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DATA SCIENCE FOR LEBANON'S PUBLIC POLICY

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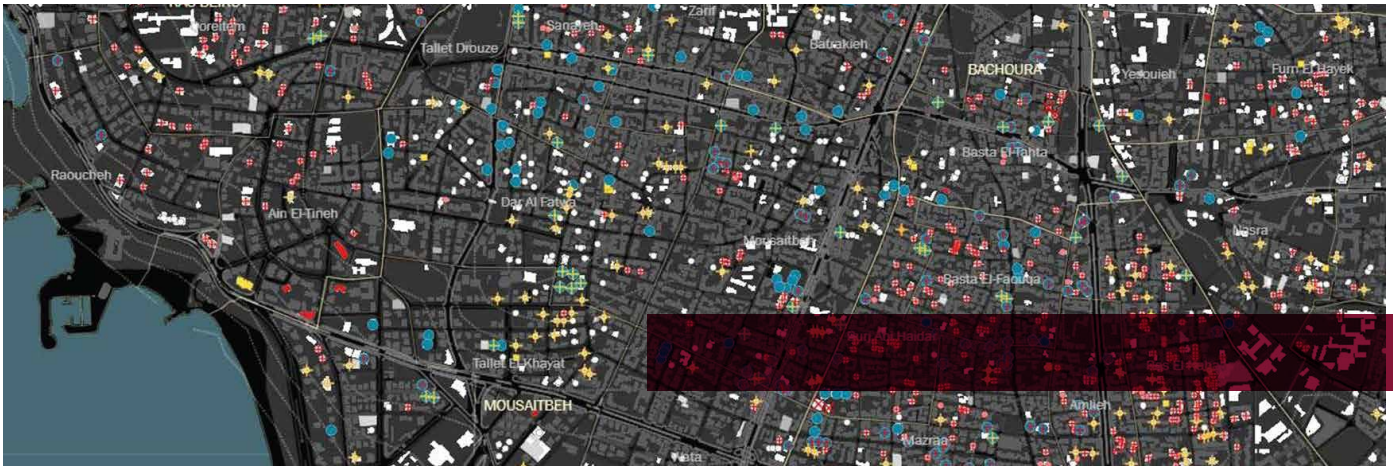
This policy brief examines the impact of data science on the public sector in the Middle East and North Africa (MENA) region in general, with a particular focus on Lebanon, based on insights from discussions and technical talks of invited data science experts at the 2023 Women in Data Science (WiDS) conference at the American University of Beirut (AUB), held on April 27-28, 2023, at the Suliman S. Olayan School of Business at AUB. The report also utilizes existing secondary data on the current situation of data science in Lebanon specifically and the MENA region more broadly.

The brief starts with an overview of the importance of data science in decision-making. Then, it presents a review of data science in public sectors across the MENA region, with emphasis on key success stories of how data science has improved the public sector in several MENA countries. The brief then focuses on the case of Lebanon, highlighting how data science can be used to improve the public sector in Lebanon, provide better disaster preparedness, and help mitigate the financial and economic crises in the country. The brief concludes with policy recommendations and interventions on how Lebanon can harness the potential of data science to drive improvements in governance, policy formulation, disaster management, and public service delivery, ultimately enhancing the overall performance of the public sector.

Overview of the Importance of Data Science in Policy and Decision Making

In today's data-driven world, the increasing importance of data science in decision-making has become evident across various sectors, including the public sector. Data analysis refers to the process of examining large sets of data to uncover patterns, trends, and insights that can inform informed decision-making (Lazarevska, Tocev, and Dionisijev, 2022). With the vast growth of data and advancements in technology, decision-makers now have access to vast amounts of data that can be connected to gain valuable insights and make evidence-based decisions. Data analysis allows decision-makers in the public sector to move beyond intuition and anecdotal evidence, enabling them to identify patterns, predict outcomes, and evaluate the effectiveness of policies and programs (Mikalef , Boura , Lekakos , and Krogstie, 2019). By leveraging data analytics techniques such as statistical modeling, data visualization, and predictive analytics, decision-makers can make more informed choices, optimize resource allocation, and enhance the efficiency and effectiveness of public services. Moreover, data analytics facilitates proactive decision-making by identifying emerging trends and potential risks, enabling policymakers to devise timely and targeted interventions (Mikalef et al., 2019). As a result, data analytics in decision-making processes has become increasingly imperative for the public sector, driving improvements in governance, policy formulation, and service delivery.

Data science has an immense potential to improve the public sector in several ways. The high importance of data science in improving the sharing, transparency, and accountability in government decision making, highlights the intersection of data science and public policy. Digital transformation of nontraditional data sources has allowed for deeper quantitative analysis in the policy process (Diermeier, 2023). The demand for increased access to data and evidence-based solutions has grown among policymakers. However, the scarcity of individuals trained in both public policy and data science poses a challenge in realizing the social benefits of collecting and analyzing government data. Therefore, it is keen to address this shortage through developing expertise in quantitative policy analysis and, establishing a hub for education and research in data science and public policy. By utilizing data analytics and advanced algorithms, data science can enable evidence-based decision – making, leading to more effective public policies (Diermeier, 2023).



How Data Science Has Advanced the Public Sectors in the MENA Region

Data science has brought about significant impact on the public sectors in the MENA region. By leveraging data-driven insights, policymakers are making more informed decisions and implementing targeted policy interventions. Improved service delivery optimized urban planning, and better healthcare management have resulted from data-driven approaches. Additionally, data science has enhanced public safety measures, fostered economic growth, and promoted innovation in the region. Overall, the integration of data science in the public sector has led to greater efficiency, effectiveness, and evidence-based decision-making, positively influencing various aspects of governance and public service delivery in the MENA region (KPMG and Microsoft, 2021).

Open data initiatives, for example, have played an essential role in promoting transparent and accountable governance, allowing citizens to access and analyze government data, thus fostering trust in public institutions and encouraging citizen engagement. Moreover, with the right data foundations in place, Artificial Intelligence (AI)-driven solutions are being sought to enhance public services. For instance, in various MENA countries like the United Arab Emirates (UAE) and Saudi Arabia, AI-powered chatbots and virtual assistants are being utilized to provide personalized and efficient public services. These examples underscore the transformative potential of data science and open data in improving governance, service delivery, and citizen experiences throughout the MENA region.

In Dubai for instance, the impact of data science on the public sector is evident through several successful initiatives. One example is the "Smart Dubai" project, which leverages open data and advanced analytics to optimize urban planning and improve public services. Through data-driven insights, the city has implemented intelligent transportation systems, reduced traffic congestion, and enhancing mobility for residents. Additionally, Dubai's healthcare sector has benefited from data science applications, with AI-powered systems being used to predict and manage disease outbreaks effectively. The city's "Dubai Health Experience" platform provides personalized healthcare experiences, driven by data analysis, leading to improved patient outcomes and resource allocation. These examples demonstrate how the right data foundations, facilitated by open data initiatives, have set Dubai on the path to AI-driven decision-making, promoting efficiency, and enhancing the quality of public services in the city.

Moreover, in Saudi Arabia, data science has significantly impacted the public sector, with one notable example being the "National Open Data Portal". This initiative, launched by the Saudi government, provides open access to a wide range of datasets from various government entities. By making this data available to the public and researchers, the country has fostered transparency and accountability in governance. Moreover, this wealth of open data has been utilized to develop AI-driven solutions to address societal challenges. For instance, in the field of public safety, predictive models have been implemented using historical crime data, allowing law enforcement agencies to allocate resources strategically and to effectively combat crime. This integration of data science and open data in KSA's public sector showcases how data-driven approaches enhance decision-making, optimize resource allocation, and promote innovation for the benefit of the nation's citizens (Shehata, A., & Elgllab, M. 2021).

In conclusion, data science has proven to be a powerful tool in transforming the public sectors of both UAE and Saudi Arabia in the MENA region. Through open data initiatives and the right data foundations, these countries have harnessed the potential of data science to drive evidence-based decision-making, optimize public services, and foster innovation. Dubai's "Smart Dubai" project exemplifies how data-driven insights have led to improved urban planning and healthcare services, while Saudi Arabia's "National Open Data Portal" demonstrates how open data has enhanced transparency and enabled AI-driven solutions for public safety. As we shift our focus to the current situation of data science in Lebanon, it is essential to learn from these successful examples and identify opportunities for Lebanon to leverage data science for the betterment of its public sectors and society as a whole (Bin Bishr, Geray, El Kaissi, and Al Shaikh, 2018).

Challenges Facing Data Science Integration into the Public Sector across the MENA region

Several reports and articles have highlighted the challenges and opportunities of data science for socio-economic development. Allagui and Ayish (2017) address the MENA region's challenges in harnessing big data, emphasizing the need for improved data infrastructure and addressing concerns related to privacy, security, and ethics. The article stresses the importance of implementing appropriate policies and regulations while considering cultural sensitivity and local perspectives.

Dixon, Bhuiyan, and Ustuner (2018) describes the current complex landscape of the public sector in the MENA region. Issues of governance, transparency, and accountability persist, hindering effective service delivery and eroding public trust in institutions. Reforming public policies, enhancing mechanisms, and promoting meritocracy are essential to address these challenges and improve overall performance.

Another key challenge facing the MENA public sector is the need to address social rights and welfare provisions. The Arab Spring uprisings have brought demands for social justice, access to education, healthcare, and social protection. While some countries have made progress in enhancing social policy and safety nets, others struggle to meet their population's needs, highlighting the importance of strengthening social protection and inclusive policies for sustainable development (Karshenas, Moghadam, and Alami, 2014).

Among the challenges, success stories have emerged in the region, strengthening the development of the public sector. For instance, Thierer, Castillo O'Sullivan, and Russell (2017) highlight the impact of AI on innovation and technology. The article stresses the role of governments in developing policies and regulations to equip employees with the necessary skills to adapt to technological changes. The article emphasizes the need to embrace AI and innovation challenges, considering psychological and sociological factors in adapting to this transformation.

In conclusion, the MENA region faces both challenges and opportunities in leveraging data science for development. Improving data infrastructure, addressing ethical concerns, and promoting cultural sensitivity are crucial for successful implementation. Governments play a significant role in shaping policies, adapting to technological changes, and fostering an inclusive and accountable public sector to achieve sustainable development goals.

Lebanon's Current Economic Situation and its Public Sector at a Glance

Lebanon's public sector has faced significant challenges for the past few years. The country has been faced with severe challenges which had severe impact on its ability to deliver suitable services and invest in the development of the public sector.

The economic and financial crises are characterized by currency devaluation, up to 85% on dollar deposits, high inflation, massive decline in average income coupled with triple-digit inflation, severe currency depreciation, and increased unemployment rates, which increased from 11.4% in 2018-19 to 29.6% in 2022 (World Bank, 2021). All these factors have strained the public sector's resources and limited capacity to meet the needs of the Lebanese citizens. Lebanon has been loaded with an overwhelming level of government debt, resulting in reduced spending on essential public services and development projects. The high public dept-to GDP ratio of 150.43% (World Bank, 2021), has put massive impact on public finances, diverting resources away from public sectors. According to the recent Lebanon Economic Monitor report, Lebanon's GDP has experienced a significant decline due to the continuing economic crisis and political instability (World Bank, 2022). The report reveals that Lebanon's GDP contracted by 25% in 2020, following a contraction of 6.7% in 2019. The ongoing crises led to a sharp decrease in investment and consumer spending, exacerbating the already dire economic situation.

In addition to the economic and financial crises, Lebanon has been significantly impacted by a series of conflicts and crises. For example, the influx of Syrian refugees due to the ongoing conflict in Syria. As per the records from Issam Fares Institute (2019), the number of refugees in Lebanon has fluctuated over time due to various factors such as the conflict intensity, changes in government policies, and voluntary returns to Syria. Prior to July 2019, the United Nations High Commissioner for Refugees (UNHCR) estimated that Lebanon hosted around 1 million registered Syrian refugees (Yassin and Khodor,2019) . It is important to note that this number refers to the registered refugees and does not include unregistered or undocumented individuals.

Moreover, the political instability has been an ongoing challenge in Lebanon, which has limited the ability of the government to develop reform strategies and implement the necessary interventions for effective public sector. Also, the absence of stable governance frameworks has made it difficult to implement much-needed policy changes to respond effectively to the needs.

Data Science in Lebanon

Data science is gradually beginning to make an impact on public policy in Lebanon. Decision-makers in governmental and public sectors are recognizing the potential of data science in informing policy-making processes, leading to the adoption of data-driven approaches such as the Access to Information Law (ATI) and a legal framework for digital transformation. Through leveraging data science tools and techniques, extensive data from various sources, including socio-economic indicators, healthcare records, and infrastructure data, have been analyzed. This analysis has provided valuable insights into different aspects of public life, ranging from healthcare and education to transportation and urban planning. Policymakers are leveraging these data-driven insights to make more informed and evidence-based decisions, potentially resulting in more effective and targeted policies. Additionally, despite challenges in implementing the ATI Law and a lack of technical expertise, the emergence of various citizen-led initiatives and government platforms highlights the potential of open data in enhancing crisis management, combating corruption, and fostering economic growth (Merhej, 2021). The integration of data science into public policy holds the promise of improving governance and enhancing transparency. Policymakers need to view data-driven policies as a means to address societal challenges and enhance public services in a more efficient and equitable manner. However, it is important to note that as of 2021, the extent of data science impact on public policy in Lebanon is still in its infancy stages. Successful implementation of data-driven policies relies on factors such as data availability, data quality, and the development of appropriate data governance frameworks. As time progresses, it is expected that the influence of data science on public policy in Lebanon will grow, facilitating more informed and forward-looking decisions for the betterment of the country and its citizens.

At the 2023 WiDS AUB conference, Dr. Carole Al Sharabati, Professor and Founding Partner of Siren Analytics, presented the current situation of integrating data science in Lebanon and reflected on its growing recognition and importance in the public sector. Despite challenges, such as limited data availability and fragmented data systems, efforts are being made to harness the potential of data analytics for informed decision-making. Ms. Brigitte Khair-Mountain, Senior Strategic Advisor, Entrepreneur, Policy Analyst, United Nations Senior Women Talent Group, and founder of Gigthree, Dubai, also highlighted how various government agencies and non-governmental organizations have launched data-driven initiatives to enhance their operations and services. Nevertheless, there is still a need for capacity building and the establishment of data infrastructure to fully realize the benefits of data analytics in Lebanon's public sector. To address these challenges, there is a need for ongoing efforts that include the implementation of data governance frameworks, data sharing agreements, and the integration of emerging technologies like artificial intelligence and machine learning. By addressing these challenges and building a solid foundation for data processing and data analysis, Lebanon can unlock the full potential of its data, driving evidence-based decision-making, policy formulation, and improved public services.

On the other hand, it is important to highlight the current situation of the legal framework for digital transformation in Lebanon. Ensuring effective implementation of the legal framework requires amendments and the creation of new laws. Existing legislation, like the e-transaction and personal data law, covers some aspects of digital transformation but lacks clarity and guidelines regarding e-signatures, data protection, and fines for violations. Additionally, the public sector needs to collaborate and be sufficiently resourced for effective implementation. Enforcement of the access to information law is crucial to make administrative acts more accessible to the public, especially in sectors like health, education, and citizenship data (ESCWA,2020). Adopting a unified identification number for citizens and implementing digital procurement processes are essential steps. However, clear definitions, development guidelines, and audit mechanisms are needed. Furthermore, laws are required for digital government, cybersecurity, accessibility, digital infrastructure, open data, education, and oversight support to create a strong and inclusive digital platform.

Understanding the data complexity and addressing data challenges are crucial steps in providing effective support for disaster management. The United Nations ESCWA (2020) report emphasizes that analyzing vast amounts of data related to refugee populations, such as demographics, health records, social media activity, and economic indicators, can provide valuable insights into the specific issues faced by Syrian refugees in Lebanon. Through data analytics, patterns and trends can be identified, shedding light on various challenges. For example, data analytics may reveal the disproportionate burden on certain regions or communities within Lebanon, the prevalence of specific health issues among refugees, or the challenges faced by refugee children in accessing education.

In conclusion, data science application for public policy in Lebanon is still at its infancy stages. Despite challenges, ongoing efforts in data governance and legal framework development indicate a promising future for data-driven decision-making, policy formulation, and public service improvement. As data science continues to evolve, we are provided with a significant opportunity to leverage data science in shaping a more informed and equitable society for Lebanon and its citizens.

How Data Science can Improve the Public Sector in Lebanon

Data Science for Disaster Management
Data Science to Mitigate the Economic and Financial Crises
Data Science to Improve the Public Sector in Lebanon

Data Science for Disaster Management

Ms. Brigitte Khair-Mountain, a Senior Strategic Advisor and Policy Analyst, emphasizes how data science has a significant impact on various aspects of disaster management, preparedness, and response. In the past decade, leveraging data analytics for informed decision-making has advanced considerably, offering promising prospects. For instance, by aggregating data from drone and satellite footage, as well as call and message data, it becomes possible to predict, model, mitigate, and report on disasters in real time. In complex emergencies, data science enables the reporting of real-time people movements using satellite and drone data, facilitating proper humanitarian access and providing accurate data for policymakers.

Furthermore, data analytics provides valuable insights to the corporate world, aiding companies in planning and mitigating the financial impact of disasters while ensuring the safety of its employees. Social media has emerged as a powerful data source for disaster recovery, as it provides timely and firsthand information from witnesses on the ground. Analyzing social media posts, combined with other data, can help track response efforts and improve preparedness for future disasters and unpredictable events.

In her talk, Ms. Khair-Mountain highlights how crucial it is for government, NGOs, and multilateral organizations to embrace data tools, including analyzing data from social media, share information, streamline response efforts, and track results. Also, increasing data literacy within organizations, investing in data and analytics tools for disaster preparedness and response, and supporting open data standards are essential steps. Other important actions include breaking down silos and fostering collaboration among NGOs and government agencies, requiring organizations to publish and digitize data. Developing a common data sharing policy, inviting universities and researchers to access data can drive innovation and progress. Finally, conducting regular conferences dedicated to data science in aid work would provide a platform for collaboration and knowledge exchange.

Data Science to Mitigate the Economic and Financial Crises

In her presentation at the 2023 WiDS @AUB conference, Dr. Rima Turk Ariss, a Senior Economist at the International Monetary Fund (IMF), Washington D.C., underscores the significance of data analytics in supporting economic and financial policies. She emphasizes that governments should harness the power of data to gain a deep understanding of their countries' economic dynamics. The IMF, with its expertise and analytical capabilities, can play a pivotal role in providing data-driven advice and analysis to aid governments in making well-informed policy decisions. As a recommendation, Dr. Turk Ariss suggests that governments should engage in regular Article 4 consultations with the IMF to receive advice on economic policy based on thorough data analysis. These consultations should involve the assessment of vulnerability indicators and risk evaluations to proactively anticipate and prevent crises. The IMF's vulnerability exercise tool is highlighted as a valuable resource that combines multiple variables to predict potential crises. However, the reliability of data is paramount, and any doubts regarding its accuracy should be thoroughly addressed before its publication.

Data Science to Improve the Public Sector in Lebanon

In her talk titled “Transforming the Public Sector with Technology and Artificial Intelligence” at the 2023 WiDS @AUB conference, Dr. Carole Al Sharabati, Professor and Founding Partner at Siren Analytics, highlights the transformative potential of technology and artificial intelligence in the public sector. Dr. Al sharabati presents examples from Lebanon, highlighting the significant impact of data analysis in various areas. One notable application is in crime prevention, where the implementation of headquarters command and control centers, vehicle and foot patrols, and operations rooms in police stations in Lebanon enabled streamlined incident and crime reporting, operational implementation, and strategic decision-making. Through data analysis and the identification of space-time clustering, crime rates were successfully reduced by 30%, contributing to the strengthening of civic culture. Additionally, the use of machine learning techniques such as the Isolation Forest algorithm aided in detecting and blocking exploits, ensuring the fair distribution of resources and inclusive aid distribution. Another area where data analysis played a vital role was in media, with the integration of tools like ChatGPT and AraBERT to detect deceit and disinformation, promoting constructive journalism. These examples highlight the potential of data-driven decision-making to bring efficiency, fairness, fraud control, and preemptive measures against deceit in low-resource contexts. Governments should prioritize the adoption of data science and AI in decision making processes. Efforts should be made to ensure data classification is accurate and comprehensive, enabling effective detection of risks and challenges. Additionally, regulation of online data should be strengthened to address gaps and protect privacy rights.

Policy Recommendations

Based on the information provided in this policy brief, the following policy recommendations can be proposed to leverage data science to improve the public sector in Lebanon:

- Establish a Data Science hub for public policy: To address the scarcity of individuals trained in both public policy and data science, the government should establish a dedicated Data Science Hub for Public Policy. This hub can serve as a center for education, research, and collaboration between data scientists and policymakers. It will help build capacity and expertise in data analytics within the public sector, leading to evidence-based decision-making and more effective public policies.

- Improve data infrastructure and governance: To fully realize the benefits of data analytics, Lebanon needs to invest in improving its data infrastructure and governance. This includes addressing challenges related to limited data availability and fragmented data systems. Implementing robust data governance frameworks, data sharing agreements, and data integration strategies will enable better data-driven decision-making across government agencies.

- Strengthen legal frameworks for digital transformation: To promote effective implementation of digital transformation initiatives, the government should work on amending and enacting new laws related to digital governance. Clear guidelines and regulations for e-signatures, data protection, fines for violations, and other digital aspects are essential to ensure a smooth transition to a digitalized public sector.

- Enhance disaster management, preparedness, and response through Data Science: The government should adopt data analytics and AI-driven tools to improve disaster management response. By analyzing real-time data from various sources, such as satellite imagery, social media, and call data, the authorities can predict, model, and mitigate disasters in real-time, leading to more effective humanitarian responses and saving lives.

- Strengthen economic and financial policies with data analytics: Engage in regular consultations with international organizations like the IMF to receive data-driven advice and analysis on economic and financial policies. Utilize data analytics to gain a deep understanding of economic dynamics, vulnerability indicators, and risk evaluations, enabling the proactive prevention of crises and better-informed policy decisions.

- Foster collaboration and data literacy: Promote collaboration among government agencies, NGOs, higher education institutions, private sector, and multilateral organizations to share data, streamline response efforts, and track results. Invest in data literacy programs to enhance the data analytical capabilities of public sector employees, enabling them to effectively use data for decision-making and service delivery.

- Support social rights and welfare provisions: Address social justice and inclusivity demands by enhancing social policy and expanding social safety nets. Data science can aid in identifying regions or communities with disproportionate burdens, allowing for targeted and efficient allocation of resources for social welfare programs.

- Strengthen data privacy and security: As data-driven initiatives grow, it becomes crucial to protect citizens' privacy and ensure data security. The government should establish robust data protection policies and regulations to safeguard sensitive information and gain public trust in data-driven initiatives.

- Foster data sharing and open data standards: Develop a common data sharing policy to encourage data sharing among government departments, research institutions, and NGOs. Embrace open data standards to promote transparency, accountability, and public access to information.

- Support research and development: Encourage and support research and development efforts in data science and its applications in the public sector. Foster partnerships between academia, private sector, research institutions, and the government to drive innovation and explore new possibilities for data-driven decision-making.

By implementing these policy recommendations, Lebanon can harness the potential of data science to drive improvements in governance, policy formulation, disaster management, and public service delivery, ultimately enhancing the overall performance of the public sector.

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