

Examining the Role of Internal Audit in the Age of Digital Transformation: The Algerian Perspective

Bouguerri Amira ^{1*}, Pr. Dahia Abdelhafid ²

¹ The higher school of commerce ESC, laboratory of Economic reforms, development and economic integration strategy (Algeria), etd_bouguerri@esc-alger.dz.

² The higher school of commerce ESC (Algeria), a_dahia@esc-alger.dz

Received: 01/11/2023

Accepted: 31/12/2023

Published: 31/12/2023

Abstract:

Over the last decade, the digital revolution has brought about significant changes in all economic sectors. This evolution refers to the process by which a company integrates digital technologies into all of its operations to enhance its overall performance.

In this context, the internal audit function plays a crucial role as an essential element in managing the risks that the company may face.

In our article, we explore the overall influence of digitization on the internal audit function, with a particular emphasis on its impact in the Algerian context.

To achieve this, we undertook a research effort involving a methodical and systematic analysis, as well as a literature review of research works sourced from high-quality databases and trying to highlight the impact of digital transformation on the role of internal audit in the Algerian context.

Our findings suggest a notable correlation between the expansion of the internal audit function in Algerian companies and the growing prevalence of digitalization. This observation indicates that the movement toward digitalization in the economic environment positively influences the internal audit activity.

Keywords: Internal audit; Digital transformation.

JEL Classification Codes: M42, O33.

1-Introduction :

During the past decade, the digital revolution has represented a significant shift across all economic domains. It involves the widespread adoption of information technologies, thereby providing various opportunities for organizations to grow, evolve, gain competitiveness, and enhance their image.

According to (Allouche .J, Zerbib.R,2020, p75; Allouche .J, Zerbib.R,2020, p75) « digital transformation refers to the process through which a company integrates digital technologies into all of its activities with the aim of enhancing its performance ».

This major revolution has significant repercussions on businesses, as they have to face new challenges such as competition, regulatory constraints, and evolving customer demands. That's why it's crucial to anticipate these challenges, and leaders must incorporate digitization of activities into their strategic vision.

According to (Oceane.Mingot, 2019,p20) , the integration of technology across all sectors of a company to change the way it operates and delivers value to its customers .

In this situation, internal audit holds a key position as a crucial function for managing the risks that the company might face, especially risks related to the use of information and communication technologies.

According to the Chartered Institute of Public Finance and Accountancy, internal audit is an assurance and consulting activity designed to add value and improve the operations of an enterprise. As a result, internal auditors must integrate this new dimension into their mission.

This research work aims to examine how digital transformation influences the internal audit function especially in the Algerian context.

In this regard, our research is based on a systematic analysis aimed at rigorously examining and evaluating the findings of multiple studies conducted by important auditing firms and organizations, as well as articles from databases such as « Sciences Directs » and « Cairn ».

We aimed to identify and comprehend the dimensions of digital transformation within companies. Given that this is a rapidly evolving topic, we focused specifically on the internal audit activity, as it represents a field in constant evolution, especially with the emergence of digital transformation.

2. Internal audit:

The IFACI has defined internal audit as an independent, objective assurance and consulting activity designed to add value and improve an organization's operations. It helps an organization accomplish its objectives by bringing a systematic, disciplined approach to evaluate and improve the effectiveness of risk management, control, and governance processes .

Internal audit has evolved continuously, encompassing various domains through diverse approaches to information processing. This practice now holds crucial significance in assisting companies with managing potential risks and achieving their objectives.

The internal audit mission involves traversing three situations that enable it to identify phases commonly referred to in traditional terms as:

- The preparation phase:

This essential step involves gathering all necessary information to understand the departments subject to the audit and to guide the mission based on the assigned objectives. It is also known as the « study » or « planning » phase.

- The execution phase:

During this stage, the focus is on examining, observing, and analyzing the identified risks and issues using logical methods, tests, and investigations.

- The conclusion phase:

Signifies the end of the mission, involving the drafting of a comprehensive and decisive final report that presents the discussed observations, findings, and recommendations.

3. Digital transformation:

Technological advancements and evolution encourage companies to embrace digitization in order to adapt to new technologies and leverage their benefits.

Digital transformation represents a fundamental concept that encompasses various changes in business operations, processes, and skills through the adoption of digital technologies.

(Dudézert .Aurélie, 2015), defined digital transformation as « the organizational transformation related to the development and integration of digital collaboration technologies into the individual and collective practices of businesses».

According to (Reis .Joao, Amorim. Marlene , Melao.Nuno et Matos .Patricia,2018) , digital transformation can be divided into three main characteristics: organizational, technological, and social aspects. They can be identified as « the use of new technologies that enable significant improvements and influence all aspects of customer life».

In the same context, (Daidj .n, Tounkara.t, Bordeaux.C, 2021, p47) confirmed this idea by emphasizing that digital transition takes various forms and can encompass interactions with all internal and external stakeholders of the company through pre-existing inter-organizational networks.

According to (Pihir and colleagues ,2018) , they outlined the key elements that facilitate the successful digital transition of companies namely:

- Strategic orientation:

Digitization encompasses all the services of an entity and thus influences its strategy.

Managers must incorporate this digital transformation into their goals and action plans to ensure the smooth functioning of the organization.

- Customer orientation:

Digitally mature companies leverage digital tools to understand their customers and their behaviors. The company's interaction with its customers leads to the creation of new offerings and the maintenance of strong relationships through well-conducted surveys.

- Technology and Process Infrastructure:

Digitized companies need to adopt new platform-based technologies and various tools to accelerate the transformation of their management and business processes.

- Skills and Capacity Building:

To ensure the success of digital transition, the company must invest in enhancing the skills, knowledge, and capacities of its employees.

- Innovation Culture and Organizational Engagement:

The company must integrate a digital vision at the core of its culture to ensure that the work environment promotes innovation and change.

4. The Impact of Digital Transformation on Internal Auditing:

In this section, we have presented previous research efforts, both academic and professional, that have attempted to address and analyze the impact of digital transformation on the role of internal auditing .

We have attempted to condense previous research efforts on internal auditing in the era of digital transformation in the table below:

Table 1. Summary of Previous Research on Internal Auditing in the Digital Transformation Era

Authors	Main results/ key findings
La fortune & al (1993)	They believe that computer methods can contribute to enhancing the quality of verifications and achieving time savings within the internal audit function.
Bergés (2002)	Technological advancements facilitate the improvement of audit decisions and conclusions while ensuring traceable accountability.
Earley (2015)	Modern technology provides auditors with the ability to: - Analyze vast volumes of data in real-time; - Enhance understanding of client processes; - Facilitate fraud detection.
Mofitt et al (2018)	Manual and repetitive activities inherent to the audit mission can be automated, including reconciliations and internal control tests.
Benkaraache & Ghnouane (2020)	Digitalization promotes value creation by automating operational processes.

Source: developed by Authors

Major consulting firms and international organizations in the industry have also addressed digital transition. Therefore, we have attempted to pinpoint and address the most essential points as

follows:

Table 2. Summary of research from consulting firms and audit organizations on the topic of digital transformation

Firm / Organization	Main results/ key findings
Firm : Earnest & Young (2018)	Information systems demonstrate a form of human intelligence that encompasses various related technologies, such as : • Data exportation; • Machine learning; • Facial recognition; • Visual recognition; • Sentiment analysis. The same firm highlights that auditors will leverage artificial intelligence to analyze data in more extensive, in depth and timely manner.
Firm : Price Water-house Coopers (2019)	Automation accelerates the process, reduces the risk of errors, and enables more detailed testing. The firm has identified four tools in digital initiatives that have a positive impact on auditing, these elements include: • Increased data analysis; • Process visualization; • Interactive dashboard creation; • The integration of robotics and artificial intelligence technologies.
Firm: Deloitte consulting (2019)	In the context of its study, the firm mentioned that automation of business processes involves the use of robotics as well as intelligent automation. The distinctive characteristics of organizations that integrate intelligent automation on a large scale can be summarized in six points: • An enterprise-wide intelligent automation strategy; • Combining RPA and artificial intelligence; • Technology, Infrastructure and cyber-security; • Well-defined processes, standards and mature processes; • Clear understanding of how to capture value; • Radical simplification driven by cost reduction needs.
The audit firm: KPMG (2016)	The firm has categorized beneficial tools and services for internal audit as follows: • Preparation tools; • Visualization tools; • Business intelligence tools: intended for decision-making and reporting; • Specialized data analysis tools for audit and internal control; • GRC (governance, risk and compliance) tools: designed to integrate continuous control and auditing into risk management, policies and procedures of the relevant entity; • etc.
European institute of internal auditors (2019)	In the context of the transition to digital, the field of internal auditing must now consider several new risk factors. The organization's research highlights that (36%) of internal audit managers identify digitalization as one of the main risks the organization facing, and nearly one in ten (9%) ranks it as the top risk, just after cyber-security at (15%) and compliance at (13%). Among the surveyed managers, a percentage states that risks related to digitalization and technology adoption will play a major role in their work in 2019 and for the years to come.

Source: developed by Authors

In order to support these research efforts, we have attempted to present practical examples

illustrating how artificial intelligence and new technologies are applied in the field of audit and internal control within companies, in the following table:

Table 3. An example of applying AI to the field of audit and internal control

Companies	AI algorithms	sector	Fields of application	1 st line	2 nd line	3 rd line
				Operational	Compliance & risks	Audit
IBM Watson	Deep learning	Audit	Analyzing credit files from banks for commercial mortgage loans portfolios.			X
Kira systems	Machine learning	Audit	Identifies extracts and analyzes text from contracts and other documents.			X
Clarifai	Deep learning	all sectors	Video analysis, construction site surveillance, drone based inventory.		X	X
Feroot privacy	Machine Learning	all sectors	GDPR compliance.		X	
JP Morgan chase (outlook coin)	Machine Learning	Bank	Interpretation of commercial loan agreements.	X		
Think big analytics teradata	Machine Learning	Bank	Fraud detection in mobile banking payments.		X	
Shift technology	Machine learning	insurance	Fraud detection in insurance claims, home, health, travel and assistance.		X	

Source: developed by Aubineau. E, Pluzanski.J & Pivard.J, (2018), p27.

5. The Impact of Digital Transformation on the Internal Audit Function in the Algerian Context:

5.1 The Trend of the Internal Audit Profession in Algerian Companies:

Previous empirical studies have employed various indicators to assess the quality of Internal Audit. For instance, in Malaysia, (Wan Nordin Wan-Hussin, Hasan Mohammed Bamahros, 2013) used publicly available data related to the investments in the Internal Audit Function (IAF). Other authors have measured this quality through the Internal Audit budget. In their study titled "Audit Committee Characteristics and Investment in Internal Audit," (Abhijit Barua, Dasaratha V Rama et Vineeta Sharma, 2010) used the Internal Audit investment budget to evaluate the variable related to Internal Audit activity.

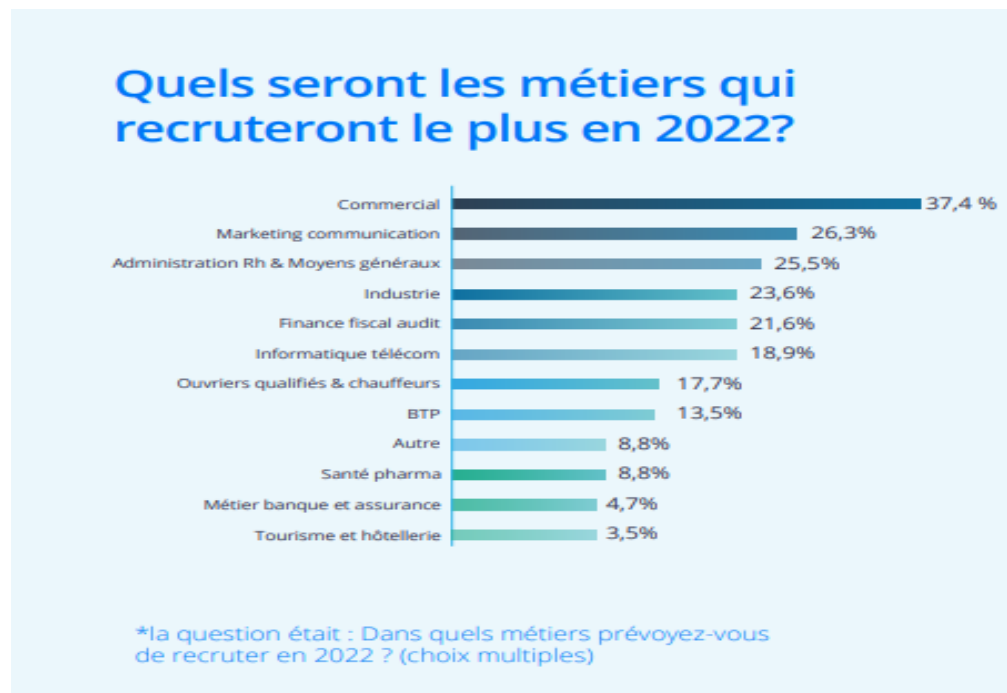
To estimate the budget of the Internal Audit function within Algerian companies, we analyzed the recruitment trend of this function. This allowed us to determine whether this trend is growing or declining. Subsequently, we were able to infer the trend of budgeting or investment by Algerian companies in the Internal Audit function.

The "Recruitment Perspectives" study, conducted by Emploitic and in its third edition, aims

to provide insight into companies' recruitment forecasts for the first half of 2022. This study is based on the participation of nearly 500 companies across the country, of various sizes and operating in different sectors.

The study revealed that the field of auditing accounts for approximately 21.6% of the recruitment forecasts, making it a sector of significant importance after the commercial, marketing, administrative, and industrial sectors. It is worth noting that these last four functions require a substantial number of personnel, unlike internal audit, which does not demand as much recruitment as the other mentioned activities.

Fig.1. projected job opportunities in 2022



Source: Emploitic, 2022, P6

According to the employment data from Emploi-Partner for the year 2023, the job market in Algeria is continuously evolving, with some sectors showing a higher demand for labor than others. The company has ranked the seven most sought-after professions, and it is interesting to note that the profession of finance and accounting expert holds the sixth position in this ranking.

Table4. Projected job opportunities in 2023

Ranking	Occupation
1	Information technology (IT) experts
2	Digital marketing and communication specialists
3	Logistics and supply chain professionals
4	Educational professionals
5	Healthcare professionals
6	Finance and accounting experts
7	Engineering professions

Source: developed by authors

Furthermore, it's worth noting that the National Employment Agency (ANEM) recently published a list of specialties highly sought after by companies, information that could be of great

interest to recent high school graduates.

Indeed, in July 2023, ANEM shared on its LinkedIn page a list of fifty (50) specialties that have been in high demand by companies over the past five years. It is noteworthy that the role of internal audit appears in the fifth position, alongside accounting and taxation. The list is presented in the table below; management holds crucial importance for all businesses. Accountants, financial auditors, and financial management experts are indispensable in ensuring effective tax and accounting management.

Table.5. Ranking of the 50 most in-demand specialties over the past five year

N°	Specializations	N°	Specializations	N°	Specializations
1	commercial sciences	18	Law	35	statistics and planning
2	mechanical engineering	19	Pharmacy	36	microbiology
3	civil engineering	20	Hydraulics	37	human-resource management,
4	chemistry	21	finance accounting	38	automation & control, process engineering,
5	tax & accounting	22	financial sciences	39	psychology
6	computer science	23	electronics	40	instrumentation maintenance
7	biology	24	general medicine	41	information and communication sciences,
8	hygiene & safety	25	industrial safety & environmental management	42	veterinary
9	economics	26	industrial maintenance	43	medicine
10	architecture	27	language & English literature	44	automation & control in petrochemical industries
11	electrical engineering	28	agronomy	45	economic management
12	electromechanical engineering	29	sociology	46	language&Arabic literature
13	management sciences	30	public works	47	banking& finance
14	language& French literature	31	automation	48	mathematics&computer science
15	electrical engineering	32	industrial-process engineering	49	translation & interpretation
16	legal & administrative sciences	33	telecommunications	50	petrochemical industries
17	marketing	34	international trade		

Source: ANEM, 2023

In addition, according to LinkedIn, fifteen future professions are emerging on the horizon. The consistent growth in the use of information technology and artificial intelligence, with a major focus on optimal data protection, is creating new professional opportunities.

It's interesting to note that the profession of Data Protection Officer generated the most interest, closely followed by that of Artificial Intelligence Engineer. These trends suggest that the role of internal audit may also play an increasingly significant role in the future.

In conclusion, the Association of Algerian Internal Audit Consultants (AACIA), established on February 22, 1993, has the primary objective of promoting and developing the field of internal auditing in Algeria. According to its 2023 declaration, it has highlighted its achievements and advancements in the field of internal audit and internal control in Algeria. Notably, more than 800 internal auditors have been trained by the end of 2022.

Our analysis reveals that the field of internal audit is in constant growth, with sustained demand in the job market. This indicates that businesses continue to invest in this sector, allocating

significant budgets to develop this essential function.

5.2 The Trend of Digital Transformation in Algerian Businesses:

The trend of digital transformation within Algerian businesses is of growing importance. To assess this transformation, three commonly used methods are available. The first method, inspired by (He & Liu, 2019) , involves evaluating whether a company has undergone digital transformations during the current year and using it as a binary variable.

The second method, as used by (Qi, Cao, & Liu, 2020) and (Zhang, Li, & Xing, 2021), measures the extent of digital transformation by examining the proportion of intangible assets related to the digital economy disclosed in the financial reports' notes of publicly traded companies, relative to the overall intangible assets. This method provides a financial perspective on digital transformation.

The third method, similar to that adopted by (Wu, Hu, Lin, & Ren, 2021) and (Yuan, Xiao, Geng, & Sheng, 2021), involves conducting a textual analysis of the annual reports of publicly traded companies. It measures the degree of digital transformation based on the presence of keywords and terminologies related to digitization. This approach focuses on the narrative aspect of the reports.

In our study, we will examine the trend of digital investments by Algerian companies. This will enable us to gain a better understanding of how these companies approach digital transformation and how they allocate resources for this purpose.

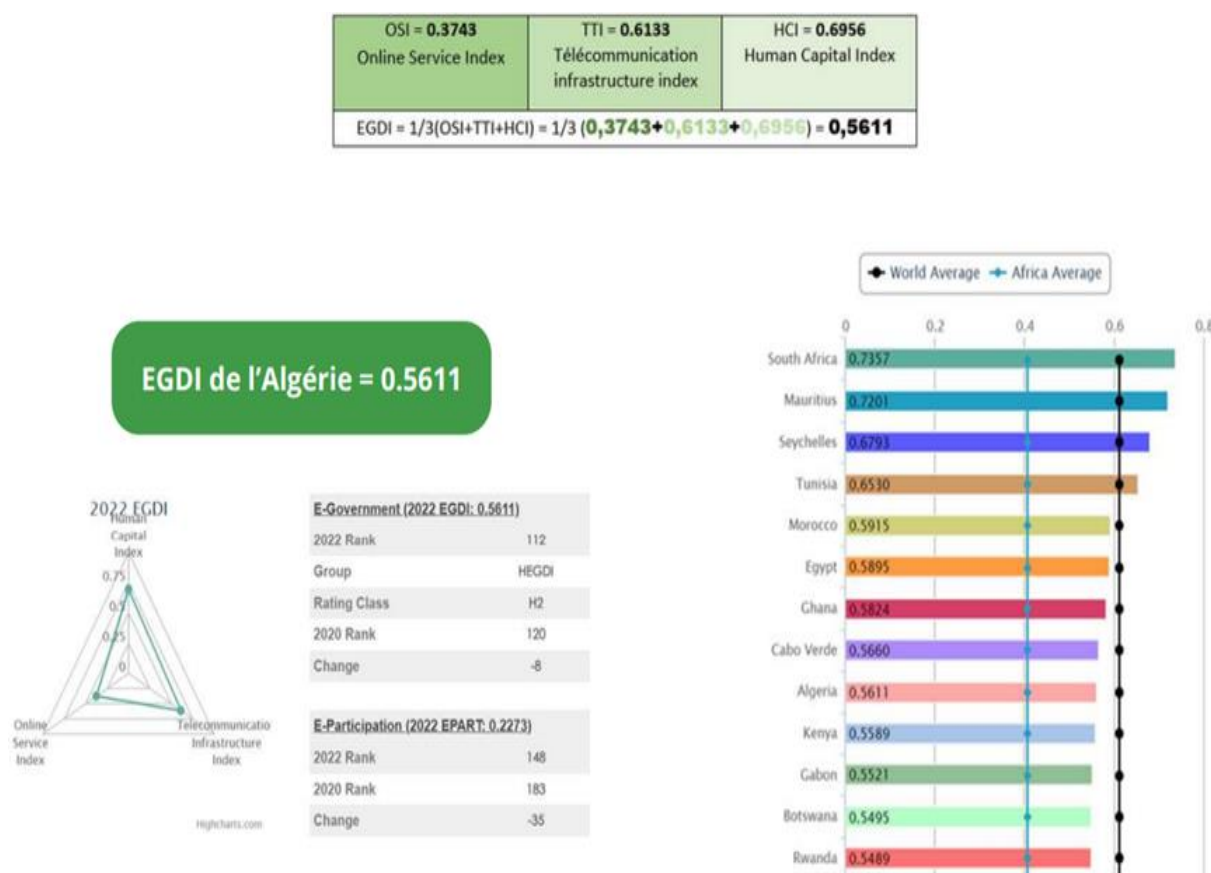
Algeria falls into Group 2 concerning the e-Government Development Index (EGDI) with a score of 0.5611. It ranks 112th out of 193 countries, marking an improvement of 8 positions compared to the 2020 ranking.

The e-Government Development Index was developed by the United Nations Department of Economic and Social Affairs .It allows the 193 United Nations member states to compare their performance in electronic governance and identify areas requiring further improvements. This index is based on 32 indicators distributed across three dimensions:

- The scope and quality of online services;
- The state of telecommunication infrastructure development Telecommunication
- Human capital (Human Capital Index).

These three dimensions measure various aspects of e-government development, from the quality of online services to the availability of telecommunication infrastructure and human capital. They are depicted in the figures below:

Fig.2.EGDI of Algeria



Source: GAAN report, 2022, P12

The Algerian government has examined various aspects related to digital development in Algeria, including the National Digital Transformation Strategy, the establishment of a Government Data Center, the implementation of electronic certification authorities, the expansion of the international telecommunications transport network, digital security issues, and the country's digital ecosystem.

The National Digital Transformation Strategy aims to enhance connectivity, promote the use of information and communication technologies in public administrations, and strengthen the governance of the economic sector. Online public services have been developed, and the strategy is based on a consensus among various stakeholders to improve public governance and promote the digital economy and citizenship.

The Government Data Center project seeks to address the current and future data management needs of public institutions and ensure service continuity.

The establishment of electronic certification authorities, such as the National Electronic Certification Authority, is intended to enhance security and international recognition.

The development of the international telecommunications transport network aims to secure the network and increase international bandwidth capacity to accommodate the growing volume of digital data traffic.

Digital security has become crucial for state sovereignty and economic development, with a focus on protecting citizens, addressing potential threats, developing expertise and governance, and ensuring inter-sectorial coordination.

Algeria has committed to digital transformation through the creation of a startup-friendly ecosystem, the digitization of administrative procedures, and the promotion of online access to public services.

According to a 2019 study by PwC in Algeria, business leaders are facing new priorities, including the need to diversify their activities, enhance the efficiency of their production tools, and expand their operations into African markets. To catch up with the changing landscape, companies are encountering significant challenges, especially concerning the digitization of business processes, such as integrating ERP systems, implementing digital transformation, and ensuring cyber-security. They are also dealing with organizational changes.

In addition, when analyzing the first study conducted by the international publisher Sage in August 2014 among 85 Algerian IT decision-makers, it emerged that more than half of the companies in Algeria expressed a desire to invest in an ERP (Enterprise Resource Planning) system. The following results summarize the reasons and objectives of these companies for implementing an ERP:

Table 6. Algerian IT decision-makers

Objectives Sample	Strategic priority	Priority Investment	Cost Improvement	Efficiency Enhancement
85 companies	79%	57%	44%	59%

Source: Sage, 2014.

According to our analysis, it is evident that Algerian companies are actively engaging in a digital transformation of their entire processes. As a result, budgets allocated for investments in digitalization tools are continuously increasing.

6- Results and Discussions

Internal auditing is a function that aims to provide reasonable and independent assurance to help the organization identify and analyze risks effectively, and to provide the necessary improvements to achieve organizational objectives.

Digital transformation is a fundamental alteration of an organization's processes and activities using digital technologies such as automation, cloud computing, the Internet of Things, etc. This digital transition has a significant impact on the field of internal auditing across several dimensions:

- Internal Audit Tools:

Through digital transformation, internal auditors can utilize various tools such as data collection and analysis software, risk management systems, monitoring platforms, and modeling tools. These tools enable effective audit missions by aiding in real-time risk identification and

assessment, as well as ensuring compliance with standards and regulations.

- Data Analysis:

Data analysis plays a crucial role in the realm of internal auditing. It involves processing large amounts of digital information to detect anomalies and risk factors. The emergence of artificial intelligence allows for instant identification of discrepancies and potential risks through in-depth analysis of diverse data types, including financial, operational, and more. The time-saving benefits offered by these technologies will also enhance the quality and accuracy of assessments.

- Internal Audit Process:

The internal audit process has also evolved. Thanks to digital technologies, internal auditors examine vast datasets and identify anomalies more quickly than before. Automation of processes and repetitive tasks enables auditors to focus on more strategic and analytical aspects. By integrating technology into internal audit processes, it facilitates remote collaboration and communication, especially for geographically dispersed audit teams. This enables the identification and resolution of issues while providing timely and appropriate recommendations.

- Challenges of Internal Audit:

In the era of digitalization, it's crucial for internal auditing to be vigilant about various risks that could impact results. These risks include:

- Data integrity and security, in terms of both volume and diversity;
- Vulnerabilities associated with new technologies;
- The design of algorithms used, as unpredictable behaviors of artificial intelligence only become apparent through experience;
- Organizational changes brought about by digitization, leading to a radical evolution of the boundaries of company activities.

- Costs of Digital Transformation:

The shift to digital incurs significant expenses related to adopting new technologies, staff training, and implementing security systems to ensure data protection. These costs are continuously rising due to the ongoing evolution of technologies.

As a result, the company's strategic choice regarding technologies and resources tends to lean towards a partial digitalization of processes. This forces auditors to juggle between digital and physical methods, creating a tangible and significant limitation as well.

- Cyber security and Internal Audit:

To ensure a successful transition to digital while maintaining security, it's essential for the internal audit function to closely collaborate with cyber-security. This collaboration aims to safeguard sensitive data and systems against cyber threats. A new responsibility for auditors is to assess security measures put in place to manage technology-related risks and ensure compliance with required security standards.

- Evolution of Internal Auditors' Skills:

In addition to their traditional skills, internal auditors must cultivate other abilities to adapt to new technologies, become accustomed to handling massive data sets, and refine their reasoning

to identify risks associated with changes. Among these new skills are:

- Proficiency in data analysis;
- Cyber security skills;
- In-depth understanding of information systems to remain relevant in this context.

It is also observed that the internal audit function within Algerian companies is growing in parallel with the rise of digitalization. This correlation suggests that the shift in the economic environment towards digitalization has a positive impact on the internal audit activity.

7-Conclusion:

The Digitizing an organization involves digital technologies, enabling process automation, data-driven decision-making, and facilitating remote communication and meeting organization. Its main goal is to enhance the efficiency and performance of the company.

During this digital transition, the processes and activities of the company have evolved, especially concerning internal auditing.

The internal auditor, who aims to assess and identify potential risks to help the company achieve its goals and adhere to its policies, has undergone significant changes in the era of digitalization.

Several aspects of the function have been impacted by this digital evolution, including the tools, information systems, networks, and software used. The processes followed have also been redefined, as well as the skills required for the auditors involved in this profession.

In this context, the role of internal auditing must adapt to seize the opportunities offered by digital technologies while retaining its fundamental methods. Additionally, it must incorporate a cyber-security responsibility to ensure an effective and thorough assessment of the company's operations and risks.

Furthermore, it's worth noting that there is a growing trend in the internal audit function within Algerian companies, aligning with the increasing prevalence of digitalization. This correlation implies that the transition of the economic landscape toward digitalization is positively influencing the internal audit activities.

However, it's important to note that this analysis has limitations, primarily due to the lack of data from Algerian companies. For more robust conclusions, it is recommended to delve into this subject using an empirical framework that would allow testing of the aforementioned observations.

In summary, the digital transformation of companies in Algeria appears to be stimulating the internal audit function, but further research and more in-depth data collection are needed to confirm these findings.

8. Bibliography List:

- **Books :**

- Aubry. Mathilde, Sow.Mamadou (2021), la transformation digitale en entreprise, édition Ellipses, France ;
- Dudézert .Aurélie (2015), la transformation digitale des entreprises, synthèse de travaux du club digitalisation et organisation de l'ANVIE, France ;
- Oceane.Mingot (2019), la transformation digitale des entreprises, Edition Maxima, Paris.

- **Theses:**

- Ben Abdennebi Abir (2020), Contribution à l'étude des faiblesses du système de contrôle interne : Déterminants de divulgation et de correction dans le contexte tunisien, université de Reims Champagne-Ardenne école doctorale sciences humaines et sociales, France.

- **Journal article :**

- Allouche .José, Zerbib.Ronan (2020), la transformation digitale : enjeux et perspectives, la revue des sciences de gestion, p75, N° 301-302, Cairn ;
- Ait lemqeddem .H, Chouay .J (2020), le rôle de la digitalisation dans l'efficacité de l'audit interne, revue française d'économie et de gestion, volume 5, N°1, pp : 48-65 ;
- Bassrih Mohamed (2023), management des risques inhérents à la transformation digitale des PME : quel apport de l'audit interne, revue IJAFMAME, volume N°04, pp : 183-196 ;
- Benkaraache. T & Ghanouane. K (2020) , Modèle théorique d'évaluation de l'apport de la transformation digitale à la chaîne de valeur des entreprises, Revue Internationale des Sciences de Gestion ,Volume 3, Numéro 2, pp : 1085 –1106 ;
- Bergès. T (2002) , les nouvelles technologies de l'information et de la communication: un nouveau paradigme technologique pour les auditeurs financiers?, Technologies et management de l'information: enjeux et impacts de la comptabilité, le contrôle et l'audit, France ;
- Bia Ibtiassam (2020), le métier de l'auditeur interne à l'ère de la transformation digitale, université hassan II, casablanca ;
- Daidj .n, Tounkara.t, Bordeaux.C (2021) , le futur de l'audit IT : quelles évolutions possibles ? état de l'art-enquête, Hal science ouverte, institut mines-telecom business school, p47 ;
- Early. C (2015) , Data analytics in auditing : Opportunies and challenges, Business Horizons, Volume58, Issue 5, September–October 2015, pp: 493–500;
- Elisabeth Aubineau, Jean-Marc Pluzanski, Jean-Marie Pivard (2018), Intelligence artificielle et métiers de l'audit et du contrôle internes, Revue Française de Comptabilité, N°525 ;

- Gamoura Zahra (2018), Réflexion autour du déploiement d'un ERP (Entreprise Ressource Planning) et les contraintes spécifiquement liées à l'environnement en Algérie. Etude de cas : L'implantation d'un ERP dans une PME : Les Eaux Minérales de Messerghine (Oran, Algérie) , [Revue Organisation et Travail](#), Volume 7, Numéro 3, pp : 66-78 ;
- Moffit, K. C., Rozario, A. M., Vasarhelyi, M. A (2018), Robotic Process Automation for Auditing , *Journal of Emerging Technologies in Accounting* , pp : 1-10;
- Maskini Nadjat, Karboubi Zineb (2022), l'audit qualité à l'ère de la transformation digitale : réflexion prospective, revue ISG, université Hassan 1 er de Settat, Maroc ;
- Reis .Joao, Amorim. Marlene , Melao.Nuno et Matos .Patricia, (2018), Digital transformation : a literature review and guidelines for future research, in world conference on information systems and technologies , Springer, pp 411-421;
- Wang, C., Wang, D., Deng, X., Wang, S. (2023), Research on the Impact of Enterprise Digital Transformation on Internal Control. *Sustainability*, 15.

● **Seminar article:**

- Lafortune. A., McNeil. J (1993), L'utilisation du micro-ordinateur en vérification au Canada : Une recherche exploratoire , *Comptabilité et nouvelles technologies*, Actes du congrès de l'Association Française de Comptabilité, France ;
- Pihir. K, Pupek. T, Furjan. M.T (2018), Digital Transformation Insights and Trends, In Proc. 29th Central European Conference on Information and Intelligent Systems, pp: 141-149.

● **Internet web sites:**

- Anem (2023), les spécialités les plus demandées par les entreprises au cours des 5 dernières années, web site : <https://www.algerie-eco.com/2023/07/22/anem-les-specialites-les-plus-demandees-par-les-entreprises-au-cours-des-5-dernieres-annees/> (consulted on 30/10/2023) ;
- Deloitte. (2019), Automatisation avec intelligence , Réinventer l'organisation à l'ère de "Avec", web site : <https://www.deloitte.com/global/en/our-thinking/insights/topics/talent/technology-and-the-future-of-work/intelligent-automation-technologies-strategies.html> , (consulted on :18/08/2023) ;
- Earnest & Young. (2018), Comment l'intelligence artificielle transformera l'audit , web site : https://www.ey.com/fr_ca/assurance/how-artificial-intelligence-will-transform-the-audit#:~:text=Parmi%20les%20exemples%20d'application,avec%20un%20examen%20manuel%20traditionnel. (consulted on : 18/08/2023) ;
- emploi-Partner (2023), les métiers les plus demandés, <https://fr.linkedin.com/pulse/les-m%C3%A9tiers-plus-demand%C3%A9s-en-alg%C3%A9rie-2023-emploiartner> , (consulted on 30/10/2023) ;

- le Secrétaire Général du Gouvernement (2022), communication premier ministre, web site : <http://www.premier-ministre.gov.dz> (consulted on 30/10/2023) ;
- LinkedIn (2023), les 15 métiers d'avenir, web site : <http://www.timesalgerie.com/emploi-linkedin-revele-les-15-metiers-davenir/>, (consulted on 30/10/2023) ;
- Price Water Coopers (2019), L'impératif de digitalisation de l'audit interne, web site : <https://www.pwc.ch/en/insights/risk/future-of-risk-2019/internal-audits-digitalisation-imperative.html> (consulted on 18/08/2023) ;
- **Reports :**
 - Djaffer Louai (2022), « perspectives de recrutement », Emploitic, Algeria ;
 - European Institutes of Internal Auditors (2019), «Risk Focus»; 3ème Edition, France;
 - IFACI (2011), cahier de recherche : des clés pour la mise en œuvre et l'optimisation du contrôle interne, du bon usage de référence de contrôle interne de L'AMF, P99, Paris ;
 - Tadjeddine Bachir (2022), « le e-gouvernement en Algérie, selon l'enquête des nations unis », GAAN, Algeria ;
 - Vermeren.Yohann & Guillaume Cuisset (2016), « Etat des lieux de l'utilisation de l'analyse de données au sein de l'audit interne », KPMG, N°08, France.