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PRODUCTIVITY  
SCIENCE**

**WORLD ACADEMY OF PRODUCTIVITY SCIENCE**

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## ABOUT US

**World Confederation of Productivity Science (WCPS)** was founded in 1969 as an apex professional body for promotion and development of Productivity Science across the Globe. WCPS brings together individuals and organisations who share common aims and objectives of Social, Economic and Environment (SEE) Productivity. WCPS regularly organizes World Productivity Congress (WPC) in member countries to deliberate on Topical Productivity Challenges. WCPS also organizes relatively smaller customized Regional Conferences and Seminars for the benefit of Regional participation.

WCPS has two Divisions, World Academy of Productivity Science (WAPS) and World Network of Productivity Organizations (WNPO).

World Academy of Productivity Science is the Academic Division of WCPS engaged in Research, Education, Capacity Building and Knowledge Management. WAPS honors Experts, Academicians, Researchers and Productivity Professionals by inducting them as Fellows of WAPS.

World Network of Productivity Organizations is the Network of Organizations across the Globe engaged in promotion and development of Productivity Science. WNPO organizes events and Training programs with support of member organizations.

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## BE A PART OF THE PRODUCTIVITY MOVEMENT IN THE DIGITAL AGE

Productivity growth plays a pivotal role in economic prosperity. When it is robust, living standards soar, and economies thrive. However, productivity growth has been low globally in the past two decades, particularly in advanced economies.

Today, the world needs productivity growth more than ever. Digital transformation represents an opportunity for improving productivity growth by enabling innovation and reducing the costs of business processes.

World Academy of Productivity Science has updated our Vision and Mission to better respond to productivity development and to lead in the discipline of Productivity Science.

WAPS' Vision is to become the premier global body for the promotion and development of productivity towards achieving worldwide collaboration and sustainable growth.

Our Mission is to create, enhance, and disseminate the body of knowledge (BOK) for global productivity through WAPS' worldwide network.

WAPS Fellows are actively involving with the Academy and lending us support. Our Advisory Council provides expert advice and feedback to the executive team to help the Academy improve. The WAPS Brainstorming Team is the strong force behind our updated Vision and Mission, and it's now helping to create action plans to achieve WAPS' objectives.

I am here to recognize our Brainstorming Team, which is currently made up of these Fellows: Leon Bian (USA), Shaik Abdul Khader (India), Barnes Sookdeo (South Africa), Veena Swarup (India), and Hendrik René Georges Van Landeghem (Belgium).

We are Charging On.

- Inaugurated in 2022, this is the fourth issue of our International Journal of Productivity Science.
- We have successfully completed the 7th Knowledge-Sharing Forum event in June.
- The 8th event is scheduled for September 12, themed "AI at the Crossroads: Public and Private Sector Innovations for Productivity."
- We are setting up task groups to roll out different initiatives. Being organized at the moment are WAPS Awareness Drive, WAPS-Productivity Science Brand Alignment Campaign, Academic and Student Interface Program.

We need you - Fellows of WAPS - to become more active with the Academy, to participate in and to bring your expertise to WAPS events, to initiate programs and/or to join our task groups to bring productivity, productivity science, and WAPS to the global centerstage.

As we have always said, "The strength of WAPS is our global network of Fellows - Global Reach with Local Knowledge."

As always, please stay in touch - the executive team looks forward to hearing from you and meeting you in person soon.

Sincerely yours,  
**Chen Shengchang**  
President, WAPS

# DOES PRODUCTIVITY SCIENCE JUSTIFY USE OF THE WORD 'SCIENCE'?

**John Heap**

Researcher at Institute of Productivity, UK

## Abstract

**Productivity Science is a term in fairly general usage to describe the principles and practises of productivity development and improvement. This paper examines the use of the word 'science' in this term to try and justify the use of the term 'productivity science' to describe such practices and activities.**

## Does Productivity Science justify use of the word 'science'?

WCPS proudly incorporates the term 'productivity science into its name., aiming to bring together people and organisations around the globe that promote, support and practice the development and improvement of productivity. Improving productivity is the only sustainable means of improving human wealth and well-being (Kim, Loayza, and Balcazar). WCPS firmly believes that such wealth and well-being is a key underpinning of world peace.

In the 2000s, WCPS clarified its definition of productivity to stress that development must address social and environmental factors in addition to established economic factors. The resulting multi-factor productivity model is described as SEE (social, environmental and economic) productivity.

Productivity improvement is recognised as a major underpinning of economic development. but is this recognition of its importance sufficient to justify the use of the word 'science'? This paper explores this issue by looking at the practice of productivity measurement and development, comparing it to the processes of investigation in what is generally referred to as 'scientific method'.

## What is science?

Science can be defined as the pursuit of knowledge and understanding of the natural and social world using a systematic methodology based on collecting evidence to prove theories/conjectures resulting from observation of natural phenomena.

The various processes and activities characteristic of science are collectively known as the 'scientific method and represent the 'how' of science - the means by which science is carried. These are activities such as systematic observation and experimentation, inductive and deductive reasoning, and the formation and testing of hypotheses and theories. (Hepburn and Andersen).

Further thought on the nature of 'science' leads to the clarification of 'the systematic method' referred to above. A common or generic process can be usefully summarised as:

- Select a problem or phenomenon to be investigated
- Observe instances of the phenomenon, recording input, contextual and environmental factors along with outcomes of the phenomenon
- Construct a hypothesis which explains the observed outcomes and relates the associated factors
- Carry out a series of experiments under varying conditions (different values of the input, contextual and

environmental factors) so that observed behaviours and outcomes of the phenomenon can be replicated - and record the conditions under which this replication takes place

- Analyse experimental data and draw conclusions
- Decide whether the hypothesis has been proved.

Scientists do use the scientific method, but they do not always do so as laid out in this exact process. They may modify the process by skipping steps, jumping backwards and forwards between steps, or repeating a number of the steps because they are dealing with imperfect real-world conditions or because they have existing, partial knowledge of the situation under review.

But they will use the core of the methodology by using observations, experiments, and data analysis to support or reject their theory of how a phenomenon works.

While conducting experiments is considered the best way to test hypotheses, sometimes this is not possible (for example in astronomy or when investigating certain phenomena relating to animal or human life) and the theory/hypothesis must be judged by observations alone.

One of the more recent 'sciences' is that of 'management science'. This term emerged with the application of science (principally data science) to management problems via approaches such as operational research, systems analysis and management information systems. Rather than applying to the whole field of 'management', the term 'management science' is possibly best reserved for the application of such techniques to managerial problem-solving and decision-making. Much of the work done and reported as management science employs mathematical techniques such as modelling & simulation, statistics and calculus.

Management more generally can benefit from both these scientific techniques and approaches based on creativity and inspiration. Many inventions and innovations have come from inspirational moments, but these, themselves, are often based on the hard work of science being applied to investigate a particular situation or problem. This is presumably the basis of Thomas Edison's famous quote: "Genius is 1% inspiration and 99% perspiration", meaning that the brainwave moment tends to follow thorough preparation and investigation.

Management can thus be considered as both a science and art form.

This mirrors progress in the behavioural sciences where over several decades psychologists have tended to converge on dual-process theories of behaviour that propose that rapid, intuitive and non-conscious cognitive processes sit alongside deliberative, reflective and self-aware ones. (Lieberman, 2007)

If the above represents the scientific method - and therefore the basis of 'science' - then 'productivity science' should broadly follow such a methodology.

There are numerous systematic approaches or methodologies that have grown up around productivity development. - Business Process Re-Engineering, Balanced Scorecard, Lean, Kaizen, Kata, Six Sigma, TRIZ and so on. Some of these are, or include, specifically science-based approaches: data envelope analysis (DEA), queuing theory, workforce planning, multi-variable analysis, six sigma etc.

However, probably we should first take a look at what is the first pairing of the words 'science' and 'management'. This is the use of the term 'scientific management' by Frederick Winslow Taylor in the early part of the 20th century.

Taylor suggested that managers should systematically examine what their workers do and codify an agreed working method, rather than allowing each man to use 'rule of thumb' and personal preference to determine how he completes a

task.

This agreed method could then be used as the basis of training any new workers.

The result is that each worker can then be given a clear task with an agreed working method and a target for completion - or throughput - based on this method. In return, the manager can prepare a production plan based on the same data and could, in some circumstances, offer incentives in the form of bonus payments for output over the agreed target. (Taneja, Pryor and Toombs, 2011)

The most comprehensive of these productivity improvement approaches do, indeed, share elements with the scientific method. They tend to use various scientific research-based principles, strategies, and analytical methods including mathematical modelling, statistics and numerical algorithms with the aim of improving the ability of an organisation to take rational and accurate management decisions by arriving at optimal or near optimal solutions to complex problems.

Sometimes it can be argued that the methodology itself has been created following adoption of the scientific method by the developers of the methodology and the end user is 'piggybacking' on the work of these developers (and their science) when they apply the methodology to a specific situation.

This is certainly true of TRIZ. TRIZ was developed by the Soviet inventor Genrich Altshuller and his colleagues and uses the acronym TRIZ which, when the Russian words are translated into English results in "The Theory of Inventive Problem Solving". TRIZ is not, though, a theory: it is a collection of tools and techniques.

Altshuller and his team looked in detail at hundreds of patents filed within Russia and eventually came to the conclusion that many of the inventions listed were solving variants of a limited number of problems. Thus what is needed is a common set of 'solutions' that can be redeployed to the whole variety of problem types. The team also noticed that many problems contain inherent contradictions, such as "We need this part to be longer, but we also need it to be heavier." The TRIZ database includes inventions and innovations that address such contradictions. (Altshuller, 1999)

Again, the users of TRIZ are building on the work of previous scientists and inventors, and of course on the work of Altshuller and his team who analysed the patent data and codified sets of general problems and sets of general solutions which can be applied to these problems.

TRIZ is very useful at the 'creativity stage' of problem solving when we are looking at new idea and innovations trying to answer the question, "How else could we achieve our desired end result?"

Examining a range of these productivity improvement methodologies and tools shows that there is certainly sufficient correspondence between these various methodologies and the scientific method to justify the use of the term 'productivity science' to cover systematic and comprehensive productivity improvement/development approaches.

The implications of the fact that systematic, comprehensive productivity improvement methodologies are based on, or align with, scientific method are that those seeking to improve organisational or national productivity should adopt a structured and systematic approach. The collection and analysis of performance data to guide and to evaluate the success of productivity improvement initiatives and programmes ensures that any long-term programme of improvement (and the nature of its application to specific situations) can be refined and improved on the basis of real-world and recent evidence.

### **Principles to underpin the application of productivity science to specific productivity development initiatives**

Consideration of the above, together with the fundamental commitment to addressing all of social, environmental and



economic productivity leads WCPS to recommend that those interested in pursuing productivity development as part of an economic development strategy should develop a strategy for productivity development which:

- Recognises particular, local cultural and social factors which might influence the effectiveness of the strategy
- Recognises the current state of infrastructure elements which might reduce the potential for higher productivity
- Uses transparent communication media and methods to ensure that those likely to be affected by the project are fully informed of the reasons for the project and the process that will be adopted in its execution
- Predicts the effects of productivity interventions using predictive modelling and the identification of causal relationships
- Adopts measures of performance which incorporate social, environmental and economic factors
- Creates targets for improvement, based on processes such as sector benchmarking which can be recognised as achievable by key players in target sectors/communities
- Recognises the importance of adopting productivity improvement approaches and methodologies which align with scientific method
- Ensures that productivity gains should be shared by the various communities involved in the situation under review/investigation - and by wider society

Adoption of these principles - along with a long-term view - is more likely to lead to outcomes which meet declared aims and objectives and which will be regarded as 'success' by all key stakeholders.

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# PRODUCTIVITY, SUSTAINABILITY AND LEADERSHIP FOR THE BENEFIT OF HUMANKIND

**Prof Barnes Sookdeo**

University of South Africa

## **Abstract**

This essay unpacks the concepts of productivity, sustainability, leadership and motivation which can be used as strategies to benefit organizations. In the volatile of the competitive manufacturing landscape, these strategies are critical to organizational sustainability. This essay also identified the necessity for productivity, sustainability, leadership and motivation as strategies to benefit organizations. The essay provides strategic insights and practical thinking to encourage organizational management to look at productivity enhancement interventions to ensure the sustainability of organizations.

## **Keywords**

Productivity, sustainability, motivation, competitiveness

## **Introduction**

The world post COVID-19 continues to suffer the aftershocks of the pandemic disruptions that have revolutionized how businesses operate worldwide. This global shift, resultant from health and economic crises forced businesses to evolve or perish. However, the pandemic has also interestingly augmented the 4IR adoption process by businesses. Businesses anticipate that adopting the 4IR can deliver superior results, such as decline in labor costs and increase in productivity and can lead to better resilience. Nevertheless, businesses markets are not invulnerable to volatility, uncertainty, complexity, and ambiguity brought about by the disruptive ability of the 4IR. Henceforth, productivity and sustainability in the 4IR has become a research topic of interest to many researchers. It is essential to elaborate on the necessity for productivity measurement and enhancement for the subsequent sustainability of organizations.

According to Lings (2014), there is apparently a very high rate of business failure among small to medium enterprises (SMMEs), in South Africa. Within the South African context, estimates indicate that 40% of all new businesses fail in their first year of existence, as much as 60% in the second year and an exceedingly high 90% within the first 10 years from inception. The 2012 Global Entrepreneurship Monitor (GEM) report supports these statistics regarding the poor survival rate and confirm that the survival rate for SMMEs in South Africa is low in comparison to global standards, (Bushe, 2019). This trend cannot be allowed to continue as the non-sustainability of organizations and subsequent job losses impact an economy. So, what are the repercussions of job losses for employees? It has been stated that for every one job loss, an average of four individuals in a household go hungry. The industrial and business environments are continually changing and seeking efficient methods of working. This can be credited to several factors, namely, competitiveness, the Fourth Industrial Revolution (4IR), globalization and the latest technological advancements in organizational processes. It is common knowledge that organizations can grow and increase their profitability by enhancing their productivity, thereby ensuring their sustainability.

## **Unpacking productivity**

Productivity improvement entails measures output per unit of input, such as labor, capital, or any other resource (Kenton, 2018). Singh (2018) very aptly defines productivity as the transformation of available materials and workforce resources into essential goods and services within an organisation. According to (Mohammed et al., 2013) shows that human capacity development involves both organizations and individuals as an investment process that allows them to realize their full potential for increased productivity. This speaks very eloquently our topic which alludes to productivity and sustainability. Working smarter and working fewer hours may have a positive impact on productivity. However, working longer hours does not necessarily result in increased productivity. Less fatigue occurs

among workers or if employees work harder during the shorter number of active hours. Organizations must attempt to reduce the consumption of resources, thereby reducing cost per unit output through utilization of proper methods, ultimately ensuring their sustainability.

The United States (US) has long enjoyed the world's highest productivity. Over the last one hundred years, productivity in the US has increased approximately four percent per year. In the past two decades, the US rate of productivity improvement has been exceeded by that of China, at 13.4%. Unfortunately, South Africa (SA) is far behind their first-world counterparts. In 2017, SA's economic performance was ranked 58th out of sixty-three countries. This requires urgent management interventions to ensure that productivity is improved in individual organizations which, in turn, automatically improves the overall productivity of a country, again, ensuring their sustainability. It is incumbent on organizations to improve their productivity, which also contributes to competitiveness and their sustainability. Increasing employee productivity should be on the forefront of any managerial mind.

### **Towards sustainability**

An organization's processes may be sustainable and continue to operate, but their work processes might not be productive. Will this eventually lead to the organisation not being sustainable? The major challenge which organizations face with manufacturing is the tendency for many managers to merely evaluate manufacturing primarily based on cost and efficiency. Seminal works by Drucker, who is widely regarded in the West as the father of the management discipline, held the view that "it is important for managers to ask the right questions rather than to get the right answers for the wrong questions". However, Cohen (2018) cautions about asking questions, as Drucker wrote that "asking the wrong question, even if you get the right answer to that question, can be worse than not asking any question at all".

For a performance measure to mean something, it must be compared to some kind of target. One of the main weaknesses of current performance management systems used by organizations is that efficiency reporting systems contain standards which are unrealistic and unachievable. To compete effectively in the marketplace, it is incumbent on organizations to outdo their competitors with superior operations. Despite these challenges, few organizations have systematic processes in place to ensure that their performance management systems continue to reflect their environment and strategies.

This places organizations under tremendous pressure to reduce their costs, increase the quality of service and provide goods of superior quality to challenge their competitors. To meet these goals and remain more competitive and sustainable, organizations embark on the use of many different strategies to make their production processes efficient and provide an output that meets customer satisfaction. In addition, organizations should always be searching for ways to optimize business processes so that they can reduce manufacturing costs. Setting standard times for operations are not just a major challenge for today's performance improvement personnel, it is critical.

### **Leadership and motivation regarding productivity**

The productivity and sustainability of an organization is closely related to effective leadership, and motivation. Productive and sustainable organizations usually have leaders who can lead, provide clear direction, and motivate team members. Motivation is also a key factor to enhance productivity and sustainability. Motivated employees work harder and produce better results. Motivation can come from rewards, challenges, and opportunities to grow and develop. Productive and sustainable organizations usually have leaders who can lead the team, provide clear direction, and show confidence in team members. Motivation is also a key factor when it comes to productivity and organizational sustainability. Motivated employees work harder and produce better results. Work motivation can be enhanced by encouraging employees with remuneration, who feel supported and have a place in the organization and leads to higher performance. Intrinsic motivation pushes employees to help them achieve the goals or tasks set. When a person is highly motivated, he/she will do his/her job to the fullest. If a person demotivated, they cannot innovate to achieve the goals of

the organisation. This motivation is required because each individual employee is expected to work effectively and full of enthusiasm to achieve high work productivity.

### **Conclusion**

Organizations in South Africa are affected annually by labor unrest with employees in constant demand for increased remuneration. "Strike season" seems to have become a norm on the South African calendar year. The author is of the opinion that an increase in remuneration must be combined with a simultaneous increase in productivity to allow for a "win-win" situation between the employer and employee. Productivity and sustainability are crucial to economic growth as the spinoff is that these strategies benefit organizations by assisting to raise the living standards of people. It is common knowledge that enhancing productivity subsequently results in higher output, reduced costs, improved employee morale, better customer service, and increased overall profitability. It also positions organizations for sustained growth. Productivity and sustainability are key to an organization's profitability and long-term success. It measures how much output an organization can produce from resources such as labor, capital, or raw materials. If an organization improves its productivity, it can generate more output from its resources, and subsequently enhancing its sustainability.

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# HARNESSING THE POTENTIAL OF AI TO REVOLUTIONIZE PRODUCTIVITY: UNVEILING OPPORTUNITIES AND TACKLING CHALLENGES

**Leon Bian**  
Fellow of WAPS

## Abstract:

From the late 1990s through the early 2000s, productivity saw substantial gains, but growth slowed significantly in the mid-2000s across the United States and other advanced economies. This trend persisted until the early 2020s, when Artificial Intelligence (AI) emerged as a game-changing force, reshaping productivity across various industries. AI plays a multifaceted role in augmenting productivity, with its potential to automate tasks, optimize processes, and foster innovation. While AI significantly enhances efficiency and reduces costs, its deployment also raises considerable challenges and ethical considerations, highlighting the need for responsible integration. Detailed analysis and empirical data provide insights into how AI redefines productivity paradigms, the opportunities it presents, and the hurdles to overcome. The study aims to offer a balanced view of AI's societal role, underscoring its transformative impact on productivity growth while reiterating the importance of responsible and sustainable workforce integration.

## 1. Introduction

Productivity refers to the effectiveness of converting resources such as labor, capital, and materials into goods and services. It is measured by the ratio of outputs produced to the inputs used in production, which is often expressed as units of output per unit of input (for example, goods produced per hour of labor). Productivity growth measurement is an important indicator of economic health and efficiency in resource utilization. It also helps policymakers and businesses make informed decisions regarding investments, labor markets, and technological advancements. Understanding productivity trends is crucial for driving economic growth and achieving desired outcomes.

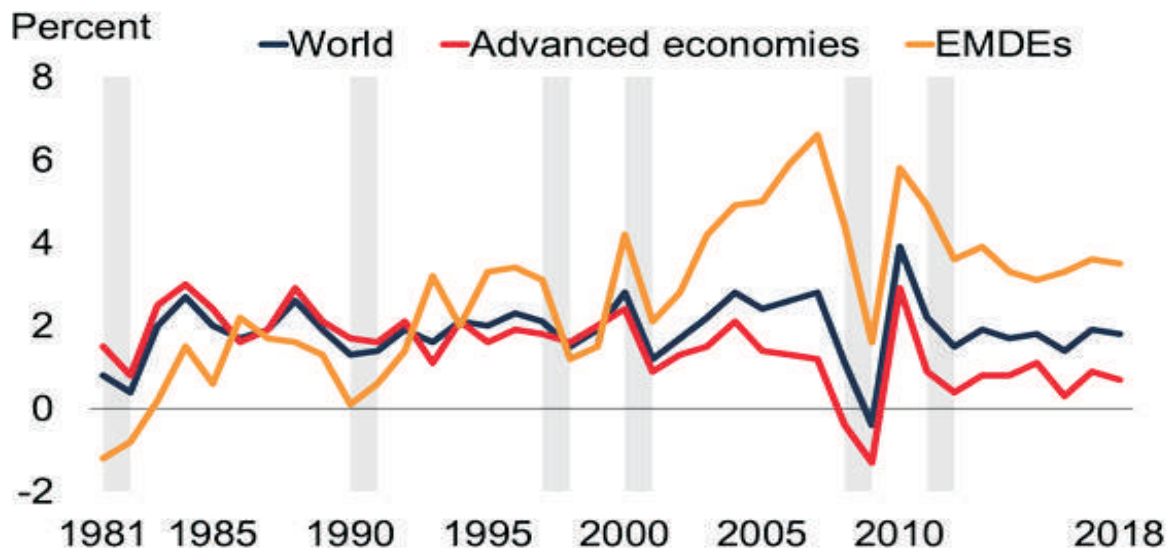


Figure 1.1 Global, AE, and EMDE productivity growth

Figure 1.1 (World Bank & Dieppe, 2021, p.4) illustrates the trends in productivity growth globally, in advanced economies (AE), and in emerging markets and developing economies (EMDE) from the early 1980s to 2018, just before the COVID-19 pandemic. Before the global financial crisis around 2009, productivity growth in advanced economies had been trending downwards for several decades while EMDEs were on an upward trajectory. After the global financial crisis, both advanced economies and EMDEs saw a brief recovery in productivity growth, but the overall trend in both economies has been downward since then. At the global level, productivity growth was sluggish, hovering around 1.8% between the end of the global financial crisis and 2018. (World Bank & Dieppe, 2021, p.4)

The COVID-19 pandemic swept the globe in early 2020, prompting many countries to implement shutdown measures that restricted movement and forced many businesses to close. As a result, the economies of various countries experienced a significant slowdown in 2020. However, in 2021, a glimmer of hope emerged through increased productivity growth after several years of lackluster performance. After experiencing an average annual labor productivity growth rate of 1.4% over the 12 years (2007-2019) before the pandemic, on June 3, the United States Bureau of Labor Statistics reported that labor productivity in the U.S. had risen by 5.4% in the first quarter of 2021 (U.S. BUREAU OF LABOR STATISTICS, 2021; Nielsen, 2023). Erik Brynjolfsson, director of the Stanford Digital Economy Lab, and Georgios Petropoulos (2021) subsequently wrote in the MIT Technology Review that this was "not merely a blip but rather a harbinger of better times to come: a productivity surge that would match or surpass the boom times of the 1990s." The authors attributed their optimism to three factors:

1. Technological breakthroughs over the last decade that had included advances in AI, the continuously decreasing cost of computing power, and progress in medical treatments like mRNA, among others;
2. A compressed timetable for restructuring digital innovations, thanks to remote working induced by COVID-19; and
3. An economy trending towards full capacity.

As Brynjolfsson and Petropoulos (2021) asserted in the same article, technology alone is usually not enough to increase productivity; it needs to be combined with factors such as business processes, human skills, and other intangibles. The latest technological advancements, powered and led by AI, had been taking time to make a difference in productivity, and that time had perhaps come (Brynjolfsson & Petropoulos, 2021). AI, with its potential to automate tasks, enhance decision-making, and improve efficiency, could be the key to unlocking a new era of productivity growth.

Brynjolfsson & Petropoulos were optimistic about the productivity growth in the US. However, their optimism turned out to be premature. While the quarterly labor productivity growth rate shot up to around 6% between the second quarter of 2020 and the first quarter of 2021, it fell in the second quarter of the same year. It remained between -2% and 2% for the rest of the period until the end of 2023 (CEIC Data, an ISI Emerging Markets Group Company, n.d.).

In late 2022, OpenAI's generative AI (GenAI) solution, ChatGPT, was launched and reportedly gained 100 million users within just two months (Curry, 2024). ChatGPT is a large language model (LLM) that can generate text similar to human-like language based on the input it receives. It can be used to assist users by answering questions, providing explanations, engaging in conversation, and helping with various tasks, such as writing assistance, summarization, generating computer code, and more. GenAI offerings, such as ChatGPT, Google's Gemini, Anthropic's Claude, and Meta's Llama, have the potential to boost productivity in many industries.

Although the nonpartisan Congressional Budget Office (CBO) predicted that US productivity growth would be at an annual rate of 1.7% in the 2020s (Congressional Budget Office, 2020), many experts have predicted that GenAI will significantly impact productivity growth. For example, Goldman Sachs predicted that GenAI would improve

productivity growth by 1.5 percentage points over ten years (Goldman Sachs, 2023). If Goldman Sachs' prediction turns out to be true, it means that the overall productivity growth in the US can be lifted to above 3% in the rest of the 2020s. This paper will explore how AI can be used to supercharge productivity and will focus on both opportunities and challenges.

## **2. The Evolution of AI in Productivity**

AI, a field that traces its roots to the Turing Test developed by British mathematician and computer scientist Alan Turing in 1950 (Oppy & Dowe, 2003), has come a long way. The term "Artificial Intelligence" was coined by emeritus Stanford professor John McCarthy in 1955, referring to the "science and engineering of making intelligent machines" capable of performing tasks that typically necessitate human intelligence (Manning, 2020; McCarthy, n.d.). These tasks include understanding natural language, recognizing patterns, solving problems, developing recommendations, and making decisions. AI can replicate cognitive functions to enhance or automate various processes across numerous industries by harnessing algorithms, data, and computational power. The technology spans basic automation to advanced machine learning and deep learning, leading to transformative innovations in almost all sectors, such as healthcare, finance, and transportation.

The 1956 Dartmouth Summer Research Project on Artificial Intelligence (DSRP AI) hosted by John McCarthy and Marvin Minsky is often considered the beginning of the AI journey in the science community (Ahlawat, 2024). Even though the conference produced little desired results, it ignited a frenzy of AI research that has flourished ever since. Great minds like Allen Newell, Herbert Simon, and Edward Feigenbaum entered the arena in the early days (Anyoha, 2017). Governments also took an interest in the field by making investments. However, due to many challenges, such as the limitation in computing power, AI research through the 1980s still needed to go a long way toward achieving the goal of human-like intelligence.

In the 1980s, AI research was characterized by two distinct camps with different approaches (Lee, 2018, p. 7- p. 10). One camp, known as the 'rule-based' methodology, used predefined rules to teach computers how to "think." The other camp, the "neural networks" approach, envisioned a system that emulated the human brain with "neurons."

During the 1990s and 2000s, AI made significant strides in demonstrating limited-purpose use cases (Narrow AI). For instance, IBM's Deep Blue computer defeated world chess champion Gary Kasparov in 1997 (IBM, n.d.), while Stanford's robot vehicle, Stanley, won the DARPA Grand Challenge by autonomously driving across California's Mojave Desert for 132 miles in 2015 (Stanley Racing Team, 2005). One of the most significant events in AI history happened in 2016 when Google's AlphaGo, a software developed using deep learning technology, defeated Go world champion Lee Se-dol (Waters, 2023). By that time, the world had realized that the "neural networks" approach was more scalable and adaptable than the "rule-based" method, while the computer industry had made exponential progress in improving computing power since the 1980s.

Despite the remarkable advancements in AI technology, its utilization in production is still very limited. In a blog post published on the Federal Reserve Bank of St Louis's website in April 2024, Aakash Kalyani and Marie Hogan (2024) estimated that the use of AI in production by firms had only increased from around 3% in 2018 to around 4.4% on average across sample waves in 2023-2024. They predicted that the benefits of AI in terms of productivity gains might take a while to realize due to the slow adoption by businesses, just like in previous technologies such as computers, cloud computing, and 3D printing. The question remains whether the emergence of GenAI will change the game.

## **3. Opportunities Presented by AI**

When we talk about AI today, people often conjure up a chatbot that can talk to you and answer your questions. However, as we have seen in the evolution of AI, industries have been experimenting with many narrow AI applications over the past several decades. For example, in the financial services industry, AI has been frequently used to gauge a borrower's creditworthiness before a bank extends a loan offer. On e-commerce websites like Amazon.com, AI predicts

the products you might like so Amazon can present you with recommendations. Similarly, streaming video services like Netflix use AI to personalize your viewing experience. Companies also leverage AI for cloud operations optimization to maintain uptime and ensure the reliability of the services in their systems. Nevertheless, as mentioned in the previous section, AI usage in production remained low as of early 2024 (Kalyani & Hogan, 2024), whereas labor productivity growth in the U.S. hovered around 0% in the past several years (CEIC Data, an ISI Emerging Markets Group Company, n.d.).

Ever since OpenAI unveiled GenAI to the world in late 2022, the outlook on AI's potential impact on productivity growth has become increasingly optimistic, although the numbers vary widely. Here are a few notable predictions from the past year that paint a compelling picture:

- Goldman Sachs (2023) predicted that GenAI technologies could contribute to a 7% increase in global GDP, equivalent to nearly \$7 trillion, and boost productivity growth by 1.5 percentage points over the next decade.
- McKinsey (2023) estimated that GenAI could improve labor productivity by 0.1% - 0.6% annually through 2040. Additionally, GenAI-powered work automation could add 0.5% - 3.5% to annual productivity growth when combined with other technologies.
- According to Ernst & Young (2024), GenAI was expected to have a significant impact on the economy, potentially adding \$650 billion over the next decade and increasing real GDP by 2.5% by 2033.
- According to the Nielsen Norman Group (2023), AI has the potential to enhance employee productivity significantly. They claimed that GenAI "tools increased business users' throughput by 66% when performing realistic tasks" based on three recent studies on AI and productivity.
- MIT Professor Daron Acemoglu (2024) is a lot more conservative in his prediction. He stated that, despite AI's potential, productivity gains over the next ten years were expected to be modest, with total factor productivity (TFP) growth estimated at around 0.71% over 10 years and potentially lower.

GenAI is poised to revolutionize various industries. McKinsey (2023) predicted that sectors like banking, high-tech, and life sciences will likely experience the most significant effects relative to their revenues. According to the research, in the banking industry, fully implementing GenAI use cases could add an estimated \$200 billion to \$340 billion per year, and similarly, the retail and consumer packaged goods sector could see an annual impact ranging from \$400 billion to \$660 billion. Among the different functions within a company, about 75% of the value that GenAI use cases could deliver falls across four areas: customer operations, sales and marketing, software engineering, and R&D (McKinsey & Company, 2023).

Let's examine a few use cases. First, take a look at customer operations. In a recent paper, Erik Brynjolfsson, Danielle Li, and Lindsey R. Raymond (2023) reviewed the impact of a GenAI-based conversational assistant among more than five thousand customer support agents. They found that the software increased productivity by 14% on average, with a 34% improvement for lower-skilled workers but minimal improvement for experienced workers. Moreover, the study revealed that AI assistance enhances customer sentiment, boosts employee retention, and facilitates worker learning.

GenAI is transforming every phase of the software development process, including requirement gathering, system design, testing, and deployment. Boston Consulting Group (BCG) claims that, when implemented at scale, GenAI can significantly enhance the quality, speed, and cost-effectiveness of innovation within the software industry (Ahlawat, 2024). In its survey, respondents saved anywhere between 1.1 days and 2.5 days in software development per week, with mid-level developers (with 2-4 years of experience) saving the most time. The survey also indicates that the



adoption of GenAI tools in software development is still in its infancy.

On May 23, 2024, OpenAI launched its latest large language model - GPT-4o, a unified model that processes text, vision, and audio inputs and outputs through a single neural network (OpenAI, 2024). It is capable of chatting with the user in a natural voice. The LLM can accomplish tasks such as analyzing spreadsheets, summarizing meeting minutes, giving interview advice, translating languages in real-time, and teaching math, among other use cases (OpenAI, 2024). The possibilities offered by GenAI are boundless.

In short, AI has the potential to significantly enhance businesses' ability to innovate, develop new products, create personalized offerings, and expand into new markets by providing actionable insights, improving efficiency, and enabling better decision-making.

#### **4. Challenges and Ethical Considerations**

Although AI, especially GenAI, has exhibited significant potential in enhancing productivity, challenges abound. This section looks at four AI challenges:

- The impact on the labor market and inequality
- Hurdles in driving adoption
- Difficulty in measuring AI's impact on productivity
- Security, privacy and other ethical implications

#### **Impact on the Labor Market and Inequality**

The disruption AI is causing in the labor market, primarily through task automation and subsequent worker displacement, is an urgent reality. In 2017, Kai-fu Lee, a well-known venture capitalist, made a bold prediction, envisioning AI replacing 50% of human jobs by 2027 (Yan, 2017). He reiterated this claim in a recent interview with Fortune Magazine (Ma, 2024). Many other researchers and analysts have echoed these concerns, albeit with less audacity. Goldman Sachs' Briggs and Kodnani warned that technological advancements in AI systems could significantly impact global employment markets by reshaping workflows and potentially automating the equivalent of 300 million full-time jobs (Goldman Sachs, 2023).

In the past, when technological breakthroughs like electricity, computers, and the Internet displaced workers, other types of jobs were created after the fact. Today, there is concern that the recent wave of AI has come so fast and on such a massive scale that society may be unable to create new jobs quickly. Moreover, unlike previous technological innovations, which predominantly displaced workers at the mid-to-low end of the spectrum, AI can extend the displacement to high-wage earners.

However, there is some encouraging news. A recent International Monetary Fund (IMF) (2023) working paper explored how AI influences labor markets in advanced and emerging economies. The paper suggested that while AI risks displacing labor through automation, it also enhances productivity and complements human work, particularly in cognitively demanding and highly skilled occupations.

AI is expected to exacerbate income and wealth inequality, particularly in advanced economies, as their exposure to AI is higher than in emerging economies. The technologies could disrupt employment in all spectrums of labor groups, but high-income workers may also benefit more from AI, leading to increased labor income inequality (International Monetary Fund et al., 2023). Additionally, enhanced capital returns due to AI could further increase wealth inequality.

The solution to the risks of labor market disruption is multi-faceted. First, researchers and businesses should focus more on developing AI solutions that augment human capabilities than simply automating human tasks. In a paper titled *The Turing Trap: The Promise & Peril of Human-Like Artificial Intelligence*, Erik Brynjolfsson (2022) argued that

augmentation, where AI complements human labor, tends to preserve human roles and distribute economic benefits more equitably than substitution.

Secondly, businesses and employees should prepare for the impact of AI as it continues to automate tasks. Companies should explore new ways to enhance customer experience and create new business opportunities by leveraging human skills that are challenging to automate. For example, Kai-fu Lee suggested that as AI surpasses human doctors in diagnosing and treating diseases, doctors may transition into "compassionate caregivers" (Lee, 2018, p.212). Companies need to support their employees by retaining them. Meanwhile, employees displaced by AI should seize opportunities to acquire new skills and knowledge and adapt to new jobs.

Lastly, at the policy level, governments should play an active role in combating the adverse impact of AI by investing in AI innovation, updating regulatory frameworks, supporting labor market transitions, and ensuring social protection for affected workers (International Monetary Fund & Cazzaniga, 2024).

### **Hurdles in Driving Adoption**

The number of businesses adopting AI to produce goods and services still needs to grow. A 2023 Business Trends and Outlook Survey (BTOS) published by the United States Census Bureau (USCB) revealed that only 3.8% of American companies used AI in production, with the highest use in the information sector, where close to 14% of the companies reported using the technology (Breaux & Dinlersoz, 2023). We must note that the percentage of U.S. firms adopting AI has remained the same since 2018, when it was 3.2%. The survey also found that, nationally, 6.5% of all firms planned to use AI in the next half a year, which is still tiny.

Globally, large enterprises have shown better progress in AI adoption than the U.S. national average. According to the IBM Global AI Adoption Index 2023, a survey of more than 8,500 IT professionals worldwide, 42% of large organizations had actively deployed AI, with an additional 40% exploring its use (IBM, 2024). Moreover, 38% of IT professionals surveyed were implementing generative AI, while another 42% were considering it. About half of the financial services industry's IT professionals reported active AI deployment, and 37% of those in the telecommunications sector said their companies were also deploying AI. In addition, most of the surveyed companies actively deploying or exploring AI had increased the pace of their rollout or investments in the past two years.

What are the hurdles to AI adoption? The main obstacles organizations exploring or implementing AI often cite include a shortage of AI skills and expertise, excessive data complexity, ethical issues, difficulties integrating and scaling AI projects, high costs, and insufficient tools for developing AI models (IBM, 2024). In the GenAI space, firms are also concerned about data privacy, trust, and transparency (IBM, 2024). In addition to technical hurdles, there are organizational challenges. For example, a firm may need to make necessary cultural and organizational changes to adapt to the wider use of AI technologies.

### **Difficulty in Measuring AI's Impact on Productivity**

Quantifying AI's impact on productivity growth is difficult due to several factors. One key issue is measuring intangible benefits, such as improved decision-making and customer experiences, which do not easily translate into traditional productivity metrics. As Erik Brynjolfsson (2023) wrote on World Economic Forum (WEF), the most common productivity measure, non-farm business productivity, effectively captures industrial sector productivity where inputs and outputs are tangible, but measuring the productivity of cognitive labor is more challenging. Additionally, there is often a lag between AI implementation and observable productivity gains, as businesses need time to adapt and optimize new technologies, making short-term impacts challenging to assess.

The relationship between AI and human labor is complex. AI can both complement and substitute for human work, and its effects vary across industries and roles. It can lead to diverse impacts that are difficult to summarize. Differences between sectors make it even harder to measure AI's impact, as it may be more noticeable in certain industries, such as

manufacturing, while more subtle in others, like services.

Data limitations pose another challenge. Comprehensive and high-quality data on AI adoption and its impact are often needed. Due to the influence of other technological and organizational changes, it isn't easy to directly attribute productivity gains to AI. Additionally, the broader economic and social context, including factors such as workforce education, regulatory environments, and market conditions, also significantly shapes AI's impact on productivity. This adds further variability and uncertainty to the measurement process.

### **Security, Privacy, and Other Ethical Implications**

Driving AI adoption involves security, privacy, and ethical considerations. Security concerns are paramount, as today's AI systems often require large datasets that can be vulnerable to cyberattacks. Organizations ought to take robust cybersecurity measures to protect sensitive data. In addition, the integrity of AI systems must be safeguarded against malicious attacks that could alter their functioning or outcomes, such as adversarial attacks designed to trick large language models.

Privacy considerations are crucial for AI systems, as they often handle massive amounts of personal data. This raises concerns about how the data is collected, stored, utilized, and shared. It's essential to comply with data protection regulations such as the General Data Protection Regulation (GDPR) and the California Privacy Rights Act of 2020 (CPRA) to address these concerns. Anonymizing personal data in AI systems is a best practice to safeguard individual identities and ensure data privacy.

Ethical issues in AI adoption encompass bias, fairness, transparency, accountability, and informed consent. AI may perpetuate or even worsen existing biases in data, which can lead to unfair or discriminatory outcomes (Chen, 2022). Ensuring fairness and minimizing bias in AI models is a significant ethical concern. Understanding the reasoning behind the decisions made by AI systems can be challenging due to the need for more transparency in their decision-making processes (Camacho, 2023). Therefore, transparent AI systems and clear accountability mechanisms are necessary. Users should be informed about how their data is used and provide explicit consent, especially in cases involving sensitive information. Intellectual property issues related to the ownership and use of AI-generated outputs must also be addressed.

Finally, building trust and public perception is vital for AI adoption. Gaining public trust involves addressing concerns about AI misuse and demonstrating AI systems' benefits and reliability. Promoting ethical guidelines and standards for AI development helps ensure that AI technologies are used responsibly. Organizations can foster a more responsible and sustainable approach to AI adoption by addressing these security, privacy, and ethical considerations.

### **5. Policy and Regulatory Considerations**

The previous section outlined numerous security, privacy, intellectual property, and ethical challenges associated with AI. Governments worldwide have been contemplating AI regulations to various extents. In March 2023, Italy swiftly banned ChatGPT due to privacy concerns (McCallum, 2023), reflecting the urgency and complexity of AI regulation. (OpenAI has since restored its service after making changes to satisfy the Italian regulators, The Verge reported in April 2023.) However, most governments have adopted a more cautious approach, recognizing AI technology's dynamic and evolving implications. There is increasing collaboration between the public and private sectors and among international communities to address these challenges.

As of now, no country has enacted comprehensive AI or GenAI regulation. Nonetheless, significant legislative initiatives are underway in Brazil, China, the EU, Singapore, South Korea, and the US, according to a recent report by McKinsey (2023). The report noted that these countries are taking different regulatory approaches, from broad AI regulations based on existing laws to sector-specific guidelines, and a common theme in global AI regulation is the focus on transparency, human oversight, accountability, technical reliability, fairness, privacy, and social well-being.

A 2024 report titled *The Artificial Intelligence (AI) Global Regulatory Landscape: Policy Trends and Considerations to Build Confidence in AI* by Ernst & Young examined the regulatory efforts of eight key jurisdictions: Canada, China, the EU, Japan, Korea, Singapore, the UK, and the US. The report identified six regulatory trends: adherence to OECD principles, risk-based regulation, sector-specific rules, integration with other policies, regulatory sandboxes, and international collaboration. These trends underscore the global nature of AI governance and aim to balance oversight and innovation.

As AI continues to evolve and integrate into various sectors, it is crucial to establish robust regulatory frameworks that mitigate risks while fostering responsible innovation. Governments and regulatory bodies must collaborate to ensure that industries develop and deploy AI solutions in alignment with societal values and ethical standards. The identified regulatory trends provide a pathway to achieving this balance and emphasize the importance of global cooperation in navigating the complexities of AI governance.

## 6. Conclusion

The launch of ChatGPT in late 2022 marked a significant milestone in artificial intelligence, capturing global attention and highlighting the transformative potential of GenAI. Although AI research and development began over 70 years ago, businesses and countries have only recently fully recognized its potential. AI, particularly GenAI, holds immense promise for driving productivity growth across almost all industrial sectors in the coming decades.

However, the journey toward widespread AI adoption is fraught with challenges. Technical, cultural, and organizational hurdles must be overcome, and critical security, privacy, and ethics issues must be addressed.

It is crucial to recognize that AI is not a panacea. Technology alone cannot solve all of humanity's problems, such as world hunger, geopolitical conflicts, social harmony, or authoritarianism. Despite the increasing capabilities of machines, they lack the uniquely human qualities of emotion, empathy, free will, and the capacity for love. As Kai-Fu Lee aptly stated in his book, *AI Superpowers: China, Silicon Valley, and the New World Order*, "Let us choose to let machines be machines and let humans be humans. Let us choose to simply use our machines and, more importantly, to love one another" (Lee, 2018, p.232).

Ultimately, the true power of AI lies in its ability to augment human capabilities, allowing us to focus on what makes us inherently human. By leveraging AI responsibly and thoughtfully, we can harness its potential to drive productivity while ensuring that human values and compassion remain at the forefront.

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## PRODUCTIVE USE OF ARTIFICIAL INTELLIGENCE IN TRAINING AND EDUCATION

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Trainers, irrespective of internal trainers or consultants and faculty in higher education institutions, need to take care of number of standard activities in order to achieve the objective of their participants to learn and meet learning objectives. They need to understand the expectations and needs of participants, develop content for the objectives to be achieved, design and develop activities that will help in effective learning and internalization of concepts, use multiple training methods to engage learners and make learning effective, use facilitation skills and variety of tools and methods of delivery to make learning interesting and participative. Trainer also plays the role of mentor and coach to provide personalized support to the learner. Role of trainer extends beyond delivery to ensure impact of learning and measurement thereof.

Artificial Intelligence (AI) refers to simulation of human intelligence processes by machine, especially computer systems. AI is therefore a technology or tool that is available to Trainers / Educators to use to make their role effective. To Trainers and educators can use AI tools for many activities that they need carry out for delivery of training and courses.

- Automate Processes : AI tools can help trainers to automate many of the routine activities including activities, games, quizzes etc.
- Discover expectations and needs: AI tools can be helpful in understanding learner expectations and needs using data analytics.
- Respond to requirements: AI tools can be used to create automated and customized response to queries and doubts of learners.
- Personalize learning : AI tools have capability of customizing learning specific to the needs of individual learners thereby making learning learner oriented and relevant.
- Predict learner behavior: AI tools can be used to assess learning and predict learning and possibility of learning retention, applicability and benefits.
- Achieve diversity and reach: AI tools have the capability of catering to diverse learners and making trainer/ educator reach anywhere and everywhere thereby extending the reach of trainer / teacher beyond the classroom.

### **Training and Teaching - Purpose for which AI can be used**

- Developing Intelligent tutoring systems
- Automated content creation
- Adaptive Assessment of Learning
- Provide 24/7 learner support
- Predictive analysis of Learning Behavior
- Instant feedback to Learner
- Developing Insights based on data analytics
- Identifying learning gaps and needs
- Mentoring and coaching of learning



### Typical AI solutions used by Trainers and educators

- Virtual reality simulations
- Learner Support chatbots
- Automated grading tools
- Content recommendation system
- Data analytics for optimization
- Intelligent tutoring systems
- Assimilation of discussions
- Synthesizing books, manuals.

### Applications of AI in Training and Education

- Create Role play scenarios
- Generate Quizzes with varying difficulty
- Create rapid videos
- Create unique images
- Practice communication skills
- Improve story telling
- Administration of LMS
- Matching Mentor- Mentee

### AI Tools for Training and Education

Application	Tool
Idea Generation/ 24/7 support	Chat GPT, NewBing, Poe,
Content creation	JasperAI, Write Smith, Article Forge
Image Creation	Midjourney, Play form, Dalle
Understanding Learner needs	Education insights, Reading Progress
Speech to text	Amazon transcribe, Buzz, Whisper
Learning Assistance	Microsoft maths, Cogni, Blippar
Personalized learning	Carnegie learning, content technologies
Assessment	Grade scanner, Tuminin, iris
Tutoring and mentoring	AllHere, Guider, Capacity
Accessibility	Synthesia, Nuance, Audio transcriber

Artificial Intelligence(AI) is a support to the trainer and educator to make his / her job efficient . Productivity of trainers and educators will get enhanced manifold with use of AI tools. What is needed is investment by trainers and educators to familiarize themselves with various AI tools and start using them for activities that they feel comfortable with. Like any other software AI tools are user friendly and can be mastered easily.

# PRODUCTIVITY MANAGEMENT FOR ORGANIZATIONAL PERFORMANCE

**Dr Rajat. K. Baisya**

President, PTMF

## **Abstract:**

Productivity is a measure of output against a given input and as such with any amount of input there will be an output depending on the efficiency of the system. In business, the inputs that normally would be required to produce the desired products and service are men, machine, money and material(4Ms). Together they constitute the primary resources of the corporation to produce useful goods and services. And managing each one of them at optimum level of productivity will determine the organisational performance. As it is the people that operate machine and utilise capital to procure material and other assets to be converted to useful products and services, people are at the centre stage in the organisation for productivity improvement. Peoples' capability and skill will determine how effectively organisations' resources will be productively deployed to deliver improved performance. By optimising the resource utilisation, improving the business processes and by building appropriate culture, corporations can enhance productivity to stimulate innovation led growth to deliver organizational performance. This article examines the complexity of critical productivity in organization and explore its impact on the basic foundations that can lead to innovation and organisation's growth.

## **Key words:**

Productivity, Performance, Innovation, Efficiency, Effectiveness, Employee Engagement, Strategic Alignment, Agility, Adaptability and Optimisation

## **Introduction:**

Productivity level of a corporation is defined as the efficiency with which it utilises its valuable resources to achieve its goals. It includes the quality and quantity of the 4 Ms in the production process. Improving productivity is thus very critical to industry unit level competitiveness resulting into business performance. Productivity as such is the engine of overall organisational performance.

Maximizing productivity is crucial for organizations aiming to succeed in a competitive market. Increased productivity enables organizations to achieve more with fewer and lesser resources, leading to increased cost effectiveness and efficiencies. Technology and external environment play a great role in productivity performance.

Organizational culture has to be conducive for innovations happening routinely for competitive advantage by encouraging employees to experiment, take calculated and manageable risks, and think creatively. Efficiency creates an environment conducive to ideas and experimentation by streamlining workflows and minimizing bureaucratic hurdles. Additionally, efficient allocation of resources allows organizations to devote time and resources to innovation, drive continuous improvement, and stay ahead of general industry trends.

Artificial Intelligence (AI) holds a very high promise to influence productivity of businesses, societies and nations. AI assists Project Manager in terms of improved resource allocation taking a holistic perspective of the project and thereby preserves the scarce resources for the business and project sponsors. AI therefore, needs to be integrated into the workflow of business as well as projects. However, it has not yet percolated to small and medium size industries who contributes to over 60% of our GDP. Cost effectiveness and other issues like risks, ethics and social issues are still

serious concerns that need to be resolved.

### **Productivity For Corporation's Growth and Performance**

Increased productivity is the catalyst that leads to growth. By using resources more efficiently, companies can increase productivity, expand market reach and take advantage of new opportunities. Here's how productivity stimulates growth:

- **Increased Output:** Higher efficiency allows organizations to produce more products with the same level of input, thus increasing sales revenue and market share. This is especially important for SMEs that seek to expand their operations and enter new markets.
- **Cost Savings:** Greater efficiency often means cost savings as resources are used more efficiently. By reducing waste and improving quality, organizations can reduce production costs, increase revenue, and reinvest savings into growth.
- **Firm Level Competitiveness:** Increased efficiency allows the company to offer better products and services than its competitors, thus increasing the company's competitiveness. The competitive advantage allows the organization to attract customers, dominate the market, and outperform its competitors.
- **Agility and Adaptability:** Effective organizations can adapt to changing markets and benefit from change. By creating a culture of agility and innovation, companies can quickly respond to customer needs, seize the immediate opportunities and stay ahead of competition.

### **Driving Innovation Through Productivity**

Innovation is the lifeblood of organizational growth and product differentiation. Productivity plays an important role to creating the beneficial environment for innovation to thrive in the following ways:

- **Resource Allocation:** Productivity optimization frees up resources that can be devoted to research and development (R&D), testing, and exploring new ideas. This allows organizations to invest in innovation without disrupting their core operations
- **Cross-functional Collaboration:** By encouraging knowledge sharing and diversity of ideas, companies can encourage creativity and enable innovation.
- **Iterative Improvement:** Productivity is a continuous journey marked by iterative improvement and adaptation. Organizations that value products are key to a culture of experimenting, and learning from failure, an important factor that encourages innovation.
- **Customer-Centricity:** Focusing on productivity allows organizations to allocate resources to projects that will directly benefit customers. By understanding customer needs companies can design products, services and processes that will deliver greater value and increase customer satisfaction.

### **Organizational Structures and Productivity**

Corporations create and design different types of structure to make it more productive. We are familiar with traditional hierarchical structure, matrix structure and lean and flat organisation structure, all created to improve organisational performance. In essence, organisation structure is designed to make use of the resources to achieve the desired results. Organisation structure and people capability generally influence productivity through several operational criteria such as:

- **Operational Efficiency:** Allocate and effectively utilize human capital, and also technology and financial assets, to complete tasks and achieve goals within established time frame.
- **Process Optimization:** Streamline workflows and eliminate bottlenecks to enhance and boost the efficiency of operations. This includes identifying inefficiencies and implementing strategies to increase productivity at every level.
- **Employee Engagement:** Create a business support system that motivates and inspires employees and provides the tools and training necessary to achieve high performance. Engaged employees are more likely to contribute positively to business productivity.
- **Strategic Alignment:** Ensure organizational goals and individual efforts are aligned with each product category's goals. Results are best achieved when all actions are aimed at achieving the organization's mission and vision.

Increasing the organizational performance depends on the organisation structure and its ability to align all its components to improve the efficiencies of partial factors as well as Total Factor Productivity. Different aspects of the structure will contribute to the overall performance as discussed below.

1. **Clarity in Roles and Responsibilities:** A clear structure ensures that everyone understands their role, who reports to them, and what is expected of them. This transparency reduces confusion, reduces effort, and increases accountability, ultimately improving performance and productivity.
2. **Efficient Communication Channels:** A well-structured system encourages effective communication at all levels of the organization. Clear and open feedback and information channels facilitate collaboration, problem-solving, and decision-making to solve problems and captures opportunities faster.
3. **Alignment with Strategic Objectives:** Establishing organizational structures based on the company's business goals. It ensures that resources are allocated according to priorities, measures are implemented effectively and the organization is focused on achieving its long-term vision, so that performance continuously improve.
4. **Agility and Adaptability:** A flexible model allows the organization to quickly adapt to changes in business, customer needs and technology. By decentralizing decision-making and empowering frontline employees, organizations can more easily respond to emerging opportunities and threats and maintain a competitive advantage.
5. **Talent Development and Succession Planning:** Carefully designed structures provide opportunities for skills development and career advancement. A clearly defined development process, training programs and experience support employee growth and retention, and ensure regular employment of talented employees in jobs that support development.

In essence, an effective organizational structure acts as a catalyst for improving performance by enhancing clarity, communication, alignment with strategic goals, agility, and talent development.

#### **Frameworks for Enhancing Organizational Productivity**

There are many methods and techniques that can be used to increase efficiency in the basic business processes. Effective business processes are important to support productivity growth and improve organizational performance. Enterprise organizations use frameworks such as Lean Six Sigma, Agile methodologies, and Total Quality Management to develop best practices, standardize processes, and drive continuous improvement. These processes provide a way to increase productivity, identify inefficiencies, resolve negative issues, and improve performance in all areas of the business.

- **Lean Management:** Lean management is based on the principles of efficiency and waste reduction, focusing on increasing efficiency while reducing resources. By identifying and eliminating non-value-added activities, organizations can improve processes and increase efficiency.
- **Agile Methodology:** Agile methods were originally developed for software development and emphasize change, collaboration, and delivery. By breaking down tasks into smaller, manageable tasks and creating cohesive teams, organizations can become more efficient and flexible.
- **Total Quality Management (TQM):** TQM is total quality improvement that includes continuous monitoring, feedback and process improvement. Total Quality Management promotes a culture of excellence and productivity by emphasizing customer satisfaction and employee involvement.
- **Performance Management Systems:** Implementing performance management allows organizations to set clear goals, track progress, and provide feedback to employees. By aligning an individual's work with the organization's goals, the business can be efficient and profitable.
- **Employee Empowerment and Development:** Investing in employee training, development and support programs creates a skilled workforce that supports productivity and innovation. By providing employees with the tools, resources, and freedom to perform their duties, organizations can unleash their potential and achieve high levels of performance.
- **Kanban:** Originally from the Toyota Production System, Kanban visualizes work, limits work, and encourages continuous improvement. It provides transparency in work situations and helps teams identify conflicts and increase work efficiency.
- **OKRs (Objectives and Key Results):** Popularized by companies like Google, OKRs align individual and team goals with corporate goals. They demonstrate clarity, focus and accountability, encourage excellence and foster a culture of success.
- **Benchmarking:** Benchmarking operational parameters with top performer and also best in class will help in understanding the performance of the business.
- **Quality Management Tools:** Seven quality tools can help businesses to understand the productivity performance of various parameters.

### **People Management for Improved Productivity for Organisational Performance**

In essence, the development of labour skills encompasses a diverse range of people, each contributing their unique talents and perspectives to create a richer and more dynamic workforce. In terms of developing professional skills, people from different backgrounds and interests have found their niche. Here are some types of people work for corporations:

1. **The Artisan:** These are very talented people, the hands of the creator. They enjoy using materials and turning them into something beautiful and functional. Whether woodworking, metalworking or textile crafts, craftsmen have a knack for precision and detail.
2. **The Analyst:** Working for an analyst is like solving a difficult problem. They are good at solving problems and optimizing processes to increase efficiency. Fields such as engineering prefer these individuals who can use critical

thinking to innovate and improve existing systems.

3. **The Caregiver:** Compassionate people with an interest in directly affecting the health of others tend to pursue careers in health care or social work. Their thoughts and passion make a huge difference in the lives of the people they help, fostering a sense of community and support.
4. **The Entrepreneur:** Visionaries see work as an opportunity for innovation and growth. They thrive in an environment where they can turn ideas into reality, take risks and seize opportunities for advancement. Their leadership and passion drive the business and inspire others to follow their business dreams.

In organizations we will have a mix of all these types of people but most important thing is that organisations need to identify them and constantly develop their skill level in the right direction and their numbers also have to be in right mix to accelerate organisational performance. We can use appropriate framework to determine organisational performance. Balanced Score Card (BSC) of Norton and Kaplan that provides feedback on internal business processes and external outcomes to continuously improve strategic performance and results would be a useful framework to be employed to determine organisational excellence.

### **Conclusion**

Organisation needs to develop right structure in the context of the optimum utilisation of resources to be efficient and productive, align each element to organisational performance and need to implement appropriate frameworks for success. Also only becoming efficient is not enough, it has to be effective which is a measure of outcome per unit of output. Productivity led performance can be achieved by improving resources utilisation, business processes and creating a culture of excellence leading to innovations to be more competitive to stimulate growth. Through the integration of ideas, employee collaboration, cocreation and leveraging a productive foundation, organizations can realize their potential and thrive in a competitive environment. As the business evolves and adapts to emerging challenges, manufacturing will continue to be the foundation of sustainable growth and competitive advantage. Finally, developing skills and capabilities of people to use technology and optimise resources can deliver organisational performance.

# IMPACT OF GLOBAL WARMING ON SUSTAINABLE PRODUCTIVITY

**Dr Arun Kumar Rath**

Fellow, WAPS

## **Introduction**

The World Commission on Environment & Development (WCED) in their report "Our Common Future" defined sustainable development as, "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs." The seventeen Sustainable Development Goals (SDGs) constitute the blueprint prepared by the United Nations for ensuring the sustainable development of the planet. SDGs hold hope of a better future for all mankind for their all-round development. The goals address the global challenges of poverty, illiteracy, inequality, climate change, environmental degradation and promise peace, justice and social dignity for all. The primary objective of sustainable development is to balance the social, economic, and environmental aspects of development. The economy must follow the vision as enshrined in the objectives of the United Nations for a responsible and ethical process of development.

The sustainable development agenda comprising the seventeen sustainable development goals have been accepted by all nations. Every nation has to evolve strategies to align its development paradigms to the emerging framework of sustainable development agenda with a target date of 2030. Issues and challenges of sustainable development are having impacts on the economies all over the world in the twenty first century.

## **SDG Midpoint Review**

The goals are to be achieved by the world community within a period of 15 years (2015-2030). The midpoint of time given for achievement of the SDGs has arrived in the year 2023. The Global Sustainable Development Report 2023 commented on the progress on the 2030 Agenda. It is disturbing to note that the report summarised the achievements of the SDGs around the world as "stagnation in the face of multiple crises". COVID 19 pandemic, Ukraine-Russia war and global warming are the major causes of the reversal of the gains achieved in the earlier years. The gravest challenge to save the planet comes from unprecedented climate change. If climate change and its basic cause the global warming are not attended to urgently, all development goals will be nullified. In this context, the Sustainable Development Goal on climate action has assumed topmost priority for the global community.

## **Goal 13: Climate action**

The objective of this goal 13 is "To take urgent action to combat climate change and its impacts by regulating emissions and promoting developments in renewable energy."

## ***Global warming***

Three factors mainly responsible for alarming levels of climate change are excessive emission of greenhouse gases, abnormal increase in carbon footprints and rise in global temperature. Burning fossil fuels, cutting down forests, intensive agriculture, excessive use of fertilisers, and livestock farming are some of the factors adversely affecting the climate and the earth's temperature. These activities add enormous amounts of greenhouse gases to those naturally occurring in the atmosphere, increasing the adverse effects of greenhouse gases and global warming.

The main driver of climate change is the greenhouse effect. Some gases in the Earth's atmosphere act like the glass in a greenhouse, trapping the sun's heat and stopping it from leaking back into space and causing global warming. Many of these greenhouse gases occur naturally, but human activities are increasing the concentrations of some of them in the atmosphere like carbon dioxide, methane, nitrous oxide and fluorinated gases. CO<sub>2</sub> produced by human activities is the largest contributor to global warming. By 2020, its concentration in the atmosphere had risen to 48% above its pre-industrial level (before 1750). Natural causes, such as changes in solar radiation or volcanic activities are also estimated

to have contributed to global warming

Climate change will cause large, permanent economic losses around the world in the long run, unless timely and sufficient adaptation and mitigating actions take place. It takes time for the full warming impact of atmospheric greenhouse gasses (GHGs) to materialise. Even if the transition to a net-zero carbon economy were to accelerate, the global average temperature would continue rising, potentially bringing with it an increased frequency and magnitude of natural hazards such as windstorms, floods and droughts.

### **How do rising temperatures affect productivity?**

It is well known that productivity at manufacturing plants may fall when temperatures persistently exceed beyond 25°C. Surveys have shown that every degree rise above 20°C can reduce productivity by as much as 4 percent. That means a rise of just 5 degrees can cut the output by 20 percent!

The level of thermal comfort would decrease. It would become more difficult to perform physical and cognitive tasks. This would lead to decrease in the labour productivity both in outdoor and indoor activities. Temperature has been found to affect income via agriculture as well as industrial and manufacturing activities. It would increase demand for energy and other neutralising facilities.

Projections suggest that, in 2030, 2.2 per cent of total working hours worldwide will be lost due to high temperatures - a productivity loss equivalent to 80 million full-time jobs.

When the working environment is too hot, people work far less efficiently. Morale plunges, and accidents and absenteeism rise. Cooling the factory shop floor is essential to keep productivity levels high and for the wellbeing of the people working in this environment. However, conventional cooling systems are not a viable solution as they are expensive. The solution is to harness the cooling power of water. New technologies such as evaporative cooling offers cost-effective solutions for production facilities.

Global warming may have three types of risks for sustaining productivity. The physical risks arising out of the long-run changes in average temperatures and sea levels are referred to as chronic risks, while the impact of natural hazards such as droughts, wildfires and storms are referred to as acute risks. In addition, the path to carbon neutrality and its enabling policies and regulations might also disrupt economic performance, in what is referred to as transition risks. Their impact will be on the factors responsible for labour productivity.

### **Paris agreement on climate change**

An international treaty on climate change was adopted in 2015. The Agreement was negotiated by 196 parties at the 2015 United Nations Climate Change Conference near Paris. As of November 2021, 193 members of the United Nations Framework Convention on Climate Change (UNFCCC) are parties to the agreement. The Paris Agreement's long-term goal is to keep the rise in mean global temperature to well below 2 °C (3.6 °F) above pre-industrial levels, and preferably limit the increase to 1.5 °C (2.7 °F). Emissions should be reduced as soon as possible to reach net-zero by the middle of the 21st century. The international community has recognised the need to keep warming well below 2°C and pursue efforts to limit it to 1.5°C.

### **"Climate Change Inaction Costly"**

The business case for net zero economies is crystal clear. Leadership vision will also focus on sustainability. Highlighting this inevitable transformation, Mr Alan Jope, Global Chief Executive Officer, Unilever warned that the estimated disruptions caused by rising temperatures will cost companies US\$1.3 trillion by 2026, and result in the loss of 80mn jobs. "Now the cost of inaction is far higher than cost of acting. Hence, to achieve superior financial performances, there is a need to build sustainable business," he added. The CEO of the multinational consumer goods giant made the remarks while speaking at an event organized by FICCI on 20 September 2022 at New Delhi.



### **Sustainable development for Productivity**

Productivity is a measure of how well a society transforms work and other resources into products and services that improve people's lives. Historically, productivity has trended upwards over time: more goods and services have been produced for the same level of input of resources, allowing living standards to rise. According to Gerd Müller, Director General of UNIDO "Sustainable industrial development can deliver a world without hunger, using sustainable energy for productive activities, and creating jobs, particularly for young people." In the past four years, the world has been hit by numerous shocks including the COVID-19 pandemic, a rising number of armed conflicts and several natural catastrophes, induced by climate change. The simultaneous impact of these shocks has been recognized as a global poly crisis.

Climate change is already having impacts on economic performance, including on GDP, labour relations and productivity. It will have even greater impacts in the future. It is crucial to explore productivity measures that are associated with the physical and natural processes linked to climate change. This includes the scientific use of fossil fuels and other materials for production, the efficiency of energy use, the carbon intensity of economies, and the productivity of natural resources including land, forests, and water resources. Improving productivity in the use of materials, energy and natural resources is central to achieving sustainable development goals, and the target of net zero. There is need for a new era of modern industrial policies, which encompass four crucial elements. First, modern industrial policies should be guided by the SDGs. Second, industrial policies should be future-ready and, right from their inception, consider the megatrends reshaping the world. Third, modern industrial policies should promote collaboration. Finally, such policies should be regionally coordinated to mitigate tensions and unlock the full potential for cooperation among neighbours.

Policy action should aim at meeting net zero while supporting productivity and wellbeing. The main policy challenge is how to design climate change policies to meet the global objective of net zero while also supporting productivity and wellbeing. To meet this challenge, governments will need to shape markets for low-carbon products and services, e.g., through regulation and standards, and give direction for technological change to accelerate low-carbon innovation and foster the uptake and diffusion of low-carbon technologies. Innovation policies are particularly important, as they can help bring down the cost of climate policy action, and simultaneously support productivity growth.

### **Revisiting Triple bottom line**

John Elkington, British management consultant and sustainability Guru, coined the phrase "triple bottom line" in 1994 for measuring performance of a business corporation in the context of sustainable development. He proposed that a company should be managed in a way that not only makes money for the shareholders, but also improves people's lives and the well-being of the planet. John Elkington advanced a sustainable model of development based upon the triple bottom line (TBL) approach. The TBL concept maintains that companies should commit to focusing as much on social and environmental concerns as they do on profits. TBL theory posits that instead of one bottom line, there should be three: profit, people, and planet. TBL seeks to assess a corporation's level of commitment to corporate social responsibility and its impact on the environment over time. Whereas profit is the traditional measure of net corporate profit in the profit and loss (P&L) account, "people" measures how socially responsible an organization has been during the period. Similarly, "planet" measures how environmentally responsible a firm has been. Organizations must adopt TBL frameworks and be accountable to all stakeholders- not just shareholders.

The three pillars of sustainable development, namely profit, planet, and people correspond to the economic, ecological, and social aspects of development. The process of development should be sustainable by balancing the economic, social and environment aspects. It is interesting to note that John Elkington is now having second thoughts about his own TBL theory. "To truly shift the needle, however, we need a new wave of TBL innovation and deployment". He feels that the sustainability frameworks will not be enough, as long as they lack the suitable pace and scale needed to stop us all "overshooting our planetary boundaries." (John Elkington, 2018). All nations have to strive harder in a more

committed manner to prevent "overshooting our planetary boundaries ". In the context of ecological disbalance due to global warming, the needs of the planet and nature must receive higher priority over the reckless pursuit of profit for economic growth.

There is a new perspective emerging in the context of global warming. Instead of balancing the three aspects of economy, society and environment, the economy tends to dominate over environment. Decisions are often taken for faster and higher economic growth at the expense of environment. It is high time the environment enjoys priority over economy. It is necessary for preservation of nature and prevention of global warming not exceeding the tipping point, which is the point of no return for the environment.

### **Climate Action: COP Conferences**

The UN Conference on the Environment and Development was held in Rio de Janeiro in 1992. It resulted in the UN Framework Convention on Climate Change ("UNFCCC"). The Committee of Parties (COP) was created as the supreme decision-making body of the Convention comprising all States that are Parties to the Convention. COP reviews the implementation of the objectives of the Convention.

Last three COP conferences at Glasgow (2021), Sharm El-Sheikh (2022) and Dubai (2023) were landmark events in the process of meaningful global action on climate protection for sustainable development. COP 26 at Glasgow (26th session of COP) brought significant outcomes in the global fight against climate change. COP 26 in Glasgow marked a step forward in global efforts to address climate change, including a material increase in ambitions to reduce emissions across the world, finalization of rules on reporting emissions and international carbon trading, and the launch of a range of new initiatives and sector deals. COP 27 at Sharm El-Sheikh closed with a breakthrough agreement to provide loss and damage funding for vulnerable countries hit hard by floods, droughts and other climate disasters. This was widely lauded as a historic decision.

COP 28 at Dubai saw major initiatives by the global community. According to an estimate by the International Energy Agency, full delivery of the energy-related pledges made at COP 28 would result in global greenhouse gas (GHG) emissions in 2030 being about four metric gigatons less than would be expected without them. COP28 delivered historic negotiated outcomes to operationalize Loss and Damage, securing \$792 million of early pledges, providing a framework for the Global Goal on Adaptation (GGA), and institutionalizing the role of the Youth Climate Champion to mainstream youth inclusion at future COPs.

### **Road Ahead**

Based upon the above analysis is suggested for sustainable productivity in the context of global warming:

1. Innovative technologies to maintain levels productivity around the world
2. Innovation policies are particularly important, as they can help bring down the cost of climate policy action, and simultaneously support productivity growth. Policy action should aim at meeting net zero while supporting productivity and wellbeing.
3. Redefine role of environment vis-à-vis economy and accord higher priority to environment
4. Financial support by rich countries to poor countries. The SDG Summit 2023 recognised the urgent need for a significant increase in financing for sustainable development, to the tune of at least \$500 billion per year, to be delivered through a combination of concessional and non-concessional finance in a mutually reinforcing way combined with the necessary reforms in the international financial architecture.
5. India should advance date of net zero emission to 2050 or even earlier, despite the problems of massive

development needs of the vast population

6. Public Policy of India should be to minimize greenhouse gases by rationalizing energy production, agricultural process, transportation and other sectors
7. Effective climate laws to ensure climate-neutral status by 2050 for all countries.
8. Reducing emissions is not enough. To achieve our climate ambitions, we will also need to capture, utilise and store carbon.
9. Land can serve as both a carbon sink, absorbing CO<sub>2</sub> from the atmosphere, and a carbon source, releasing CO<sub>2</sub> through activities such as deforestation. Sustainable land management practices, including afforestation and protection of existing carbon stocks, have great potential for carbon sequestration. Moreover, carbon can be stored in the long term in durable products made of sustainably sourced wood.
10. Climate change is also causing losses in agricultural production and reducing suitable areas for crop cultivation. These challenges are putting the livelihoods of those dependent on the sector in danger.

### **Conclusion**

Industries and firms have to adapt to new regulations and invest in sustainable practices and technologies. It is apprehended that there may be some short-term productivity setbacks as marginal costs increase and demand decreases. However, the long-term outlook is more favourable. Shifting towards a greener economy could temporarily decrease overall labour productivity but is important for mitigating climate change.

Stricter environmental protection is beneficial for productivity growth. The impact of climate policies on resource reallocation across sectors is likely negative, as the more carbon-intensive sectors are currently more productive than the sectors that are expected to grow due to the green transition.

In conclusion, while shifting towards a greener economy can lead to temporary declines in labour productivity in the shorter term, it could yield several long-term productivity benefits.

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## WAPS SIXTH KNOWLEDGE SHARING FORUM SUMMAR

### Dr Sunil Abrol

WAPS held its sixth Knowledge Sharing Forum on March ,7,2024.

Following were the panelists :

1. Dr Payal Kumar, Principal Academic Advisor, ISH, India.
2. Prof. Barnes Sookdeo, University of South Africa.

Mr. Remi Dairo coordinated the session as moderator.

Mr. Remi Dairo welcomed all the speakers and participants and gave perspective to the topic.

Dr Sunil Abrol, Vice President, WAPS welcomed speakers and participants in particular, Mr. Anil Yilmaj , President , WNPO. He thanked Mr. Anil for motivating WAPS team by his presence. Dr Abrol gave a brief about WAPS activities including forthcoming virtual Fellow induction event.

Mr. Remi invited the two speakers to share their thoughts on the topic before opening the floor for discussion.

The key points made by the two speakers are summarized below :

Dr Payal Kumar :

- Sustainability and Productivity are double edged swords.
- Need for long term investment to see the benefits.
- Over consumption by society is a challenge
- Climate change is impacting productivity
- Sustaibility is essential and beneficial
- Sustainability for the benefit of Global Society
- Women in workforce are declining
- Women are crucial agent for sustainability
- Artificial Intelligence will impact both productivity and sustainability
- Need for sustainability to be seen in all aspects including supply chain, ESG, Operations etc.
- Human well being necessary for productivity

Prof. Barnes Sookdeo :

- Productivity necessary for sustainability
- 45% organization in South Africa fail in first year and close.
- Closure leads to job losses and economic disaster
- Efficiency should be in forefront
- Competition is increasing
- Automation helping in bringing change.
- Human Capacity development will help
- Need to work smarter - increase employee productivity
- Make processes productive through multi dimensional approach
- Need to set time standards
- Leadership, Effective management and employee motivation key to productivity
- Financial sustainability critical for success
- Labor unrest impacting productivity

The presentations were followed by a discussion based on questions from the participants.

Mr. Leon Bian member KSF team closed the session by thanking all the speakers and participants for a lively session.

## WAPS SEVENTH KNOWLEDGE SHARING FORUM SUMMARY

### Dr Sunil Abrol

WAPS seventh Knowledge Sharing Forum event was held on June 13, 2024 with following panelists:

1. Prof. Michael, Shepherd, Professor Emeritus, University of Dalhousie, Canada
2. Ms. Yue Cathy CHANG, USA
3. Mr. Lun PENG, China

Mr. Leon Bian moderated the session.

Ms Anita Tang , Vice President, WAPS welcomed the speakers and participants and presented the AI generated message from Mr. Chen Shenyang , President, WAPS.

Mr. Leon requested the panelists to introduce themselves briefly. Each panelist gave a brief of his/ her area of work. Mr. Leon invited speakers to give their presentations which will then be followed by discussion.

Following key points were made by the three panelists :

Prof. Michael Shepherd

- AI reshapes productivity
- AI to be used for achieving triple bottom line.
- AI to help achieve sustainability.
- AI to help in Social, Economic and Environmental productivity
- AI applications in Agriculture sector critical
- AI for assessing soil health, monitoring by drones, green house management, weather forecasting.
- Need for creating awareness of application of AI to masses

Ms. Yue Cathy CHANG

- AI is good with lower cost for quality output
- There are ethical issues associated with AI
- AI does not think strategically
- One needs to learn how to use AI to make decisions
- White collar jobs more likely to be exposed to AI technologies
- AI helps in work flow, Operations, functional productivity and efficiency
- AI helps in Automation of routine task
- AI has application in Social Analysis and assistance
- AI enhances problem solving, creativity and innovation
- AI can accelerate expert knowledge
- Opportunities for T shaped talent
- AI will impact quality of Research, Analytics and Policy formulation

Mr. Lun PENG

- AI is transformer
- More the parameters, smarter the AI
- Predictive AI is optimizing the world
- AI industry contributes to 7% of world GDP
- Conversation AI applications for chatting ( Text to Text)
- Image AI applications for (Text to Image )
- Music AI for application in ( Text to Music )
- Video AI for applications in ( Text to Image/ Video )

- AI powered work flow
- AI copilot developed by Microsoft
- AI Agent Platform
- AI Agent Gaming
- AI Agent Education
- AI Agent E commerce
- AI Agent Creativity
- AI Agent Community
- AI multiplies results , customer communication and expertise

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**WORLD  
CONFEDERATION OF  
PRODUCTIVITY  
SCIENCE**



## **International Journal of Productivity Science (IJPS)**

### **A WAPS Publication**

The International Journal of Productivity Science (IJPS) is a quarterly WAPS Publication focuses on SEE (Social, Environmental and Economic) Productivity. It is a platform for productivity researchers and practitioners to share their views and foster discussion.

#### Guidelines for Authors:

1. Paper submitted is required to be related to Productivity in any sector or area of operation (Social, Environmental, Economic).
2. Paper submitted should be in the English language.
3. Paper should be original writing bases on authentic events, data, case studies, facts, etc.
4. Paper length should be between 2,500-3,000 words, abstract should be between 250-300 words.
5. Contents of the paper should be annotated.
6. Author should give appropriate acknowledgment and references to recognize sources of information, data, etc.
7. Manuscript should be in double space, typed in Times New Roman font, with font size 12, or Arial, font size 11, in MS Word file.
8. There should be a separate page for Title, Name of Author(s), Institutional Affiliation, email ID, etc.
9. Author will be responsible for conforming to IPR requirements and regulations and disputes if any, arising out of the submitted paper will be his/her responsibility.
10. Paper would be Peer Reviewed before acceptance for publication.
11. Authors would retain IPR of the paper published in IJPS. However, IJPS would have rights to use the material appropriately for WAPS publications and activities giving due credits to author.
12. All papers should be submitted to the President to WAPS: [secretariat@waps.info](mailto:secretariat@waps.info)

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## **WORLD ACADEMY OF PRODUCTIVITY SCIENCE (WAPS) MEMBERSHIP JOIN APEX INTERNATIONAL PROFESSIONAL BODY IN PRODUCTIVITY**

About WAPS:

WAPS ( [www.waps.info](http://www.waps.info)) is the academic Division of World Confederation of Productivity Science ( WCPS ). WCPS([www.wcps.info](http://www.wcps.info)) is apex international body engaged in promotion and development of Productivity Movement across Globe. WAPS secretariat is currently in China and WCPS secretariat is currently in Canada.

Management : WAPS is managed by a WAPS Board comprising of President, Vice Presidents and Advisors. Committees for various activities and projects are constituted by WAPS Board from time to time.

Activities : WAPS is engaged in Publications, Research, Training and Capacity Building, Round Tables, Webinars etc. for promotion of Productivity Movement. Current WAPS activities include:

1. International Journal of Productivity Science (IJPS) : WAPS produces an E journal for the benefit of members annually with contributions from Fellow, members and other professionals.
2. Knowledge Sharing Forum : WAPS organizing every quarter a Webinar based discussion on themes of relevance with speakers across Globe.
3. Fellow Induction : Eminent productivity professionals are inducted as WAPS Fellows by WAPS Board through a nomination and selection process.

Membership Benefits:

1. Membership of Global professional body in Productivity
2. Get free soft copy of IJPS , WAPS E journal
3. Opportunity for professional development and learning
4. Networking with Global productivity professionals
5. Participate in WAPS/WCPS events at special terms
6. Speak at WAPS/WCPS Forums/ conferences
7. Get inducted as prestigious WAPS Fellow ( an honorary recognition )
8. Contribute papers in IJPS as author
9. Opportunity to move to WAPS / WCPS management roles
10. Opportunity to get involved in WAPS/WCPS projects

Membership Fee :

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**IJPS**

**INTERNATIONAL JOURNAL OF PRODUCTIVITY SCIENCE  
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