Artificial Intelligence in Saudi Arabia: Leveraging Entrepreneurship in the Arab Markets

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Abstract: Recent technological advances in the field of Artificial Intelligence (AI) is transforming the entrepreneurial landscape of the Middle East dramatically; even more for Saudi Arabia which is undergoing massive economic diversification. While AI is already making its presence felt in the areas of banking, finance, robotics, and industry for the purposes of forecasting, business process improvement and providing solutions to complex tasks, the technology is yet to permeate the start-up scene and position itself as a vital ingredient for nascent entrepreneurship. This paper explores the AI-induced proliferation of the start-up environment in Saudi Arabia and delves into the complete adoption of AI. It analyses the ability of the Kingdom to break away from its oil 'addiction' and leverage AI at a crucial juncture for the region.

Keywords Artificial Intelligence, Entrepreneurship, Technology, Saudi Arabia

I. INTRODUCTION

Following the early entrepreneurial-focused research of Karl Vesper [1], scholars have attempted to explore and test the pedagogical potential of entrepreneurship within higher education. Gartner and Vesper (1994), by definition, highlighted universities with entrepreneurship courses that delivered business entry theories, either by start-up or acquisition or within established organizations; beyond the characteristics of intrapreneurship [2].With an average of one introductory course offered by universities and schools of business management in the early 80s, the offerings soon escalated to phenomenal levels within undergraduate and postgraduate streams, by way of majors and minors [3].The rationale for offering entrepreneurship-centric courses was theoretically expected to (a) raise awareness of entrepreneurship as a viable career option, (b) motivate students to venture into the field, and (c) to equip university students with the knowledge, skills and tools required [3].

Garnet and Vesper suggested that, while the 'basics' of entrepreneurship were fundamentally different from the 'basics' of management, students enrolled in entrepreneurial courses were likely to have received little to none true "hands-on / real world" applicable knowledge and trade skills regarding the business side of entrepreneurship. And although the ability to 'stomach' the "tolerance for ambiguity" seemed to lack empirical credibility in entrepreneurial traits, a separate ability to "manage" or successfully deal with ambiguity was suggested as an important trait for entrepreneurs. Also, the difference in 'basics' of entrepreneurship and management may be attributed to the attention placed on equivocal situations, i.e. development of new product lines or service range, market penetration. And it is the ability to transform equivocal situations to non-equivocal that entrepreneurs had to have the 'stomach' for, as it appeared to be the essence of entrepreneurship [2].

With innovation and technological advancements, the vital elements fueling entrepreneurship and economic growth, extreme transformations have taken place including the steam engine and electricity. But despite growing literature in the field of entrepreneurship and focused courses supplemented with workshops, the uncertainty of the entrepreneurial process still harbors risk and aversion. Spurred on by Vesper, the quest for knowledge entrepreneurship continues, as technology takes yet another leap forward with Artificial Intelligence (AI) [4].

This paper analyses the current entrepreneurialscene in Saudi Arabia. It then looks at the potential of AI and the possibilities of tapping into knowledge entrepreneurship. Towards the end, the paper examines the applications of AI within the context of entrepreneurs in the Arab world and is followed by the conclusion.

II. ENTREPRENEURSHIP IN SAUDI ARABIA

Tackling the issue of entrepreneurship, acceptance of ambiguity and the introduction of entrepreneurship in academia, the Kingdom of Saudi Arabia recognized entrepreneurship as an engine of growth and as the single most important player towards the modernization of its economy [5]. With extrinsic and intrinsic societal benefits including innovation, tackling unemployment, satisfaction of new customer demands and driving GDP included, new ventures were key to the region's economic diversification policies, including job creation for the youth. Moreover, creative disruptions are not only a vita conduit for personal wealth creation, but also catalysts for social change.

Having frequently been molded on the core of the *refugee effect* and the Schumpeter effect, ambiguities in existing literature give rise to postulations that the interrelation between

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entrepreneurship and unemployment reflects deferent conflicting forces [6]. But the lack of entrepreneurship and total entrepreneurial activity (TEA) also incurred an economic cost in terms of foregone economic growth (Audretsch and Thurik,2000; Audretsch, Carree, van Stel and Thurik, 2002; Carree and Thurik, 1999; Carree, van Stel, Thurik and Wennekers, 2002; Audretsch, Carree and Thurik, 2001) [7].

But, by and large, even though entrepreneurship was prevalent in the Saudi Arabia for several centuries now, with tremendous economic gains already foregone, administrative efforts and the focus of the formal education system only diverted towards entrepreneurship recently. With the Kingdom's entrepreneurial ecosystem still restricted in terms of experience and to the infancy stage, government reforms sought to infiltrate and effectively intervene at strategic, institutional and enterprise levels to streamline and catalyze the entrepreneurial revolution. With a multitude of opportunities originating from changes to market structure formation, market perception and recombination of knowledge, there existed sufficient AI-related prospects to explore.

Challenges, however, remained despite active government reforms, particularly related to regulations and bureaucracy, access to funding and access to talent. Further, having 93% and 73% internet and smartphone penetration per capita, respectively, and with half the population under the age of 25 and support organizations tripling between 2006-2015, was not sufficient to leverage the Kingdom's existing framework or entrepreneurial revolution, as shown in Fig. 1 [8].

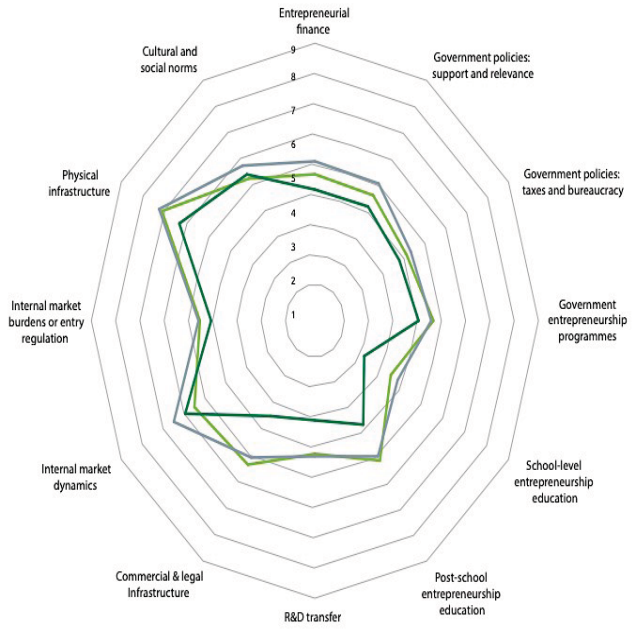

Fig. 1. Average status of Saudi Arabia's entrepreneurial framework conditions compared with Asia, Oceania and GEM averages, 2017

With problems of large numbers of youth unemployment also plaguing the Arab world, (Alasrag, 2010) highlighted the statistics as a significant challenge since most of the population was categorically young. Marič et al (2010) believed an increase in TEA could be a viable solution to the unemployment problem with their findings built on the hypothesis that a higher rate of unemployment would stimulate forced transition into entrepreneurship. The hypothesis also pointed towards higher rates of entrepreneurship applying downward pressure on unemployment statistics. But based on the statistical significance in their study, the hypothesis was neither confirmed not refuted. Consequently, it seemed likely that entrepreneurial activity could not be only the result of a push-effect of unemployment, but it could also be a driven by a pull-effect of a thriving economy with new opportunities, seemingly in tune with the non-oil diversification strategies of Saudi Arabia, and indicators of the entrepreneurial ecosystem (Fig. 2) [7].

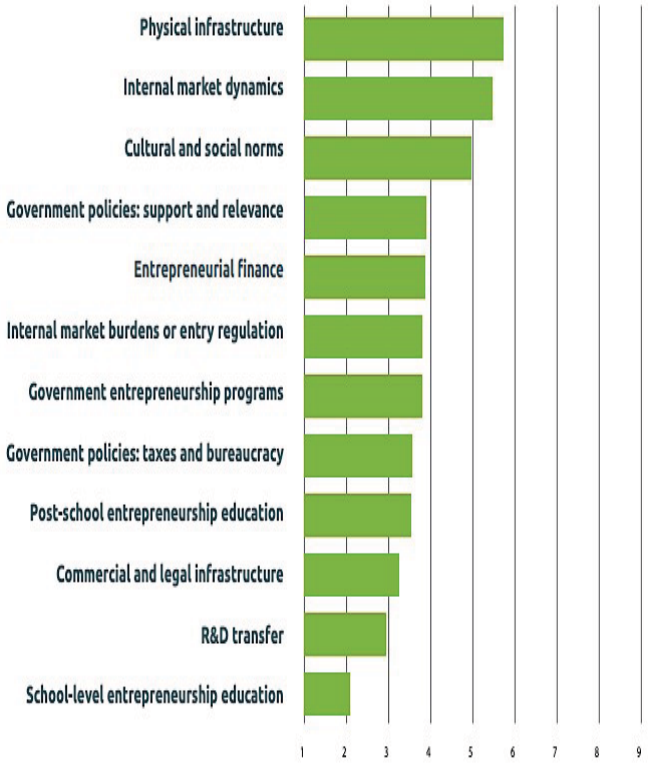

Fig. 2. Averages for indicators on entrepreneurship framework conditions in Saudi Arabia, 2017

Artificial Intelligence in the Arab World

The original idea behind AI was to attempt to create a cognitive system with similar or better general intelligence that humans. And with the recent resurgence of AI due to increased computational power and storage capacities, AI technology has begun to infiltrate the finance, healthcare, robotics, retail and insurance industry.

With eight interrelated pillars of the entrepreneurial ecosystem (see Fig. 4) influencing the speed and ability by which entrepreneurs scale new ventures, the role of AI in (a) leveraging and driving revenue, (b) market penetration (c) automation and (d) business simulation / expansions cannot be undermined. And despite the downside of initially deterring high investment costs and a learning curve, the ability of AI to scale efficiencies and lower costs proved enticing.

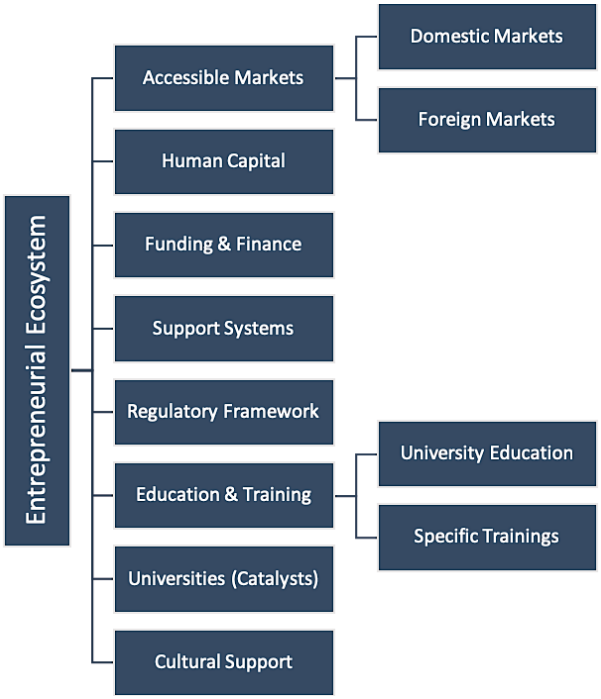

Fig. 4. Growth scenarios for Saudi Arabia and United Arab Emirates

But when the Fourth Industrial Revolution just started to seep into the Arab World, which had for long been a consumer of technologies, the homegrown revolution was still in its infancy. With Sophie, the first humanoid robot to be awarded personhood and citizenship of a country, and AI Arabic bots conceptualized to improve the customer experience [9], the Saudi region was yet to fully embrace the AI Revolution; through focused investments in infrastructure, communication networks, access to mentors and manufacturers, and funding that could withstand a possible AI winter. With AI's ability to infiltrate, automate and develop non-oil sectors in Saudi Arabia, directed investments could strategically position the Kingdom for years to come. As per PwC's Data Analytics who developed the AI Impact Index (see Fig. 3), of the USD 320 billion AI impact predicted for the Middle East, Saudi Arabia was expected to gain 12.4% (USD 135.2 billion)- second only to the United Arab Emirates at 14% [10].

Contribution of AI by Industry	Absolute contribution in 2030 (Billions)	Contribution of AI to ME GDP by industry
Construction and Manufacturing	USD 99	12.4%
Energy, Utilities & Resources	USD 78	6.3%
Public sector, including health and education	USD 59	18.6%
Financial, Professional, Administrative Services	USD 38	13.6%
Retail, Wholesale Trade, Consumer Goods, Accommodation and Food Services	USD 23	19%
Transport and Logistics	USD 12	15.2%
Technology, Media, Telecommunications	USD 10	14%

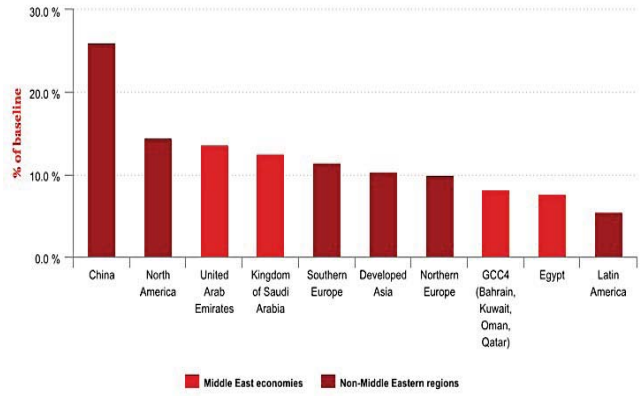

Fig. 3. Contribution of AI to the ME Industry & Region in 2030

With the passage of time, as the age-old mentality of the entrepreneur's fear of failure and societal shame for failed ventures faded away,bold entrepreneurial traits came into light, replete with risk-taking proclivity and some propensity of relative aggression.But it was the predicted boost in internet users from 63.7% to 85% and a unified digital health record from 0% to 70% both by 2020 that truly paved the way for AI, rendering the possibilities for nascent entrepreneurs seemingly endless. And while the Arab region was among the earliest adopters of technology, particularly AI, access to infrastructure and skilled labor in the region proving to be the key enabling factors. Added to that wasa young Saudi population comprised mostly of people who were digitally savvy, tech-oriented and adopted technology easily. By combining AI, a robust business idea executed within an appropriate ecosystem and watched over by effective governance and regulations, Saudi could

catalyze and even accelerate in its journey towards Vision 2030.

III. THE POTENTIAL OF ARTIFICIAL INTELLIGENCE

In comparison to traditional economic growth models which were limited to capital, labor and "factors of production", Accenture's adapted growth model was a modified version that included Artificial Intelligence as a discrete factor rather than include it as a usual technology-based productivity enhancer [11]. And according to the growth model, the "baseline" scenario and "AI Steady State" scenario illustrated the potential impact of including AI as a new "factor of production". As per estimates, the Kingdom's economic growth rate could witness an addition 1.1 percent with gross value-add approximated at USD 215 billion for Saudi Arabia [11].

Contrary to belief, AI strategies could augment and, in some cases, create human capital in an environment that demands a more knowledge-intensive, higher-value-added workforce, despite acute saturation of the public labor market. By allowing talent access to information as required, AI could further propel innovation.

AI also provided the agility needed to thrive in a continuously changing and unpredictable environment, which would otherwise be ineffective through human intervention, especially when dealing in competitive global markets. By allowing entrepreneurs access to AI systems, manufacturing start-ups can change volume of production rapidly, and employ dual-use strategies that permit high levels of preparedness without diverting finances into industrial investments [12]. This, without the heavy initial required for lean manufacturing, does provide decision makers with some flexibility for output levels. Finding the product-market fit also becomes easier through AI specialties such as audience segmentation and machine learning, to process raw consumer data into categorized customer segments.With advertisements by Facebook and Google already allowing businesses to pinpoint and target internet surfers to their value proposition, AI unleashes the ability to 'understand' and 'predict' customer behavior even before they log on to a website.

Furthermore, with the technology now entering its "third wave" - the application of patented proprietary data structures called "canonicals" - the degree of computing power was expected to decrease while providing entrepreneurs with better insights; not limited only to organic and synthetic data analysis in market research, but extending to social media insights - relationships, impressions and 'reach' [13].

Having understood the need for entrepreneurship-focused education and an outlook of the Saudi ecosystem,the challenge for nascent entrepreneurs to adopt AI and leverage their start-ups in the Kingdom seemed interesting.With the nation on the brink of a major economic shift and explosive possibilitieson the horizon, the potential for AI and its impact could only vaguely been quantified.

IV. CONCLUSION

As Saudi Arabia imbibes entrepreneurship within the educational system, and promotes nascent entrepreneurship through administrative initiatives, the Kingdom is one of the leading adopters of AI technology. The nation, and the region as whole, will face challenges as it continues to adapt and adopt the AI culture, which extends beyond just the cognitive method of human thoughts. As the country continues to diversify away from the oil dependence which had become an "addiction" for the country, start-ups sought encouragement and support to breakthrough into markets. With AI providing them the potential to leverage their product or service to the *right* consumer segment and *focus* their marketing efforts, the opportunity to scale operations definitely existed. Thus, with modifications to culture, policies and practices, business regulations and transparency (in terms of big data collection), AI and entrepreneurs could proactively serve the needs of consumers.

There exists sufficient potential and scope for further investigation to explore the relationship of AI with nascent entrepreneurship, which could positively bring about a drastic change in our understanding of the Arab business environment - and perhaps for other regions too.

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