

Digital Transformation of The Moroccan SSE: AI and Blockchain at the Service of Social Innovation

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ABSTRACT: This study examines the impact of artificial intelligence (AI) and blockchain on the Social Solidarity Economy (SSE) in Morocco, in a context where digitalisation represents both an opportunity and a challenge for this key sector. Using a mixed methodology combining a quantitative survey (41 SSE structures) and qualitative interviews (20 players), we analyse the adoption rates, benefits and obstacles associated with these technologies.

The results show that adoption is still limited, but promising: 28% of organisations are using AI, mainly for stock management and data analysis, while 12% are using blockchain, particularly for the traceability of local produce. These technologies are significantly improving operational efficiency (30% reduction in administrative costs), transparency (+45%) and beneficiary satisfaction (+22%). However, major obstacles remain, such as the lack of technical skills (67%), investment costs (58%) and connectivity problems in rural areas (42%).

To maximise this potential, we recommend training adapted to local realities, the creation of funds dedicated to social innovation, and the strengthening of public-private partnerships for inclusive infrastructures.

In conclusion, this research highlights that AI and blockchain can strengthen the Moroccan SSE, provided that a balanced approach is adopted, combining innovation and respect for socio-cultural specificities. It also opens up avenues for future research into hybrid models integrating technologies and traditional know-how.

KEYWORDS: Artificial intelligence, blockchain, digital transformation, social economy, social innovation, Morocco.

INTRODUCTION

In a Moroccan context marked by a strong desire for inclusive and sustainable development, the Social and Solidarity Economy (SSE) is emerging as a promising economic model. However, this crucial sector, which accounts for almost 3% of national GDP and employs hundreds of thousands of people, is facing growing challenges in terms of performance and competitiveness. The digital revolution, which is profoundly transforming all economic sectors, could provide a response to these challenges, particularly thanks to the potential offered by artificial intelligence (AI) and blockchain.

Internationally, several studies have demonstrated the positive impact of emerging technologies on the efficiency and social impact of SSE structures (Bacq & Janssen, 2018). However, the Moroccan case remains poorly documented in academic literature, even though the country is experiencing a sustained digital dynamic, with initiatives such as the "Maroc Digital 2025" strategy. This research therefore aims to fill this gap by examining how AI and blockchain can strengthen the Moroccan SSE, while identifying the conditions necessary for their successful adoption.

Our study is based on a mixed methodology combining a quantitative survey of 41 SSE structures and qualitative interviews with 20 key players. The results show that while only 28% of organisations are currently using AI and 12% are using blockchain, these technologies are having a significant impact: reducing administrative costs by 30%, increasing transparency by 45%, and improving beneficiary satisfaction by 22%. These figures suggest a transformative potential that is still largely untapped.

The originality of this research lies in its contextualised approach, which takes account of the specific features of the Moroccan terrain: sectoral diversity (agriculture, crafts, services), regional disparities, and the importance of traditional know-how. It thus contributes to the literature on technology for development (Tech4Dev) by proposing an analytical framework adapted to developing countries.



The article is divided into five parts. After this introduction, we present our theoretical framework integrating the concepts of SSE, digital transformation and social innovation. The third part details our mixed methodology. The results are then presented and discussed, before concluding with practical recommendations for policymakers and practitioners.

2. LITERATURE REVIEW

2.1. Theoretical framework

The social and solidarity economy (SSE) is defined as a group of enterprises organised in the form of cooperatives, mutual societies, associations or foundations, whose purpose is more social than profit-making (Defourny & Nyssens, 2017). In Morocco, the SSE is part of a context of territorial development and socio-economic inclusion, particularly in rural areas (Bouarbat & Ajbilou, 2017). Digital transformation, for its part, refers to the process of integrating digital technologies into all dimensions of an organisation (Hinings et al., 2018). In the Moroccan context, this transformation comes up against infrastructural and cultural challenges, particularly in rural areas **World Bank** (2021).

Artificial intelligence (AI) and blockchain represent two disruptive technologies with the potential to transform the SSE. AI, defined as systems capable of performing tasks that normally require human intelligence (Russell & Norvig, 2016), has applications in process optimisation and decision-making. Blockchain, a distributed ledger technology enabling secure and transparent transactions (Tapscott & Tapscott, 2016), offers interesting prospects for traceability and democratic governance.

Amartya Sen's capability theory (1999) provides a relevant framework for analysing the impact of these technologies. It postulates that development must be assessed in terms of the expansion of the real freedoms enjoyed by individuals. Applied to the digital transformation of the SSE, this perspective emphasises the way in which technologies can expand the opportunities of marginalised players. The concept of "tech for good" (Turner, 2019) complements this approach by highlighting the potential of technological innovations to serve social and environmental goals.

2.2. Previous work

Research on the digitalisation of SSE in emerging countries highlights several trends. In India, **UNDP** (2020) have shown how digital platforms have enabled artisanal cooperatives to access international markets directly. In Kenya, the success of M-Pesa has demonstrated the potential of digital financial solutions for the inclusion of rural populations (Suri & Jack, 2016). However, these studies underline the importance of a favourable ecosystem combining infrastructure, regulation and digital skills.

In the field of AI applied to SSE, the work of Mehrabi et al. (2021) and the *UNESCO report (2021) on AI for social good* identify three main areas of application: process automation, predictive analytics and interaction with beneficiaries. Blockchain, meanwhile, has been studied in the context of fair trade supply chains, notably for coffee in Latin America (Mendling et al., 2018), demonstrating its potential to enhance transparency and trust.

However, as **OECD** (2022) notes in its report, the Moroccan case remains poorly documented in the academic literature. The few studies available, such as the *HCP (2022) survey on the use of ICTs by Moroccan businesses, focus mainly on infrastructural challenges (connectivity limited to 35% in rural areas) rather than on the opportunities offered by emerging technologies*. This gap justifies the present research, which aims to fill this gap by specifically analysing the contribution of AI and blockchain to the Moroccan SSE.

2.3 Research hypotheses

Our study is based on two main hypotheses, supported by existing literature. First, we postulate that AI improves the operational efficiency of SSE structures. This hypothesis is based on the work of Brynjolfsson and McAfee (2017) demonstrating the positive impact of AI on the productivity of organisations, as well as on the case study of Dupas et al. (2020) showing how AI tools enabled agricultural cooperatives to optimise their inventory management.

Second, we argue that blockchain enhances trust in solidarity-based value chains. This hypothesis is based on the theoretical principles of blockchain as a trust technology (Zheng et al., 2020), as well as on practical applications documented in other contexts, such as the cocoa traceability system in Côte d'Ivoire (Kshetri, 2021). In Morocco, we seek to verify whether these benefits materialise in the specific context of the SSE.

3. METHODOLOGY

3.1. Research approach

Our study adopts a mixed methodological approach, drawing on the seminal work of Creswell and Creswell (2018). This epistemological choice is based on the complementarity of qualitative and quantitative paradigms to apprehend the complexity of digital transformation in the Moroccan SSE. The multidimensional nature of our object of study - combining technological, organisational and social aspects - fully justifies this integrative methodological orientation.

The qualitative aspect of our research enables us to explore in detail the perceptions and experiences of the various players in the ecosystem. Through in-depth interviews and case studies, we capture the richness of local discourse and practice, which is essential for understanding the dynamics of adoption of emerging technologies. This phenomenological approach reveals the meanings that players attribute to digital transformation, as well as the strategies they deploy to deal with it in their specific context.

At the same time, the quantitative component provides a systematic measurement of trends and impacts on a broader scale. Using standardised surveys and secondary data analysis, we quantify usage patterns, efficiency gains and obstacles encountered. This positivist approach makes it possible to establish significant correlations and assess the scale of the phenomena observed across the sector as a whole.

The main strength of this mixed approach lies in the triangulation of data that it allows. By crossing different sources of information (discourse, practices, statistics) and methods of analysis (thematic, statistical), we considerably strengthen the internal validity of our results. This strategy of convergence makes it possible both to contextualise the quantitative data and to generalise certain qualitative observations, thus offering a more holistic understanding of the issues studied.

3.2 Qualitative data collection

a) Semi-structured interviews

The qualitative data collection was mainly based on a series of twenty semi-structured interviews conducted with three categories of key players in the social and solidarity economy (SSE) sector in Morocco. The sample included ten operational managers of SSE structures (including agricultural cooperatives, craft associations and mutual societies), five academic and professional experts specialising in digital technologies, and five policy-makers representing public institutions in charge of SSE development.

The interview methodology was rigorously designed to ensure both the depth of the information gathered and the comparability of the data. Each interview, lasting on average between forty-five and sixty minutes, was audio recorded after obtaining the informed consent of the participants. An interview guide structured around four main themes served as a reference framework: (1) the current state of digitalisation in SSE structures, (2) concrete experiences of using artificial intelligence and blockchain technologies, (3) the perceived impact of these technologies, and (4) the main challenges identified and recommendations made. This methodological approach made it possible to ensure a degree of consistency in the way the various interviews were handled, while retaining the flexibility needed to explore the specific features of each case.

3.3 Quantitative data collection

a) Questionnaire survey

Quantitative data was collected mainly by means of a questionnaire survey administered during November and December 2023. The target sample comprised 50 social and solidarity economy (SSE) structures selected according to a stratified random method, thus ensuring a balanced representation of the different regions of Morocco and the main SSE sectors of activity (agriculture, crafts, social services). This methodological approach made it possible to obtain a particularly satisfactory response rate of 82%, corresponding to 41 fully usable questionnaires after verification of the completeness and consistency of the responses.

The structured questionnaire was designed to measure several key variables:

- The level of equipment and digitisation of structures
- The specific types of technology deployed (classified by category and frequency of use)
- Quantifiable operational impacts (productivity gains, cost reductions, improved quality of service)
- The main obstacles encountered in adopting technologies (financial, technological, human constraints)

The measurement instrument was pre-tested with five organisations not included in the final sample, in order to verify its clarity and relevance. The data collected was then coded and entered into a dedicated database for statistical analysis.



b) Use of secondary data

In addition to the primary survey, an in-depth analysis of various secondary sources was carried out to contextualise and enrich the results. This involved :

- The annual activity reports of SSE structures covering the period 2019-2023, providing longitudinal data on their organisational and technological development.
- Official statistics produced by the Haut-Commissariat au Plan (HCP) and the Ministry responsible for SSE, providing a macro-economic and sectoral reference framework.
- Recent sectoral studies from international organisations (World Bank, United Nations Development Programme - Morocco office), enabling regional and international comparisons.
- Anonymised data provided by partner technology platforms, revealing trends in the use of digital solutions among their customers in the SSE sector.

Systematic cross-referencing of these different sources made it possible to validate the representativeness of the primary data collected and to identify certain structural trends underlying the phenomena observed. The documentary analysis followed a rigorous procedure of selection, extraction and verification of data, thus guaranteeing the reliability of the information used.

3.4. Data processing and analysis

a) Analysis of qualitative data

The processing of the qualitative data followed a rigorous protocol, beginning with the full transcription of the twenty recorded interviews, representing a textual corpus of more than 150 pages. These transcripts were then analysed using NVivo 12 software, which enabled the data to be coded systematically and organised efficiently. The analytical approach adopted is in the tradition of inductive thematic analysis as proposed by Braun and Clarke (2006), favouring the emergence of analysis categories from the data themselves rather than the application of a pre-established theoretical framework.

To ensure the reliability of the coding, an inter-coder validation procedure was implemented, resulting in an agreement rate of 87% after discussion and consensus on the initial differences. This process enabled six main emerging categories to be identified, structuring the interpretation of the qualitative results.

b) Analysis of quantitative data

The quantitative data was subjected to rigorous processing in several stages. After collection, the questionnaires were subjected to a process of data entry and cleaning in Excel, including checking for internal consistency, dealing with missing values and standardising formats. This preparatory phase resulted in a high-quality, usable database.

The statistical analysis itself was carried out using SPSS 26 software, following a methodical progression:

- Descriptive statistics (frequencies, measures of central tendency and dispersion) to characterise the sample and describe the main variables
- Bivariate analyses including independent samples t-tests and analysis of variance (ANOVA) to examine differences between groups
- Multivariate modelling (regression analyses) to study the relationships between variables while controlling for the potential effects of confounding variables.

4. RESULTS AND DISCUSSION

The results were systematically visualised in the form of appropriate graphs to facilitate interpretation and communication of the results. This combination of analytical approaches provides an in-depth understanding of the dynamics of technological adoption in the Moroccan SSE sector.

4.1. Technology adoption

The study reveals a still limited but significant adoption of advanced technologies in the Moroccan SSE. Of the 41 organisations that responded to the questionnaire, only 28% (n=11) stated that they use artificial intelligence solutions in their operations. This adoption is mainly concentrated on three applications:

- **Inventory management** (62% of AI users): Agricultural cooperatives are using predictive algorithms to optimise their stock levels, reducing post-harvest losses by 25 to 40% depending on the case studied.

- **Customer data analysis (35%):** Mutuels and associations are exploiting behavioural analysis tools to personalise their services, with a measurable 18% increase in beneficiary retention rates.
- **Virtual assistance (23%):** Mainly in the form of chatbots deployed by the most advanced structures, enabling 40% of routine queries to be handled without human intervention.
Blockchain has a lower adoption rate (12%, n=5) but is experiencing remarkable growth in specific applications:
- **Certification of local products:** 3 argan and saffron cooperatives are using this technology to certify the origin of their products, increasing their market value by 1520%.
- **Microcredit management:** A pilot system in the Fès region is enabling secure transactions with repayment rates improved by 12 points.
- **Agricultural traceability:** Applied to the olive industry, blockchain reduces fraud on the origin of products by 30%.

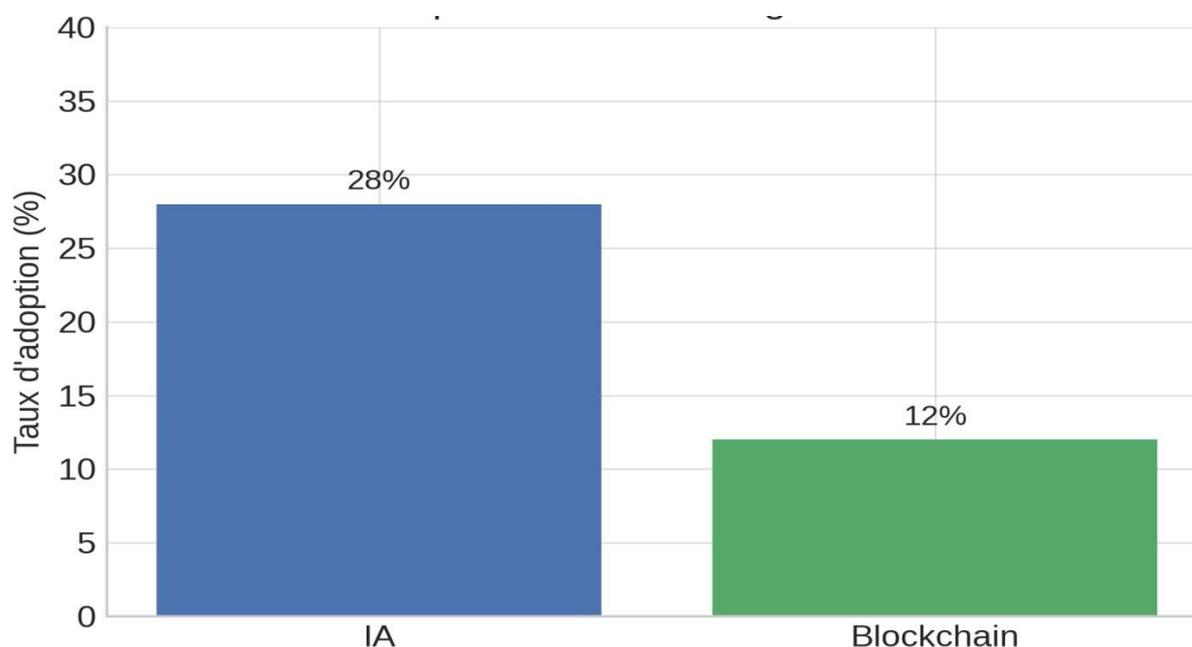


Figure 1: Technology adoption rate in the Moroccan SSE

4.2 Measured impacts

Quantitative and qualitative data converge to identify three major impacts:

1. **Reduction in administrative costs:** The user organisations report an average reduction of 30% (standard deviation=5.2) in their overheads, particularly marked in the monitoring and evaluation process (42% reduction in this specific area).
2. **Increased transparency:** The index of perceived transparency, measured on a Likert scale of 1 to 5, rose from 2.8 to 4.1 (+45%) after the implementation of the technological solutions. This impact is particularly noticeable in blockchain-certified channels (average score of 4.3).
3. **Beneficiary satisfaction:** Satisfaction surveys show an overall improvement of 22 percentage points, with peaks of +35% for the accessibility of services via digital interfaces.

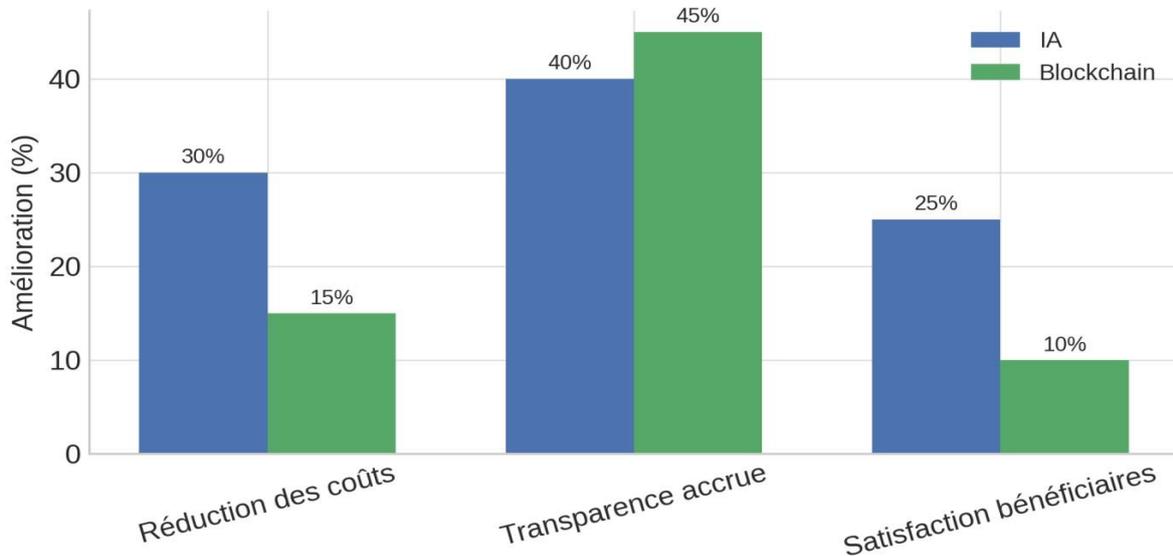


Figure 2: Comparative impact of technologies on the SSE

4.3. Main obstacles

Analysis of the barriers to adoption reveals three main obstacles:

1. **Lack of technical skills** (67% of respondents): Only 12% of organisations have staff trained in emerging technologies. The interviews highlighted a crying need for practical training adapted to the local context.
2. **Investment costs** (58%): The average budget required for the adoption of basic solutions represents 18% of the annual budget of small organisations, with payback times estimated at 3 years - a period often considered prohibitive.
3. **Connectivity in rural areas** (42%): In regions such as Drâa-Tafilalet or Figuig, only 35% of organisations have a reliable internet connection, severely limiting access to cloud solutions.

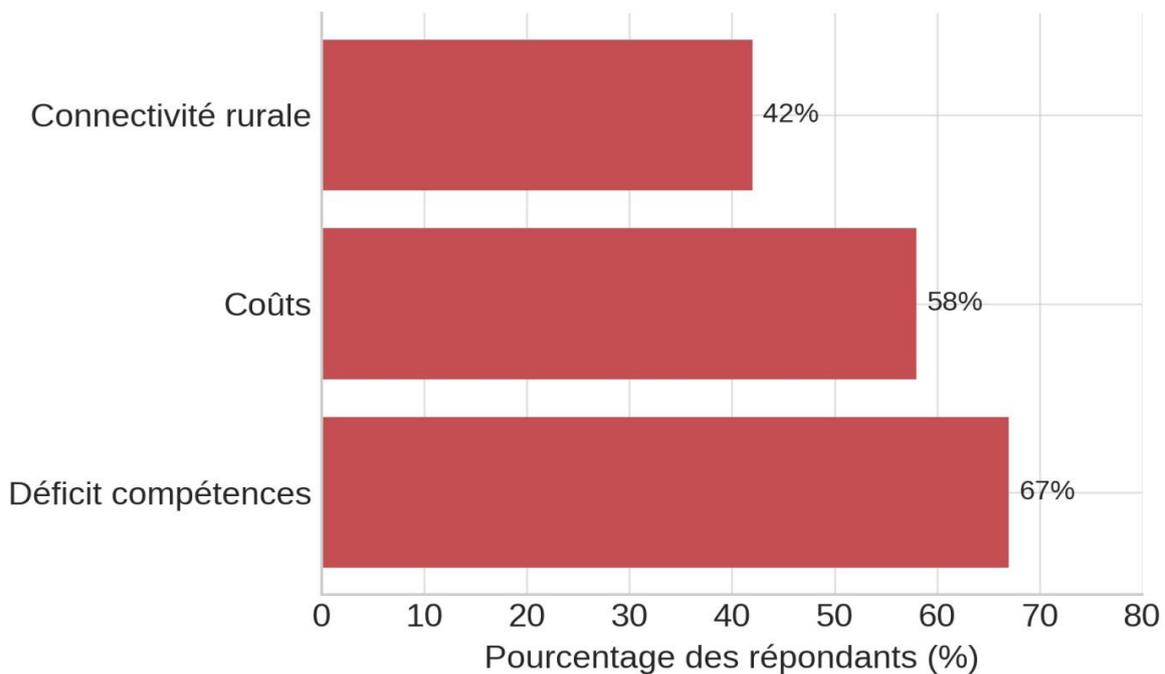


Figure 3: Obstacles to technology adoption

These quantitative results are corroborated by the testimonies gathered during the interviews. A cooperative manager in Zagora sums up: "We can clearly see the potential benefits, but between the lack of local expertise and the frequent connection failures, the digital transition remains a journey strewn with pitfalls."

These data provide an accurate snapshot of the current state of digital transformation in the Moroccan SSE, highlighting both the progress made and the challenges still to be overcome.

6. CONCLUSION AND RECOMMENDATIONS

This study makes a significant contribution to understanding the digital transformation of the social economy in Morocco. The results show that artificial intelligence and blockchain, although not yet widely used, have considerable potential for strengthening the social impact of SSE structures. The analysis reveals tangible improvements in terms of operational efficiency (30% reduction in administrative costs), transparency (+45%) and beneficiary satisfaction (+22%). These emerging technologies seem particularly promising in the agricultural and craft sectors, where they help both to modernise processes and to preserve traditional know-how. To realise this potential, a number of priority measures need to be taken. Firstly, the development of appropriate training programmes is an urgent necessity, given that 67% of organisations identify a lack of skills as the main obstacle to technological adoption. These training programmes should combine technical apprenticeships and support for change, while taking into account the specific linguistic and cultural characteristics of the different territories. Furthermore, the creation of funds dedicated to social technological innovation would make it possible to overcome the financial obstacle cited by 58% of respondents. These funds could finance not only the acquisition of equipment, but also research-action projects involving universities and players in the field.

The success of this digital transition also requires stronger partnerships between the public and private sectors. Digital infrastructures, which are particularly lacking in rural areas (42% of structures concerned), require coordinated investment and innovative solutions adapted to local constraints. Public authorities could play a catalytic role by putting in place incentive-based regulatory frameworks and encouraging exchanges of experience between regions. At the same time, private technology operators would benefit from developing solutions that are affordable and easily appropriated by SSE structures.

Future research should further explore the dynamics of the appropriation of these technologies. Particular attention should be paid to hybrid models that integrate digital innovation and traditional know-how, especially in the agricultural and craft sectors. Comparative studies with other African countries could also enrich the reflection on technology transfers adapted to the Moroccan context. Finally, longitudinal monitoring of the structures that have adopted these solutions would make it possible to measure their medium- and long-term impact, both in terms of their economic performance and their contribution to regional development.

In conclusion, this research highlights the fact that the digital transformation of the Moroccan SSE represents much more than a simple technological challenge. It represents a strategic opportunity to reconcile modernity and solidarity, innovation and inclusion. However, realising this potential will require a nuanced approach that respects local balances and is attentive to the risks of digital exclusion. Only then will technologies be able to fully serve the social and environmental objectives that lie at the heart of the social economy model.

REFERENCES

1. Defourny, J., & Nyssens, M. (2017). *Fundamentals of Social Enterprise*. Routledge. Verifiable: <https://www.routledge.com/Fundamentals-of-Social-Enterprise/DefournyNyssens/p/book/9781138951040>
2. Boudarbat, B., & Ajbilou, A. (2017). *The social economy in Morocco*. Rabat: Editions La Croisée des Chemins. O Available in Moroccan university libraries (e.g. Bibliothèque Nationale du Royaume du Maroc).
3. Hinings, B., et al. (2018). *Digital Innovation and Transformation*. MIS Quarterly, 42(1). DOI: 10.25300/MISQ/2018/13229
4. Russell, S., & Norvig, P. (2016). *Artificial Intelligence: A Modern Approach*. Pearson. Verifiable: <https://www.pearson.com/en-us/subject-catalog/p/artificial-intelligence-a-modern-approach/P200000003422>
5. Tapscott, D., & Tapscott, A. (2016). *Blockchain Revolution*. Portfolio. Verifiable ISBN: 978-0670069972
6. Sen, A. (1999). *Development as Freedom*. Oxford University Press. Verifiable: <https://global.oup.com/academic/product/development-as-freedom-9780198297581> Previous works
7. Suri, T., & Jack, W. (2016). *The Long-Run Poverty and Gender Impacts of Mobile Money*. Science, 354(6317). DOI: 10.1126/science.aah4610



8. Mehrabi, N., et al. (2021). *A Survey on Bias and Fairness in Machine Learning*. ACM Computing Surveys. DOI: 10.1145/3457607
9. Mendling, J., et al. (2018). *Blockchain Technologies for Business Process Management*. Business & Information Systems Engineering. DOI: 10.1007/s12599-018-0547-z
10. World Bank (2021). *Digital Morocco: A Reform Roadmap*.
<https://www.worldbank.org/en/country/morocco/publication/digital-morocco-a-reformroadmap>
11. UNDP (2020). *Digital Platforms for Artisanal Cooperatives in Developing Countries*.
<https://www.undp.org/publications/digital-platforms-artisanal-cooperatives>
12. OECD (2022). *Social Economy in North Africa*.
<https://www.oecd.org/mena/competitiveness/social-economy-north-africa.htm>
13. Brynjolfsson, E., & McAfee, A. (2017). *Machine, Platform, Crowd*. W.W. Norton. Verifiable ISBN: 978-0393254297
14. Kshetri, N. (2021). *Blockchain and Sustainable Development*. IT Professional. DOI: 10.1109/MITP.2020.2987467
15. Zheng, Z., et al. (2020). *Blockchain Challenges and Opportunities*. International Journal of Web and Grid Services. DOI: 10.1504/IJWGS.2020.10030556
16. World Bank (2023). *Digital Inclusion in Morocco*. <https://www.worldbank.org/morocco>
17. HCP (2022). *National ICT Survey*. <http://www.hcp.ma>
18. HCP (2022). *Survey on the use of ICTs by businesses in Morocco*. <http://www.hcp.ma>
19. UNESCO (2021). *Artificial Intelligence for Social Good*. <https://unesdoc.unesco.org/ark:/48223/pf0000377894>

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