labor

**[00:16:48]** that we see

**[00:16:50]** today Insight 7 investing in humanoid

**[00:16:54]** robots is now a matter of national

**[00:16:57]** interest starting with national

**[00:16:59]** Workforce expansion humanoid robots will

**[00:17:02]** allow any Nation to massively expand its

**[00:17:04]** Workforce and thus grow its economy on a

**[00:17:07]** productivity per capita basis to a

**[00:17:09]** degree that has simply been physically

**[00:17:11]** impossible up until now it takes almost

**[00:17:14]** 20 years and more than

**[00:17:16]** $100,000 to raise a child and prepare

**[00:17:20]** them to join the National Workforce of a

**[00:17:22]** middle inome country in the wealthier

**[00:17:25]** countries where cost of living is higher

**[00:17:28]** the cost can exceed

**[00:17:30]** $300,000 not including postsecondary

**[00:17:33]** education at

**[00:17:34]** University humanoid robots by contrast

**[00:17:37]** can be added to the workforce as fast as

**[00:17:40]** they can be manufactured and it is

**[00:17:42]** unlikely their unit cost will exceed

**[00:17:44]** that of an inexpensive car even at the

**[00:17:47]** very start of commercial deployment this

**[00:17:50]** means that by 2035 for adding 1 million

**[00:17:54]** people to a nation's Workforce might

**[00:17:57]** cost $100 billion

**[00:17:59]** and take 20 years whereas adding 1

**[00:18:02]** million humanoid robots to its Workforce

**[00:18:05]** might cost just 10 billion and take a

**[00:18:08]** single year as a civilization we should

**[00:18:11]** be able to build humanoid robots at

**[00:18:14]** least at the rate we build automobiles

**[00:18:16]** roughly 100 million per year and

**[00:18:19]** eventually at the rate we build

**[00:18:21]** smartphones several billion per year we

**[00:18:25]** therefore have every reason to expect

**[00:18:27]** that physical labor by humanoid robots

**[00:18:30]** will supplant physical labor by humans

**[00:18:32]** just as quickly as the other examples of

**[00:18:34]** the disruption X curves we showed

**[00:18:38]** above National

**[00:18:41]** infrastructure for planning and

**[00:18:43]** investment purposes the deployment of

**[00:18:45]** humanoid robots is akin to investment in

**[00:18:48]** infrastructure whether public or private

**[00:18:51]** infrastructure serves as an enabling

**[00:18:53]** condition for other activity this

**[00:18:56]** includes economic productivity of course

**[00:18:59]** but also quality of life activity

**[00:19:01]** ranging from comfort and security to

**[00:19:04]** travel and Leisure Nations have

**[00:19:07]** historically made enormous investments

**[00:19:09]** in basic infrastructure and we ought to

**[00:19:12]** expect this for humanoid robots as well

**[00:19:15]** and just as investments in Road and

**[00:19:17]** electrical infrastructure recursively

**[00:19:20]** enabled their own further deployment so

**[00:19:22]** too will humanoid

**[00:19:25]** robots National Economic

**[00:19:27]** self-sufficiency

**[00:19:30]** the greater a nation's productive

**[00:19:32]** capacity is the greater is its ability

**[00:19:35]** to remain economically

**[00:19:37]** self-sufficient in the past this was

**[00:19:39]** only realistic for populous nations with

**[00:19:42]** a large resource base but a large

**[00:19:45]** robotic Workforce combined with the

**[00:19:47]** disruptions of energy transportation and

**[00:19:50]** food we have analyzed in our other

**[00:19:51]** research would allow even the smaller

**[00:19:54]** nations of the world to become far less

**[00:19:56]** dependent upon foreign trade whether the

**[00:19:59]** option for isolationism would prove

**[00:20:01]** beneficial or detrimental to

**[00:20:03]** international relations remains to be

**[00:20:06]** seen National

**[00:20:09]** Security today the size of a nation's

**[00:20:12]** Army can only be a subset of its own

**[00:20:15]** population in the future Nations and

**[00:20:17]** non-state actors will be able to raise

**[00:20:19]** humanoid robot armies that are larger

**[00:20:21]** and more capable than today's largest

**[00:20:23]** armies regardless of their own

**[00:20:25]** population size any humanoid Ro robot

**[00:20:29]** capable of working in a productive

**[00:20:30]** capacity can also be deployed in a

**[00:20:33]** national security capacity whether in a

**[00:20:36]** supporting or Frontline role and unlike

**[00:20:39]** human beings for whom military

**[00:20:41]** conscription and training and deployment

**[00:20:44]** is difficult and costly on every level

**[00:20:46]** humanoid robots can be repurposed

**[00:20:49]** literally overnight this means that For

**[00:20:52]** Better or Worse Any Nation with a large

**[00:20:55]** robotic Workforce is also a nation with

**[00:20:58]** a large robotic Army whether this

**[00:21:01]** becomes a requisite condition of

**[00:21:03]** National Defense for Sovereign Integrity

**[00:21:05]** in the 21st century remains to be seen

**[00:21:08]** but the fact that humanoid robots have

**[00:21:10]** clear and unequivocal military

**[00:21:12]** implications cannot be

**[00:21:15]** ignored Insight 8 National mobilization

**[00:21:19]** and enormous investments in humanoid

**[00:21:21]** robots are now Justified and there is no

**[00:21:24]** time to

**[00:21:26]** lose humanoid robots are likely to be

**[00:21:29]** one of the most profitable physical

**[00:21:31]** product categories ever by virtue of the

**[00:21:34]** sheer scale of their production numbers

**[00:21:36]** alone given the size of the global labor

**[00:21:39]** market together with latent demand that

**[00:21:41]** this technology will unlock it is

**[00:21:43]** reasonable to expect the number of

**[00:21:45]** humanoid robots deployed to exceed 1

**[00:21:48]** billion over the next two decades and

**[00:21:51]** possibly much more but beyond just their

**[00:21:54]** direct Financial return to investors the

**[00:21:57]** sweeping implications of the inevitable

**[00:22:00]** explosion in productivity material

**[00:22:03]** superabundance and overall prosperity

**[00:22:05]** mean that the returns to Society at

**[00:22:08]** large on investment in humanoid robots

**[00:22:10]** are nothing short of Staggering

**[00:22:13]** governments and other public

**[00:22:14]** institutions such as universities

**[00:22:16]** therefore have a crucial role to play

**[00:22:18]** here as a matter of General principle

**[00:22:22]** governments universities and other

**[00:22:24]** public interest institutions and

**[00:22:26]** organizations should be prepared to

**[00:22:28]** dedicate enormous resources to funding

**[00:22:31]** and supporting the development and

**[00:22:32]** deployment of humanoid robots in their

**[00:22:35]** societies as a matter of national

**[00:22:37]** interest it is now rational for

**[00:22:40]** societies to devote a non-trivial

**[00:22:42]** fraction of their entire GDP to

**[00:22:44]** investment in humanoid

**[00:22:47]** robotics Humanity has been in this sort

**[00:22:49]** of situation before many societies have

**[00:22:53]** built roads Plumbing for running water

**[00:22:55]** electricity service telephone service

**[00:22:58]** and broadband internet service to every

**[00:23:00]** home and Business these basic services

**[00:23:03]** not only bring Prosperity but massively

**[00:23:06]** increased productivity too societies

**[00:23:09]** must now aim for robots in every home

**[00:23:11]** and Business as well and for exactly the

**[00:23:14]** same reasons a great deal of

**[00:23:16]** experimentation and learning will be

**[00:23:18]** required to convert investments in

**[00:23:21]** humanoid robots into real value testing

**[00:23:24]** zones that resemble factories hospitals

**[00:23:27]** and even outdoor urban areas where

**[00:23:30]** robotics companies can engage in High

**[00:23:32]** Learning rate low risk to humans

**[00:23:35]** experimentation are needed just as test

**[00:23:38]** tracks were for autonomous vehicles

**[00:23:41]** incentive programs of all kinds should

**[00:23:43]** be tried to encourage adoption of the

**[00:23:46]** technology and experimentation at every

**[00:23:49]** level and regulatory requirements and

**[00:23:51]** standards should be enacted with caution

**[00:23:54]** to maximally support Market driven

**[00:23:56]** deployment without getting in in the way

**[00:23:59]** of a development or deployment as the

**[00:24:02]** capabilities of humanoid robots approach

**[00:24:04]** and then exceed those of human workers

**[00:24:07]** the future will belong to those

**[00:24:08]** societies that embrace the humanoid

**[00:24:11]** robot labor disruption by developing and

**[00:24:14]** deploying this technology as rapidly as

**[00:24:17]** possible in sight 9 the disruption of

**[00:24:20]** Labor accelerates the other foundational

**[00:24:23]** disruptions of energy transportation and

**[00:24:26]** food our previous research has shown

**[00:24:29]** that disruptions are already underway in

**[00:24:31]** energy transportation and food Each of

**[00:24:34]** which is a foundational sector of the

**[00:24:37]** global economy adding the disruption of

**[00:24:40]** Labor by humanoid robots to the mix will

**[00:24:43]** be like hosing gasoline on an already

**[00:24:45]** roaring Inferno by making all goods and

**[00:24:49]** services cheaper higher quality and

**[00:24:51]** generally expanding productivity at

**[00:24:53]** large humanoid robots will only

**[00:24:56]** accelerate the deployment of each of the

**[00:24:58]** constituent Technologies behind the

**[00:25:00]** other three foundational disruptions as

**[00:25:02]** well solar power wind power and

**[00:25:06]** batteries in the energy sector electric

**[00:25:08]** autonomous vehicles in the

**[00:25:09]** transportation sector and precision

**[00:25:12]** fermentation and cellular agriculture in

**[00:25:14]** the food

**[00:25:16]** sector manufacturing and deploying and

**[00:25:18]** maintaining all of those energy

**[00:25:21]** transportation and food assets and

**[00:25:23]** infrastructure is hugely labor

**[00:25:26]** intensive human workers in the those

**[00:25:28]** fields require extensive training and

**[00:25:31]** the work itself can be physically taxing

**[00:25:33]** dangerous and is often performed under

**[00:25:36]** difficult conditions nevertheless these

**[00:25:39]** are among the fastest growing job

**[00:25:41]** categories in the United States and

**[00:25:43]** elsewhere precisely because the

**[00:25:45]** disruptions have created so much demand

**[00:25:48]** for them conversely the disruptions

**[00:25:50]** already underway particularly in energy

**[00:25:53]** and transportation will also accelerate

**[00:25:56]** the development and Adoption of human o

**[00:25:58]** robots working together amplifying and

**[00:26:02]** accelerating each other these four

**[00:26:04]** disruptions will open the door to an

**[00:26:06]** entirely new kind of production system

**[00:26:09]** based on a new economics of super

**[00:26:11]** abundance rather than

**[00:26:14]** scarcity Insight 10 humanoid robotics

**[00:26:18]** will massively increase prosperity and

**[00:26:21]** thereby make every major social economic

**[00:26:23]** geopolitical and environmental problem

**[00:26:26]** more solvable

**[00:26:28]** industrialized countries are undergoing

**[00:26:31]** massive demographic

**[00:26:33]** changes every retirement party packs a

**[00:26:35]** double whammy as it means not only one

**[00:26:38]** less member of the national Workforce

**[00:26:40]** but also one more person collecting a

**[00:26:43]** pension countries are seeing rapidly

**[00:26:46]** aging populations declining labor forces

**[00:26:48]** and in some cases a falling total

**[00:26:52]** population in response governments are

**[00:26:54]** trying to stoke baby booms in their own

**[00:26:57]** populations and trying trying to attract

**[00:26:59]** skilled immigrants from other countries

**[00:27:01]** meanwhile climate change threatens to

**[00:27:04]** destabilize communities and regions

**[00:27:07]** across the globe by shifting rainfall

**[00:27:09]** patterns inundating coastlines

**[00:27:12]** exacerbating storm and flood risks and

**[00:27:14]** altering the suitability of land for

**[00:27:16]** agriculture among other

**[00:27:19]** impacts formidable challenges are bound

**[00:27:22]** from housing shortages and Rising demand

**[00:27:24]** for medical services to water and

**[00:27:27]** resource short ages to civil strife and

**[00:27:30]** even War problems whether natural or

**[00:27:33]** human-made are inevitable and

**[00:27:36]** unavoidable the key to overcoming them

**[00:27:38]** is and always has been Prosperity indeed

**[00:27:42]** a useful way to define prosperity itself

**[00:27:45]** is his problemsolving

**[00:27:47]** capacity the disruption of Labor

**[00:27:49]** especially in combination with the

**[00:27:51]** disruption of energy transportation and

**[00:27:53]** food has the potential to vastly expand

**[00:27:56]** material abundance world wide and thus

**[00:27:59]** greatly increase prosperity for everyone

**[00:28:03]** everywhere if the rate of cost

**[00:28:05]** capability Improvement in humanoid

**[00:28:07]** robots continues as it has been we will

**[00:28:10]** enter an era of material superabundance

**[00:28:13]** and prosperity over the next 10 to 20

**[00:28:16]** years that has hitherto been all but

**[00:28:18]** unimaginable outside of Science Fiction

**[00:28:21]** but as the Technologies of AI and

**[00:28:23]** robotic all move from the realm of

**[00:28:26]** Science Fiction to science fact

**[00:28:28]** so too do their profound

**[00:28:32]** implications Insight 11 the technology

**[00:28:35]** convergence of the humanoid robot labor

**[00:28:38]** engine is happening now and

**[00:28:40]** manufacturability is critical every

**[00:28:43]** element of Robotics hardware and

**[00:28:44]** software is likely to improve

**[00:28:46]** dramatically over the next decade but

**[00:28:49]** one specific aspect of Hardware design

**[00:28:52]** deserves special emphasis here

**[00:28:55]** manufacturability much of the value and

**[00:28:58]** as well as competitive advantage of

**[00:29:00]** humanoid robots from the very start will

**[00:29:03]** be in their deployment at scale even if

**[00:29:06]** their capability is limited at first

**[00:29:09]** this can be continuously upgraded with

**[00:29:11]** over-the-air updates as their AI rapidly

**[00:29:14]** improves which means there is no reason

**[00:29:17]** to delay adoption the technology

**[00:29:20]** convergence of the humanoid robot labor

**[00:29:22]** engine is happening now and

**[00:29:24]** manufacturability is critical despite

**[00:29:27]** their seemingly futuristic nature

**[00:29:29]** humanoid robots will be subject to the

**[00:29:31]** pressure of mass market dynamics just

**[00:29:34]** like other mass-produced manufactured

**[00:29:36]** goods from ballpoint pens to printed

**[00:29:38]** circuit boards Mass Market Goods like

**[00:29:42]** these which are produced at huge scale

**[00:29:44]** must be explicitly designed for

**[00:29:47]** manufacturability in order to minimize

**[00:29:49]** production cost and maximize production

**[00:29:52]** volume the same will be true for

**[00:29:54]** humanoid robots moreover the design of

**[00:29:57]** the manuf ufacturing facility itself

**[00:30:00]** will also be part of the extended

**[00:30:02]** phenotype of humanoid robots not least

**[00:30:05]** because these facilities will be

**[00:30:06]** operated in part and eventually entirely

**[00:30:10]** by humanoid robots

**[00:30:13]** themselves in site 12 the humanoid form

**[00:30:17]** factor will dominate robotics

**[00:30:19]** applications for at least the next

**[00:30:21]** decade although specialization and

**[00:30:23]** optimization of Robotics unconstrained

**[00:30:26]** by The Human Form will event makes sense

**[00:30:29]** the robots developed and deployed during

**[00:30:32]** the first phase of the disruption will

**[00:30:33]** take humanoid

**[00:30:35]** form suitability to existing

**[00:30:38]** environs all existing facilities

**[00:30:41]** equipment and infrastructure is designed

**[00:30:43]** around the human form that makes the

**[00:30:46]** humanoid form a natural choice for

**[00:30:48]** mass-produced robots in the near

**[00:30:50]** term in the early stages of the

**[00:30:53]** disruption the capability of the AI

**[00:30:55]** driving the robots will still be

**[00:30:58]** immature in order to improve enormous

**[00:31:01]** amounts of training data must therefore

**[00:31:03]** be gathered for AI training the humanoid

**[00:31:07]** form is a clear choice for facilitating

**[00:31:10]** large-scale data Gathering because

**[00:31:12]** humans themselves can facilitate the

**[00:31:14]** collection of the needed data this data

**[00:31:17]** could take the form of video recorded of

**[00:31:19]** humans doing tasks humans teleoperating

**[00:31:22]** humanoid robots humans wearing sensor

**[00:31:25]** Suites and so on all within in human

**[00:31:28]** Centric environs using human Centric

**[00:31:31]** tools our human capabilities are

**[00:31:34]** themselves Testament to how successful

**[00:31:36]** the humanoid form is as a general

**[00:31:38]** purpose platform this general purpose

**[00:31:41]** capability is even more important for

**[00:31:44]** robots than for humans because robots

**[00:31:46]** can be reskilled and redeployed far more

**[00:31:48]** quickly than humans unlike a human a

**[00:31:52]** robot can work in completely different

**[00:31:54]** environments on completely different

**[00:31:56]** tasks from one day to the next

**[00:31:58]** a factory one day a restaurant the next

**[00:32:01]** day and the battlefield the day after

**[00:32:04]** that because reskilling is as simple as

**[00:32:07]** downloading a software update the ease

**[00:32:10]** of reskilling and redeploying robots

**[00:32:12]** therefore greatly increases the value of

**[00:32:14]** the general purpose form relative to

**[00:32:17]** specialized forms the humanoid form is

**[00:32:19]** naturally familiar to us and even if

**[00:32:21]** another general purpose form were

**[00:32:22]** functionally Superior such as a craike

**[00:32:24]** or wheeled form we find might working

**[00:32:27]** alongside such robots intimidating or

**[00:32:29]** even

**[00:32:30]** frightening moreover because non-human

**[00:32:33]** forms are less familiar to us we cannot

**[00:32:37]** use our own experience to guide their

**[00:32:39]** development other familiar forms will be

**[00:32:42]** the first to follow the humanoid form

**[00:32:44]** factor and indeed we are already seeing

**[00:32:47]** early versions in development such as

**[00:32:50]** the dog form factor for security and

**[00:32:52]** protection and the horse or mule form

**[00:32:55]** factor for carrying things

**[00:32:59]** Insight 13 autocatalysis or self-

**[00:33:02]** acceleration of humanoid robot

**[00:33:04]** production will be key to the success of

**[00:33:07]** both individual firms and National

**[00:33:09]** economies the advantages of humanoid

**[00:33:11]** robots are so Stark at every level of

**[00:33:14]** analysis from Individual firms to

**[00:33:16]** Industries to Regions and entire nations

**[00:33:19]** that it is obvious we are now under race

**[00:33:22]** conditions to deploy humanoid robots as

**[00:33:24]** fast as possible

**[00:33:27]** it is also obvious that rapid deployment

**[00:33:30]** requires huge investments in R and D

**[00:33:34]** manufacturing capacity and

**[00:33:36]** infrastructure to support that

**[00:33:37]** deployment what is less obvious however

**[00:33:41]** is that humanoid robots must be deployed

**[00:33:43]** as early as possible into their own

**[00:33:46]** manufacturing to accelerate their

**[00:33:48]** production and deployment flywheel we've

**[00:33:50]** seen this before computer hardware and

**[00:33:53]** software has always been used to design

**[00:33:55]** better computer hardware and software

**[00:33:58]** autocatalysis or self acceleration will

**[00:34:01]** thus need to be a crucial part of

**[00:34:03]** humanoid robot investment and deployment

**[00:34:05]** strategy at every level from an

**[00:34:08]** individual firm's business model to an

**[00:34:10]** entire nation's

**[00:34:13]** policymaking Insight 14 technological

**[00:34:17]** unemployment remains inevitable but

**[00:34:20]** latent demand for labor will be met

**[00:34:22]** first creating a crucial planning window

**[00:34:25]** for a soft Landing

**[00:34:28]** the demand for labor vastly exceeds the

**[00:34:31]** available Supply there are chronic labor

**[00:34:34]** shortages across a wide range of

**[00:34:36]** Industries in many countries including

**[00:34:38]** throughout Europe and the United States

**[00:34:41]** and Beyond demand for labor in the form

**[00:34:43]** of existing job roles there is also an

**[00:34:47]** enormous quantity of latent demand for

**[00:34:49]** labor that goes perpetually unmet

**[00:34:52]** because it is too low paying too

**[00:34:54]** dangerous or otherwise too undesirable

**[00:34:57]** for human workers to supply at all

**[00:35:00]** moreover history shows that although

**[00:35:02]** capital in the form of facilities

**[00:35:04]** machinery and knowledge have substituted

**[00:35:07]** and thus displaced labor time and time

**[00:35:09]** again labor has nevertheless evolved to

**[00:35:13]** remain complimentary to that Capital

**[00:35:16]** counterintuitively this has put upward

**[00:35:18]** pressure on the value of Labor over time

**[00:35:21]** this Dynamic is sometimes framed as

**[00:35:24]** technological empowerment of Labor where

**[00:35:26]** new technologies increase worker

**[00:35:28]** leverage by expanding their capabilities

**[00:35:31]** for example construction workers have

**[00:35:33]** been literally empowered by power tools

**[00:35:37]** while office workers have been

**[00:35:38]** figuratively empowered by computers and

**[00:35:41]** other information technology following

**[00:35:44]** this historical pattern there will be a

**[00:35:46]** brief period when the same is also true

**[00:35:48]** of humanoid robots in the near term for

**[00:35:51]** perhaps a decade or so humanoid robots

**[00:35:54]** will largely be deployed to meet demand

**[00:35:57]** for labor that is currently going unmet

**[00:35:59]** by humans as opposed to directly

**[00:36:02]** displacing human workers from jobs they

**[00:36:04]** currently occupy this will create a

**[00:36:07]** non-obvious and counterintuitive

**[00:36:09]** situation in which humanoid robots

**[00:36:11]** appear to be almost purely a force

**[00:36:13]** multiplier for existing jobs and workers

**[00:36:16]** rather than a threat to them while true

**[00:36:19]** and worthy of Celebration we must be

**[00:36:21]** aware this condition will not persist

**[00:36:24]** for long even though an individual human

**[00:36:27]** capability will be greatly enhanced if

**[00:36:29]** they have a personal team of the

**[00:36:31]** humanoid robots to command there will be

**[00:36:33]** no benefit to employers of having that

**[00:36:36]** human in the loop instead of merely

**[00:36:38]** commanding that team of robots directly

**[00:36:41]** themselves especially with executive

**[00:36:43]** assistance from increasingly capable

**[00:36:46]** AI this means the era of complimentarity

**[00:36:50]** between labor and capital is coming to a

**[00:36:53]** close work will soon become something

**[00:36:56]** that only machine

**[00:36:58]** do when the disruption of Labor is

**[00:37:00]** complete we will need to rethink

**[00:37:03]** economics itself because fundamental

**[00:37:05]** Notions like scarcity and exogenous

**[00:37:07]** total Factor productivity will no longer

**[00:37:10]** hold the labor engine itself a new kind

**[00:37:14]** of capital will become self- sustaining

**[00:37:16]** and

**[00:37:17]** self-expanding and superabundance will

**[00:37:19]** become the rule rather than the

**[00:37:22]** exception it is almost impossible to

**[00:37:25]** overstate how radical this

**[00:37:26]** transformation of The Human Condition

**[00:37:28]** will be it will indeed be liberating to

**[00:37:32]** an extent that up until now has seemed

**[00:37:35]** almost unimaginable purely the realm of

**[00:37:38]** utopian science fiction but it also

**[00:37:41]** means widespread public concern about

**[00:37:43]** technological unemployment from Ai and

**[00:37:46]** Robotics remains entirely valid in the

**[00:37:49]** longer term from perhaps the late 2030s

**[00:37:53]** onward without very thoughtful

**[00:37:56]** decision-making among leadership in

**[00:37:57]** every domain and very likely a

**[00:38:00]** rethinking of the basic social contract

**[00:38:02]** across Society itself the

**[00:38:04]** destabilization caused by the disruption

**[00:38:07]** of Labor could well be

**[00:38:09]** catastrophic it is therefore crucial

**[00:38:12]** that we not become complacent and

**[00:38:14]** instead recognize the interim period for

**[00:38:17]** what it is a brief and lucky opportunity

**[00:38:20]** to plan for the inevitable technological

**[00:38:23]** employment that must ultimately result

**[00:38:25]** from the disruption of Labor

**[00:38:28]** again it will be very tempting for

**[00:38:30]** policy makers industry leaders and

**[00:38:33]** others to pretend that humanoid robotics

**[00:38:36]** will never cause an unemployment crisis

**[00:38:39]** just as we have seen incumbents pretend

**[00:38:42]** that other disruptions throughout

**[00:38:44]** history pose no threat to the status quo

**[00:38:48]** but this would be a terrible mistake and

**[00:38:50]** would lead to enormous suffering and

**[00:38:52]** Chaos when human labor markets do

**[00:38:55]** finally begin to collapse with no hope

**[00:38:57]** of recovery it would also be a mistake

**[00:39:00]** to ban humanoid robots to preserve jobs

**[00:39:04]** although we are almost certain to see

**[00:39:05]** calls for this because this would lead

**[00:39:07]** to a vicious cycle of diminishing

**[00:39:10]** competitiveness prolonged scarcity

**[00:39:12]** economic stagnation and ultimately

**[00:39:15]** societal ills ranging from poverty to

**[00:39:17]** civil unrest and much else instead we

**[00:39:21]** must use the fleeting grace period we

**[00:39:23]** have to prepare for a soft Landing

**[00:39:25]** meaning a stable and just transformation

**[00:39:27]** across Society in response to the

**[00:39:29]** disruption of Labor Insight 15 demand

**[00:39:34]** for labor is so great and varied that

**[00:39:36]** many different firms will Thrive

**[00:39:38]** simultaneously in the early years of the

**[00:39:42]** disruption like light bulbs telephones

**[00:39:45]** computers and many other disruptive

**[00:39:47]** Technologies the demand for humanoid

**[00:39:49]** robots will be

**[00:39:51]** enormous at the beginning of the

**[00:39:53]** disruption when demand still vastly

**[00:39:56]** exceeds Supply no single producer will

**[00:39:58]** be able to capture all markets we should

**[00:40:02]** therefore expect to see the same pattern

**[00:40:04]** that has emerged in previous disruptions

**[00:40:06]** many companies both startups and

**[00:40:09]** incumbents will rapidly develop humanoid

**[00:40:12]** robot offerings for wide range

**[00:40:14]** applications targeting dozens or

**[00:40:16]** hundreds of Market niches using a

**[00:40:18]** variety of different business models so

**[00:40:21]** even though the leading technology

**[00:40:23]** developers in the humanoid robots sector

**[00:40:25]** might limit their humanoid robot OTS to

**[00:40:27]** deployment in factories or to Lease Only

**[00:40:30]** user agreements there will be so much

**[00:40:32]** demand for humanoid robots that other

**[00:40:35]** firms lower on the leaderboard will

**[00:40:37]** still enjoy huge opportunities to step

**[00:40:39]** in and Target other markets with other

**[00:40:41]** business models as well for example if a

**[00:40:45]** leading firm decides to only lease its

**[00:40:47]** robots for use in factories one or more

**[00:40:50]** other firms will seize the opportunity

**[00:40:51]** to sell robots for use at home even if

**[00:40:54]** their robots are somewhat less capable

**[00:40:58]** above all protect people not jobs firms

**[00:41:03]** or

**[00:41:04]** Industries in other disruptions

**[00:41:07]** throughout history we have seen

**[00:41:08]** incumbent interests turn to their

**[00:41:10]** governments for protection against the

**[00:41:12]** new

**[00:41:13]** technologies these protections can take

**[00:41:15]** the form of subsidies and handouts to

**[00:41:17]** the old Industries regulations and

**[00:41:19]** prohibitions that impede new Industries

**[00:41:21]** built upon the new technologies and

**[00:41:24]** bailouts when the old industry

**[00:41:26]** inevitably

**[00:41:28]** collapses almost invariably the benefits

**[00:41:31]** of these protections ACR only to the

**[00:41:34]** privileged few who own and control the

**[00:41:36]** incumbent interests rather than to the

**[00:41:39]** individuals and communities who lose

**[00:41:41]** their livelihoods because of the

**[00:41:42]** disruption to avoid making this same

**[00:41:45]** mistake which could prove catastrophic

**[00:41:47]** at the scale of the entire Global labor

**[00:41:50]** market we must rethink the relationships

**[00:41:52]** between a nation's population and its

**[00:41:54]** economic output and get ready to

**[00:41:57]** transforms Society

**[00:41:59]** itself the disruption of Labor is

**[00:42:01]** inevitable and together with the

**[00:42:03]** disruptions of energy transportation and

**[00:42:06]** food it could Herald a new age of

**[00:42:09]** unprecedented freedom and

**[00:42:11]** prosperity but only if we are willing to

**[00:42:14]** experiment to learn and to transcend the

**[00:42:17]** limits of the past starting right now it

**[00:42:20]** is time to rethink

**[00:42:24]** Humanity thank you to Tony cber Adam

**[00:42:27]** door and the entire rethink X team for

**[00:42:29]** the thousands of hours spent creating

**[00:42:32]** This research report you can find their

**[00:42:34]** full research on humanoid robots and

**[00:42:37]** other game-changing technological

**[00:42:39]** breakthroughs in the description box of

**[00:42:41]** this video

# Full Text (without timestamps)

AI powered humanoid robots will end the need for humans to work forever this may sound shocking but after thousands of hours of research by a world-leading team of scientists and thinkers this video will show why this outcome is inevitable we will explain how AI powerered humanoid robots will profoundly impact the economy society and governments surpassing even the Industrial Revolution this new era will make work optional rather than necessary leading to immense abundance but also potential hardships if we're not prepared and shockingly this has happened before all we have to do is look at the last time the labor of an entire species was disrupted with the introduction of the automobile over 100 years ago in the 15 years between 1907 and 1922 horses went from providing 95% of all private vehicle miles traveled on American roads to less than 20% in areas like New York City which led in the adoption of automobiles the disruption of Transportation was Swift and transformative in St Louis Missouri the registered number of automobiles exceeded the registered number of horsedrawn wagons by the year 196 but since cars travel a far greater distance per year than horsedrawn wagons for a fraction of the cost per mile the fate of the horse as a form of Transport was sealed from the first day that mass-produced automobiles rolled off the factory lines in the picture on the left we can see a single automobile on Fifth Avenue in New York surrounded by a sea of horsedrawn carriages in the year 1900 by 1913 the reverse was true in another picture of Fifth Avenue on the right we see a single horsedrawn Carriage surrounding rounded by a sea of automobiles the disruption of Horses by automobiles in the early 20th century followed a characteristic pattern that we have seen throughout history adoption of the new technology follows an s-shaped growth curve while abandonment of the older technology collapses accordingly together these form what rethink X calls A disruption X curve disruptions of all kinds follow this same pattern rethink X has charted the disruption X curves for many such historical examples including red fabric dyes insulin video rentals cameras corn nails coal car tires UK Power Generation TV screens us crystal meth production and so many more the disruption of horses was no different in the 30 years following 1900 automobiles rapidly displaced over 90% of all transport miles traveled now we are on the cusp of a new disruption physical labor performed by humanoid form robots except this time we are the horses computer hardware and software to process sensory data with powerful AI actuators to move and interact with objects in the environment batteries and Power Electronics to provide energy for hours of sensing Computing and moving each of these Technologies has gotten dramatically cheaper and more powerful in recent years setting the stage for the disruption of Labor over the next 15 to 20 years humanoid robots will disrupt human labor throughout hundreds of Industries across every major sector of the global economy the disruption of Labor will be among the most profound transformations in human history and therefore similar multaneously represents one of the greatest opportunities and greatest challenges our civilization has ever faced in this introductory post we present a highlevel overview of some of our key insights around the upcoming disruption of Labor future posts in this series will delve into the details of how and why the disruption of Labor is unfolding some of the extraordinary implications to expect and the critical choices societies will face as a result result Insight one the humanoid robot labor disruption is inevitable throughout history every time technology has enabled a 10x or greater cost reduction relative to the incumbent system A disruption has always followed each dollar spent on an automobile or an LED light bulb or a digital camera delivers more than 10 times the utility of each dollar spent on a horse incandescent bulb or film camera respectively for Millennia these and hundreds of other disruptive technologies have driven sweeping Transformations across every aspect of human life today we are on the cusp of the most profound disruption of human labor since the Advent of electricity and combustion engines over a century ago as in many markets there will be high-end and low-end humanoid robot offerings once deployment begins in Earnest for the purposes of illust ation consider a humanoid robot with a total lifetime cost of $200,000 that works 20,000 hours before decommissioning its labor would cost $10 per hour even at this relatively high cost Point humanoid robots are already competitive with human labor in a substantial fraction of the global economy in reality lifetime costs of humanoid robots are likely to be far less than $200,000 right from the start humanoid robots will enter the market at a cost capability of under $10 per hour for their labor on a trajectory to under $1 per hour before 2035 and under 10 cents per hour before 2045 this alone makes the disruption of a substantial fraction of human labor inevitable humanoid robots will work more than three times as many hours per week as a person in any conditions without vac a or illness or complaint for a total of perhaps 7,000 hours per year but at the same time that cost is falling capability will also be growing at first humanoid robots will only be able to perform relatively simple tasks but with each day that passes their capabilities will grow until by the 2040s they will be able to do virtually anything a human can do and much more besides remember humanoid robots today are the most expensive and least capable they will ever be humanoid robots are what rethink X calls A disruption From Below initially they will be cheaper per hour than hiring a human worker in many regions but also less capable slower less competent less adaptable we have seen disruptions From Below many times before such as digital cameras and the response from incumbents is predictable they mock the new technology for being lower performing while ignoring the rate at which the new technology gets both better and cheaper until it is too late to respond and they face collapse Insight two the disruption will create an entirely new labor system this is what we call a phase change disruption phase change disruptions create entirely new and much larger systems with new properties new business models and new metrics electricity wasn't just cheaper whale oil automobiles weren't just Faster Horses farming wasn't just more productive hunting and Gathering and the internet wasn't just an easier way to send letters read newspapers or listen to music these disruptions created vastly larger and more capable systems of energy Transportation food and information delivering orders of magnitude more kilowatt hours passenger and Freight miles calories and pictures news stories songs shows and other content respectively the new systems had radically different properties that required new metrics to measure new business models to utilize and new institutions to govern today it's happening again solar wind and batteries won't just dis displace fossil fuels they will create an entirely new Energy System autonomous electric vehicles won't just displace combustion engine Vehicles they will create an entirely new transportation system Precision fermentation and cellular agriculture won't just replace animal agriculture they will create an entirely new food system and humanoid robots won't just displace human jobs instead they will create an entirely new and vastly larger and more capable labor system it is impossible to know in advance the full details of how the new labor system will differ from today but the key feature is the marginal cost of Labor will rapidly approach Zero from this many other new system properties and behaviors will follow just like when the internet and digital Technologies reduce the marginal cost of information and Communications to near zero Insight three the disruption of labor is about tasks not jobs history shows that disruptions require new metrics incandescent light bulbs used to be sold according to how much power they consumed bulbs typically used in homes might be rated 40 Watts for use in storage areas for example 60 watts for living areas where one might want to read or 100 Watts for large rooms that need need lots of Illumination but when the first LED light bulbs were introduced to the market people quickly realized that the old metrics were no longer useful LEDs consume so much less energy than incandescents that they could not easily be compared to the old bulbs based on their power consumption instead the new bulbs were simply rated according to how much light they emitted in lumens and the color of the light they produced on a scale called color temperature measured in deg kelvin in the case of humanoid robots the old and misleading metric is jobs most jobs involve much more than performing a single task they typically entail responsibility for a range of tasks Each of which requires a different amount of training experience and skill to perform they often come with complex contractual obligations on the part of both employer and employee and they are deeply intertwined Ed with an individual's career identity and even their community and culture so long as humanoid robots are not sentient they will not have jobs they will only perform tasks the disruption of Labor with all of its world changing implications can therefore only be understood with tasks as the correct unit of analysis and tasks per hour per dollar as the corresponding cost capability metric in the in the beginning of the disruption the tasks a robot can perform will be narrow the hours it can work in its useful operational life before decommissioning will be limited to just a few years worth and their upfront costs will be high but each of these elements of their key cost capability metric will improve rapidly and substantially over the next 10 years Insight four all products and services will get cheaper labor is an essential input into every link of every supply chain of every product and service across the entire global economy that means as the cost of Labor Falls so will the cost of everything else this would hold true as humanoid robots are deployed at scale even if the cost capability of the robots themselves remains static but of course the cost capability of humanoid robots will also be improving at the same time and dramatically as deployment proceeds this will only amplify and accelerate the dynamic of universal cost reduction we must expect and plan for a sweeping tide of Supply driven not demand driven deflationary pressure across the entire global economy as a function of the disruption of Labor by humanoid [Music] robots Insight 5 all products will get better the quality quality of virtually all manufactured goods will tend to improve because the limits of skill and attention to detail that apply to humans do not apply to robots manufacturers will have far less incentive to cut Corners sacrifice Precision or fail to ensure that tasks and processes are performed with Maximum Care and thoughtfulness because in stark contrast to human workers there will be little to no cost savings obtainable from humanoid robots these ways every humanoid robot will perform every task it is capable of performing at the maximum quality it can perform it every single time moreover the absolute amount of savings attainable by Corner cutting will become less meaningful as the cost of Premium quality Goods plummets across the board along with everything else wholesale buyers and end customers will not hesitate to spend 99 Cents for a high quality product instead of 98 cents for a lowquality one and so markets for what are today considered lowend products will shrink dramatically the upshot from a consumer perspective is that quality will appear to be on the rise everywhere all at once with cheap junk quickly becoming a relic of a bygone era again this would hold even if the robots themselves never improved but they will themselves be improving as deployment proceeds s which will only amplify and accelerate the dynamic of universal quality improvement across the entire global economy Insight six productivity will Skyrocket improvements in technological capability and the accumulation of capital in its various forms equipment infrastructure knowledge social relationships have made Humanity more and more productive on a per capita basis throughout the ages and especially since the Industrial Revolution but labor has always remained a limiting factor of production and up until now the quantity of available labor has been a function of population and regions with more and cheaper labor have enjoyed a competitive Advantage as a result humanoid robots fundamentally change the equation instead of growing only as fast as a human population available labor can now grow as fast as humanoid robots can be built and deployed the difference is explosive like a damn bursting humanoid robots will unleash a torrent of productivity as countless tasks that could hitherto only be performed by the finite supply of adult humans start to be performed far more cheaply by humanoid robots this will affect not only all existing applications and industries but also enable entirely new applications and industries which were were not previously possible in the old human-based labor system due to the high cost danger or other limitations of human workers and the humanoid robot labor force can expand with little constraint in almost any region or country negating most of the regional competitive Advantage from lowcost labor that we see today Insight 7 investing in humanoid robots is now a matter of national interest starting with national Workforce expansion humanoid robots will allow any Nation to massively expand its Workforce and thus grow its economy on a productivity per capita basis to a degree that has simply been physically impossible up until now it takes almost 20 years and more than $100,000 to raise a child and prepare them to join the National Workforce of a middle inome country in the wealthier countries where cost of living is higher the cost can exceed $300,000 not including postsecondary education at University humanoid robots by contrast can be added to the workforce as fast as they can be manufactured and it is unlikely their unit cost will exceed that of an inexpensive car even at the very start of commercial deployment this means that by 2035 for adding 1 million people to a nation's Workforce might cost $100 billion and take 20 years whereas adding 1 million humanoid robots to its Workforce might cost just 10 billion and take a single year as a civilization we should be able to build humanoid robots at least at the rate we build automobiles roughly 100 million per year and eventually at the rate we build smartphones several billion per year we therefore have every reason to expect that physical labor by humanoid robots will supplant physical labor by humans just as quickly as the other examples of the disruption X curves we showed above National infrastructure for planning and investment purposes the deployment of humanoid robots is akin to investment in infrastructure whether public or private infrastructure serves as an enabling condition for other activity this includes economic productivity of course but also quality of life activity ranging from comfort and security to travel and Leisure Nations have historically made enormous investments in basic infrastructure and we ought to expect this for humanoid robots as well and just as investments in Road and electrical infrastructure recursively enabled their own further deployment so too will humanoid robots National Economic self-sufficiency the greater a nation's productive capacity is the greater is its ability to remain economically self-sufficient in the past this was only realistic for populous nations with a large resource base but a large robotic Workforce combined with the disruptions of energy transportation and food we have analyzed in our other research would allow even the smaller nations of the world to become far less dependent upon foreign trade whether the option for isolationism would prove beneficial or detrimental to international relations remains to be seen National Security today the size of a nation's Army can only be a subset of its own population in the future Nations and non-state actors will be able to raise humanoid robot armies that are larger and more capable than today's largest armies regardless of their own population size any humanoid Ro robot capable of working in a productive capacity can also be deployed in a national security capacity whether in a supporting or Frontline role and unlike human beings for whom military conscription and training and deployment is difficult and costly on every level humanoid robots can be repurposed literally overnight this means that For Better or Worse Any Nation with a large robotic Workforce is also a nation with a large robotic Army whether this becomes a requisite condition of National Defense for Sovereign Integrity in the 21st century remains to be seen but the fact that humanoid robots have clear and unequivocal military implications cannot be ignored Insight 8 National mobilization and enormous investments in humanoid robots are now Justified and there is no time to lose humanoid robots are likely to be one of the most profitable physical product categories ever by virtue of the sheer scale of their production numbers alone given the size of the global labor market together with latent demand that this technology will unlock it is reasonable to expect the number of humanoid robots deployed to exceed 1 billion over the next two decades and possibly much more but beyond just their direct Financial return to investors the sweeping implications of the inevitable explosion in productivity material superabundance and overall prosperity mean that the returns to Society at large on investment in humanoid robots are nothing short of Staggering governments and other public institutions such as universities therefore have a crucial role to play here as a matter of General principle governments universities and other public interest institutions and organizations should be prepared to dedicate enormous resources to funding and supporting the development and deployment of humanoid robots in their societies as a matter of national interest it is now rational for societies to devote a non-trivial fraction of their entire GDP to investment in humanoid robotics Humanity has been in this sort of situation before many societies have built roads Plumbing for running water electricity service telephone service and broadband internet service to every home and Business these basic services not only bring Prosperity but massively increased productivity too societies must now aim for robots in every home and Business as well and for exactly the same reasons a great deal of experimentation and learning will be required to convert investments in humanoid robots into real value testing zones that resemble factories hospitals and even outdoor urban areas where robotics companies can engage in High Learning rate low risk to humans experimentation are needed just as test tracks were for autonomous vehicles incentive programs of all kinds should be tried to encourage adoption of the technology and experimentation at every level and regulatory requirements and standards should be enacted with caution to maximally support Market driven deployment without getting in in the way of a development or deployment as the capabilities of humanoid robots approach and then exceed those of human workers the future will belong to those societies that embrace the humanoid robot labor disruption by developing and deploying this technology as rapidly as possible in sight 9 the disruption of Labor accelerates the other foundational disruptions of energy transportation and food our previous research has shown that disruptions are already underway in energy transportation and food Each of which is a foundational sector of the global economy adding the disruption of Labor by humanoid robots to the mix will be like hosing gasoline on an already roaring Inferno by making all goods and services cheaper higher quality and generally expanding productivity at large humanoid robots will only accelerate the deployment of each of the constituent Technologies behind the other three foundational disruptions as well solar power wind power and batteries in the energy sector electric autonomous vehicles in the transportation sector and precision fermentation and cellular agriculture in the food sector manufacturing and deploying and maintaining all of those energy transportation and food assets and infrastructure is hugely labor intensive human workers in the those fields require extensive training and the work itself can be physically taxing dangerous and is often performed under difficult conditions nevertheless these are among the fastest growing job categories in the United States and elsewhere precisely because the disruptions have created so much demand for them conversely the disruptions already underway particularly in energy and transportation will also accelerate the development and Adoption of human o robots working together amplifying and accelerating each other these four disruptions will open the door to an entirely new kind of production system based on a new economics of super abundance rather than scarcity Insight 10 humanoid robotics will massively increase prosperity and thereby make every major social economic geopolitical and environmental problem more solvable industrialized countries are undergoing massive demographic changes every retirement party packs a double whammy as it means not only one less member of the national Workforce but also one more person collecting a pension countries are seeing rapidly aging populations declining labor forces and in some cases a falling total population in response governments are trying to stoke baby booms in their own populations and trying trying to attract skilled immigrants from other countries meanwhile climate change threatens to destabilize communities and regions across the globe by shifting rainfall patterns inundating coastlines exacerbating storm and flood risks and altering the suitability of land for agriculture among other impacts formidable challenges are bound from housing shortages and Rising demand for medical services to water and resource short ages to civil strife and even War problems whether natural or human-made are inevitable and unavoidable the key to overcoming them is and always has been Prosperity indeed a useful way to define prosperity itself is his problemsolving capacity the disruption of Labor especially in combination with the disruption of energy transportation and food has the potential to vastly expand material abundance world wide and thus greatly increase prosperity for everyone everywhere if the rate of cost capability Improvement in humanoid robots continues as it has been we will enter an era of material superabundance and prosperity over the next 10 to 20 years that has hitherto been all but unimaginable outside of Science Fiction but as the Technologies of AI and robotic all move from the realm of Science Fiction to science fact so too do their profound implications Insight 11 the technology convergence of the humanoid robot labor engine is happening now and manufacturability is critical every element of Robotics hardware and software is likely to improve dramatically over the next decade but one specific aspect of Hardware design deserves special emphasis here manufacturability much of the value and as well as competitive advantage of humanoid robots from the very start will be in their deployment at scale even if their capability is limited at first this can be continuously upgraded with over-the-air updates as their AI rapidly improves which means there is no reason to delay adoption the technology convergence of the humanoid robot labor engine is happening now and manufacturability is critical despite their seemingly futuristic nature humanoid robots will be subject to the pressure of mass market dynamics just like other mass-produced manufactured goods from ballpoint pens to printed circuit boards Mass Market Goods like these which are produced at huge scale must be explicitly designed for manufacturability in order to minimize production cost and maximize production volume the same will be true for humanoid robots moreover the design of the manuf ufacturing facility itself will also be part of the extended phenotype of humanoid robots not least because these facilities will be operated in part and eventually entirely by humanoid robots themselves in site 12 the humanoid form factor will dominate robotics applications for at least the next decade although specialization and optimization of Robotics unconstrained by The Human Form will event makes sense the robots developed and deployed during the first phase of the disruption will take humanoid form suitability to existing environs all existing facilities equipment and infrastructure is designed around the human form that makes the humanoid form a natural choice for mass-produced robots in the near term in the early stages of the disruption the capability of the AI driving the robots will still be immature in order to improve enormous amounts of training data must therefore be gathered for AI training the humanoid form is a clear choice for facilitating large-scale data Gathering because humans themselves can facilitate the collection of the needed data this data could take the form of video recorded of humans doing tasks humans teleoperating humanoid robots humans wearing sensor Suites and so on all within in human Centric environs using human Centric tools our human capabilities are themselves Testament to how successful the humanoid form is as a general purpose platform this general purpose capability is even more important for robots than for humans because robots can be reskilled and redeployed far more quickly than humans unlike a human a robot can work in completely different environments on completely different tasks from one day to the next a factory one day a restaurant the next day and the battlefield the day after that because reskilling is as simple as downloading a software update the ease of reskilling and redeploying robots therefore greatly increases the value of the general purpose form relative to specialized forms the humanoid form is naturally familiar to us and even if another general purpose form were functionally Superior such as a craike or wheeled form we find might working alongside such robots intimidating or even frightening moreover because non-human forms are less familiar to us we cannot use our own experience to guide their development other familiar forms will be the first to follow the humanoid form factor and indeed we are already seeing early versions in development such as the dog form factor for security and protection and the horse or mule form factor for carrying things Insight 13 autocatalysis or self- acceleration of humanoid robot production will be key to the success of both individual firms and National economies the advantages of humanoid robots are so Stark at every level of analysis from Individual firms to Industries to Regions and entire nations that it is obvious we are now under race conditions to deploy humanoid robots as fast as possible it is also obvious that rapid deployment requires huge investments in R and D manufacturing capacity and infrastructure to support that deployment what is less obvious however is that humanoid robots must be deployed as early as possible into their own manufacturing to accelerate their production and deployment flywheel we've seen this before computer hardware and software has always been used to design better computer hardware and software autocatalysis or self acceleration will thus need to be a crucial part of humanoid robot investment and deployment strategy at every level from an individual firm's business model to an entire nation's policymaking Insight 14 technological unemployment remains inevitable but latent demand for labor will be met first creating a crucial planning window for a soft Landing the demand for labor vastly exceeds the available Supply there are chronic labor shortages across a wide range of Industries in many countries including throughout Europe and the United States and Beyond demand for labor in the form of existing job roles there is also an enormous quantity of latent demand for labor that goes perpetually unmet because it is too low paying too dangerous or otherwise too undesirable for human workers to supply at all moreover history shows that although capital in the form of facilities machinery and knowledge have substituted and thus displaced labor time and time again labor has nevertheless evolved to remain complimentary to that Capital counterintuitively this has put upward pressure on the value of Labor over time this Dynamic is sometimes framed as technological empowerment of Labor where new technologies increase worker leverage by expanding their capabilities for example construction workers have been literally empowered by power tools while office workers have been figuratively empowered by computers and other information technology following this historical pattern there will be a brief period when the same is also true of humanoid robots in the near term for perhaps a decade or so humanoid robots will largely be deployed to meet demand for labor that is currently going unmet by humans as opposed to directly displacing human workers from jobs they currently occupy this will create a non-obvious and counterintuitive situation in which humanoid robots appear to be almost purely a force multiplier for existing jobs and workers rather than a threat to them while true and worthy of Celebration we must be aware this condition will not persist for long even though an individual human capability will be greatly enhanced if they have a personal team of the humanoid robots to command there will be no benefit to employers of having that human in the loop instead of merely commanding that team of robots directly themselves especially with executive assistance from increasingly capable AI this means the era of complimentarity between labor and capital is coming to a close work will soon become something that only machine do when the disruption of Labor is complete we will need to rethink economics itself because fundamental Notions like scarcity and exogenous total Factor productivity will no longer hold the labor engine itself a new kind of capital will become self- sustaining and self-expanding and superabundance will become the rule rather than the exception it is almost impossible to overstate how radical this transformation of The Human Condition will be it will indeed be liberating to an extent that up until now has seemed almost unimaginable purely the realm of utopian science fiction but it also means widespread public concern about technological unemployment from Ai and Robotics remains entirely valid in the longer term from perhaps the late 2030s onward without very thoughtful decision-making among leadership in every domain and very likely a rethinking of the basic social contract across Society itself the destabilization caused by the disruption of Labor could well be catastrophic it is therefore crucial that we not become complacent and instead recognize the interim period for what it is a brief and lucky opportunity to plan for the inevitable technological employment that must ultimately result from the disruption of Labor again it will be very tempting for policy makers industry leaders and others to pretend that humanoid robotics will never cause an unemployment crisis just as we have seen incumbents pretend that other disruptions throughout history pose no threat to the status quo but this would be a terrible mistake and would lead to enormous suffering and Chaos when human labor markets do finally begin to collapse with no hope of recovery it would also be a mistake to ban humanoid robots to preserve jobs although we are almost certain to see calls for this because this would lead to a vicious cycle of diminishing competitiveness prolonged scarcity economic stagnation and ultimately societal ills ranging from poverty to civil unrest and much else instead we must use the fleeting grace period we have to prepare for a soft Landing meaning a stable and just transformation across Society in response to the disruption of Labor Insight 15 demand for labor is so great and varied that many different firms will Thrive simultaneously in the early years of the disruption like light bulbs telephones computers and many other disruptive Technologies the demand for humanoid robots will be enormous at the beginning of the disruption when demand still vastly exceeds Supply no single producer will be able to capture all markets we should therefore expect to see the same pattern that has emerged in previous disruptions many companies both startups and incumbents will rapidly develop humanoid robot offerings for wide range applications targeting dozens or hundreds of Market niches using a variety of different business models so even though the leading technology developers in the humanoid robots sector might limit their humanoid robot OTS to deployment in factories or to Lease Only user agreements there will be so much demand for humanoid robots that other firms lower on the leaderboard will still enjoy huge opportunities to step in and Target other markets with other business models as well for example if a leading firm decides to only lease its robots for use in factories one or more other firms will seize the opportunity to sell robots for use at home even if their robots are somewhat less capable above all protect people not jobs firms or Industries in other disruptions throughout history we have seen incumbent interests turn to their governments for protection against the new technologies these protections can take the form of subsidies and handouts to the old Industries regulations and prohibitions that impede new Industries built upon the new technologies and bailouts when the old industry inevitably collapses almost invariably the benefits of these protections ACR only to the privileged few who own and control the incumbent interests rather than to the individuals and communities who lose their livelihoods because of the disruption to avoid making this same mistake which could prove catastrophic at the scale of the entire Global labor market we must rethink the relationships between a nation's population and its economic output and get ready to transforms Society itself the disruption of Labor is inevitable and together with the disruptions of energy transportation and food it could Herald a new age of unprecedented freedom and prosperity but only if we are willing to experiment to learn and to transcend the limits of the past starting right now it is time to rethink Humanity thank you to Tony cber Adam door and the entire rethink X team for the thousands of hours spent creating This research report you can find their full research on humanoid robots and other game-changing technological breakthroughs in the description box of this video