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AI-Driven Digital Feature Integration in Large-Scale Technology Conglomerates: Case Studies on AI Utilization in Job Portals in The MENA (Middle East and North Africa) Region.

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Abstract

This paper explores the boom of AI-based applications and features in the Middle East/North Africa (MENA) region, especially focusing on how artificial intelligence synthesizes product-led growth and drives the development and integration of innovative features in various product domains. Available evidence represents that the boom of AI-led technology development has both led to the creation of several AI startups and has facilitated the construction of digital platforms that are better at adapting to market trends, personalizing content for consumers, and anticipating consumer behavior. We focus on Bayt.com, the largest job portal in MENA, to demonstrate the increasing integration of AI tools and features in large-scale, complex systems, analyzing how this impacts user perception, user behaviors, and other KPIs, such as retention and growth factors. There is sufficient research around AI applications and the types of features that are being incorporated. However, there exist academic gaps in mapping out how exactly AI features are powering applications in regions with different cultural, social, ethical, and business practices, such as MENA and APAC.

Keywords: Artificial Intelligence , AI Driven Job Portals , MENA , Case studies.

1. Introduction

Artificial intelligence, while having no generally accepted definition, is most commonly seen as the science and engineering of producing intelligent machines. It has also been referred to as the study of intelligent “agents” that can perceive the environment through sensors and perform actions through actuators [3]. In one of its most popular definitions, any machine that passes the Turing Test classifies as AI.

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There are, and have always been, broad technological, legal, ethical, and business considerations concerning the development of AI and its integration into digital ecosystems. With the rise of intelligent conversational models such as ChatGPT, we understand AI models as being generally capable of performing tasks that are generally predicated on computational systems being able to "learn", which helps them solve problems. For example, today, there are numerous AI tools out there, such as tools that create high-resolution images based on simple text prompts, tools that can analyze user sentiment from text, and tools that can simulate human conversation effectively [1] [4] [5].

The transformative utility of AI in multifarious domains and sectors has prompted organizations around the world to consider the large-scale utilization of AI tools and features, such as chatbots, natural language processors, and sentiment analyzers. Similarly, the increasing recognition of AI tools around the world has prompted technology companies to integrate AI within their applications, driving innovation and creating value for users. Several large product companies around the world have been experimenting with AI driven features, such as personalized content that attracts consumers, relevant suggestions based on collected user data, behaviors, and other metrics, and much more [6].

The Middle East/North Africa region, composed of countries such as Saudi Arabia, Bahrain, Jordan, the UAE, Turkey, Morocco, and others, has become a lucrative hub for AI research and globalized investment. Given the rise of digitalization in the region, the Middle East/North Africa region is expected to accrue anywhere from 2-5% of the overall benefits of AI development by 2030. With that context, it is pertinent to evaluate the top performing AI case studies in MENA and understand the direction that AI development is taking in the region.

The most nuanced way to do this is to select a top performing software tool in MENA and evaluate the infrastructure, processes, and tools they are using to pioneer AI development within their software products.

For the purposes of this paper, we have selected the Middle Eastern/North African region's top performing job portal, Bayt.com, which was established in 2000 and has since grown into a software and AI powerhouse in the region. Analyzing the trends and patterns Bayt.com is working on will help us identify the overall trend and direction that some of the top software companies in MENA are taking towards AI development.

Analyzing the growth and integration of AI features into various product niches, such as healthcare, property, fintech, and more, can be accomplished by an overview of large-scale digital solutions, an overview of their AI tools, and a comprehensive study of the value AI is driving for these digital platforms.

2. AI-Driven Platforms

The development and commercialization of AI features, and conversational agents like OpenAI's ChatGPT, Snapchat's "My AI", and Google Bard have prompted millions of users to turn to these AI tools for quickness, ease, and high performance. Several existing digital applications have already integrated various AI mechanisms into their workflow and user experience and are leveraging the power of these features to drive conversion, retention, and consumer satisfaction [7].

2.1 Ecommerce Platforms

For instance, in e-commerce, Amazon uses AI features to provide users with dynamically updated pricing, which changes based on a set number of metrics, personalized product recommendations based on user behaviors and the preferences they exhibit, and the ability to use their voice when shopping through Amazon's AI agent, Alexa. Moreover, Amazon and other e-commerce brands such as Shopify and eBay also utilize machine learning models to study consumer preferences, purchasing habits, and scrolling patterns to create suggestive "pushes" and to predict what these consumers are most interested in purchasing [8].

Beyond consumer facing applications, ecommerce companies also utilize AI models and features internally, as part of their large and often complex internal systems, such as for inventory management, tracking, updating warehouse items, and more.

2.2 Social Media and Content Flagging

Large social media platforms like Facebook and X use machine learning algorithms to detect and filter out spam, fake news, and offensive content. This effect has been intensified by the COVID-19 pandemic and recent political events, such as the US presidential election and other important political happenings. AI has been routinely integrated into these social media platforms to act as a classifier and detect fake news. The potential for assisting large social media conglomerates with content moderation has become an indispensable tool of media regulation, given the limitations of human intervention and the rapid, often uncontainable growth of content on these platforms [9][10].

2.3 Healthcare

AI platforms in healthcare have seen empirical benefits in terms of both proactive health care, focused on health management, as opposed to reactive care, which happens post-diagnosis. AI tools and features in health apps can potentially cut yearly US healthcare costs by USD 150 billion in the next two years.

There are several platforms that utilize AI to make healthcare affordable and accessible. Ada Health and Babylon Health help users with self-assessment, where they use large machine learning models to match users with potential diseases and conditions, they may be facing based on the symptoms they experience and their medical history.

The use of AI tools has already been incorporated into healthcare. It includes machine learning (ML) that provides greater accuracy in diagnosis, treatment and support, research, clinical administration, and outcome prediction, computer vision for data analysis and understanding non-verbal cues, and natural language processing (NLP) for individual to individual [11]. For example, Mayo Clinic uses AI to triage complex illnesses to help identify the best health professional for a specific symptom [12]. With continuous improvement in AI techniques, mental health practitioners may redefine mental illnesses more objectively than currently done in the DSM-5, identify these illnesses at an earlier stage when interventions may be more effective, and personalize treatments that vary from health services [13].

The use of wearable AI tools such as FitBit can be used to monitor the quality of sleep and heart rate, which can offer insights for therapy sessions instead of relying on patients to give them accurate reports [12]. Fitbit has already been used as an acceptable tool to complement behavioral activation therapy for patients with depression [14]. AI can also help physicians spot trends within complex data such as history, past treatments, and behaviors.

Several chatbots have also shown empirical benefits, such as Woebot, which automates cognitive behavioral therapy (CBT) and has been associated with a decrease in depression for subjects using Woebot as compared to subjects using an ebook as a source of therapy [15]. Wysa, an emotional-wellbeing app, can be used to "coach" users in terms of their habits, moods, and more by utilizing CBT [16]. Replika.ai allows users to have engaging and helpful conversations on mental health with their avatars, with no fear of judgment, empathy, and emotionally comforting responses being their main selling points [17]. For younger users, chatbots like Siri have been instrumental in shaping their emotional responsiveness, and social interaction skills, and in simulating a safe, criticism-free learning environment in their early socialization phases [18]

2.4 Transportation

Uber, Tesla, Careem, and Grab use AI tools for various purposes. For example, Uber employs complex AI systems that dynamically update routes, pricing, and accommodate for external factors, such as demand and supply patterns, driver availability, etc. Uber's CX agents also utilize AI to detect fraud on the platform [2].

Uber uses AI for route optimization, dynamic pricing, and predicting demand patterns. Machine learning algorithms analyze traffic data, rider behavior, and historical data to optimize routes and match drivers with riders more efficiently. AI is also used for fraud detection and improving customer support through chatbots.

Tesla has utilized AI models in fleet management and to innovate with and improve its "self-driving" performance. Various sensors consistently take in the vehicle's surroundings, improving its ability to navigate roads, avoid obstacles, and make fast decisions on the go.

3. Bayt.com: MENA Job Seeking Platform

Historically, MENA countries have shown relative weakness in terms of having the ability to benefit from the "tech boom" and the digitization of previously physical markets and niches. The primary reason why this has been the case is that these countries have based most of their economy and their stake in physical markets, and the digital sector has remained relatively underfunded. However, in certain markets within MENA, such as the GCC countries, globalization has brought about a significant shift towards digitalization, resulting in several new startups being created and digital products being developed [19]. Bayt.com is one of these platforms, being the largest job portal in the MENA region, with millions of active users and thousands of jobs being posted every day.

3.1 Background:

Bayt has constantly updated its platform with new AI updates, features, and tools that drive personalization. As other job seeking portals in the world, such as Workable and Linkedin kept innovating and keeping up with global UX patterns, Bayt had a unique problem to solve: acquiring and retaining a brand of users uniquely different from those in the first world. Users with different cultural backgrounds, different user needs, and different patterns of usage and perceptions of technology [21].

Along with this, language constraints in MENA often make it difficult for local, home-grown applications to be globalized and extend in popularity beyond the region. However, research shows that AI applications have picked up popularity owing to the global AI boom which extends beyond the confines of culture and geography [20].

3.2 Search Functions:

Instead of a basic keyword search, Bayt utilizes NLP techniques to improve its search results. The methodology happens as follows: The search engine analyzes the user intent behind the entered keywords. A popular NLP model, such as BERT, is used to change the keyword into a vector representation. This process captures the semantic meaning behind the keyword. The semantic meaning enables Bayt to understand contextual variations, synonyms and antonyms, and account for local patterns of language in the MENA region to improve search results

Secondly, to optimize search results, Bayt used "Learning to Rank (LTR) Algorithms" such as LambdaMART or RankNet, that optimize search results based on the user's perceived intent. This intent is gauged through a combination of metrics, such as previous or current job applications submitted by the user, what they have browsed, their clicks, and historical behavior on the website.

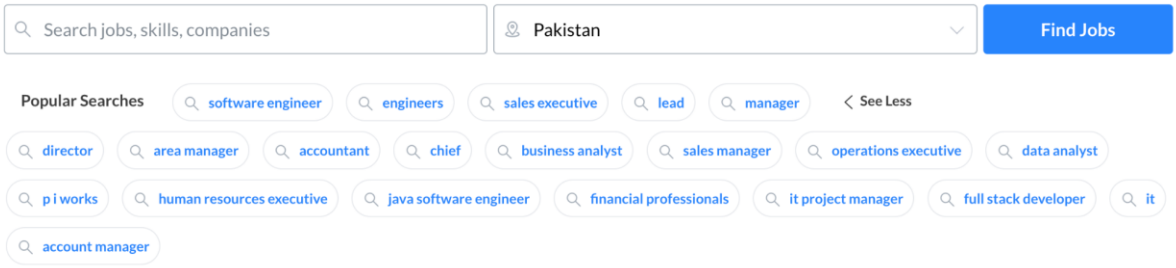

Figure 1.1: "Popular Searches" populate based on AI models that gauge what users similar (in terms of jobs searched, location, work experience, etc.) to the current user are searching frequently

3.3 CV Scoring and Ranking:

Unlike most job portals in MENA, Bayt.com recognized that local users had strong preferences for complete visibility and comparative rankings that could represent their current context within systems. Also, empirical research has found that users generally prefer strong and clear data visualizations that are easily comprehensible and give users easy context, even if they scan them quickly. The actual challenge was to incorporate AI within these mechanisms and automate the scoring, ranking, and data visualization processes for employers and job seekers on the platform.

As explained in the previous section about NLP utilization for parsing search keywords, the same techniques and models are utilized to parse CVs uploaded to the platform and extract information like experience, skill sets, publications, interests, and more into different sections, structure the information, and then proceed to match them with available jobs on the platform or rank the relevance of a CV against a particular job.

Semanting matching techniques are then employed to compare the extracted information using vector-based similarity metrics and the more matches that are found, the greater score is assigned to the parsed information. For instance, a resume that has the words "Senior HCI and UX Expert" submitted to the role of "HCI and UX Engineer" will have a greater assigned score than if it were submitted to the role of "Python Developer"

Another stage of the process is to then assign different weights to various parts of the resume. A large gap in the technological AI development of other job portals for a long time was that they were simply unable or less effective in weighing various parts of a submitted resume, which led to inaccurate suggestions, less effective rankings, and prioritization of less important parts of the resume, such as hobbies/interests being given the same weight than a candidate's work experience. Bayt.com introduced weighted scoring systems using techniques such as Logistic Regression that assigned weights based on employer preferences, historical collections of data, and more. Once this weighting system was established, the AI now aggregates these scores to calculate the overall score assigned to a CV, as shown in Figures 1.2 and 1.3

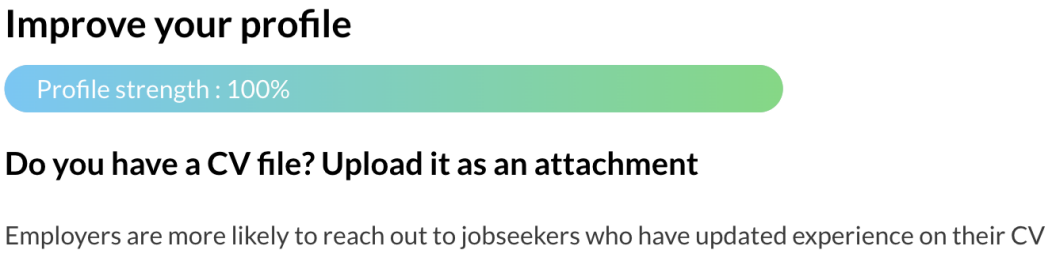

Figure 1.2: "CV scoring" that assesses the strength and completion of a user's profile.

Figure 1.3: Ranking the user's CV against other applicants using NLP techniques to weigh their experiences against each other

3.4 AI Customizations for Employers:

User customizations and personalization is a significant element and priority for both early-stage startups and established digital products. This is evidenced by the growth of AI-engineered personalization across digital apps/websites. For instance, several apps and websites in ecommerce and other niches offer personalized recommendations, customizable profile sections, conversational personalization in apps tailored towards mental health and towards education. UX research has repeatedly proven the efficacy of personalizing interfaces for specific user personas, which highlights the relevance and usefulness of specific interfaces to specific types of users [22] [23].

To cater to a broader group of users, specifically employers, Bayt allowed employers to set various custom scoring criteria, where employers can adjust the importance and weights assigned to individual parts of the CVs, can set mandatory qualifications, years of experience, or place more weight on one skill as opposed to another.

Moreover, employers are enabled further by the application AI by using their previous hiring patterns to suggest similar candidates available in their pool, which makes recruiting extremely easy in an already saturated market where talent sourcing is becoming difficult because of the massive influx of local and international resources into the MENA tech industry.

3.5 Candidate Comparisons & Data Visualizations:

To foster visibility in a competitive and saturated market, Bayt utilizes open and easily accessible contextual clues for users. According to the most well-established heuristics of user experience and HCI design, keeping users aware of their context within digital systems is an important metric of retention and enjoyment. Users prefer contextual guidelines that remove the obscurity of traditional job search mechanisms, and AI-driven insights and visualizations such as charts, graphs, and tables help users feel much more self-assured with the UX of the platform.

AI-driven comparisons are consistently performed on qualifications, experience, skills, and more KPIs to create relevant graphs and insights. Clustering techniques, such as K-Means, are used to group and rank applicants to give both employers and employees fair context on how the overall recruitment process is going and what stage they are at.

Historically, users have complained about a lack of transparency and red taping around the processes and pipelines of HR solutions and job platforms. In the MENA region, this effect is exacerbated owing to lesser familiarity with standard digital practices and processes, meaning that users are less likely to recognize the standard patterns in these applications that are followed in the first world, and likely require a higher degree of simplicity, iconography tailored to local cultures, simpler and easier data visualizations, and easier textual explanations of content that did not cognitively overload these users. To save costs and have a faster process overall, the second part of the process was to automate these processes with complex layers of AI underneath the application [24].

Figure 1.4 Example of data visualizations utilized by Bayt.com's internal talent pool application, Talentera

3.6 Bayt AI+ :

The most modern addition to the AI features pool for Bayt.com, particularly for recruiters, is Bayt AI+, a pioneering AI experience in HR tech in the MENA region. An overview of the features that drove the most conversions for Bayt AI+ is as follows:

Job Description AI Helper: AI helps recruiters create relevant, easy-to-scan, and SEO friendly JD templates that they can save and reuse. Essentially it cuts time for employers significantly by using ML techniques and crafting relevant job descriptions.

CV search: Extensive and comprehensive views of talent resumes and qualifications. Huge filtering mechanisms that operate based on clustering data and indicating the quantity of relevant data available in each cluster. For instance, Pakistan (34) has UX Designers (12), out of which those with 5 Years of Experience (3) are available for hire. The CV search mechanism relies on complex algorithms that enable fast searching, account for preferences, and simplify the selection experience. For example, the AI feature called “Smart Summary” takes a candidate’s best features and highlights them on the CV card, meaning recruiters can quickly scan the user’s strengths and can make initial judgements using them. Also, users can also access another conversational AI feature that finds profiles for them based on text prompts, such as “find me a UX designer who’s worked in Fintech before and lives in MENA”, and the AI bot will bring the most relevant searches based on the entered keywords. This tool can also be used to rate various CVs, using commands like “Rate this CV out of 10 against XYZ job opening”, and can be used to get interview question templates for specific jobs, such as “give me five interview questions I can ask for Job ID #4345”. Using these smart conversational approaches, AI tools help quickly filter and bring results in large-scale systems with millions of user data profiles and multiple layers of pre-existing data.

CX Agents: Instead of over relying on an entirely human customer service and CX team, Bayt AI+ incorporates intelligent chatbots that have either initial conversations with users and direct them to more advanced human help or have entire conversations with customers just like a real CX agent would. This is extremely helpful because it indicates how the next wave of smart applications in MENA will be shifting to AI tools to compensate for lack of trained labor and expensive costs of labor training and onboarding. Unlike the first world, where sufficient resources exist to train and onboard employees, several MENA companies have limited funding and limited global outreach, so they need to rely on innovative solutions to fill that resource gap. AI-based conversational agents are rapidly attracting consumers, being praised by business stakeholders, and are helping large product conglomerates like Bayt millions of dollars on company costs yearly [25],[26].

4. Thematic Analysis of Perception Surrounding AI in Technology Apps

To better understand the perceptions of people in MENA regarding the growth of AI in digital applications, an online survey was built and shared with individuals living in MENA, both working in tech and having extensive interactions with digital apps and those who had relatively lower knowledge of and interactions with apps and AI in general. It was an open-ended survey where users could openly type their interactions with such technology. We collected the survey responses across a 20-day period,

analyzed their responses, grouped individuals into two broad sections, defined codes, themes, and grouped data together to define the thematic analysis given below.

4.1 Section A (Higher knowledge and usage of apps and AI tools)

Codes:

Appreciation of AI growth
Hopeful about greater innovation and more insights
Utilization of AI technology in personal and professional life
Reported increase in productivity and motivation after using specific tools in workflow
Some concern about the threats to the economy if AI technology remains relatively unregulated

Themes:

Hopefulness
Output
Regulation

Description:

The group of people with more advanced knowledge of AI and applications were very hopeful and positive about the AI boom happening in MENA. They recognized that AI technology has grown exponentially in the last decade and has seeped into all sorts of industries and has started to impact global economies. Moreover, they were also hopeful about more advancements being spread out across MENA region companies with regards to the adoption of AI tools and features that could help streamline their processes, innovate, and cut costs. They remarked on having used these tools in various ways to improve their personal workflows and hold themselves more accountable, while taking input from these tools on several important decisions at work. This group of people was cautious, however, about the legal implications of the almost unmanageable growth of AI in recent years. They questioned the government's ability to accurately predict and legislate for this boom, and they questioned the government’s responsiveness and effectiveness in dealing with crises in tech spaces, such as Cambridge Analytica. They also had concerns about the economy, and how increased automation of tasks would impact labor markets, given that people are now being replaced by automated AI agents, such as AI ordering systems, self-driving vehicles, and AI robots in factories that are replacing human labor and are cheaper on average to sustain and maintain.

4.2 Section B (Lower knowledge and usage of apps and AI tools)

Codes:

Fear of AI
Misconceptions about what AI is and is not
Hopelessness around governmental action
Preference of not using these apps extensively
Some frustration about how AI is disrupting established industries

Themes:

Fear
Anxiety

Misinformation

Description:

The group of people with lesser knowledge of AI and applications demonstrated limited knowledge of what AI applications actually are and what they entail, along with buying into common stereotypes about these apps. They repeatedly referenced pop culture and depictions of AI and robots in fiction, while claiming that AI would become an uncontrollable force that would exceed the human race in terms of mental capacity, physical strength, and would harbor a desire to demonstrate superiority over the human race eventually. They remarked about how they have not used or seen AI applications as much, with ChatGPT being the only tool some of them claimed to use moderately. They preferred conventional methods of doing things and did not trust the current capacity of generative AI beyond their understanding of what the human mind can accomplish. A lot of disdain was expressed in terms of how AI has disrupted various traditional industries in the market and has caused harm to the labor force. Examples of Tesla and self-driving cars were given as an example of AI innovations that have harmed conventional automobile industries. AI self-checkouts were blamed for the massive layoffs of fast-food workers in the restaurant industry. ChatGPT and other conversational tools were heavily criticized for undermining human creativity, reducing human thought and writing to an afterthought, and undermining the writing, poetry, and art industries. There was not much hopefulness shown with regards to if the government recognizes the existing and potential dangers of AI and how it is disrupting labor markets. There was also not much hope surrounding the growth of AI apps and features, with claims suggesting that these apps were just convoluting the tech space and were confusing, especially for older users that were having difficulty adapting to the ever-changing nature of these AI tools.

5. Limitations

This research is reliant on a tech giant in MENA for its elemental information, but since Bayt is a private entity, it has been challenging to access more detailed information about the exact nature of its AI programs, techniques, and other auxiliary processes. While we have been relying on previously explored concepts that are publicly known, the reliance on secondary resources may affect the depth and the accuracy of the findings.

Secondly, this study is based specifically in the MENA region and how AI has grown to be increasingly favored by large technology companies with specific user bases with different backgrounds, contexts, and perceptions of digital apps compared to the west. The takeaways from this study about how AI is specifically being used to improve the functionality of a job platform in the MENA region may not be applicable to similar companies and products outside of MENA.

6. Conclusion

Several companies are innovating with AI technology more than ever before. In these times, it is pertinent to study the application and specific usage of AI features in different technological niches in the MENA region, so as to create guides and benchmarks for other companies and individuals looking to harness AI and recognize the immense potential and impact AI can generate for companies in terms of user onboarding, retention, conversion, and consequently, business revenue. Given that this is a unique pool of users with different habits and interests, it will be insightful to map out how companies are using AI to specifically generate buzz around their products and improve their UX workflows.

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