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### RESEARCH ARTICLE

#### DIGITAL TRANSFORMATION IN MOROCCO AND HUMAN CAPITAL: WHAT EMPIRICAL RELATIONSHIP?

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#### Abstract

In recent years, there have been profound changes in the knowledge economy in the world, which mark in an irreversible way the passage to a new era of the immaterial, the investment in knowledge which has exceeded that made in the equipment. The resources invested in the production and dissemination of knowledge, in particular research and development, education, training, human capital as well as in information and communication technologies (ICT) are constantly increasing. The purpose of this article is to study the importance of human capital in the digital age and find the relationship between digital transformation in Morocco and its human capital?

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#### Introduction:-

Digital implies a change in the world at social, political, cultural and economic levels, etc. Indeed, the dematerialization of economies is a reality built with exponential advances. The growth of digital GDP in developed countries is an illustration of its importance. Morocco is part of this dynamic to benefit from it in terms of modern and inclusive development. It has an impact on professions, achievements, routines, skills and upheaval in scientific approaches and types of thinking, for example. The Digital Morocco 2020 strategy was developed to accelerate the country's digital transformation and position it as a regional digital hub. This strategy is reinforced by the creation of the digital development agency responsible for optimizing and modernizing the government's digital platforms and practices. In fact, the appropriation of ICTs as well as their production and export have been included in the processes of economic and social development. Morocco has won a position of regional leader thanks to the following assets:

- a legal and regulatory framework promoting the development of telecom networks and services under conditions of fair competition;
- a modern telecoms infrastructure;
- notable growth in the mobile telephony sector;
- a dynamic of outsourcing to the country – ICT skills centers, regional dynamics and the emergence of new ICT professions: offshoring;
- liberalization of the audiovisual sector with the establishment of an autonomous regulatory body.

For its part, and in order to meet the needs of Morocco (engineers, designers, developers and managers, etc.), a training program for 10,000 engineers/year has been initiated to support the vast multi-sectorial development project. This program aims to increase by more than 50% the number of graduates from the Higher Education institute and universities.

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In addition, in order to consolidate the offshoring offer, Morocco is preparing to launch the "Impact Plan". This strategy, which is broken down into five lines of action, is aimed in particular at promoting the software industry, strengthening the competitiveness of local ICT incubators, strengthening computer security and accelerating the pace of deployment of the use of ICT.

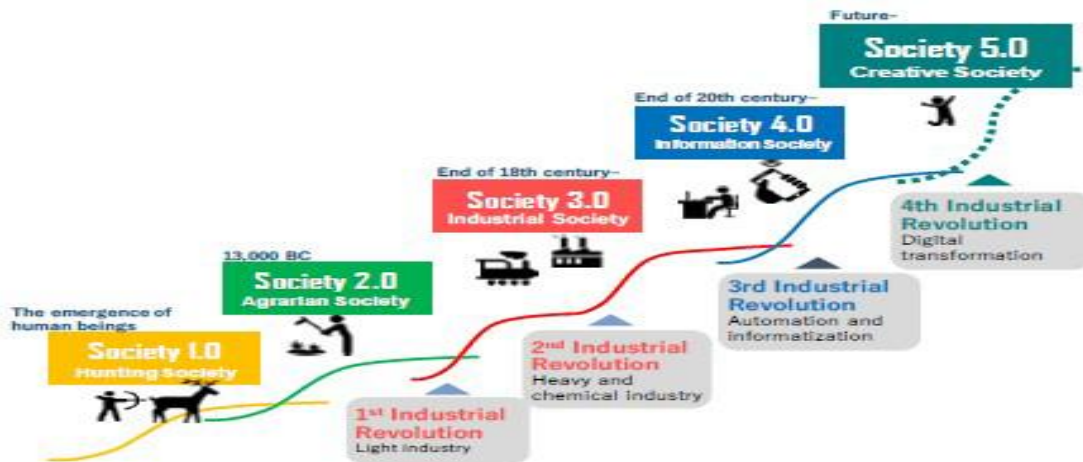
Also, in order to succeed in the collective appropriation of ICTs and play the role of a regional platform, the public authorities have drawn up a national ICT strategy "e-Morocco", which sets itself the objective of developing an economy knowledge enabling digital inclusion and the strengthening of Morocco's position on the international scale in this area.

#### Digital Transformation and evolution of societies:

Digital transformation, also called digitization, is still a protean concept; some practitioners characterize it as "the changes brought about by digital technologies in all aspects of human life".

The notion of digital or digital transformation raises questions about the nature of the changes made possible by the latest developments in the field of ICT. The different waves of technological development have all, to varying degrees, had a profound impact on socio-economic and organizational development.

#### Evolution of human society



**Source:** Report Society and SDGs (2020), The Evolution of ESG Investment, Realization of Society 5.0, and Achievement of SDGs - Promotion of Investment in Problem - Solving Innovation. P: 11.

#### The readiness Index Values index and digital diffusion in Morocco

The World Economic Forum (WEF) has published its report on New Information and Communication Technologies at the global level, which shows the determining role of ICT in promoting innovation and the development of economies, assesses countries' progress in terms of access to and use of these technologies and, consequently, their impact on the growth process and on the competitiveness of economies. It is, on the other hand, an opportunity for each country to draw inspiration from the various successful experiences and strategies at the international level. It assesses the competitiveness of countries in terms of ICT on the basis of several criteria: the institutional and regulatory framework, infrastructure, human resources, the level of education, research and development, the level of telephone subscription and to the Internet, e-administration, e-commerce, etc.

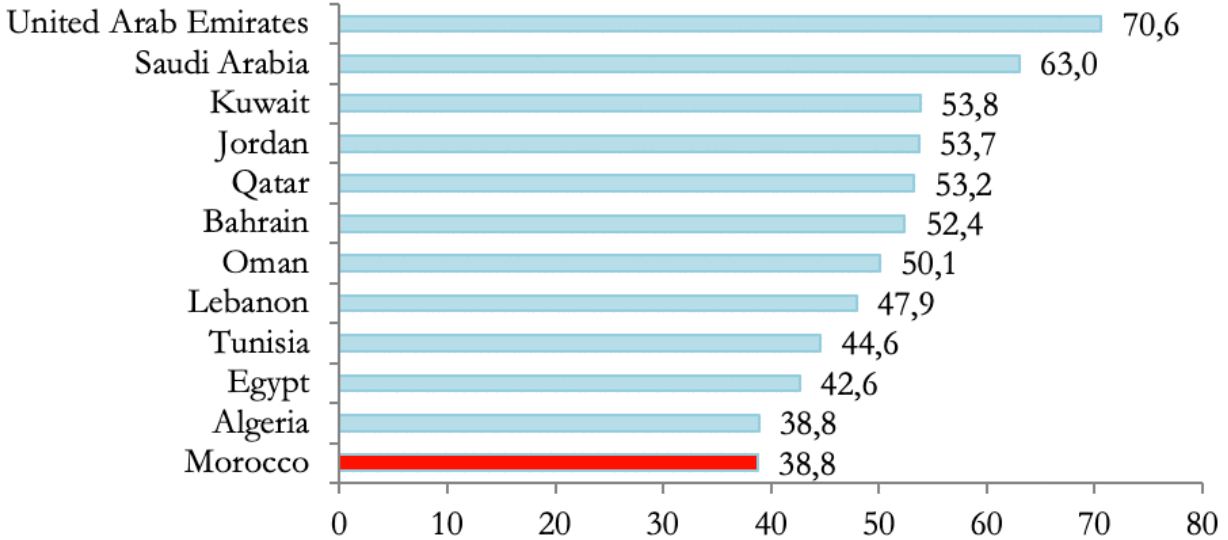
It also indicates that the current global recession has affected almost all regions and all areas of industry and indicates that investment in broadband can ensure better availability of information, transform social interactions, to contribute to the reduction of poverty and the improvement of the daily life of citizens, to facilitate access to health care and education, to connect small businesses to new customers and in certain countries create a middle class. It places Denmark as the most competitive economy in the world in the field of NTIC, followed by Sweden, the United States and Singapore. On a regional level, European countries, thanks above all to the Nordic countries (Finland, Iceland, Norway) have ranked well in terms of NICT and the network economy. For its part, Morocco ranks 79th among the 134 countries selected.

**Methodology:-**

My methodology is to carry out a comparative study of digital transformation in Morocco applied to a sample of Arab countries (Algeria, Tunisia, Lebanon, Egypt, Jordan, Qatar) and Asian countries (Singapor and Malaysia) and their impact on growth digital and the economy and human capital.

**III-1 Positioning of Morocco compared to a sample of Arab countries in the technology pillar in 2020**

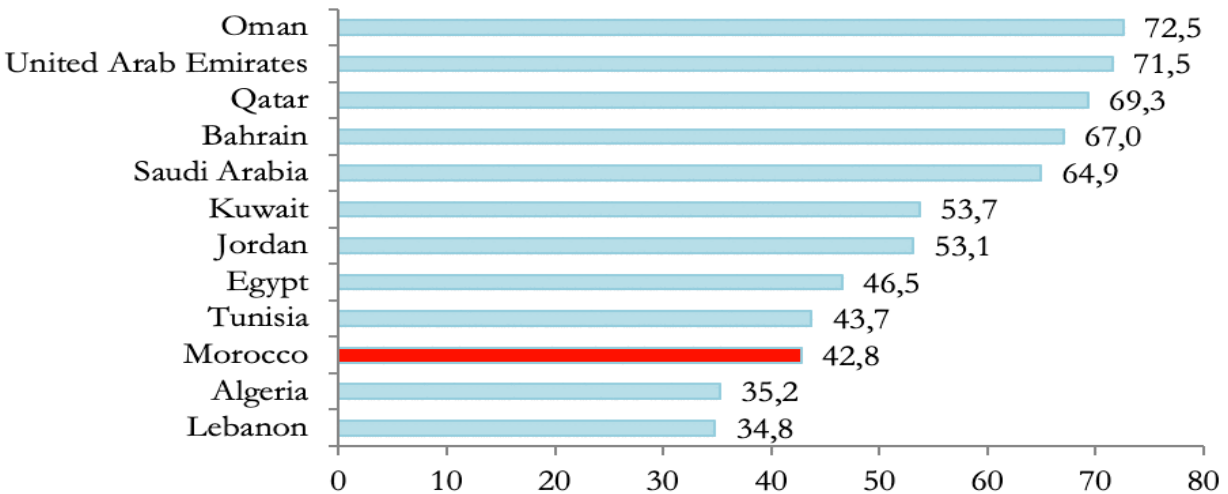
According to the latest Network Readiness Index (NRI) report, at the level of the "Government" sub-pillar, Morocco has a good score for the indicator relating to online public services (50.91) and a good ranking in terms of government and higher education R&D spending (39th).



Source: Elaboration of the DEPF based on data from the networkreadiness index 2020

Au niveau du sous pilier inclusion, le Maroc possède le plus faible score de l'échantillon. Il est pénalisé dans les indicateurs relatifs à l'écart entre les sexes en matière d'utilisation d'internet, l'écart socioéconomique dans l'utilisation des paiements numériques et le gap au niveau rural dans l'utilisation des paiements numériques.

**Positioning of Morocco in relation with Arab countries in the governance pillar in 2020**



Source: Elaboration of the DEPF based on data from the networkreadiness index 2020

**Comparative table of ICT development according to the Global NRI index and HDI index of Morocco with Arab and Asian countries in 2022**

Country	Score NRI	Rang mondial (131)	Human Development indice HDI on 2021
Singapor / Asiatic country	79.35	2 <sup>ème</sup>	<b>0,939</b> (12 <sup>ème</sup> )
Malaisie / Asiatic country	60.58	36 <sup>ème</sup>	0,803 62 <sup>ème</sup>
Qatar / Arabic country	57.87	42 <sup>ème</sup>	0,855 42 <sup>ème</sup>
Jordan/ Arabic country	48.31	70 <sup>ème</sup>	0,720 102 <sup>ème</sup>
Egypte / Arabic country	47.76	73 <sup>ème</sup>	0,731 97 <sup>ème</sup>
Maroc	46.5	79 <sup>ème</sup>	0,683 123 <sup>ème</sup>
Tunisie / Arabic country	45.46	84 <sup>ème</sup>	0,731 97 <sup>ème</sup>
Liban / Arabic country	42.30	91 <sup>ème</sup>	<b>0,706</b> 112 <sup>ème</sup>

**Source:** ranking according to NRI of the World Economic Forum 2022 and HDI according to UNDP Report 2022

Morocco according to the NRI score of 2022 is ranked (79th) is largely advanced by the Asian countries Singapore (2nd) and Malaysia (36th) and also exceeded by the Arab countries in particular Egypt (73rd) and Jordan (70th). The 2022 Readiness Index Values Indicator is defined by the WEF: as a global index of the application and impact of ICT on the development of the economy throughout the world.

**Analyse SWOT indicators Telecom NRI of MOROCCO**

**Table 1: Morocco rankings by sub-pillar**

Sub-pillar	Rank	Sub-pillar	Rank
Regulation	37	Businesses	81
Economy	49	Trust	81
Access	68	Governments	86
Future Technologies	69	Quality of Life	86
SDG Contribution	72	Individuals	90
Content	80	Inclusion	111

**Table 3: Strongest and weakest indicators of Morocco**

Strongest indicators	Rank	Weakest indicators	Rank
3.2.4 E-commerce legislation	1	4.3.2 SDG 4: Quality Education	74
4.1.6 ICT services exports	22	2.1.5 Adult literacy rate	89
4.1.1 High-tech and medium-high-tech manufacturing	24	2.2.3 Knowledge intensive employment	119
1.1.5 International Internet bandwidth	31	3.1.3 Online access to financial account	121
2.1.1 Mobile broadband internet traffic within the country	33	3.3.5 Rural gap in use of digital payments	123
3.2.2 ICT regulatory environment	39		
2.3.4 R&D expenditure by governments and higher education	40		
1.1.3 FTTH/building Internet subscriptions	44		
3.2.5 Privacy protection by law content	46		
4.3.4 SDG 7: Affordable and Clean Energy	47		
4.3.5 SDG 11: Sustainable Cities and Communities	53		

**Table 1,3:-** source study of PORTULANS Institute on MOROCCO 2022.

### III-6-Human Development in Morocco and economic Growth

#### III-6-1- Human Development Index HDI

The HDI: this index is published by the United Nations, it measures the social and cultural development of a country, and the objective is to reflect the life expectancy at birth, the level of education and the real GDP by inhabitant. This indicator is based on the idea that development consists of living a long life, achieving a good level of education and having a decent standard of living. The UNDP classification of countries according to the HDI is as follows:

0.800 ≤ HDI < 1: high human development (Switzerland 0.962 in 2021 ranked 1st) 0.500 ≤ HDI < 0.800: average human development (Morocco 0.683 ranked 123rd) HDI < 0.500: low human development (Yemen 0.455 ranked 183rd).

The calculation of the HDI focuses on aspirations such as access to knowledge in its various dimensions, the availability of sufficient material resources to lead a decent life and live a long and healthy life. It relies above all on education to reflect the conditions for human beings to lead a dignified life, this factor has made it possible to promote human development in Scandinavian countries such as Switzerland which was ranked 1st in 2021 with a rate of 0.962.

Finally, the HDI is a national average that masks many inequalities between genders, regions and income classes. It remains an indicator that does not reflect the reality of the procedure adapted by a nation to conduct its human development policy. In addition, it is based on per capita GDP, which is only an average, which can therefore distort the result. It brings together the different aspects of human deprivation. Indeed, it covers 4 major aspects of human life: the ability to live a long and healthy life, knowledge, economic means and participation in social life.

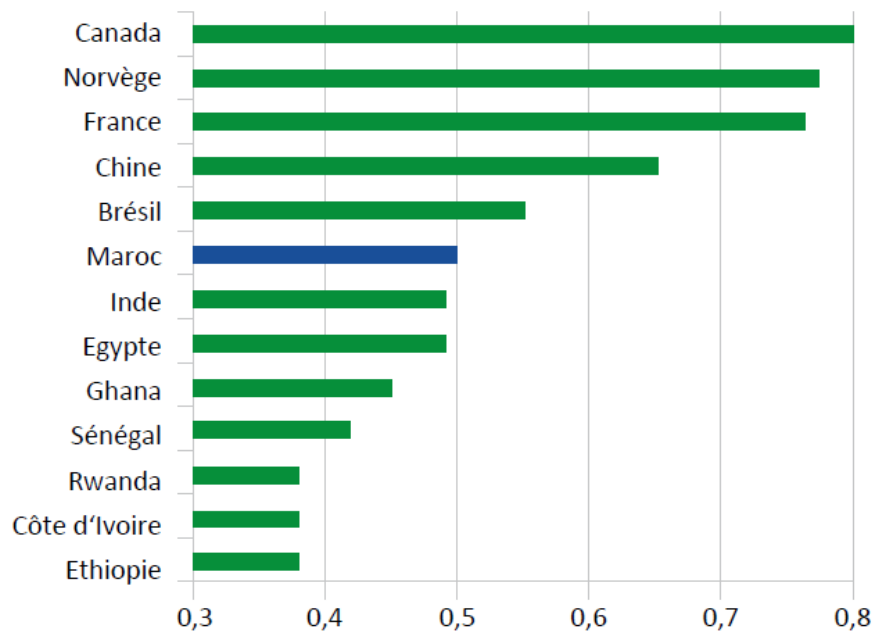
#### **Human development in Morocco and prospects for economic growth**

##### **Intangible capital, human development and economic growth in Morocco**

The most telling case in Morocco is the development of aeronautics which cannot be done without training. This field is in full development and benefits from a phenomenon of outsourcing on a global scale. Thus the emphasis

was placed on training in order to develop a qualified and competitive workforce, in this sense the OFPPT was involved in the preparation of these training courses. In addition, the implementation of the national initiative for human development (INDH), also marks an important change in the field of the promotion of the socio-economic sector and the development of skills. In this regard, the concept of human development also aims to reconcile social justice and equity with a clear imperative of efficiency and economic growth. This is why any discrimination linked to gender, or to socio-economic, ethnic and cultural criteria is fundamentally counterproductive with regard to human development. This threatens social cohesion and economic efficiency. Particular attention should therefore be paid to the appropriate long-term economic and social policy by undertaking a strategic approach that takes human development into account and ensures better financing of the latter. It is a question of stimulating economic growth, employment and promoting development in order to meet the challenges linked to globalization which requires a qualified workforce. When vulnerability is considered from a human development perspective, attention is drawn to the risk of degradation of individual and national circumstances and achievements. It is about designing policies and proposing preparedness measures against threats to subsequently make human development progress more robust (UNDP, 2014).

Morocco Human Capital Index, compared to selected countries, 2020



Source: Banque Mondiale, 2020

### Presentation of the adopted model

As part of my comparative study, I adopted an econometric method based on an ARDL (Auto Regressive Distributed Lag) model. This model was originally introduced and developed by Pesaran et al. (2000), it was designed with the aim of avoiding several shortcomings that the models established up to that time failed to satisfy. Then, the ARDL model has the advantage of not requiring that all the variables be integrated of the same order, as is the case of the approach cointegration developed by Johansen and Juselius (1990). The objective of this model is to check if the long-term relationships are present when we have a group of variables, some of which may be stationary, while the others are not. Also, this model comes to satisfy the need in econometrics to treat the short series.

The basic form of an ARDL regression model is as follows (Pesaran et al., 2001):

La forme de base d'un modèle de régression ARDL est la suivante (Pesaran et al., 2001) :

$$d(Y_t) = c + \lambda Y_{t-1} + \beta X_{t-1} + \sum_{i=1}^m a_{1,i} * d(Y_{t-i}) \dots + \sum_{i=0}^k a_{2,i} * d(X_{t-i}) + \varepsilon_t$$

- $c + \lambda Y_{t-1} + \beta X_{t-1}$  : Représente l'estimation de l'équation à long terme ou  $\lambda$  est le coefficient correction de l'erreur à long terme.
- $\sum_{i=1}^m a_{1,i} * d(Y_{t-i}) \dots + \sum_{i=0}^k a_{2,i} * d(X_{t-i})$  : contient des informations sur la relation entre la variable endogène et les variables exogènes à court terme.
- $\varepsilon_t$  : C'est le terme d'erreur ou de « perturbation » aléatoire, que nous supposons être « bien comporté » dans le sens habituel. En particulier, il est indépendant du temps.

The purpose of this article is to examine what relationship exists between digital transformation in Morocco and its human capital?

A recent study using modeling through an Autoregressive Lag Time Model (ARDL), attempted by BEN SAMOUD and ASSI (2021) on the contribution of human capital to economic growth in Morocco, the resulting empirical results highlight the determining role and the positive effect of the different aspects of human capital on economic growth in Morocco in the long and short term.

And according to the research studies of (Mounir TAJOUÏ et al, 2022) published in the journal of Multidisciplinary Studies in Economic and Social Sciences REMSES, there is an empirical and theoretical relationship that the knowledge economy is today becoming a vector of development economical, and generator of added value at a lower cost. And it has a positive effect on economic growth in the short and long term.

Therefore, to achieve sustainable economic development and according to our modelling, Morocco (or any other developing country) must invest more in projects that generate and disseminate knowledge, and encourage innovative activities. This knowledge must be gradually integrated into production processes in order to increase productive capacities, ensure higher annual growth rates and reduce the major economic gaps to align with the developed economies which were the first adopt knowledge-based economic policies and take full advantage of its benefits.

### Analysis And Discussion Of Results:-

By examining the results obtained by the various researchers who used the ARDL (Auto Regressive Distributed Lag) model, we note that:

- according to the research studies of (Mounir TAJOUÏ et al, 2022) published in the journal of Multidisciplinary Studies in Economic and Social Sciences REMSES, there is an empirical and theoretical relationship that the knowledge economy is now becoming a vector of development economical, and generator of added value at a lower cost. And It has a positive effect on economic growth in the short and long term. Which means that there is an empirical and theoretical relationship between digital transformation in Morocco and economic growth with a positive effect in the short and long term.

- And according to a study attempted by BEN SAMOUD and ASSI (2021) using modeling through an Autoregressive Scaled Delay (ARDL) model, on the contribution of human capital to economic growth in Morocco, the resulting empirical results highlight the determining role and the positive effect of the different aspects of human capital on economic growth in Morocco in the long and short term.

- And therefore there is a systematic empirical relationship according to the Autoregressive Lag Time Model (ARDL), between Digital Transformation in Morocco and human capital with a positive effect in the short and long term.

Education has potential impacts on economic growth, it is the main factor of production. The authors who are interested in the subject of economic growth give particular importance to the accumulation of human capital and deal with the various aspects of the role of human capital in growth (Lucas 1988, Romer 1990).

In this regard, the new industrial countries, such as South Korea, which have favored education have been able to register remarkable progress in terms of human development and the building of human capital. These countries have put in place training plans that adapt to labor market requirements and enable economic growth.

In the same vein, it seems that growth is more determined by immaterial endogenous factors such as the production of ideas, knowledge and knowledge (Boyer, 2002). This places particular emphasis on education, health, culture and the wealth of nations in general.

This is how education and growth seem to be intrinsically linked. The analytical approaches developed all conclude that education has a positive impact on the level and rate of growth. The level of education of the active population represents its qualification for work. These are initiatives that are supposed to generate human and economic wealth. In return, economic growth is expected to generate and spread social and human progress. Morocco, in this regard, has long been aware of the importance of the knowledge economy to ensure sustainable economic development. This awareness was clear in the public policies adopted since its independence. But all these efforts did not lead to any satisfactory results. The problems related to this inefficiency have accumulated over the time that Morocco finds itself in difficulty to get out of it, the latest attempts by the public authorities reside, for example, in the strategic vision of education 2015-2030, which intervenes to fill the gaps observed. We can say that our analysis of the existing theoretical and empirical relationship (ARDL model) and the positive effect of the knowledge economy on economic growth and on human capital.

This human wealth means that special attention is given to the most sensitive periods: investments in early childhood education and efforts in terms of employment opportunities for young people are all measures that make it possible to improve life skills and capacities and therefore human development (UNDP, 2014).

### **Conclusion:-**

We can conclude that there is an empirical and theoretical relationship according to the ARDL model (Autoregressive Distributed Lag) between Digital Transformation in Morocco and human capital with a positive effect on the active life of citizens. Intangible capital is therefore wealth that constitutes a new parameter that has its positive impact on economic life.

As a result, Morocco has every interest in favoring the formation of human capital in order to seize the opportunities offered by the knowledge economy to initiate human development. The choice of knowledge, as a long-term vision, is motivated by several considerations, in particular the acceleration of technological progress and the development of the knowledge society. Nations that have taken this path have been able to successfully emerge in a matter of decades. The case of South Korea is significant in this respect.

These Results converge well with the conclusions and objectives of the New Development Model whose purpose, The acceleration of technological transformations, under the effect in particular of the digital transition which should lead to disruptions in production methods, Robotization, automation, networked production or artificial intelligence technologies and should greatly reduce the importance of human intervention and labor in many sectors. These trends require countries like Morocco to place the formation of human capital and R&D and innovation among its development priorities, and to accelerate its upgrading in terms of technological infrastructure, to strengthen its competitiveness. And continue its development. The country's overall competitiveness will depend essentially on the quality of its human capital. And be worthy and at the height of this country like what the Atlas Lions team did at the 2022 Football World Cup in Qatar which hoisted the Flag of Morocco High.

However, The New Development Model (NMD) aims to strengthen the national human capital, through a vast program of reforms that should ensure quality education for all, improve the performance of the higher education



system and guarantee access to services. Quality health care and health coverage for all. The NMD has set itself 3 targets for this purpose, by 2035:

- The increase of the Human Capital Index to 0.75 in 2035;
- The increase in the density of nursing staff per 1,000 inhabitants to 4.5;
- The increase in the number of pupils mastering the basics of reading, mathematics and science at the age of 15 to 75%.

To achieve these targets, the strategic choices set by the NMD at the level of national education relate to the development of investments in the training and motivation of teachers, the reorganization of the school career and the evaluation system, the renovation of the contents and pedagogical methods for effective and fulfilling teaching the accountability of institutions to make them the engine of change and the mobilization of actors.

To improve the performance of higher education, the NMD recommends anchoring a strong and autonomous governance of the university, open to the territorial ecosystem, setting up training courses of excellence and developing Public Private Partnerships (PPP ), to promote professional training, to develop a scientific research system based on independent evaluation and financing and to establish an attractive status for teacher-researchers.

The NMD also proposes the development of health services by strengthening the public health system, supporting the demand for care, operationalizing the generalization of medical coverage, improving the overall supply of care to better respond to the demand of citizens, the overhaul of health governance, including at the territorial level and the strengthening of the resilience of the health system in the face of the risk of future health crises.

However, overall, the public authorities appear proactive. Thus, to overcome the limits of previous plans, which will not have lived up to its ambitions, delays in several projects, problems identified at the level of governance and management, the note on general guidelines for the development of Digital in Morocco in horizon 2025 approved by the Digital Development Agency took over in order to ensure the continuity of the momentum created by the previous projects.

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