Chapter 9
The Application of Robotic Process Automation (RPA) in Accounting: The Perspective of the Lebanese Economic Crisis

Farag Edghiem
Institute of Management Greater Manchester, UK

Noha Hariri
Institute of Management Greater Manchester, UK

Eman S. Alkhalifah
Princess Nourah Bint Abdulrahman University, College of Arts and Design, Saudi Arabia

ABSTRACT

The Lebanese economy has been experiencing dramatic changes marking political and financial waves of reform and turmoil over the last decade, and specifically after the latest consecutive recessions. All sectors of the local economy had been substantially affected by the economic recession. The accounting system which is directly connected with business sectors was hindered by the economic crisis developments where the compliance of business entities that are on the verge of collapse with IPSASs (International Public Sector Accounting Standards) became extremely problematic. This chapter explores robotic process automation (RPA) in the accounting domain from the perspective of the Lebanese economic crisis.

INTRODUCTION

The Lebanese economy has been experiencing dramatic changes marking political and financial waves of reform and turmoil over the last decade, and specifically after the latest consecutive recessions. All sectors of the local economy had been substantially affected by economic recession. The accounting sys-

DOI: 10.4018/978-1-7998-9815-3.ch009

tem which is directly connected with business sectors was hindered by the economic crisis developments where the compliance of business entities that are on the verge of collapse with IPSASs (International Public Sector Accounting Standards) became extremely problematic. This chapter aims to illustrate the major emerging challenges to the Lebanese accounting system and SMEs compliance with accounting standards IPSASs. In view, the factors that emerged amid the Lebanese economic crisis, such as the fluctuation of currency exchange rate, the evaluation of stocks and their impact on importing and exporting businesses and accounting practices, will be explored. The theoretical framework provided in this chapter highlights the key studies addressing the challenges to Lebanese SMEs and accounting system in terms of reporting and compliance with accounting standards IPSASs. Accordingly, this chapter provide valuable and useful insight to theory and Lebanese SMEs' practitioners and regulators.

ASPECTS OF THE LEBANESE CRISES

Since the year 2011 the Lebanese economy growth started to decline marking a series of political turmoil and unrests in neighboring countries (Asonitou and Hassal, 2019). A combination of political crisis and economic recessions accompanied with venomous protests had stagnated the economy until the crisis reached its peak in August 2020. Both the explosion of Beirut port and the Covid-19 virus outbreak added substantial constrains that led to an extensive economic crisis (Ryan *et al.,* 2020). The influx of refugees from neighboring countries aggravated the economic crisis by limiting job opportunities and the personal income (Makdissi and Tannous, 2020) There was no escape from rising public debts, estimated at 172% in 2020 and made Lebanon to be the third most indebted country in the World (Waymire and Basu, 2011). The local currency deteriorated rapidly and the International Monitory Funds estimated inflation rate to phenomenally escalated from 2.9% in 2019 to 85.5% 2020 to affect all Lebanese economic sectors.

Over decades, successive governments have borrowed huge loans from local and foreign creditors. Half of the country's income goes to pay off the creditors' debt, and the majority of the remaining income is used to pay the salaries of public employees leaving a small proportion for productive investments (Nasrallah and El Khoury, 2021). The Lebanese government did not have many feasible solutions but to raise impose a new tax system which led to unprecedented levels of inflation, deterioration of the national currency and a sharp fall in personal income and savings values. The worldwide breakout of the Covid-19 virus additionally affected the Lebanese economy and necessitated imposing more than one lockdown to deepen the economic crisis (Serhan, 2020). Many businesses were forced to close their doors to contain the spread of the virus leading to further revenue cuts and staff numbers being slashed. As indicated in international reports, Lebanon sustained 6.5% contraction in 2019, and regionally the country scored the 2nd largest negative economic projection for 2020 (Nasrallah and El Koury, 2021).

A series of political protests took place in Lebanon in October 2019, known as 'October revolution' and which was triggered by imposing excessive taxes on essential commodities such like gasoline and utility bills, and non-essentials like tobacco and Voice over Internet Protocol (VoIP) calls applications. These protests expanded rapidly in retaliation to the government's chronic failure to provide basic services such as the supply of water and electricity (El-Gammal, 2012). The protests engaged the public opinion that demanded control over the unacceptable level corruption that hindered the political and economic development in Lebanon. Eventually, the explosion of the main port in the Lebanese capital Beirut on 4 August 2020 forced the government to resign leaving Lebanon in profound economic, health and political crises (Serhan, 2020).

LEBANESE SMES AND THE ACCOUNTING SYSTEM

Prior and during the current economic crisis, the state economy in Lebanon heavily depends on small and medium enterprises SMEs contribution (Nasrallah and El Khoury, 2021). SMEs can attract fresh funds from investors and generate revenues from customers (Kemayel, 2015), 98% of SMEs provide the main sources of export and import earnings and contribute around 67% of employment opportunities (Majzoub and Aga, 2015). Potentially, SMEs largely contribute to mitigate the impact of the current crisis and increase resilience against the unstable Lebanese economy structure (Makdissi and Tannous, 2020). Makdissi *et al.* (2016), proposed that the absence of a plan for economic development to support businesses had negatively affected the role of SMEs in the national economy growth. The lack of coordination between different stakeholders obstructed the business sector's improvement while the latter may be a viable solution to maintain economic growth (Elbahnasawy *et al.,* 2016; Malaeb, 2018).

The collective impact of the consecutive crises in Lebanon hampered Lebanese businesses where banks ceased business lending to provide the essential capital to businesses to fund its operations. The interest rate substantially increased due to the declining value of the Lebanese currency that lost about 75% of its original value (Ahmad and Nasseredine, 2019). In general, problems of economic structure accompanied with consecutive economic crises posed as detrimental challenges to the Lebanese business sector (Makdissi and Tannous, 2020).

Businesses and governments are obliged to provide financial statements and to reflect true and fair values of their financial positions and subsequently ensure that the credibility and transparency of statements are maintained to reflect honesty in handling private and public funds (Barton, 2009). Lebanon's accounting system adopts the International Public Sector Accounting Standards IPSASs system but there are still concerns of the actual compliance with this system's standards. The challenges to the implementation of IPSASs in Lebanon could be classified under the three main categories listed in the subsequent sections.

From a legal perspective and according to Ali and Stefan (2019), Lebanon is one of the Mediterranean countries which have a strong legal framework but due to its political instability the actual implementation of the legislations is frequently stalled. This has affected economic stability and limited law enforcement through government bodies monitoring discretionary application of accounting and reporting (El-Gammal, 2012). Another main barrier is the cost implication. Lebanon accounting system considers implementing IPSASs as a basic requirement to produce consolidated financial statements for all controlled companies which is time consuming and very costly, especially in a country that is suffering a financial regression and economic deterioration (Kemayel, 2015). Adding to the cost implication the lack of government support, resistance to change in the accounting system and a lack of understanding of the importance of IPSASs (Ahmad and Nasseredine, 2019) makes it difficult for business to comply with these standards.

The fluctuation of the Lebanese currency adds further difficulty to the accounting practice as the price of imported goods varies highly at certain times as the exchange rate fluctuates. In view, it would be extremely difficult to comply with principle accounting standards such as the FIFO (First In First Out) rule whilst businesses tend to apply the LIFO (Last In First Out) rule instead (Hakim and Bizri, 2015). The appraisal of assets may also be problematic for the accounting practice, due to the fluctuating Lebanese currency rate, to accurately report in businesses or government financial statements in view of complying with IPSASs (Makdissi and Tannous, 2020). The Lebanese government introduced some measures to overcome the above challenges which require accountants to sufficiently learn the accounting standards, undertake relevant training and replacing the outdated accounting software (Malaeb, 2018).

AUTOMATION IMPLICATION IN THE ACCOUNTING PRACTICE

The accounting practice is fundamentally based on accuracy, transparency and consistency when recording or reporting financial accounts (Serhan, 2020). The application of Robotic Process Automation RPA is widely perceived to provide a competitive edge to accounting practices to realise these requirements to a high standard. Accounting processes follow sophisticated rules and procedures that are relatively convenient to achieve through automation (Jedrzejka *et al.,* 2019). However, there are preconditions for RPA set up including the cost of implementation and RPA software (Ghasemi *et al.,* 2011). In comparison to manual processing of financial accounts, RPA can save the time and effort by reducing error margins, providing tracking checks, managing and approving documents. The accounting practice is typically task intensive; time and tedious effort are critical challenges for accountants when manually handling transactions, collecting data from fragmented systems and then processing the accounts (Fernandez and Aman, 2018).

Before the start of the millennium accounting jobs such as payroll clerks and bookkeepers were predicted to be substituted (see for example Kerremans *et al.,* 1991). Technology develops to decrease the use of labor along with creating new opportunities at more creative and advanced levels. However, technology is developing at a higher speed than expected to undermine some professions and create new avenues of employment which requires upskilling to an unprecedented level to secure employment (Serhan, 2020). The accounting practices have been widely influenced by automation which requires accounting professional bodies to set strategies that contain the impact of automation on employment, such as when computers replaced the function of bookkeepers and payroll clerks (Fernandez and Aman, 2018). Specifically, the accounting job market in Lebanon needs to be somewhat protected as successive governments are widely accused to fail in safeguarding the public interest effectively (Rkein *et al.,* 2019; Serhan, 2020).

The government initiatives to support the automated transformation of the Lebanese accounting practice are criticised for not supporting the accounting workforce with sufficient training and upskilling to accommodate the automation transition in the accounting practice (Ghasemi *et al.,* 2011). Lebanese accountants, like in other developing countries, experienced difficulty in understanding the technological accounting guidance whether in relation to ISAPS or IFRS (Rkein *et al.,* 2019). The absence of a supportive organisational vision on automation adds further complexities to the accounting profession while the country is undergoing economic regression, structural changes and political instability (Rkein *et al.,* 2019). Accountants in Lebanon are additionally under pressure due to poorly implemented accounting RPA which may cause inaccuracy in financial reports or sometimes incomplete reports which may cause serious damage to any business's reputation (Rkein *et al.,* 2019). Automation errors can affect the accuracy of accounts and consequently the quality of annual reports and regulatory compliance which may result in fines and sanctions (Fosber *et al.,* 2009).

In contrast, the increase in speed, accuracy, and volume capacity of computers compared to their existing human counterparts are the key reasons for the integration of artificial intelligence (AI) into business processes (Ali & Abdel-Haq, 2021; Jarrahi, 2018). For example, portfolio performance is analysed by traders and investors who make automated market predictions using an intelligent computer system known as "Kensho." Rkein et al. (2019) confirm that Robotic Process Automation (RPA) has transformed traditional auditing practises by enabling accounting firms to improve audit quality, business processes, and services. Auditors are expected to perform at a higher level because their time will be freed up for more important tasks. Additionally, automation has spawned new fields of application

Table 1. Impacts of automated accounting

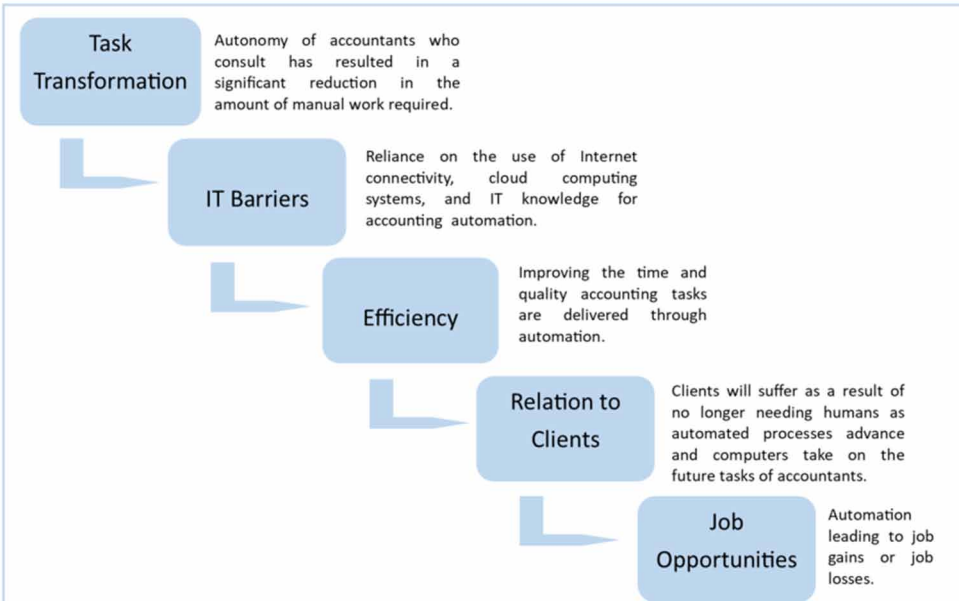
Impact	Description
Task Transformation	The autonomy of accountants who consult has resulted in a significant reduction in the amount of manual work required. On the other hand, accounting consultants can concentrate on providing analytical services. As a result, consultants have more time to devote to their clients' and businesses. Due to the increasing automation of routine tasks, advisory services have grown in popularity over the last few years.
Relationship with clients	Associate accounting consultants do not view automated processes as a negative development. As a result of automation, new services, such as consulting, will emerge, and more advanced and beneficial services will be provided, increasing the number of customers. The introduction of new services, particularly advanced consulting, will increase the demand for face-to-face customer interaction. Regardless of how advanced automation becomes (Sun & Lu, 2017), computers will never completely replace humans. According to scientists, computers and programmes are insufficient for tasks such as data analysis and interpretation.
Efficiency	Automation and the resulting reduction in manual handling allow the consultant to devote more time to other tasks.
IT Barriers	Sun and Lu (2017) assert that modern computers and software are woefully inadequate. Despite increased confidence in automation, accounting consultants continue to view misstatement risks as a contemporary issue. Additionally, automated accounting requires less human intervention, which results in decreased downtime and increased security. Consultants have had to deal with accountants being unable to perform their duties due to a lack of Internet access and power. Dimitriu and Matei (2014) argued that hacker attacks would cause significant damage to accounting firms in terms of data loss and disruption.
Job Opportunities	Automated accounting, according to Frey and Osborne (2017), will result in job losses. Automation reduces the amount of human intervention required in a process. Accounting assistants are frequently assigned repetitive tasks that are ripe for automation. Accounting consultants with less experience or accounting assistants are in a surrender risk zone. According to Shim and Yang (2018), employees with a low level of education are being pushed out of their jobs unless they develop a more cognitive orientation in order to retain their jobs. When developing new competencies, cognitive tasks are frequently performed by a senior accountant or more experienced professional, ensuring that these professionals are not replaced in the future. On the other hand, few believe that computers will soon be capable of performing some of these functions. As automated accounting becomes more prevalent, the number of accountants available to fill open positions will decrease.

as a result of the new competencies required. It is possible to automate evidence collection and complex data report generation using predictive analytics (Edwards & Edwards, 2016; Fitz-enz & Mattox, 2014; Logic, 2018), thereby saving time and improving customer service.

Other researchers express reservations about automation's ability to stimulate innovation in new applications and competencies. Rkein et al. (2019) asserts that the number of new graduates employed by companies is expected to decline significantly as AI tools are increasingly being used to replace the work performed by new graduates, resulting in expectations of a significant decline in graduate employment by these companies. Automation conjures up images of a human worker performing the same tasks as a machine in people's minds. Employees, particularly at the highest levels, cannot be replaced. It makes no difference how advanced systems and technology become; human beings will always be required to strategize, influence, and collaborate with key stakeholders to improve financial and business performance. Therefore, people working in finance must be prepared and adaptable when it comes to automation. Although accounting firms and consultants can anticipate a number of benefits from automated accounting, Table 1 summarises the key impacts of automation on accounting firms based on five critical points.

As previously stated, accounting professionals have mixed feelings about automation, making it difficult for others to adopt automated processes. When negative attitudes and distrust of systems are overcome, others are encouraged to express their opinions. Despite this, there are some positive outcomes. Account-

Figure 1. Model of automation impacts on financial sector



ing professionals' jobs will become easier as a result of automation, which is one of the primary reasons for their optimistic outlook. According to Rkein et al. (2019), automated systems enable professionals to be strategic and develop into true business partners, thereby improving their employment experience and perceived value within the organisation. Financial controllers may be able to predict potential problems based on patterns in big data (Ali & Edghiem, 2021; Subrahmanyam, 2019). What matters most in the long run is how data is used in the workplace. By analysing this data, businesses can make more informed decisions and strategic moves. As a result, big data is critical to the accounting profession.

IMPLICATIONS OF AUTOMATED ACCOUNTING IN LEBANON

Since this chapter aims to contribute to automated accounting in the Lebanese context, this motivation is inspired by researchers in Lebanon encouraged to conduct similar studies to gain a better understanding of the impact of automation on various accounting jobs and the readiness of the Lebanese and regional labour markets to address advanced needs for accountants and auditors capable of acting as informed consultants and strategists in the face of automation. Using the five impact areas in the previous section, this section analyses the situation in Lebanon with respect to automated accounting. Based on the five impact areas discussed below, the following model demonstrates the current automation impacts on the Lebanese financial sector.

Task Transformation

Due to the elimination of manual journal entries and tasks, Lebanese accountants can now focus exclusively on analytical services. According to Frey and Osborne (2017), accountants have the opportunity

to improve their cognitive abilities, critical thinking, and ethical values as entry-level tasks are now automated. However, the accountant's sole responsibility is to ensure that the journal entries are accurate. According to Alarcon and Staut (2017), the rise of automation has resulted in an increase in critical thinking and judgement. In the Lebanese context, performing manual labour will advance to more strategic roles, while employees already in strategic roles will advance (Rkein et al., 2019).

IT Barriers

The adoption of automated accounting is expected to result in an increase in the use of Internet connectivity, cloud computing systems, and IT knowledge (Ali, 2020; M. Ali, 2019; Ali et al., 2020). Dimitriu et al. (2014) have argued that hacker attacks result in data loss and disruption. Anyone looking to steal data from a computer will view it as an excellent opportunity to hack or even sabotage the system, demonstrating that the organisation has a lack of control over accounting processes and data. Cloud Accounting Software, it is claimed, will eventually revolutionise the accounting profession by enhancing financial operations, client interaction, and the speed and efficiency with which clients' needs can be met on a timely basis (Rkein et al., 2019). By automating evidence collection and complex data reporting, predictive analytics can save time and improve client service. AI, for example, has advanced to the point where machines can replicate human expertise by extracting data from complex documents. This can be perceived as a threat and an opportunity for the Lebanese financial sector because where automation may result in job losses, there will always be the need for human interaction and intervention to keep automotive practices in check.

Efficiency

Automation can increase an accounting firm's efficiency improving the time and quality accounting tasks are delivered. Rather than writing and filing reports and then designing vouchers, automation streamlines all of these operations into a single double-click process, resulting in tasks being completed and reported in less time. According to several authors, cloud computing provides a competitive advantage for small and medium-sized businesses (SMEs) by making it easier for them to access cost-effective, dependable, and adaptable information technology (IT) solutions (Ali, 2019; Ali et al., 2020; Velayutham, 2021). This is a potential gain for the Lebanese financial sector given the demand for such technologies in the country to improve businesses process (Ben Hassen, 2018).

Relation to Clients

Clients will suffer as a result of no longer needing humans as automated processes advance and computers take on the future tasks of accountants. For accountants, automation had a sizable positive effect on their firm's clients. Due to technological advancements, accountants can now communicate with and serve their clients thousands of miles away simply by sending emails. If the client relationship is not handled properly, it may even come to an end (Taipaleenmäki & Ikäheimo, 2013). According to the authors, accounting consultants are frequently mistaken for computers when processes are automated, as the system handles the majority of the tasks automatically. On the other hand, Sun Lu (2017) believes that computers will never be able to completely replace humans in terms of critical thinking, analytical abilities, and the capacity to make judgments. Alternatively, AI can be used to automate accounting tasks, which is

another great opportunity for the Lebanese financial sector as they can benefit from utilising existing human capital, while introducing new innovations that may not pose as much of a threat as perceived.

Job Opportunities

While technology will almost certainly create more jobs than it destroys, some industries will see more job losses than gains due to automation, resulting in fluctuations in the Lebanese economy. Businesses and government agencies are more likely to invest time and money in determining how automation can complement their current operating models and what this means for their employees. According to Frey and Osborne (2017), accounting automation will eliminate entry-level and repetitive tasks, resulting in job losses and decreased human interaction with the process. While simple accounting tasks may be automated, automation serves as a third hand for the accountants and has no bearing on their career.

Similarly, financial controllers may now be able to anticipate problems based on big data patterns, rather than focusing exclusively on detecting problems after they occur (Subrahmanyam, 2019). Machines will enable accountants to collaborate on decisions, thereby improving their work experience and perceived value within the organisation. What matters most is how organisations use data. It can be used to analyse collected data in order to make more informed business decisions and strategic business moves. Cognitive tasks, such as critical thinking, are therefore immune to automation in the future. Vermeulen et al. (2018) established this by arguing that job losses in 'applying' sectors are offset by job gains in complementary, quaternary, and spill over sectors. Numerous macro-level employment scenarios have been examined, and rather than facing the 'end of work,' humanity is confronted with usual structural change, which presents a degree of uncertainty concerning the impact of automation on the Lebanese financial sector and economy.

CONCLUSION

The consecutive crises in Lebanon have drawn attention to specific implications of robotic process automation RPA in the country and beyond in similar countries in the Middle East region. Typical shortfalls of accounting practices, in view of the Lebanese economic crisis, can include tax evasion, shortage of skills or employment cost. Further challenges to the accounting practice are the lack of transparency and accountability resulting in poor corporate reporting (Adamu and Ahmed, 2014; Naimy, 2014) that could be aggravated during the economic crisis (Pozzoli and Ranucci, 2020) to make compliance with international financial reporting standards IFRS extremely difficult.

According to Schnifer and Weder (2001), the implementation of IFRS in Asian countries, such as Lebanon, became quite problematic. Ahmad and Nasseredine (2019), proposed that Lebanese accountants have been encountering challenges when trying to apply IPSASs, particularly in relation to the evaluation of business assets such as inventories. Some businesses modified their accounting practices in order to improve or maintain their current financial performance (Hakim and Bizri, 2015). The integrity of the Lebanese accounting profession at large is increasingly challenged to cope with the deteriorating economic situation in terms of maintaining accurate financial reporting. The need reform of the current accounting practices is urgent to ensure the compliance with accounting standards and reflect accurate financial reporting to avoid alienating investment capital (Bank, 2010; Beschel and Ahern, 2015).

Although RPA application is widely believed to help overcome the aforementioned challenges, RPA implementation may be perceived with some skepticism in relation to the Lebanese economic crises. Employment opportunities in general and in accounting specifically may be slashed as a consequence of RPA to add additional pressure on the economy. Other drawbacks of RPA may also persist, such as when automation errors affect the accuracy of corporate reports and regulatory compliance as highlighted in the study of Perera and Chand (2015). This effect may be more intense in countries that are experiencing dynamic economic changes (Rkein *et al.,* 2019). The economic crisis in Lebanon had a profound effect on regulatory systems, businesses and accounting practices where poorly implemented RPA would impact the accuracy of financial reporting and the consequent investment or regulatory decisions (Fosbre *et al.,* 2009).

The body of research on RPA application in the Lebanese accounting sector may still be at an infancy stage but it has escalated in recent years, especially in response to the profound crises that unsterilised the country's economic sectors. As we illustrate the scope of the current Lebanese economy, the implications and challenges to RPA in accounting practices, we propose that future research should explore the implications of RPA from individual/accounting employee's behavior perspectives to look into the relevant skills set and acceptance of RPA. Future research should also explore the impact and application of RPA processes in different Lebanese business sectors.

REFERENCES

Adamu, S. A., & Ahmed, A. D. (2014). IPSASs and Nigerian public sector: The challenges of first time adopters. *International Journal of Social Sciences and Humanities Innovations*, *2*(1), 151–160.

Ahmad, A. S., & Nasseredine, H. (2019) Major Challenges and Barriers to IPSASs Implementation in Lebanon. *Proceedings of the International Conference on Business Excellence*, *13*(1), 326-334. 10.2478/picbe-2019-0029

Alarcon, J., & Staut, M. T. (2017). The Internet of Things: The CPA's Role in the New World of Business. *Pennsylvania CPA Journal*, *1*, 26–31.

Ali, K., & Stefan, I. B. (2019) The study of Accountants Perceptions of Different Security Systems Adopted in the Public Accounting Sector in Lebanon. *Proceedings of the International Conference on Business Excellence*, *13*(1), 335-346.

Ali, M. (2019). Cloud Computing at a Cross Road: Quality and Risks in Higher Education. *Advances in Internet of Things*, *9*(3), 33–49. doi:10.4236/ait.2019.93003

Ali, M., & Abdel-Haq, M. K. (2021). Bibliographical Analysis of Artificial Intelligence Learning in Higher Education: Is the Role of the Human Educator and Educated a Thing of the Past? In Fostering Communication and Learning With Underutilized Technologies in Higher Education (pp. 36-52). IGI Global.

Ali, M., & Edghiem, F. (2021). Sustainable Business and Collaboration Driven by Big Data Analytics Amidst the Emergence of the Remote Work Culture. In *Remote Work and Sustainable Changes for the Future of Global Business* (pp. 15–32). IGI Global. doi:10.4018/978-1-7998-7513-0.ch002

Ali, M. B., Wood-Harper, T., & Ramlogan, R. (2020). A Framework Strategy to Overcome Trust Issues on Cloud Computing Adoption in Higher Education. In Modern Principles, Practices, and Algorithms for Cloud Security (pp. 162-183). IGI Global. doi:10.4018/978-1-7998-1082-7.ch008

Ali. (2019). Multiple Perspective of Cloud Computing Adoption Determinants in Higher Education a Systematic Review. *International Journal of Cloud Applications and Computing, 9*(3), 89-109.

Ali. (2020). Multi-Perspectives of Cloud Computing Service Adoption Quality and Risks in Higher Education. In D. B. A. Mehdi Khosrow-Pour (Ed.), *Handbook of Research on Modern Educational Technologies, Applications, and Management* (2nd ed.). IGI Global.

Asonitou, S., & Hassall, T. (2019). Which skills and competences to develop in accountants in a country in crisis? *International Journal of Management Education*, *17*(3), 100308. doi:10.1016/j.ijme.2019.100308

Bank, W. (2010). *Global Development Finance 2010: External Debt of Developing Countries*. World Bank Publications. doi:10.1596/978-0-8213-8229-5

Barton, A. (2009). The use and abuse of accounting in the public sector financial management reform program in Australia. *Abacus*, *45*(2), 221–248. doi:10.1111/j.1467-6281.2009.00283.x

Ben Hassen, T. (2018). Knowledge and innovation in the Lebanese software industry. *Cogent Social Sciences*, *4*(1), 1509416. doi:10.1080/23311886.2018.1509416

Beschel, R. P. J., & Ahern, M. (2015). *Public Financial Management Reform in the Middle East and North Africa: An Overview of Regional Experience*. World Bank.

Dimitriu, O., & Matei, M. (2014). The expansion of accounting to the cloud. *SEA–Practical Application of Science*, *2*(4), 237–240.

Edwards, K., & Edwards, M. R. (2016). *Predictive HR Analytics: Mastering the HR Metric*. Kogan Page. https://books.google.co.uk/books?id=yOqnCwAAQBAJ

El-Gammal, W. (2012). Determinants of audit fees: Evidence from Lebanon. *International Business Research*, *5*(11), 136. doi:10.5539/ibr.v5n11p136

Elbahnasawy, N. G., Ellis, M. A., & Adom, A. D. (2016). Political instability and the informal economy. *World Development*, *85*, 31–42. doi:10.1016/j.worlddev.2016.04.009

Fernandez, D., & Aman, A. (2018). Impacts of robotic process automation on global accounting services. *Asian Journal of Accounting and Governance*, *9*, 123–132. doi:10.17576/AJAG-2018-09-11

Fitz-enz, J., & Mattox, J. (2014). *Predictive Analytics for Human Resources*. Wiley. https://books.google.co.uk/books?id=PunoAwAAQBAJ

Fosbre, A. B., Kraft, E. M., & Fosbre, P. B. (2009). The globalization of accounting standards: IFRS vs. US GAAP. *Global Journal of Business Research*, *3*(1), 61–71.

Frey, C. B., & Osborne, M. A. (2017). The future of employment: How susceptible are jobs to computerisation? *Technological Forecasting and Social Change*, *114*, 254–280. doi:10.1016/j.techfore.2016.08.019

Ghasemi, M., Shafeiepour, V., Aslani, M., & Barvayeh, E. (2011). The impact of Information Technology (IT) on modern accounting systems. *Procedia: Social and Behavioral Sciences*, *28*, 112–116. doi:10.1016/j.sbspro.2011.11.023

Hakim, R. R., & Bizri, R. M. (2015). The education gap in the accounting profession evidence from Lebanon. *World Review of Business Research*, *5*(3), 13–29.

Jarrahi, M. H. (2018). Artificial intelligence and the future of work: Human-AI symbiosis in organizational decision making. *Business Horizons*, *61*(4), 577–586. doi:10.1016/j.bushor.2018.03.007

Jędrzejka, D. (2019). Robotic process automation and its impact on accounting. *Zeszyty Teoretyczne Rachunkowości*, *161*(105), 137–166. doi:10.5604/01.3001.0013.6061

Kemayel, L. (2015). Success factors of Lebanese SMEs: An empirical study. *Procedia: Social and Behavioral Sciences*, *195*, 1123–1128. doi:10.1016/j.sbspro.2015.06.158

Kerremans, M., Theunisse, H., & Van Overloop, G. (1991). Impact of automation on cost accounting. *Accounting and Business Research*, *21*(82), 147–155. doi:10.1080/00014788.1991.9729827

Logic, R. (2018). *Predictive and Prescriptive Analytics: Your Supply Chain Needs Both*. Retrieved 13th May from https://blog.riverlogic.com/predictive-and-prescriptive-analytics-supply-chain-needs-both

Majzoub, S., & Aga, M. (2015). Characterizing the gap between accounting education and practice: Evidence from Lebanon. *International Journal of Business and Management*, *10*(12), 127–132. doi:10.5539/ijbm.v10n12p127

Makdissi, R., Khawaja, D., & Mekdessi, S. (2016). SMEs Awareness of Global Performance Issues; Case of Lebanon and Romania. *Journal of Business and Management*, 49–56.

Makdissi, R., & Tannous, J. (2020). Funding Challenges Facing SMEs' Growth in Lebanon. *International Journal of Business and Economics Research*, *9*(1), 50. doi:10.11648/j.ijber.20200901.16

Malaeb, O. (2018). Small and Medium Enterprises in Lebanon: Obstacles and Future Perspectives. *Management*, *8*(1), 175–193.

Naimy, V.Y. (2004) Financing problems faced by the Lebanese SMEs: An empirical study. *International Business & Economics Research Journal, 3*(1).

Nasrallah, N. & El Khoury, R. (2021) Is corporate governance a good predictor of SMEs financial performance? Evidence from developing countries (the case of Lebanon). *Journal of Sustainable Finance & Investment*, 1-31.

Perera, D., & Chand, P. (2015). Issues in the adoption of international financial reporting standards (IFRS) for small and medium-sized enterprises (SMES). *Advances in Accounting*, *31*(1), 165–178. doi:10.1016/j.adiac.2015.03.012

Pozzoli, M., & Ranucci, S. (2013). The process of implementing the accounting harmonisation in the Italian Local Governments: The case of Prato. *International Journal of Business Research and Development*, *2*(3). Advance online publication. doi:10.24102/ijbrd.v2i3.335

Rkein, H., Issa, Z. A., Awada, F. J., & Hejase, H. J. (2019). *Does Automation of the Accounting Profession Affect Employability? An Exploratory Research from Lebanon*. Open Journal of Business and Management.

Rkein, H., Issa, Z. A., Awada, F. J., & Hejase, H. J. (2019). Impact of Automation on Accounting Profession and Employability: A Qualitative Assessment from Lebanon. *Saudi Journal of Business Management*, *4*, 372–385.

Ryan, S. G. (2008). Accounting in and for the subprime crisis. *The Accounting Review*, *83*(6), 1605–1638. doi:10.2308/accr.2008.83.6.1605

Schiffer, M., & Weder, B. (2001). *Firm size and the business environment: Worldwide survey results*. The World Bank. doi:10.1596/0-8213-5003-X

Serhan, A. (2020). Development of Accounting Information Systems and the Barriers Faced in Developing Nations. *Business Excellence and Management*, *10*(2), 84–96. doi:10.24818/beman/2020.10.2-06

Shim, M., & Yang, H.-S. (2018). Interindustry wage differentials, technology adoption, and job polarization. *Journal of Economic Behavior & Organization*, *146*, 141–160. doi:10.1016/j.jebo.2017.11.014

Subrahmanyam, A. (2019). Big data in finance: Evidence and challenges. *Borsa Istanbul Review, 19*(4), 283-287.

Sun, Z., & Lu, X. (2017). Fault Detection and Diagnosis System in Process industry Based on Big Data and WeChat. *MATEC Web Conf.*, 139. 10.1051/matecconf/201713900008

Taipaleenmäki, J., & Ikäheimo, S. (2013). On the convergence of management accounting and financial accounting – the role of information technology in accounting change. *International Journal of Accounting Information Systems*, *14*(4), 321–348. doi:10.1016/j.accinf.2013.09.003

Velayutham, S. (2021). *Challenges and Opportunities for the Convergence of IoT, Big Data, and Cloud Computing*. IGI Global. https://books.google.co.uk/books?id=IXkSEAAAQBAJ

Vermeulen, B., Kesselhut, J., Pyka, A., & Saviotti, P. P. (2018). The Impact of Automation on Employment: Just the Usual Structural Change? *Sustainability*, *10*(5), 1661. Advance online publication. doi:10.3390u10051661

Waymire, G., & Basu, S. (2011). Economic crisis and accounting evolution. *Accounting and Business Research*, *41*(3), 207–232. doi:10.1080/00014788.2011.574266