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The Evolution of The Manicure Business: From Traditional Methods to The Use of Artificial Intelligence and Robotics

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Abstract: The paper gives a profound evolution of the business of Manicure Development. It started from the transformation of the manual traditional techniques to the use of technological solutions in the present day. The paper also depicts the original historical background from the civilization of ancient Egyptian and Chinese, manicure popularization in the twentieth century up to the current time of copious use of automation, artificial intelligence, and robotics within the industry. It centers the discussion on the change that technology is bringing into the beauty industry with promises to make services more efficient, accessible, and personalized to redefine the customer experience. The paper basically summarizes the main stages in the development of classical methods through electric tools, software for salon management, and the most recent state-of-the-art innovation.

The study aims to explore the influences of up-to-date technologies on the business of manicure, tracking changes that occur due to automation and artificial intelligence, compare them with traditional methods, and put forward, if it is possible, the improved quality and works due to better productivity of services. The relevance comes from the breathtaking speed that changes the beauty business with technology use to optimize processes and satisfy increased demands from customers for more individual experiences. What is new in this article is an extended comparative presentation of historical references with a contemporary view of technological trends, which enables one to spotlight the main driving forces of movement in the sphere of beauty and make reasoned forecasts.

Beauty industry specialists and manicurists would find the article quite practical since it gives practical ideas on how to apply technologies that would leverage competitiveness and the level of service. Entrepreneurs would find the work capable of shedding light on market trends and innovation incentives in the manicure business. The examples of the use of AI and robotics will inspire technologists and developers to create new solutions.

Keywords: manicure, automation, artificial intelligence, robotics, personalization of services, salon management, social networks, history of manicure, nail art.

Introduction: It had a rich history dating back to places like Egypt, Babylonia, and India where nail art was initially considered a symbol of wealth and higher status. Egyptian mummies found with gilded nails are a testimony of this or the earliest known Chinese nail varnish back in 3000 bc e. Further democratization occurred with modern manicure, introduced by Revlon in 1932 and quite rough at that [1]. The revenue in the Nails market worldwide for now amounts to US$12.99bn, while in average, each person worldwide generates US$1.66 in revenue in the Nails market in 2025 [9]. In it, there would be leading nail artists and salons defining creativity over the can of worms known as self-expression through codes, identity, and whatnot.

The place of studying dynamics of the nail business transformation influenced by technology relates to enormous changes that modern innovations render in the beauty industry as a whole. Technological innovations like process automation, and AI vastly change service delivery, making it more efficient, accessible, and customizable than was previously imaginable. Changes don't only relate to the operational side of the business as well as customer interaction — that's why the topic is so relevant for understanding how the industry changes through innovation.

In a broad conception of the beauty industry, technology contributes to rationalizing processes and enhancing the quality of services. For instance, automated processes imply the application of robotic systems in conducting procedures such as that of a manicure. Clockwork, one of the robotic manicure systems, performs a manicure in ten minutes, compared to a manual process that might typically take up to thirty or even sixty minutes [2]. This greatly enhances productivity, reduces operating costs, and broadens the possibility of service availability among a larger group of people, maintaining consistency of quality by virtually eliminating human error.

Artificial intelligence is also at the forefront of transforming the beauty industry— nail business included— through data analytics and service personalization. With AI, such vast details pertain to customer preferences, purchases, and market trends, predicting the need for specific services and products is placed at an easy disposal. For instance, companies like NARS Cosmetics develop products based on AI analytics of customer data. Therefore, in the nail sector, this becomes possible to forecast which colors of polish or design styles are in demand, thus benefiting the salons by optimizing their inventories and offering current solutions.

This, in turn, translates to higher convenience and ease of reaching the service, with the offering being newly facilitated by home devices like the Nimble robot, which can serve professional manicures at home [4]. Very typical of the modern pace of life, in which consumers realize the value of their time. Therefore, in the long run, because business processes are redefined under the modern beauty industry concept, the very same customer experience helps bring into sharp focus this need to study its impact on the segment of nails as a part of the general trend.

MATERIALS AND METHODOLOGY

Research methodology is an in-depth approach to studying manicure from the past to the present high-tech industry based on history, culture, technology, and market with All sources in historical transformation were prerequisites from the time of henna application in Ancient Egypt as a status symbol. to nail art popularized by pop culture (Cardi B) and social networks [1, 6] Technological roboticization cases are Nimble robot for home manicure [4]; AI starts in the beauty industry with virtual testing of designs and trend forecasting [3]. Market data [6, 8] supplement product safety analysis [7]. The methods are the Comparative analysis, critical assessment of media information [2, 4], and Scientific information [7] and consideration Ethical repercussions due to automation [2].

RESULTS AND DISCUSSION

Techniques of a classical manicure based on the manual method of nail preparation and the use of simple tools embody the principles of a traditional approach to nail care, which are in demand to this day [5]. This set of

procedures is a complex performed manually by a master without the use of complicated electrical devices. It is the process of preparing the nail plate and cuticle with simple tools like metal files, scissors, tweezers, and wooden sticks. It begins with the preparation of the nail and includes cleaning and removal of the old coat if any. The cuticle is processed next; back cutting or trimming should be done very precisely to avoid any skin injury. The last stages involve working with the nail plate; filing it and making it shiny plus applying lacquer if needed [5]. This is an approach through which the master can pay attention to the respective peculiar features of the nail condition of the client, and give a personal result.

The outcome is mainly dependent on the skill and experience of the manicurist. Such quality fluctuation may occur particularly when working with inexperienced manpower. Notwithstanding this, manual nail procedures are continuously updating by incorporating such items as safe nail polish and antiseptic coatings on tools that take the comfort and hygiene of the procedure to a point higher than before.

Manicurists facilitate the service process as chief executors — their professionalism and experience influence the quality and end result of the manicure. They engage in all procedures, like preparing the nails, coating, and creative design — steps that require not only technical skills but also the ability to fulfill the individual requirements of customers. The aesthetic result and customer satisfaction directly depend on the quality of the master's work.

A great advantage that the manicurists have is that they deliver their services based on the desire of the clientele in order to make sure that the services are custom-made to fit their needs. This is true even more today with the rising demand for personal services. As evidenced by [6]: An influx of services on-demand has entered the nail salon industry for last-mile delivery, with customers ordering through an app and having nail technicians come to them. The creativity of the practitioners also has created opportunities for them to develop special designs that meet the aesthetic expectations of the clientele and clearly differentiate manual labor from automated technologies. Nonetheless, the advantages are joined by downsides regarding the consumption of time and involving the human factor.

A new technology to emerge into the business of modern nail styling will constitute a reactionary leap in innovation, substantiating or contradicting olden manual ways possibly articulated some sections back throughout the piece discussing manual approaches and masters. Automated implements have stamped alterations into the manicure practice hike up its efficacy and quality. The e-file starts offering impeccable or much quicker nail treatment, presenting an evolving time to work with, and reduces the danger for the vectors of very different stimuli for some harm to the surface of the nail plate. Said ultraviolet lamp, also supposed to dry out the varnish and more particularly the gel-varnish quicker, reduces customer waiting time. Indeed, the application of the latter enumerated tools shortens the duration of the service as determined by the above-mentioned authors [7].

The development of software for salon management, online scheduling, and CRM systems can also be noted among the key factors behind the modernization of the industry. Booking online makes it easier to book appointments and will enable customers to choose convenient slots without involving the staff which decreases the work reference of staff and optimizes work schedules. CRM systems collect and analyze customer data, including information about their browsing history and preferences; it opens an opportunity to provide personalized services and improve quality as well.

The next promising area of manicure business development is through social networks and online platforms. Instagram and Facebook indeed give space for visualization of works, reviews posting, or implementation, for example, of targeted advertising campaigns to draw in new clients and, simultaneously, to maintain footfall. In shaping the reputation of the salon, the internet reviews become a major brand. Beauty parlors use the most active social channel [6] — Instagram: 68% for an account. This is visible in Figure 1. This unquestionably draws attention to digital instruments in the escalating competitive competition of the beauty business, where effectiveness in customer relations stands at a high premium.

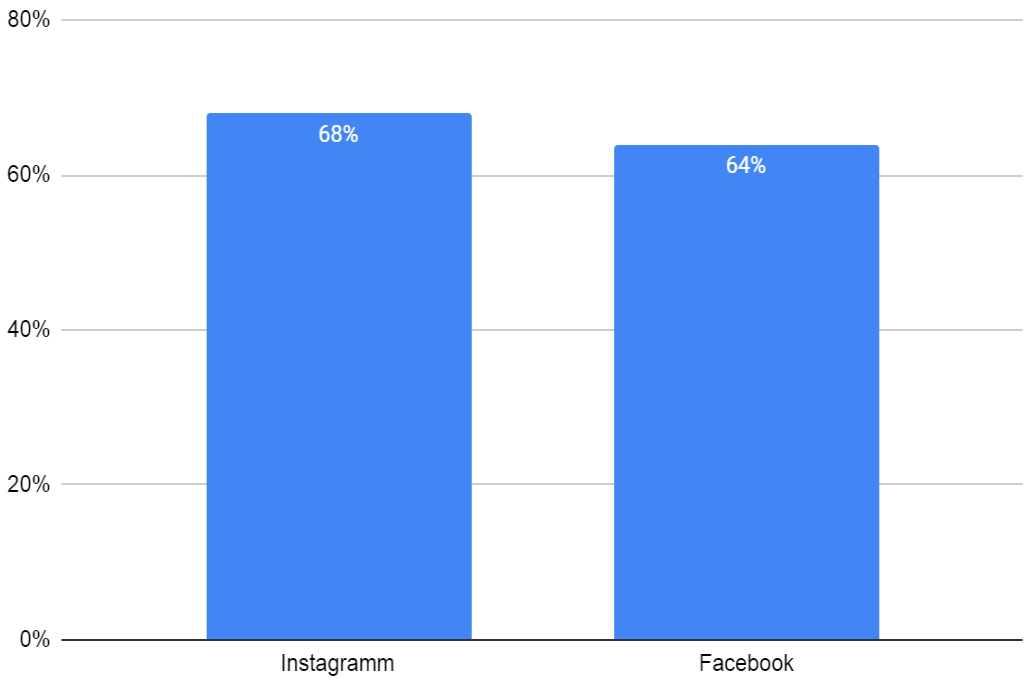

Fig. 1. Statistics on the use of Instagram and Facebook as a social channel [6]

The introduction of artificial intelligence to the nail business is a leap forward in the evolution of the industry based on previously set technological milestones. Having transcended the transition from traditional to data-driven methodologies, AI has increasingly become an ally in the quest to optimize processes and make enterprises more customer-centric while balancing that ambition with a pledge to remain competitive amidst market dynamism. This part discusses the three major thematic areas of AI application in the nail sector: data analysis for demand prediction, customization of proposals to customers, and automation of monotonous operations, each contributing to effectiveness and representing typical tendencies of personalization and automation in the contemporary beauty industry at large.

Demand forecasting is one of the principal boons of AI in nails. Companies will be able to predict the popularity of some particular nail polish color, nail design, or services based on sales history, seasonality, and present social media trends; with the help of machine learning algorithms, this feature will be easily available to them. More specifically, AI can offer specific insights into which shades are popular at specific periods, say seasons or major holidays or events such as fashion weeks. Such information can influence inventory since market revenues are depicted to increase (Figure 2) and salons and stores would then prefer to purchase suitable products and

quantities to minimize costs and avoid overproduction.

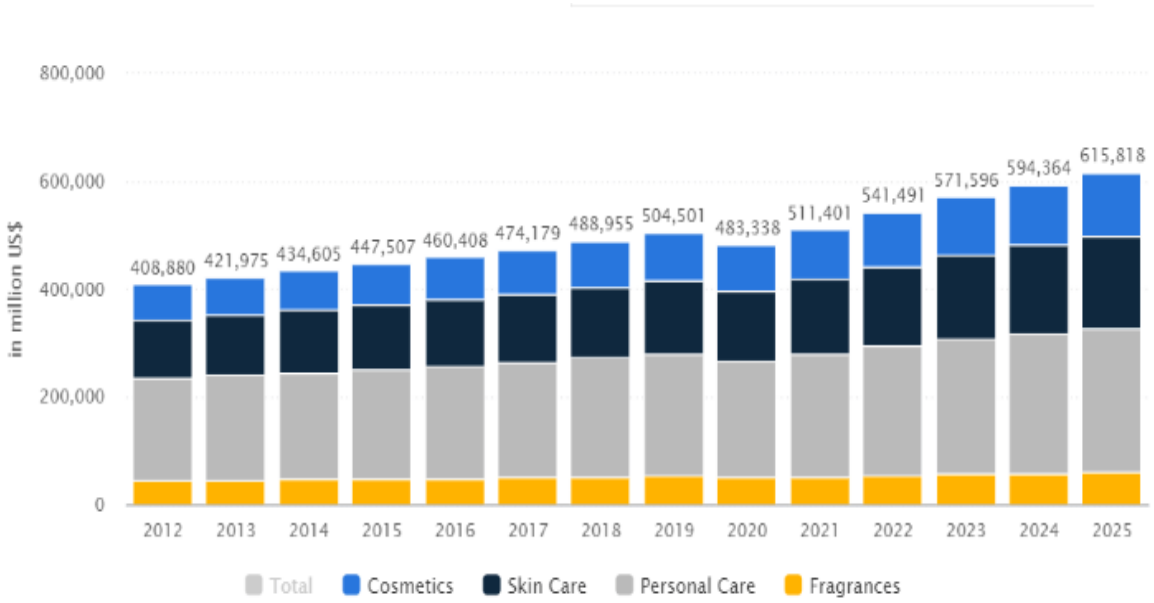

Fig. 2. Dynamics of revenue growth in the manicure industry market [3]

The other major use of AI is in the personalization of offers for customers, which will be more and more important in the beauty industry. Analyzing the customer data—browsing history plus the condition of the nails, skin tone, or preferences in the individual style—helps AI systems take up personalized design, care, or product recommendations. This way, the customers will be more satisfied and loyal since they get services that fit them best. For example, artificial intelligence will see to it that the customer is given a choice of designs that match the skin tone or recommends skincare treatment based on the nail plate condition.

It simplifies a lot of work automation of routine tasks available in the operation of a nail salon. It manages schedules assists with customer queries and even processes payments, allowing the craftsmen to be apparently involved in more creative work. For instance, an automated answering bot will promptly respond with the current pricing, availability, or types of service while there is the optimization of peak hours and technician capturing typical scheduling systems in place to ensure minimized waiting duration.

Robotics in the nail industry is one more giant stride in the beauty technology development ladder following the applications of artificial intelligence reviewed above. The introduction of robots automates processes that have always been done manually, such as applying polish and nail polish. An instance is the Clockwork robot that was created in San Francisco [2]. This device applies artificial intelligence algorithms and 3D scanning to evaluate the shape and size of the nails to facilitate accurate polish application. The whole process consumes less than 10 minutes, far much quicker than the traditional period of manicure, which lies between 30 and 60 minutes. Another example is for the Nimble robot, which is assigned for home use [4]. The machine can also apply professional nail polish and treatment. This gives more and more people ever-stronger abilities to do their own manicures, all without ever setting foot in a salon. These devices really help to show just what a future wearable machine for the nail hostelry can do, coming with an automated solution for fundamental procedures.

Robots enable one to speed up the process and make it more precise and less dependent on the human factor than before. For instance, a manicure performed by a Clockwork robot lasts for only 10 minutes, which is 3–6 times faster than the time taken for a master with high skills performing the same task depending on the complexity of the task [2]. The 3D scanners and artificial intelligence algorithms make the system almost error-proof in applying varnish and nail processing. The client has a special requirement of nail shape and size, or demands intricate designs with a high level of detail, which make accuracy extremely authoritative. As for the human factor, quality variability—something typical for manual labor and dependent on the worker's experience, fatigue, or subjective qualities—will disappear.

Quality and accessibility of the manicure services through the use of robotics are varied. Robots help to raise the quality by making it more standardized and therefore more predictable to customers who expect predictable results, for example, through making it fully

possible to avoid common pitfalls, such as problems with polish application and differences in the treatment of nails between appointments. The accessible option presumes that spread and brought closer service possibilities can be made available for an introduction of robots. Nimble will be able to make the professional manicure at home; installation of Clockwork, a compact robot, in public places such as shopping malls, airports, and offices brings accessibility to the time-poor user. And this will happen especially if there has not been the use of salons by their using public on account of their very busy schedules. However, the robots are still not able to perform well in complex creative assignments like providing individual nail art, which still need human input in some parts of the sector.

Another direction of the development of nail service is the manicure business connected which involves further robotization and integration of AI and VR into the process. Robotics has already introduced massive changes in the industry by automating the process of nail polish application and even processing nails. This will help to do the process faster and with higher accuracy. With the AI system in place, it will be easier to evaluate data about the customer to respond to personalize treatment and predict the required design or nail polish color. Meanwhile, consumption of such services on an increasing interest in personalized nail solutions makes higher demands on the quality of the customer experience so innovations in nail design can now be pre-visualized. The technologies exist and create synergy by changing the approach to service delivery in the beauty industry.

A really potential area for the development of new things in the nail industry would be 3D printing of nail designs. This technology allows for the creation of design elements that low-skilled nail professionals were never able to produce, either because there were no ready-to-use appropriate materials or because highly skilled design artists were required. One of the possibilities is the ability to make artificial nails with individual patterns, textures, or even three-dimensional surface details-imprint designs or miniature statuettes. It opens up completely unthought-of before creative horizons, which appeals to clientele that much more craves individual solutions. Also, this can be preceded by the implementation of 3D printing with virtual reality to view and change designs first in virtual space, which will be more pleasing to the clients and streamlined in the consulting system.

In the next few years, manicure will grow dynamically due to the full-fledged use of technological solutions, which, in turn, will make sustainable development and diversification within the industry possible. The global market volume of Nail Care Products is estimated at $25.76 billion in 2025, and $36.27 billion in 2032 (Figure 3). The data gives market growth.

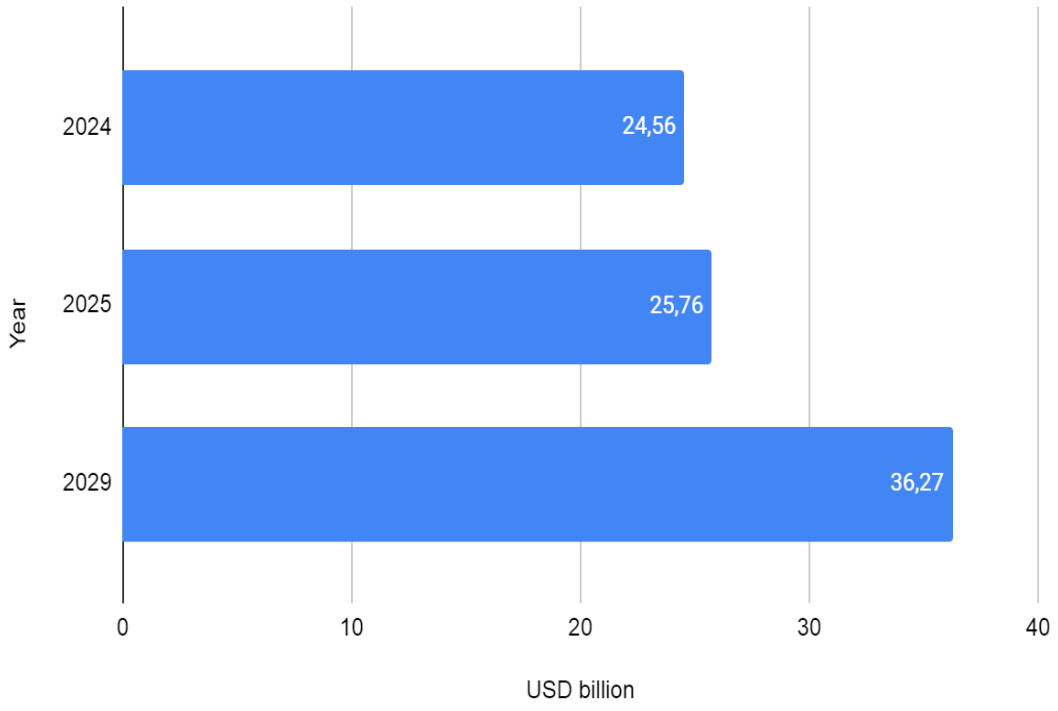

Fig. 3. Growth dynamics of the nail care products market [8]

Such is the acceleration of the rise by a buildup of the increase in demand for traditional services and incoming innovations, robotic and of AI. An ultimate salon, where both robots will carry out simple processes and challenging designs and the AI shall manage the business processes, marketing campaigns, and logistics instantiations. Thus, the future of the nail industry involves an unceasing series of technological improvements, preferences for customization and increased efficiency to make it possible to reshape it and adjust to the changing dynamics in the demand and supply conditions; also the future of the nail industry will better adapt to customer preferences.

CONCLUSION

Evolution of the nail business – from traditional craft to modern, high-tech industry

At one time, manicure depended on human skill and simple tools. Over time, electric devices crept into nail services, including nail files and drying lamps, which made the process more accurate and faster. Much later, salons transitioned into using software for recording clients as well as other modalities of business, which they found very useful. As for the present moment, we already know that robots and artificial intelligence are heavily used in the manicure industry; machines apply varnish and designs in a consistent manner, which is fast.

Such innovations have a direct impact on services and customer convenience: imperfections of humans are erased by robots through an error-free procedure that is far more predictable. AI helps determine personalized services for each customer based on his tastes, and VR shows what the final outcome of a nail paint would look like. This makes the process convenient and interesting for the people themselves and more operational for the businesses.

The future of the nail business is the constant change that new technologies bring. Robots may be given even more tasks, and maybe there could be salons where machines do everything. Design selection through virtual reality or remote consultation with an artist through it will be some of the common services. 3D printing and similar technologies will open new gates to limitless creativity in creating unconventional decorations on nails. With time, it may develop into a system where customers, artists and technology are closely related without unnecessary hassles, which will in turn further enhance the nail business.

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