University Incubators: Cultivating Innovation for a Flourishing Entrepreneurial Society

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Abstract:

This research explores the vital role of universities in shaping entrepreneurial societies through effective incubation systems. It traces the evolution of universities from teaching-focused institutions to hubs of research, innovation, and entrepreneurship. Despite the recognized importance of knowledge, innovation, and entrepreneurship, universities have not fully leveraged their potential in these areas. The study analyzes the strengths and weaknesses of university incubators, emphasizing their role in revenue generation and collaboration with businesses, government, and communities. Key factors driving this transformation include human capital, knowledge, research, and development. These elements have propelled economies towards knowledge-based models, emphasizing creativity, innovation, and supportive infrastructures. In entrepreneurial societies, universities play a pivotal role by fostering entrepreneurial culture and nurturing innovative leaders. The study concludes by outlining future directions and policy recommendations for enhancing university incubators, ensuring their continued contribution to entrepreneurial excellence and economic growth.

Keywords: University incubator, U-I linkages, Entrepreneurship; Triple Helix.

Introduction

The global higher education sector has experienced profound changes in recent years, driven by an increasing emphasis on key factors such as competitiveness, the development of human capital, the pursuit of quality research, and the promotion of creativity, innovation, and entrepreneurship. These elements are fundamental in reshaping and revitalizing the higher education system, as highlighted by Mok (2015). In alignment with this, a study by Olivares and Wetzel (2014) provides valuable insights into how universities have adapted by

enhancing their operational efficiency through economies of scale and scope. This research underscores the fact that globalization, coupled with rising competition, has placed substantial pressure on public higher education institutions to make more effective use of their resources. Consequently, these institutions have not only sought to increase their operational efficiency but have also endeavored to expand their influence and diversify their activities. This expansion often involves broadening their educational offerings to include a wider range of disciplines, thereby addressing the growing demand for multi-disciplinary expertise and catering to the evolving needs of a globalized society. By adapting to these demands, universities are increasingly positioning themselves as engines of innovation and societal progress, fostering a more dynamic and globally competitive academic environment. Muhammad, S. K. P. (2023), Pathan, M. S. K. (2022), Khan, M. S. (2021)

The evolving role of universities reflects this societal shift. Initially, education was viewed as a social good, emphasizing universal access and the public right to education (Vryonides and Campriani, 2013). Subsequently, a new phase emerged, focusing on fostering a research-oriented culture within educational institutions, promoting research and development as integral components (Casu. 2016; Worthington and Lee, 2015). However, universities have recently departed from the altruistic pursuit of basic research as a public good. Instead, they have transitioned into profit-driven entities, catering to specific customer segments with products priced for sale (Muhammad, S. K. P. (2023), Pathan, M. S. K. (2022), Khan, M. S. (2021) Audretsch, 2014). This shift from non-profit to profit-oriented models have intensified competition among universities. To enhance product value, universities must prioritize product quality and implement continuous improvement mechanisms. In this fiercely competitive environment, the focus has broadened to include profit maximization, quality education, research, industry collaborations, and the transformation of students into entrepreneurs rather than mere job seekers (Gul and Ahmad, 2012).

In this new paradigm, universities have transformed into problem-solving entities, targeting industries and businesses. Universities assist these entities by offering viable solutions to their challenges. Facilitating knowledge transfer to industries, fostering innovation, and promoting entrepreneurship have become paramount goals. Universities have embraced various initiatives, one of which involves the establishment of university incubators (Amezcua, 2010). In contrast to alternative knowledge transfer mechanisms like science and technology parks, university incubators necessitate lower financial investment, infrastructure, and technical capabilities. This transition towards more economical and adaptable initiatives is in harmony with the evolving landscape of higher education. This study aims to dissect this evolving trend within universities and explore the concept of entrepreneurial universities. This research delves into the role of knowledge transfer mechanisms, particularly examining how university incubators serve as pivotal tools in fostering the development of an entrepreneurial society aimed at achieving socio-economic progress. Audretsch (2014) Muhammad, S. K. P. (2023), Pathan, M. S. K. (2022), and Khan, M. S. (2021) offer a critical assessment of how universities are evolving beyond their traditional roles of education and research, transitioning into dynamic hubs that not only facilitate innovation but actively contribute to entrepreneurial ecosystems. These institutions are increasingly positioning themselves as key drivers of entrepreneurship, supporting the growth of startups and small businesses, and nurturing an environment where creativity and

business acumen intersect. By providing vital resources, mentorship, and access to networks, university incubators play an instrumental role in transforming academic research and innovation into tangible economic contributions. Audretsch's evaluation underscores the significance of universities as active participants in shaping an entrepreneurial society, helping to bridge the gap between knowledge generation and its practical application in the market. In doing so, they contribute to broader socio-economic goals by fostering job creation, promoting innovation, and addressing societal challenges through entrepreneurial solutions. This transformative role highlights the evolving mission of universities as not only centers of learning but also as essential players in driving economic development and societal advancement.

The Involvement of Universities in Generating Knowledge, Advancing Research, and Driving Economic Progress

Throughout history, scholars from various disciplines have been drawn to the pursuit of knowledge, recognizing its profound influence on society. Marshall (1920) succinctly identifies knowledge as a key driver for improving productivity, while the process of transferring knowledge is viewed as a critical factor in boosting competitiveness and securing valuable resources among firms that engage closely with one another Muhammad, S. K. P. (2023), Pathan, M. S. K. (2022), Khan, M. S. (2021). Despite the immense potential of knowledge, it remains inert in terms of its contribution to economic development unless it is effectively disseminated to businesses—a process that involves considerable time, effort, and financial investment, as noted by Arrow (1962).

The development of Endogenous Growth Theory (EGT) has further heightened the focus on knowledge as a central element in driving economic expansion. Unlike earlier theories, EGT emphasizes the role of knowledge and human capital as intrinsic components of production, influencing economic outcomes directly. Pioneering economists like Lucas (1988) and Romer (1986, 1990, 1994) played a significant role in the emergence of EGT during the mid-1980s, challenging traditional exogenous and neoclassical growth models, which placed less emphasis on knowledge. According to EGT, knowledge, particularly that generated through research and development (R&D), is fundamental to sustained economic growth. This theory also advocates for substantial investment in R&D and the development of human capital, particularly within the framework of higher education institutions and universities, which are seen as crucial hubs for innovation and the generation of new ideas. Such investment is viewed as essential not only for advancing scientific inquiry but also for fostering a more dynamic, knowledge-driven economy, where the practical application of research leads to broader economic benefits.

Historically, universities have served as primary centers for generating knowledge. However, in contemporary times, a growing scholarly consensus advocates for a more collaborative approach between academia and industry, focusing on the exchange of knowledge to promote sustainable competitive advantages (Muhammad, S. K. P. (2023), Pathan, M. S. K. (2022), Khan, M. S. (2021) Bruneel, D'Este, & Salter, 2010; Hashmi & Shah, 2013). Researchers have explored the critical link between knowledge generation and economic growth, to persuade policymakers to allocate greater financial resources to this sector. Numerous studies have demonstrated a positive correlation between knowledge

dissemination and economic development in developing nations (Afzal et. al. 2011; Jalil & Idrees, 2013; Kimenyi, 2011; Mercan & Sezer, 2014). A recurrent theme in these findings is the necessity for increased funding, particularly in higher education, to drive significant economic progress.

The origins of this shift in the academic paradigm can be traced back to Bologna University, acknowledged as the world's first university, where tuition fees were introduced for instruction in Roman law, reflecting the inherent value placed on education. Initially, universities aimed to maximize student enrolment while promoting equitable access to education (Berger & Kostal, 2002). Over time, this notion of fair access evolved to include quality teaching and performance standards, increasingly measured through key metrics (Jalaliyoon & Taherdoost, 2012).

In addition to their educational mission, universities play a pivotal role in research and development (R&D), a critical component for driving both economic and social advancements. According to the principles of Endogenous Growth Theory (EGT) and the Knowledge-based Economy concept, R&D is a fundamental pillar of economic growth, though it tends to advance more rapidly in developed nations while progressing at a slower rate in developing countries. The indicators of a knowledge-based economy include a robust R&D sector, active innovation, and a highly skilled workforce (Muhammad, S. K. P. (2023), Pathan, M. S. K. (2022), Khan, M. S. (2021)Raspe & Van Oort, 2006). R&D activity is typically measured through outputs such as scholarly publications, patents, licensing agreements (Ahmad, 2012; Cavaller, 2011), citations, and overall R&D expenditure (Akhmat et al., 2014). Despite these metrics, scholars continue to emphasize the need for enhanced R&D efforts, stressing the importance of both the creation and dissemination of knowledge across society.

In recent years, greater recognition has been given to research that fosters innovation, particularly that which promotes creativity, and the development of new products or processes aimed at improving quality and production efficiency while simultaneously lowering transaction costs. For the higher education sector to significantly contribute to economic growth, fostering innovation must remain a priority. Kowang et al. (2013) have proposed an innovative model incorporating key principles to strengthen Higher Education Institutions (HEIs) and research universities, equipping them to navigate and excel in an increasingly competitive landscape driven by knowledge and innovation.

Academia and Entrepreneurship Development

In the context of Endogenous Growth Theory (EGT), pioneered by Romer (1986, 1994), human capital, innovation, and knowledge emerge as critical factors that contribute to increasing marginal returns, though their impact varies significantly across nations due to differences in technological advancements. This marks a departure from traditional economic models such as Solow's (1956), which emphasized capital and labor as the primary drivers of growth. Romer's model suggests that these traditional factors are no longer as central in explaining economic growth, particularly in a global economy driven by knowledge and technological innovation.

However, the notion within EGT that positions knowledge as a non-depreciable asset is not without contention. Critics argue that, in practice, firms must continuously compete to maintain their edge in knowledge-based economies, making knowledge a more competitive

and finite resource than EGT implies (Acs et al., 2003). Moreover, the concept that knowledge can be transferred seamlessly and at no cost has been heavily debated. Research demonstrates that knowledge transfer is frequently hindered by geographical, financial, and regulatory barriers, which add complexity and cost to the process (Canepa & Stoneman, 2005; Cohen et al., 2002; Singh & Marx, 2013). Acs et al. (2003) further argue that knowledge transfer requires a deliberate, strategic approach, particularly when channeling it into entrepreneurial ventures.

A significant shift occurred in the 1980s with the introduction of legislative frameworks that treated knowledge transfer as a commercial commodity, challenging the previously held notion of unrestricted access to knowledge (Grimaldi, Kenney, Siegel, & Wright, 2011). The Bayh-Dole Act played a crucial role in this transformation by encouraging the commercialization of knowledge generated within universities, thus diminishing what Audretsch (2014) describes as the "knowledge filter." The "knowledge filter" refers to the challenges in converting research into practical economic applications, often caused by institutional or regulatory barriers (Acs et al., 2003; Audretsch, 2014). While EGT suggests that research and development (R&D) would naturally lead to economic growth, the existence of this filter demonstrates that such progress requires active intervention.

Universities, in response to these challenges, have increasingly adopted entrepreneurial roles, fostering sustained relationships with industries to ensure that their research translates into commercial products. Entrepreneurship, in this context, serves as a crucial mechanism for narrowing the gap between academic knowledge and its economic application, thereby reducing the effects of the knowledge filter (Muhammad, S. K. P. (2023), Pathan, M. S. K. (2022), Khan, M. S. (2021) Braunerhjelm et al., 2010; Qian & Acs, 2013). The term "entrepreneurial universities," first introduced by Etzkowitz (1983), captures the evolving mission of universities to dynamically transfer research into marketable innovations. Moreover, the concept of the "magic beanstalk vision," coined by Miner, Vaughn, Eesley, and Rura (2001), highlights universities' growing involvement in entrepreneurial activities aimed at fostering industrial and technological growth.

This evolution has seen universities transition from their traditional roles in education and research to embrace a "third mission"—the active transfer of knowledge to society through partnerships with industries. This shift has also redefined universities from nonprofit institutions to entities capable of generating revenue, particularly through commercialization activities (Bercovitz & Feldmann, 2006). According to Geuna and Muscio (2009), entrepreneurial development not only propels economic growth but also provides universities with additional income streams through collaborations with industries. In countries like Pakistan, university-industry partnerships, as explored by Gul and Ahmad (2012), are becoming instrumental in strengthening higher education institutions and fostering innovation.

Through these collaborations, universities transform into catalysts of entrepreneurial development, initiating new ideas, supporting their implementation, and bringing innovative ventures to the marketplace. Thune and Gulbrandsen (2014) examined the dynamics of university-industry collaborations, noting how these relationships have evolved. More recently, Audretsch (2014) conceptualized the entrepreneurial university as an institution capable of generating new ventures, commercializing them in novel markets, and facilitating

the flow of knowledge from academia to both profit-oriented and nonprofit sectors.

University Incubators

The National Business Incubation Association (2014) defines business incubation as a vital process that offers essential services and resources to assist entrepreneurs in the creation and establishment of new ventures. Incubators are regarded as critical support systems for emerging entrepreneurs, playing a central role in helping them overcome the significant challenges that typically accompany their entrepreneurial endeavors (Muhammad, S. K. P. (2023), Pathan, M. S. K. (2022), Khan, M. S. (2021) Chen, 2009; Grimaldi & Grandi, 2005c). Shahzad, Ali, Bajwa, and Zia (2012) further highlight the indispensable role of incubators in promoting sustainable entrepreneurial growth.

Incubators provide a comprehensive range of services designed to support entrepreneurs. Al-Mubaraki and Busler (2010) describe these services as including shared office spaces with technical facilities, managerial mentoring, networking opportunities, access to valuable knowledge, and financial capital, alongside initial funding to nurture entrepreneurial initiatives. Beyond these basic services, incubators also engage in crucial activities such as selecting and screening potential incubates (Dee et al 2011), managing intellectual property and patenting processes (Chandra, Alejandra, & Silva, 2012), fostering collaborations between universities and industries (Colombo et al., 2012; Schwartz & Hornych, 2010; Tang, Baskaran, Pancholi, & Lu, 2013), providing a risk-tolerant environment for early-stage ventures (Özdemir & Şehitoğlu, 2013), mediating transaction costs (Tang et al., 2013), and facilitating access to both national and international markets (Chandra et al., 2012).

Historically, the Batavia Industrial Center, established in 1959 in New York, USA, is recognized as the world's first business incubator, marking the inception of this concept (Lewis, 2002). The incubation movement gained momentum in the 1980s, growing from just 12 incubators in that decade to 1,250 by 2012 in the USA alone. Globally, the number of incubators surpassed 7,000 in 2014 (National Business Incubation Association, 2014), reflecting the exponential growth of this model and its critical role in promoting entrepreneurship on an international scale.

Incubators are broadly classified into two main types: profit-oriented and non-profit incubators (Allen & McCluskey, 1990). A significant portion of non-profit incubators are supported by academic institutions and research organizations (Muhammad, S. K. P. (2023), Pathan, M. S. K. (2022), Khan, M. S. (2021) Phillips, 2002). Chandra et al. (2012) note that the majority of incubators worldwide fall under the non-profit category, with most being funded by government bodies and supplemented by rental income from tenants. This rapid expansion underscores the increasing recognition of incubators as essential tools for fostering innovation and entrepreneurial development. The widespread adoption of incubation strategies globally highlights the diversity of approaches aimed at cultivating a supportive ecosystem for startups and entrepreneurial ventures, including both profit-driven and non-profit models. As this ecosystem continues to evolve, a nuanced understanding of these diverse models becomes crucial for policymakers, entrepreneurs, and stakeholders involved in driving economic growth through entrepreneurship.

Universities have also become central players in this entrepreneurial landscape, contributing significantly to the management of incubators, research and development (R&D), innovation,

commercialization, and the nurturing of entrepreneurs in both developed and developing nations (Miner et al., 2001). University incubators, specifically designed to create robust entrepreneurial ecosystems, are increasingly recognized for their role in supporting spinoffs and small to medium enterprises (SMEs) during their early stages of development and growth (Studdard, 2006). These incubators offer crucial resources and create an environment conducive to entrepreneurial success (Mian, 1996), with Palumbo and Dominici (2013) defining university incubators as systems sponsored by universities that provide dedicated spaces within academic premises to support the development of university-affiliated startups.

Universities are thus expanding their traditional roles by engaging more actively in the incubation process, not only fostering the growth of new businesses but also contributing to the larger economic ecosystem. University incubators are increasingly seen as strategic tools that drive the transformation of innovative ideas into viable, sustainable ventures. As the global economy places greater emphasis on entrepreneurship as a key driver of growth, the role of university incubators becomes even more vital. Understanding and leveraging the potential of these incubators is integral to promoting innovation-driven economies.

From a historical perspective, university incubators offer essential resources, such as location, expert human capital, funding, and opportunities for fostering innovation and commercialization. Despite their acknowledged importance, industry-backed incubators have been slower to emerge (Chandra et al., 2012). Studies have categorized the necessary resources for the optimal functioning of university incubators into four core areas: human, financial, organizational, and technological resources, all of which are essential for supporting entrepreneurial activities (Somsuk et al., 2012). Salem (2014) underscores the importance of university incubators, especially for student entrepreneurs, who use these platforms to build connections with industry and establish their businesses.

A thorough analysis of university incubators reveals several key factors that determine their success. These include the quality of infrastructure, networking opportunities, human and technical support, faculty and staff involvement, and the overall reputation of the institution (Culkin, 2013; Bruneel et al., 2012; Somsuk et al., 2012; McAdam & Marlow, 2011; Gstraunthaler, 2010; Ratinho, 2010; Todorovic et al., 2008; Grimaldi & Grandi, 2005; Lee & Osteryoung, 2004). Together, these dimensions contribute to the foundational strength and effectiveness of university incubators, enabling them to offer crucial support and create an environment that nurtures the growth and success of entrepreneurial ventures. The continued evolution and integration of these dimensions reflect the ongoing commitment of university incubators to foster innovation and entrepreneurship in an increasingly competitive global landscape.

The Function of University Incubators in Cultivating an Entrepreneurial Society

The National Business Incubation Association (2014b) conceptualizes incubation as an active and dynamic framework designed to support entrepreneurs in overcoming critical challenges faced during the early stages of venture creation. Far from simply offering physical spaces, incubators have evolved into comprehensive support systems that play a key role in assisting nascent businesses (Chen, 2009). Shahzad et al. (2012) highlights the indispensable contribution of incubators to sustainable entrepreneurial growth, emphasizing their

importance in fostering long-term success for startups.

According to Al-Mubaraki and Busler (2010), these entrepreneurial hubs provide a wide range of services aimed at nurturing startups. Incubators offer shared workspaces equipped with technical resources, provide managerial guidance, facilitate vital networking opportunities, and offer access to essential knowledge and financial capital. They also extend support through initial funding schemes that help entrepreneurs secure the necessary resources to start their businesses. Additionally, incubators play a crucial role in screening and selecting promising ventures (Dee et al., 2011), managing patents and intellectual property rights (Chandra, Alejandra, & Silva, 2012), and building important linkages between universities and industries (Colombo, Piva, & Rentocchini, 2012; Schwartz et al., 2010; Tang, Baskaran, Pancholi, & Lu, 2013). Moreover, incubators help mitigate early-stage risks for entrepreneurs (Özdemir et al., 2013), streamline transaction costs (Muhammad, S. K. P. (2023), Pathan, M. S. K. (2022), Khan, M. S. (2021)Tang et al., 2013), and provide access to national and international markets (Chandra et al., 2012), ensuring that new ventures have the necessary tools to thrive.

Historically, the concept of business incubation originated with the establishment of the Batavia Industrial Center in New York, USA, in 1959 (Lewis, 2002). Though their role was initially marginal, the 1980s witnessed a significant shift in the relevance of incubators, marking a period of rapid expansion. The number of incubators in the USA grew from just 12 in the 1980s to 1,250 by 2012, while globally, their number surpassed 7,000 (National Business Incubation Association, 2014a). This historical evolution underscores the growing recognition of incubators as essential instruments for fostering innovation and entrepreneurial development across the world.

Incubators are typically divided into two main categories: profit-oriented and non-profit organizations (Allen et al., 1990). Notably, the majority of non-profit incubators are rooted in academic and research institutions, with their operations often supported by state funding and rental income from incubators (Phillips, 2002; Chandra et al., 2012). The prevalence of non-profit incubators highlights their role as crucial drivers of entrepreneurial ventures, particularly in contexts where long-term economic development and innovation are prioritized.

Universities play a vital role in this ecosystem by contributing to the management of incubators and promoting research and development, innovation, commercialization, and entrepreneurship in both developed and developing economies (Muhammad, S. K. P. (2023), Pathan, M. S. K. (2022), Khan, M. S. (2021) Miner et al., 2001). University-backed incubators are strategically positioned to support spinoffs and small-to-medium enterprises (SMEs), providing the necessary foundation for their growth and development (Studdard, 2006). Palumbo and Dominici (2013) describe these university incubators as university-sponsored systems specifically designed to cultivate and nurture university spinoffs, with the explicit goal of fostering entrepreneurial growth.

Chandra et al. (2012) emphasizes the historical importance of university-based incubators, noting their significant role in providing key resources such as expert knowledge, funding, and opportunities for innovation and commercialization. McLean et al. (2012) categorize the resources required for the optimal functioning of university incubators into four primary domains: human, financial, organizational, and technological. Salem (2014) asserts that

university incubators represent the most impactful category of incubators, particularly for student entrepreneurs, who use them to forge critical connections with industries and establish their businesses.

The success of university incubators, as identified by various researchers, is grounded in several key dimensions (Bøllingtoft & Ulhøi, 2005; Bruneel et al., 2012; Culkin, 2013; Gstraunthaler, 2010; Lee & Osteryoung, 2004; McAdam & Marlow, 2011; Somsuk et al., 2012; Todorovic et al., 2008). These dimensions include infrastructure, networking opportunities, human and technical support, active involvement of faculty and staff, and the reputation of the institution itself. Collectively, these factors highlight the diversity and effectiveness of university incubators in fostering entrepreneurship and driving economic development. By supporting startups and facilitating the growth of new ventures, university incubators play an essential role in shaping innovation-driven economies and promoting entrepreneurial success.

Conclusion

In the face of the complexities that define today's global economic environment, many nations struggle with both financial and human resource limitations. A promising solution to these challenges lies in the development of entrepreneurial universities, which are increasingly seen as critical drivers of economic advancement, pushing countries toward knowledge-based economies (Al-Mubaraki & Bulser, 2013). The transformative role of knowledge, innovation, entrepreneurship, and incubators in influencing the direction of national growth is well recognized. However, numerous economies still face significant hurdles in fostering innovation, creating entrepreneurial ecosystems, and addressing the lack of incubators, particularly in academic settings. To address this gap, Lacuna et al. (2013) advocate for strengthening university-industry linkages, which serve as a powerful tool for promoting entrepreneurship. At the heart of this effort is the university incubator, a dynamic platform that brings together academia, industry, government, and society. This collaboration is not merely beneficial; it is a fundamental requirement for a country's economic, social, and financial progression. Establishing a vibrant entrepreneurial climate necessitates a commitment to the Quadruple Helix approach, which underscores the critical importance of university incubators in this process.

At this crucial time, higher education systems must undergo significant expansion and consolidation, with a particular emphasis on the role of incubators. Policymakers bear the substantial responsibility of highlighting the importance of university incubators by introducing strategic incentives such as financial aid, legislative support, and fostering private sector participation. In a world marked by intense global competition, university incubators are becoming indispensable for transferring academic knowledge to industry, commercializing research outputs, and advancing national innovation strategies. This interconnected process of knowledge transfer, commercialization, and innovation forms the cornerstone upon which entrepreneurial societies are constructed.

Regardless of their stage of development, economies must recognize the importance of integrating university incubators into their policy frameworks, annual development strategies, and financial planning. The inclusion of university incubators in national strategic blueprints is vital, as they act as catalysts that propel countries toward long-term prosperity,

economic stability, and sustained growth. Simultaneously, the academic community is called upon to explore the intricate workings of university incubators, particularly in their role of promoting innovation, facilitating commercialization, and fostering entrepreneurial societies. Rigorous research is required to thoroughly investigate the impact of university incubators in developing economies, where their role in stimulating innovation and growth is of paramount importance.

However, the successful implementation of university incubators is not without challenges. A critical assessment is necessary to identify the obstacles encountered by both universities and national economies. It is imperative to examine how these challenges can be overcome and how the long-term effectiveness of university incubators can be sustained. These are pressing questions that demand careful exploration by scholars and policymakers alike.

Understanding the complexities of university incubators requires a deep investigation into the resource-based perspective, institutional growth, and the networking opportunities they offer. This comprehensive examination is essential for enhancing the operational capacities of these incubators, paving the way for improved performance, efficiency, and long-term success.

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