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Article

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Abstract

This paper indicates the impact of Artificial intelligence on the production processes and employment opportunities. Artificial intelligence is one of the most challenging phenomena to labour in many modern societies, but its sway over production and employment opportunities is crucial. This research paper is based on a theoretical framework, the Economic Circular 3D-Model (EC3D-Model), and an inductive research method. The triangulation method is used for data collection, and the data have been analysed with the help of a theoretical framework. As a consequence, the study found that in real sectors of the economy concerning the production process, there are twenty-seven (27) possible production procedures. However, in the case of AI impact, fortunately, only two, Y1 and Y10, can have an adverse effect on employment opportunities. In addition, Y1 and Y10 are two conditions that lead to labour surplus, with Y1's capital and output level remaining constant and labour decreasing. Similarly, with Y10's level of output increasing, the capital remains constant, and labour decreases. Furthermore, the study found that the technological impact on the level of output in Afghanistan over the last two decades has increased from 17.32% to 56.9%. This impact is, in fact, labour's vigour, which is reflected in the form of technological advancements, such as AI, in the economy.

Keywords: *Artificial Intelligence, Capital, Labor, National Accounts, Afghanistan, Economic Circular 3D-model*

1. Introduction

With the artificial intelligence industry, employment opportunities would be shortened, and many people would lose their jobs, because it is necessary to carry out a detailed examination of the labor market through the model of goods and services and monetary flows in order to know which economic sector will be affected by AI changes, and how. We used to start with the economic development of a society, which means having a meaningful life, good working conditions, proper and easy access to hygienic foods, good health, quality education, and living high standards. However, all these would be viable then if the accuracy of a country's accounts is remarkably reliable. Generally, the more reliable the accounts are, the more accurately we plan economically. Accordingly, to illustrate the smooth and accurate relationships among different sectors of the economy, the study developed an economic circular 3D model. As we know, economics is a social science [1], and from a new classical point of view, economics is the study of humankind in the ordinary business of life [2]. Since humans live in a 3D environment and perform

all their economic activities within a contextual framework, the relationship between human activities and economic indicators should also be interpreted in a 3D manner. It is necessary to note that we cannot fully express all the relationships between economic sectors using a 2D table. It is needed to have a display of all social sciences, in 3D models, which would be much more comprehensive than 2D models [1].

On the other hand, Artificial Intelligence (AI) is one of the most challenging phenomena in the modern age. To this extent, AI has its own merits and demerits, both of which are noteworthy. Hence, from AI's evolution stages to its rapid progression in the field of developmental economics, we observed massive fluctuations and modulations in technological tools, which helped humans satisfy their needs for a life of ease. Since the Industrial Revolution and recent technological advancements in industries, workers have occasionally lost their jobs, and machines have taken over their work. For this reason, AI is poised to be the future of technology, which may significantly influence employment opportunities in the market and other economic sectors, comparatively more than in previous eras. AI has numerous positive aspects that can expand our social and economic choices, ultimately leading to human prosperity. However, we are frequently concerned about the potential for AI to exert undue influence over national economies until we can study the economic system in a more positive light and forecast the future of our economy, also suggesting ways to make that future even better. The national income and product accounts typically indicate the spending habits of consumers and producers, as well as investment and government expenditure, along with the net export amount, and all other flows of money, goods, and services between different economic sectors. When we consider the possible production cases, we may realise that only a few cases would endanger our economy. This inductive research aims to examine the impact of AI on the national account or production process, where labour and capital are the key factors of production. Thus, AI will have a negative impact on labour in a few specific cases, which we will discuss in this research study. The expected outcome of this research study is that AI will lead to a labour surplus, and as a result of AI's influence, the unemployment rate is expected to increase.

2. Literature Review

As unemployment and production issues are a national phenomenon, we examine the impact of the artificial intelligence industry on tasks from a macroeconomic perspective.

Economic Circular 3D model: Quesnay's Table is often regarded as the first circular flow model in economics, illustrating the continuous flow of goods, services, and money within an economy. It highlights the interdependence of different sectors and the importance of maintaining balance among them. He divided the economy into three distinct social classes: productive classes, landowners, and non-agricultural sectors [3]. According to Eglantina Hysa, the aim of his paper is (1) to identify the main components of a circular economy, which are also supportive of sustainability and development; (2) to check the impact of these variables in the economic growth of European Union countries; (3) to find out if the three components of sustainable development adopted to circular economy (CE) indicators (environmental–social–economic) are significant to economic growth [4]. A business model must be flexible and adaptable in response to market changes, driven by shifts in technology, the economy, and the environment. In a

[1] To determine any theory or law from social sciences as a whole, 3-Dimensional plane [Coordinates systems] should be used for.

circular economy, a new method of business modelling is essential [5]. Results indicate that significant differences persist in the development level of the circular economy across various regions. In addition, this study identifies the inhibitors of circular economy development based on the DEA results and proposes suggestions for establishing an effective mechanism to promote CE development [6].

Unemployment: According to Okun's Law, for every 1% increase in the unemployment rate, a country's GDP will be roughly 2% lower than its potential GDP [7]. Following World War II, high unemployment created insecurity and resistance to organisational and technical change. The rise in youth unemployment means that many young people are losing skills or employability [8]. According to Abbas Valadkhani, the rate of unemployment responds positively to the output gap and increasing economic uncertainty, and negatively to higher growth rates of real investment and inflation, supporting the view that a degree of trade-off exists between inflation and unemployment [9]. A classical question is whether innovation creates or destroys jobs. The conventional approach views innovation as a transformative force in the economy, leading to economic growth and job creation. Another approach highlights various mechanisms that can compensate for the primary effect of innovations, making the ultimate effect of innovations on labour demand unclear [10]. The findings from the NARDL model indicate that positive asymmetric shocks from the cost of war, GDP growth, final government expenditure, foreign direct investment, and the rule of law significantly decrease the unemployment rate.

In contrast, their adverse asymmetric shocks increase the unemployment rate in both the short and long runs [11]. As Eshaq investigates the relationship and impact of GDP, FDI, LF, and EX on unemployment in Afghanistan in the long run. FDI, Labour Force (LF), and Export (EX) have a negative and insignificant relationship with unemployment (UN). On the other hand, GDP has a negative and significant relationship with unemployment in the long run [12].

Artificial Intelligence and National Income: AI, as a technology platform, can automate tasks previously performed by labour or create new tasks and activities in which humans can be productively employed. Recent technological change has been biased towards automation, with insufficient focus on creating new tasks where labour can be productively employed [13]. Artificial intelligence has a nonlinear impact on unemployment, with the acceleration of its use reducing unemployment, but only at low levels of inflation. In this case, no "switch effect" between "displacement effect" and "replacement effect" is registered. Otherwise, the contribution of artificial intelligence to unemployment is relatively neutral [14]. New technologies, such as AI, can contribute to growth and the emergence of superstar firms through product innovation [15]. According to Zhou Shao, Pareto's principle applies to the outputs of AI scholars, and these outputs have been increasing at an explosive rate over the past two decades. In addition, the authors delve into AI competition, which accelerates technology development, talent flow, and collaboration [16]. In the South Asian region, the youth unemployment rate (YUR) was estimated at 18.8% in 2020 and is projected to increase to 18.9% due to a lack of appropriate skills in 2021 [17]. Researchers analysed 22,000 tasks carried out by workers across the U.K. economy, finding that 11% are currently at risk of displacement by AI [18]. Our study offers hope for developing countries to leverage AI specialisation as a means to diversify their sources of comparative advantage. The paper documented how sector-specific AI investments not only lead to subsequent specialisation in other AI

investments but also develop capabilities in goods and services. The paper also presented an operational framework, along with country case studies, to demonstrate how inherent AI capabilities can help pre-existing industries become more competitive and/or discover new areas of specialisation [19].

3. Materials and Methods

This research paper is based on a theoretical framework (EC3D-Model) and an inductive research method. For collecting the data, triangulation is used. AI is one of the newest and most challenging issues in the world, and especially in developing countries, researchers and policymakers are concerned about the impact of AI on employment opportunities and labour cost prospects. For gathering data, secondary sources have been used to estimate and predict the impact of AI on employment opportunities, particularly concerning production (Gross Domestic Product by Industrial Origin). We examine the secondary data for GDP and unemployment (2002-2018), taken from the National Statistics and Information Authority (NSIA).

- For a crucial Investigation, a theoretical framework has been utilised to determine the impact of AI on labour and capital. This theoretical framework consists of the EC3D Model, which shows that out of the four factors of production, only two (Labour and Capital) are affected by technological changes.
- Since we have two input variables "L" & "K", and one output "Y" variable, which gives us (3^3=27) production combinations.
- Furthermore, in this paper, the two sectors (Primary and Service) have been used as proxies for total capital formation and total labour force, respectively.
- Ultimately, in the production function, labourers were replaced with AI, and we examined the impact of AI on national accounts in Afghanistan.

$$LP_1 + KP_2 = Y \;\; \rightarrow \;\; Ai + KP_2 = Y$$

4. Results and Discussion

To estimate the future aftereffect, gap, or plus, it is necessary to elaborate on the objective contextual relation between different flows within the economic circular model.

1. AI's Sway over Different Parts of the Economic Circular 3D-Model: All economic activities of humankind proceed in a contextual environment; therefore, the relationship between human activities and economic indicators should also be interpreted in a 3D manner. Thus, the study plotted an Economic Circular Model, which is explanatory from three dimensions. The government and the firm are the two necessary Real sectors for the main object (the family), and conceptual sectors are the tools for running these real sectors.

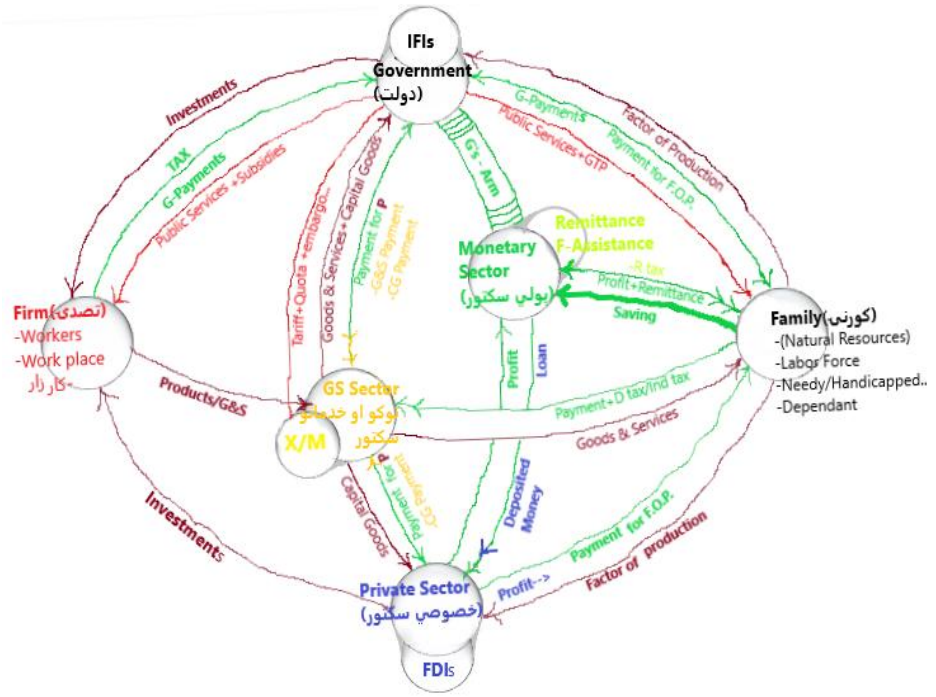


Fig. 1. Combination of Economic Circular 3D-model(2)(3)

1 Main Object:	2 Real Sectors	1 Sub-Real Sector	3 Conceptual Sectors	3 Sub-Conceptual Sectors
*Family	*Government *Firm	*[X - M]	*Private Sector *Monetory Sector *GS Sector	*Remittance *FDIs *IFIs

Source: Plotted by the author

In Table I, 3D-Model, we observed that AI may only influence 2 real sectors (Government, and Firms) & 1 sub-real sector ($X-M$), and will directly affect the Main Object (Family). The remaining 6 (3conseptual, and 3sub-conseptual) sectors do not exist physically; it is needless to say anything about Ai affection upon these 6 unreal sectors. It is visible that family, Government, Firm, and $X-M$ are getting affected by Ai, which is the four elements of National Income $C+I+G+XN$ as well. If we decompose NI, we will realise that two factors (Labour and capital) have a vital role in the production process.

$$Y=f(K,L) \quad \rightarrow \quad \bar{K}\,,\ \bar{L} \ \ \&\ \ \bar{Y}, \qquad\qquad LP_1+KP_2=\mathrm{Y}$$

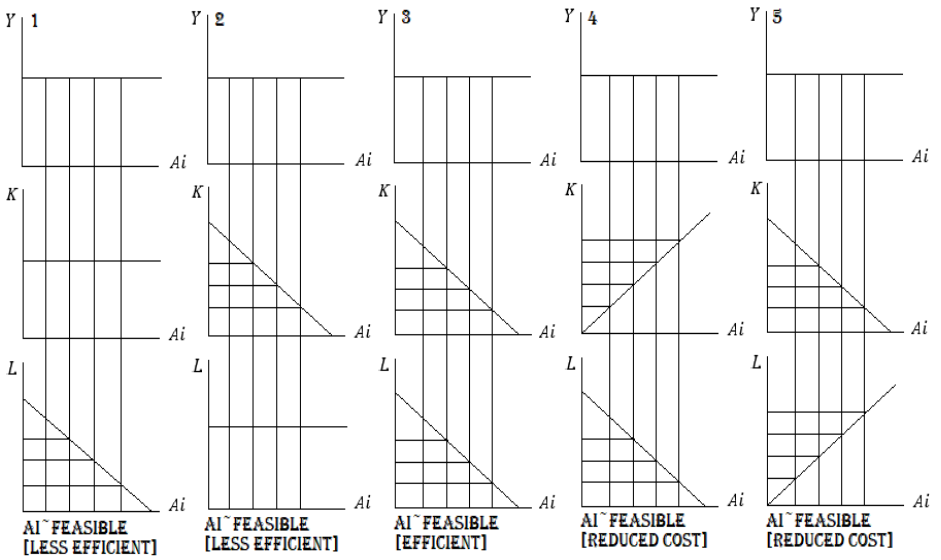
TABLE I
Affection of Iso-quant

Iso-quant - Combinations	L	K	Production
A	8	16	4M
B	6	20	4M
C	4	24	4M

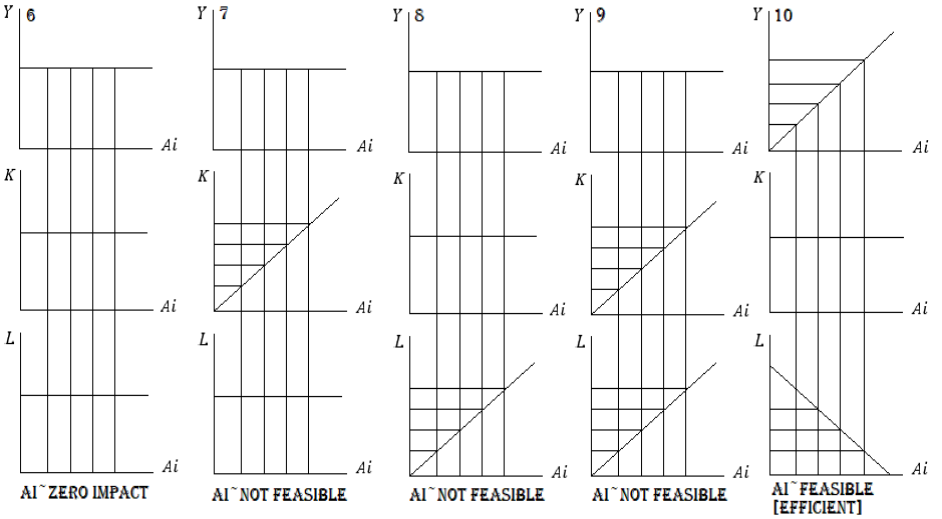
Source: Created by the author

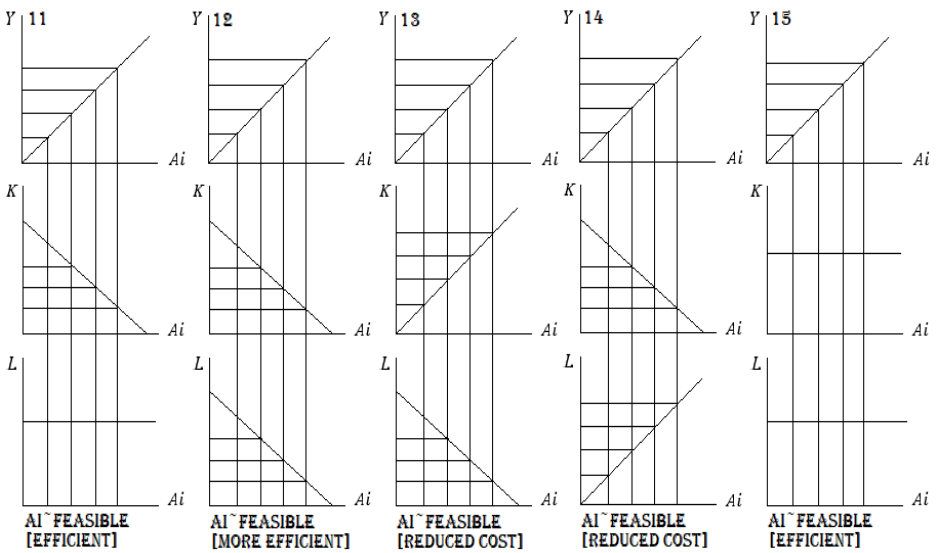
2 The circles in 3D-model are in contexture forms, not symmetric circle or straight forward.
3 Real sectors are must for the main object, and conceptual sectors are the tools for running the real sectors.

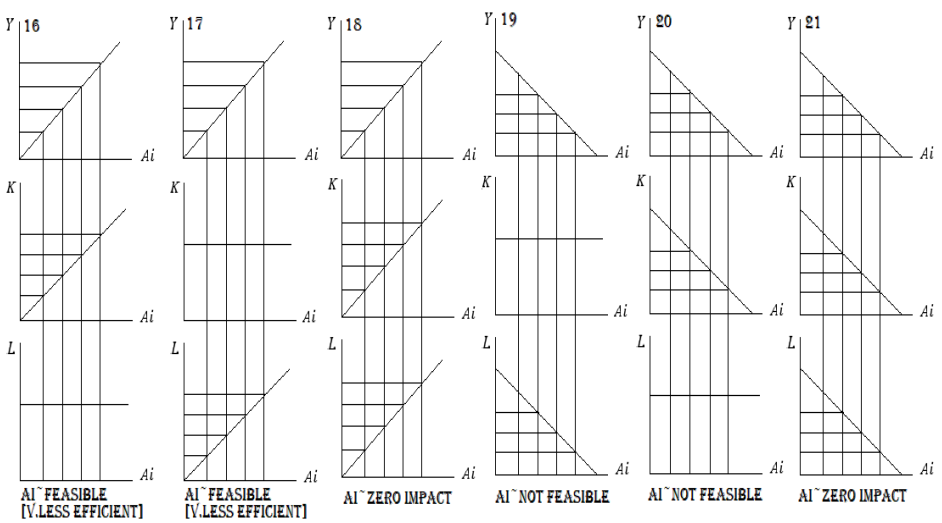
National income is the function of labour and capital. If we examine NI from the Iso-quant curve(4)(5) point of view, we will understand that L and K will have a proportionally inverse relation with each other. Suppose, in Table II, we want to produce $4m$ with $16k$ and $8l$, we can produce the same $4m$ with $20k$ and $6l$, and we can produce $4m$ with another combination of $24k$ and $4l$. It means, in every combination with decreasing $2l$, we have increased $4k$, until we could produce $4m$. Since Ai would impact $Y = f(K, L)$ profoundly unlike the Iso-quant line. Historically, technological advancements have often led to a portion of workers losing their jobs, while the overall amount of production remains relatively unchanged. Additionally, that surplus labour will be accounted for as an economic gap in the production process. The Production/Aggregate Supply is the Function of Capital and labour $Y = f(K, L)$. However, at the moment, the used technology version also determines the quality and quantity of the products. Consequently, we would rather have Ai instead of technology, as a superior approach in the production process. Considering $Y = f(K, L)$, & $Y_{K,L} = f(Ai)$, we have 27 possible procedures of the production process. To be specific, these 27 possible procedures illustrate the concept of return to scale (IRS, DRS, and CRS) from an opposite perspective.



[4] Iso-quant line, gives us the same level of output with different combination of L and K with respect to quantity.
[5] Iso-cost line, also gives us the same level of output with different combination of L and K with respect to cost.


Y 6
K
L
Ai
AI ~ ZERO IMPACT
Y 7
AI ~ NOT FEASIBLE
Y 8
AI ~ NOT FEASIBLE
Y 9
AI ~ NOT FEASIBLE
Y 10
AI ~ FEASIBLE
[EFFICIENT]


Y 11
K
L
Ai
AI ~ FEASIBLE
[EFFICIENT]
Y 12
AI ~ FEASIBLE
[MORE EFFICIENT]
Y 13
AI ~ FEASIBLE
[REDUCED COST]
Y 14
AI ~ FEASIBLE
[REDUCED COST]
Y 15
AI ~ FEASIBLE
[EFFICIENT]


Y 16
K
L
Ai
AI ~ FEASIBLE
[V.LESS EFFICIENT]
Y 17
AI ~ FEASIBLE
[V.LESS EFFICIENT]
Y 18
AI ~ ZERO IMPACT
Y 19
AI ~ NOT FEASIBLE
Y 20
AI ~ NOT FEASIBLE
Y 21
AI ~ ZERO IMPACT

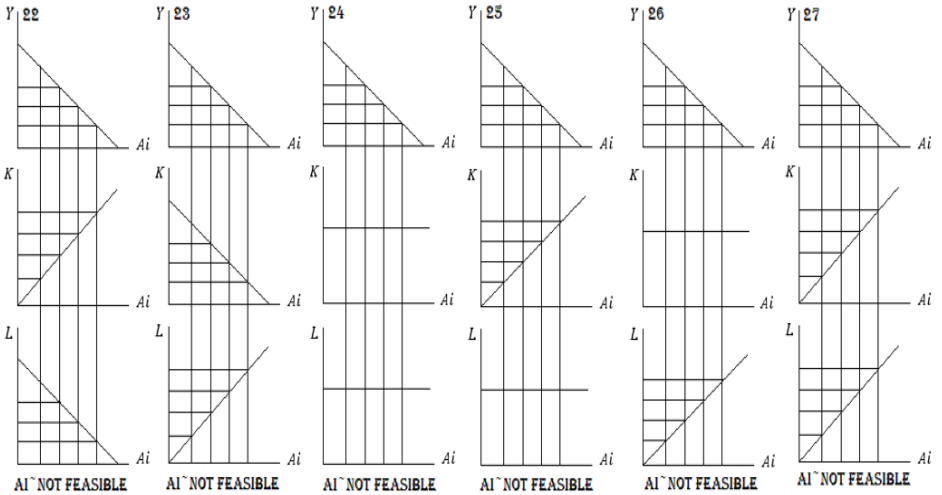


Fig. 2. Possible Curves of Production

Source: Plotted by author

TABLE II
Manner of Production

27 - Possible Production Procedures	**Feasibility at the existence of AI**	
11	Not feasible	
3	Zero impact	
4	Reduced cost / indicates the Iso-cost line concept as well	
2	Very less efficient	
2	Less efficient	Y1(Capital), Y2(Labor)
4	Efficient	Y3(L, K), Y10(K), Y11(L), Y15(0)
1	More efficient	Y12(K,L)

Intensive

Source: Plotted by the author

In the above tables, it is observable that out of 27 possible production procedures, only 2 (Y1, Y10) approaches may have troubled us. The remaining 20 procedures may not have any particular partiality with AI, and obviously, it has no role in the production process of these 22 cases. We study 7 cases (1 more efficient, 4 efficient, and 2 less efficient), through which Y3 and Y12 will still have opportunities, as both are capital- and labour-intensive. Also, **Y15** is not dangerous to the economy, and **Y2 and** Y11 are labour-intensive. However, only two cases (Y1 and Y10), due to the AI effect, will lead to a sharp decline in the employment rate, creating AI's Economic Gap or Surplus Labour, which is the main concern of this paper. To consider the same effect from the aspect of return to scale, it means we are assessing the area of increasing returns to scale, where Ai plays a crucial role.

$$let \quad LP_1 \cong Ai[6] \;\rightarrow\; LP_1 + KP_2 = Y \;\rightarrow\; Ai + KP_2 = Y \;\rightarrow\; Ai = Y - KP_2$$

*$Ai \;\; replaces \; LP_1$. It is worth noting that Ai might possibly unemploy all laborers or either a portion of the laborers working in a firm:

$$Ai \;\tilde{R}\; LP_1 \;\rightarrow\; Ai = Y - KP_2$$

$$2Ai \;\tilde{R}\; LP_1 \;\rightarrow\; Ai = \frac{2Y - 2KP_2 + 2lP_1 + lP_1}{2}$$

$$nAi \;\tilde{R}\; LP_1 \rightarrow Ai = \frac{nY - nKP_2 + nlP_1 + lP_1}{n}$$

$$Ai's \; Sway \; over \; National \; Income \; in \; Percentage = Ai = \frac{nY - nKP_2 + nlP_1 + lP_1}{n}$$

$\boldsymbol{Y} \rightarrow National\ income[GDP]$,

$\boldsymbol{KP_2} \rightarrow Capital\ goods\_Primary\ Sector$

$\boldsymbol{LP_1} \rightarrow Wages\ and\ Salary\_Service\ Sector$

$\boldsymbol{n} \rightarrow Unemployed\ labour\ payoff$,

In Table II, the national income has not been calculated at constant prices; it is reported at current prices (Unit: Million Afghanis). We calculate the AI from $\frac{nY - nKP_2 + nlP_1 + lP_1}{n}$, where (n) indicates the unemployment rate out of the labour force in Afghanistan [7][8] in each and every single year:

TABLE III
AI Impact

Year	GDP=Y	SS = LP1	PS = KP2	LP1+KP2	Labor force	UR%	UR = n	P.a. /total	Ai Sway	AI %
1381	202530.5916	69161.95737	87689	156850.96	4920000	7.94	390648	5491.46	184016.1435	17.32
1382	240670.9153	86224.84801	99095	185319.85	5310000	7.93	421083	6837.63	227813.3736	22.93
1383	267310.0722	105495.7228	89593	195088.72	5540000	7.93	439322	8365.81	283225.4054	45.18
1384	327745.3874	123480.0818	113074	236554.08	5790000	7.93	459147	9791.97	338164.0795	42.95
1385	375151.9533	142890.5373	123735	266625.54	6070000	7.93	481351	11331.2	394320.1009	47.89
1386	518613.7895	200584.8141	176557	377141.81	6120000	7.92	484704	15886.3	542654.2299	43.89
1387	541112.5668	238021.0956	152614	390635.1	6210000	7.92	491832	18851.3	626532.2886	60.39
1388	632793.5437	280224.3819	199766	479990.38	6500000	7.92	514800	22193.8	713264.5519	48.6
1389	746859.0034	358650.4284	211774	570424.43	6740000	7.91	533134	28369.2	893748.074	56.68
1390	896162.1714	428571.4142	252138	680709.41	7100000	7.91	561610	33900	1072608.228	57.57
1391	1086159.55	546121.9649	285884	832005.96	7520000	7.92	595584	43252.9	1346410.141	61.83
1392	1196687.815	619181.8055	304595	923776.81	7880000	7.92	624096	49039.2	1511287.247	63.6
1393	1221086.138	632234.5595	302794	935028.56	8290000	9.01	746929	56964.3	1550537.796	65.83

[6] AI actually is the sum of (labor equivalent effect + AI's surplus effect)
[7] The data set have been taken from National Statistics and Information Authority (NSIA).
[8] The data set have been taken from National Statistics and Information Authority (NSIA).

1394	1260008.506	661155.3408	282712	943867.34	8630000	10.01	863863	66181.6	1638461.836	73.59
1395	1373027.315	708727.9101	326764	1035491.9	8910000	11.18	996138	79235.8	1755000.17	69.48
1396	1434553	731,593	345661	1077254	9250000	11.21	1036925	82011.6	1820493.921	68.99
1397	1478707.065	761596.2629	318080	1079676.3	9240000	11.22	1036728	85451.1	1922232.241	78.04
1398	1321600	783451	340900	1124351	9220000	11.71	1079662	91742.1	1764159.54	56.9

Source: Created by the author

2. AI's Economic Gap/Surplus Labour?

a) In the possible production procedure, two conditions, Y1 and Y10, pose serious challenges, and this is what we refer to as an economic gap or surplus labour. We can deal with the above challenges in the following ways:
b) Economic gap or surplus labour is a bold plus for the economy. If the government takes clever steps regarding these gaps, it will still result in increasing the level of output.
c) If the researcher or the responsible parties do not concern themselves with the danger of the AI gap, this may lead to structural unemployment.
d) It is worth noting that, on the other hand, AI will also help labour increase their capacity, knowledge, skills, abilities, and capabilities.

Conclusion

This paper indicates the impact of Artificial intelligence on the production processes and employment opportunities. Artificial intelligence is one of the most challenging phenomena to labour in many modern societies, but its sway over production and employment opportunities is crucial. This research paper is based on a theoretical framework, the Economic Circular 3D-Model (EC3D-Model), and an inductive research method. For the collection of data, the triangulation method is used, and the data have been analysed with the help of a theoretical framework. Data analysis in this study is selected and examined based on the literature review. In this research work, output has typically increased with a slow increment in capital, which was crucial due to the rise in labour costs.

As a consequence, we found that in real sectors of the economy with respect to the production process, we have twenty-seven [27] possible production procedures. However, in the case of AI impact, fortunately, only two Y1 and Y10 can have an adverse effect on employment opportunities. We learned that there should be a proportional and well-conditioned relationship between labour and capital; otherwise, one side's weight will not positively impact the level of output. In addition, Y1 and Y10 are two conditions that lead to labour surplus. With Y1's capital and output level remaining constant and labour decreasing, and also with Y10's level of output increasing, the capital remains constant, and labour decreases.

Furthermore, we found that the technological influence on the level of output in Afghanistan over the last two decades has increased from 17.32% to 56.9%. This impact is, in fact, labour's vigour, which is reflected in the form of technological influence, specifically AI, in the economy. In the possible production conditions only efficient cases are considerable, and out of efficient cases are only two significant, which are capital intensive, and also one case of capital and labor intensive we have, and is much more efficient, where labour and capital saturating each other, otherwise Y1 and Y10 are those

combination of production which increase unemployment level, as you have seen the graph for Y1, and Y10.

Recommendations:

1. The Economic Circular 3D model represents a real-life relationship among economic sectors and other critical variables. By using and understanding this Circular 3D-model, we can assess macroeconomic theorems perfectly.
2. Focus on the very few conditions in the production process that are only efficient, significant, and capital-intensive.
3. Any unemployment resulting from the impact of AI will be structural; therefore, it is necessary to educate labourers in advance and explain how people can adapt to future work, as well as how artificial intelligence can be utilised.
4. On the other hand, AI will also help labour, especially in capacity building, which will, in turn, increase the level of knowledge, skills, ability, and capability of workers; it means that with the improvement of AI, human capacity will also improve.
5. In the preliminary stages, AI is expected to lead to a labour surplus in the fields of liberal education and the liberal arts. Thus, in the future, such workers will easily lose their jobs; therefore, they should seek to develop supportive skills and abilities from now on.
6. Everyone must acquire knowledge, skills, abilities, and capabilities in a technology-oriented direction or in accordance with the AI vectorial dimension.

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