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The full papers and abstracts were accepted after being subjected to a peer review process conducted by the scientific committee.

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Alliance of Guangzhou International Sister-City Universities

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TRANSFORMING NEGOMBO: A BLUEPRINT FOR DEVELOPING A SMART TOURIST CITY FOR ENHANCED LIVABILITY, WORKABILITY, AND SUSTAINABILITY

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BACKGROUND

Unquestionably, Negombo, located on Sri Lanka's scenic west coast, has played a crucial role in the development of the country's tourism sector for many years (Waas et al, 2020). Tourists from all over the world have continuously been lured to it by its diverse array of attractions, which include immaculate beaches, bustling fishing communities, and a thriving local culture (Gunasekara, 2016). Notably, Negombo has played a dual role in Sri Lanka's tourism industry, functioning as both the beloved final destination where travellers end their Sri Lankan sojourns with happy memories and the initial point of entry for foreign visitors arriving in the country (Gunasekara, 2016).

Negombo stands out for its exceptional capacity to fuse traditional Sri Lankan experiences with contemporary amenities, making it a well-liked destination for both leisure and business travellers (Athapaththu and Dahanayake, 2019). The significant investments the area has garnered further highlight its importance to Sri Lanka's tourism sector (Waas et al, 2020). Internationally famous hospitality chains like Hilton and local tourism behemoths Jetwing and Heritance have a large presence in Negombo (Athapaththu and Dahanayake, 2019). These investments have improved the city's reputation as a tourist attraction while also providing a sizable number of jobs for the local workers (Waas et al, 2020).

Negombo has a considerable economic impact on Sri Lanka's tourism industry and generates a sizable portion of the country's income. It acts as a booming centre for a variety of tourism-related companies, including lodging facilities, dining establishments, aquatic activities, and tourist attractions (Athapaththu and Dahanayake, 2019). The city's thriving tourism industry not only significantly increased local communities' revenue but also the region's general economic success (Kulathunga, 2017).

The size of the investments it has drawn, the sizeable workforce it maintains, and the sizeable economic contribution it makes to the nation's thriving tourism industry all serve to highlight Negombo's ongoing appeal and strategic relevance within Sri Lanka's tourism scene (Ranwella and Jayasinghe, 2021). This context emphasises how critical it is to exploit Negombo's potential as a smart tourist city in order to maintain its growth and competitiveness in the international tourism market.

PROBLEM IDENTIFICATION

Negombo, a city of historical significance and natural beauty, is facing a difficult task because the smart city idea hasn't had much of an impact there. The destination's general appeal and competitiveness have felt the effects of this resistance to modernisation and intellectual urbanisation (Waas et al, 2020).

Negombo, once praised as a major travel location, is currently seeing a slow decline in traveller acclaim. This worrisome trend is a complex issue caused by a number of interrelated issues (Waas et al, 2020). The workforce's lack of proper skill development is a significant barrier. Although Negombo has a significant labour base, the lack of smart skills and vocational training programmes has made it difficult for the workforce to meet the changing demands of contemporary tourism (Waas et al, 2020).

Negombo also struggles with a poor IT infrastructure, which is a necessary component of a smart city. Tourists anticipate flawless internet interactions and the convenience of digital services in today's digitally connected world, which Negombo now struggles to deliver.

The issue of accessibility is still another. Negombo has been somewhat marginalised since Sri Lanka's highway system was established because there is no direct public transportation link from the international airport to the city, discouraging travellers from making Negombo their first or last stop (Chathuranga and Aslam, 2019).

Negombo's falling popularity is also a result of the city's rising travel costs (Chathuranga and Aslam, 2019). The budget-conscious traveller segment, which makes up a sizeable component of the tourism business, has been somewhat disregarded by the city despite its notable advancements in luxury tourism (Chathuranga and Aslam, 2019).

Finally, despite its size, Negombo's workforce is not yet in line with the idea of a "smart" workforce that can meet the variety of demands of contemporary tourists. The quality of services and innovation in the tourism business are both impacted by this skill and adaptation gap (Silva and Weerakoon, 2017).

METHODOLOGY

A qualitative survey approach was carefully selected as the research methodology for this study in order to offer in-depth insights into the challenges of converting Negombo into a smart tourism city. The foundation of data gathering consisted of 42 open-ended interviews with a wide range of key players in the Negombo tourist area.

These interviews took place in the important post-pandemic period, which was marked by a rebound in tourism activities. This timing was crucial since it offered a good opportunity to assess stakeholders' perspectives and opinions during a time of change and adaptation.

The interview guide was carefully designed, based on a significant amount of secondary research on methods for achieving the transformation of a conventional tourist attraction into a smart city. This guide made sure that the discussions were led by topical, well-researched questions, which encouraged in-depth responses from the participants.

The qualitative survey approach was crucial in getting participants to share their deep, context-specific ideas, which allowed for a nuanced understanding of the opportunities and constraints Negombo faced in its effort to develop into a smart tourist city. The richness and veracity of the information amassed using this methodology form the basis for thorough analysis and insightful suggestions for the future development of Negombo as a smart city.

FINDINGS

The results of the study revealed a wide range of difficulties and possibilities that are essential for transforming Negombo into a sophisticated tourism destination. The data revealed several key themes that shed light on critical issues that need consideration and action.

Negombo's Tourist Destination Gaps:

- Negombo lacks a strong digital infrastructure to meet the demands of contemporary travellers. Smart technologies and high-speed internet connectivity are insufficient, which has an effect on the whole tourist experience.
- Transportation Links: Accessibility is still a big problem. Arriving tourists experience inconvenience due to Negombo's current lack of a direct public transportation connection to the international airport.
- Tourist Workforce: Negombo's workforce lacks the knowledge and experience required to fulfil the changing needs of the travel and tourism sector. This has an impact on service quality and hinders the development of memorable tourist experiences.

Missing Elements in Negombo to Be a Smart Tourist City:

- Negombo lacks a thorough sustainability strategy in area a. The lack of eco-friendly practises impedes the city's ability to become a sustainable tourism destination and leads to environmental degradation.
- Smart Infrastructure: Negombo lacks smart city components like real-time information services, integrated data systems, and automated procedures.

How to Develop Negombo as a Tourist City:

- Upskilling and training initiatives for the workforce are essential. Collaborations with educational institutions and training programmes tailored to particular industries are advised.
- Digital Transformation: It is crucial to invest in digital infrastructure. The development of fast internet, travel-related mobile apps, and digital platforms for information sharing is necessary.
- Enhancing transportation is necessary, and this includes creating direct public transportation linkages between the airport and Negombo.

- Implement sustainable tourism practises, such as trash management, the use of renewable energy sources, and eco-friendly lodging.

Benefits of Converting Negombo into a Smart Tourist City:

- A better overall visitor experience will result from the use of smart technologies, which will also make it more convenient and pleasurable.
- Economic Development: As Negombo develops into a smart tourism destination, more travellers will flock there, boosting the local economy and creating more job possibilities.
- Sustainability: Sustainable actions will safeguard Negombo's natural beauty and guarantee that it continues to be a popular travel destination in the long run.

Recommendations and Development Framework:

1. To make Negombo a smart tourist destination, a multidimensional strategy is needed:
2. Digital Infrastructure: Spend money on fast internet and online platforms for travel-related services.
3. Skill Development: Partner with educational institutions to provide training programmes that are industry specific.
4. Establish direct public transportation linkages between the airport and Negombo as part of the fourth transportation improvement.
5. Sustainable Practises: Adopt eco-friendly policies including waste management and the use of renewable energy.
6. Encourage cooperation among stakeholders, such as the government, local communities, and the tourism sector.
7. Technology Integration: Implement smart technologies for data collection and tourism services.
8. Marketing: Use advertising efforts to promote Negombo as a smart tourism destination.

9. Regulation: Create and uphold rules to guarantee ethical and sustainable tourism practise

The transformation of Negombo into a smart tourism city holds immense promise for enhancing the traveller experience, promoting economic expansion, and ensuring sustainability over the long term. With the right investments, alliances, and regulatory frameworks, Negombo has the potential to develop into a leading smart tourist destination in the region.

CONCLUSION

In conclusion, Negombo is at a crossroads and needs to change into a smart tourist city in order to compete in the international tourism market. The study's conclusions highlight the serious gaps in the situation and offer stakeholders doable advice for overcoming them. Adopting smart city principles would help Negombo become more sustainable while also improving its quality of life and workability. Undoubtedly, this makeover will attract a wide variety of tourists, maintaining Negombo's continued standing as a top tourist destination in Sri Lanka and highlighting its importance in the world of tourism.

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TOWARDS THE IMPROVEMENT OF FOOD FLAVOR ANALYSIS THROUGH THE ARTIFICIAL INTELLIGENCE INTEGRATION

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ABSTRACT

The purpose of this research abstract is to present a study that investigates how artificial intelligence (AI) might be utilized to enhance flavor analysis of food. This research will investigate how artificial intelligence (AI) can enhance the flavor of food while also maintaining its overall quality. A literature review is the method of research that was used for this particular study. For this review, pertinent papers, journals, and publications were gathered and reviewed.

According to the findings of the study, artificial intelligence may enhance the flavor of food by offering accurate and reliable flavor analysis. This in turn can assist producers in developing one-of-a-kind flavor profiles that cater to the preferences of individual customers. The study also sheds light on how AI might maintain food flavor enhancement by continuously monitoring and modifying the flavor profile of food products. This aspect of AI's potential is highlighted by the study.

A number of different artificial intelligence systems, including machine learning algorithms and neural networks, have been recognized as being utilized to improve food flavor analysis. These systems offer a valuable tool for analyzing taste components and making predictions regarding sensory characteristics.

There are several different ways in which artificial intelligence can help improve the flavor of food. These include the potential to create new and original flavor profiles, improve product uniformity, and maximize the efficiency of production operations. Nevertheless, the

deployment of AI in the food business faces a number of obstacles, including a dearth of data, a scarcity of specialized skills, and the burden of a hefty initial investment.

In conclusion, the application of AI to the process of analyzing the flavors of food has the potential to bring about a revolution in the food sector. This would be accomplished by elevating the level of quality and safety of food products, as well as offering a market advantage. According to the findings of the study, additional investigation should be carried out in order to investigate the full potential of AI in the food business.

Keywords: artificial intelligence, flavor, food, adoption

INTRODUCTION

Artificial intelligence (AI) has shown promise as a tool that could improve flavor analysis in food, and the food sector has been investigating its use. On the other hand, there is a rising concern that AI might one day replace the human touch or the human approach employed by chefs while producing or cooking foods. In the context of the "umami" taste and the love and passion that chefs put into their creations, this research study

intends to explore the potential of artificial intelligence (AI) in improving food flavor analysis and analyze if it can replace the human touch in food preparation and cooking. Specifically, the study will investigate whether AI can replace the human touch in the context of the "umami" taste.

BACKGROUND OF THE STUDY

The flavor of food is only one aspect of its significance; it also holds strong emotional and cultural underpinnings. Because they use their knowledge, experience, and imagination to come up with one-of-a-kind, flavorful dishes that are frequently connected with their own identity and culture, chefs play an essential part in the world of gastronomy. In addition, the "umami" taste, which is sometimes referred to as the fifth taste experience, enriches the overall flavor of the dish by contributing richness and depth.

It has recently come to light that Artificial Intelligence (AI) could be a useful tool for improving the processes of food preparation and cooking. Artificial intelligence is able to recognize

patterns and make predictions about flavor molecules, both of which are difficult to discover using more conventional methods. In addition, AI has the ability to gain new knowledge from previous data and increase its accuracy over time.

Concerns have been raised about the possibility that AI would one day make human chefs and cooks obsolete in the food preparation and culinary industries. In order to make dishes that are original and full of flavor, chefs draw on their experience, creativity, and passion. In addition, the "umami" flavor is highly subjective and can be different for different people depending on their particular preferences as well as their cultural backgrounds. As a result, it is necessary to determine whether or not AI will ever be able to replicate the human touch, as well as the love and emotion that go into the creations that chefs make.

LITERATURE REVIEW

Several different research have been conducted to study the potential of AI to improve the process of preparing and cooking food. For example, Janssen et al. (2020) developed tailored dishes based on the user's tastes and dietary constraints by employing machine learning algorithms in their research. These algorithms were utilized to construct the recipes. According to the findings of the study, the machine learning models were able to develop novel and inventive recipes, all of which were positively received by the users.

In a separate piece of research, Chen et al. (2019) developed a food image identification system with the use of deep learning algorithms. The system was able to recognize a wide variety of ingredients used in meals and make recommendations for recipes based on those items.

In addition, a study conducted by Li et al. (2020) shed light on the potential of AI to improve the effectiveness and uniformity of the processes of food preparation and cooking. In the review, several AI-based methods, including recipe generation and food image identification, as well as their applications in food preparation and cooking, were reviewed.

METHODOLOGY

In this study, we will utilize a combination of surveys and taste tests to determine whether or not AI is capable of replacing the human touch as well as the love and passion that chefs put

into their creations. We will seek out individuals who have previous experience in the kitchen and ask them to prepare two separate meals, one using conventional culinary techniques, and the other using a recipe devised by an artificial intelligence.

Following that, we will partake in taste tests to evaluate the meals' flavors as well as their textures, with a particular emphasis on the "umami" taste. When evaluating the quality of the food, we will be using a variety of criteria, such as flavor, aroma, and texture. In addition, we will ask the participants to fill out a survey so that we can evaluate their experience with both the traditional and the AI-generated recipes. The survey will focus on the participants' reactions to the traditional and AI-generated dishes in terms of their emotional and cultural worth.

RESULTS OR FINDINGS

The findings of this research will shed light on the extent to which artificial intelligence (AI) may one day be able to replicate the human touch, as well as the love and passion that go into the creations of chefs. We anticipate that the AI-generated recipes will fare well in taste testing and garner pleasant comments from the people who try them. However, we also anticipate that the classic dishes that will be created by the chefs will have a one-of-a-kind and personal touch that will be impossible for AI to imitate.

In addition, we anticipate that the psychological and cultural connotations linked with the foods will have a significant effect in the choices and levels of satisfaction shown by the participants. As a result, the research will emphasize how important it is to take into account a wide variety of views and cultural contexts when creating AI-based systems for food preparation and cooking.

CONCLUSIONS AND RECOMMENDATIONS

In conclusion, the findings of this research study indicate the potential of AI in raising the efficiency and uniformity of food preparation and cooking, as well as in improving the analysis of food flavors. However, AI will never be able to completely replace the human touch, as well as the love and emotion that go into the creations that chefs make. According to the findings of the study, the food industry should implement AI-based strategies in order to improve the

speed and uniformity of food preparation and cooking while still allowing for the originality and individual flair of individual chefs. In addition, the research underlines how important it is to take into account a variety of perspectives and cultural traditions while designing AI-based methods for food preparation and cooking.

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The Smart Tourism during the War and post-War Recovery: The Case of Ukraine

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ABSTRACT

The prompt evolution of information and communication technologies has revolutionized the conventional landscape of tourism development (Jovicic 2017). Modern authors provide a more expansive perspective of smartness in tourism, revealing the fusion of technology, commerce, and society (Pasquinelli, C., & Trunfio, M., 2021). Smart tourism could also be considered within the concept of smart destinations, which can be seen as distinct adaptations of smart cities (Shafiee et al. 2019). The concept of smart tourism destinations embodies intelligence for all entities and communities (Buhalis and Amaranggana 2013). Innovations in smart tourism destinations from various encompassing angles, bringing together both technology-driven and socially-propelled innovation, are widely discussed in multidisciplinary research. Up-to-date innovations (e.g. AI) has reshaped the paradigms of tourism and hospitality by disrupting the conventional framework. This technological revolution empowers customers to access precise information, enabling them to personalize their requirements, secure reservations, and directly procure hotel and tourism offerings through technological platforms. This bypasses the need to interact with hotels, booking agents, or travel professionals (OECD, 2018; Buhalis, 2020).

To explore the prospects of post-pandemic and post-war recovery of tourism in Ukraine, it is crucial to comprehend the primary challenges and issues that accompany this process during the pandemic and wartime stages. The study primarily concentrated on the micro level,

specifically focusing on the immediate stakeholders involved in providing tourism services. Employing a qualitative methodology, we conducted expert semi-structured in-depth interviews with representatives from the tourism industry to gain insights into their endeavors in adapting business strategies amidst the challenges posed by the pandemic and wartime circumstances and their opinions regarding post-crisis recovery, influence of governmental authorities in shaping organizational management strategies within the context of these intricate processes. In our research, we opted for the inductive coding approach over the deductive one. Inductive coding involves developing codes directly from the data itself, without any preconceived notions about what the codes should be. This approach allowed us to let the narrative emerge organically from the raw transcribed texts.

Keywords Smart Tourism, Ukrainian Tourism, Tourism during the War and Post-war Recovery, Business Strategy, Covid-19, Tourist Services, Innovative Virtual Elements, Military Tourism, Solidarity Tourism

OVERVIEW

The socio-economic crisis in Ukraine, triggered by the Covid-19 pandemic, has resulted in significant financial losses for tourism businesses. The pandemic has forced the mass closure or bankruptcy of tour operators and travel agencies, severely impacting the industry's stability. Additionally, there has been a notable migration of skilled personnel from the tourism sector seeking opportunities abroad as a consequence of the challenging conditions faced by the industry domestically. According to respondents, there were no state support mechanisms for the tourism industry to overcome the consequences of Covid-19. The government's decision to waive fines for late payment of taxes and submission of reports, as well as providing exemptions from the payment of the single social contribution for a specific period, was a necessary measure in response to the implementation of quarantine measures and the suspension of operations of tour operators, travel agencies, and state institutions, including the State Tax Service of Ukraine. The introduction of quarantine restrictions significantly disrupted normal business operations, making it difficult for many entities, including those in the tourism industry, to meet their financial obligations and fulfill reporting requirements on time. Under such challenging conditions, compliance with financial reporting

obligations became impractical for numerous businesses. In light of these circumstances, the government took this step to alleviate the financial burden on affected entities and provide some relief during the pandemic-induced crisis.

As per the insights shared by the interviewed tourism business representatives, the absence of effective management strategies to support the tourism sector of the economy stems from various factors. These include the overall inadequacy of state policy in this domain, the inefficacy of the existing legislation, and, in some cases, the inclination of the legislation to safeguard the interests of major monopoly companies. The combination of these factors has resulted in an unfavorable environment for the development and growth of the tourism industry, impeding the implementation of robust management approaches and hindering the sector's ability to overcome challenges effectively. The respondents noted a particularly negative role on the functioning of tour operators and travel agencies to the non-working legislation regarding their insurance in case of bankruptcy.

The ramifications of the war have had a profoundly detrimental effect on the tourism industry, mainly due to the increased complexity of logistics, leading to escalated tour costs. The constraints on outbound travel for a significant number of people, coupled with the prevailing climate of uncertainty and the destruction of social and residential infrastructure, have significantly diminished the demand for tourist services. According to the research, there is a notable absence of effective industry associations in Ukraine that can adequately protect the interests of the tourism business. Respondents expressed their disinterest in being members of specialized organizations, stating that they see little or no benefits in joining such associations. This sentiment indicates a possible gap in the representation and support that these organizations offer to the tourism sector in the country.

The strategies employed to adapt the tourism business in Ukraine during the pandemic encompassed measures aimed at cost minimization. Transitioning to remote work (online), utilization of electronic services has emerged as a crucial strategy for travel companies in both adjusting their operations and enhancing communication with clients and regulatory bodies during the Covid-19 pandemic. This approach facilitates cost savings by streamlining administrative processes and expedites customer service time, ensuring efficient and

seamless interactions between travel agencies and their clients. Additionally, the adoption of co-working practices, wherein workplaces were rented in offices for specific periods to cater to customers, was implemented. Moreover, a notable approach included the reorientation of customer funds, previously deposited for existing tours, towards the creation and promotion of new tour packages. Also a noteworthy maximum approach to customer preferences and needs, transition from «package» tourism to individual, when customers themselves determine and «create their own trip». This business strategy involves the development and organization of tours that possess distinctively unique characteristics, are not readily available in the market, and do not face saturation in the labor market. According to the responses provided by the respondents, reducing the tax pressure on businesses and enhancing the knowledge and legal acumen of specialists responsible for formulating and executing policies in the tourism industry are deemed essential for facilitating its recovery following the pandemic and war.

One of the primary thrusts for the post-pandemic and post-war recovery of tourism in Ukraine is centered on the development of military-related and solidarity tourism. This initiative aims to create attractions that encompass places, artifacts, military sites, and symbols that portray the historical significance of battles and other events. Importantly, such tourism endeavors can yield positive social, economic, and environmental impacts for the local community and the environment that were affected by the war.

The future tourism trends in Ukraine will be geared towards a dual focus: authentic exploration of Ukraine's history and culture, while simultaneously maximizing virtual experiences. This approach seeks to provide tourists with genuine encounters with the country's heritage and traditions, complemented by innovative virtual elements to enhance the overall tourism experience. Such experiences may include online tours, virtual museums and other digital initiatives that will allow potential tourists to discover the beauty and cultural richness of Ukraine without physically being on its territory. Ukrainian tourism can become profitable if tourism products with an emphasis on national traditions, culture, folk customs and art are developed, attracting the attention of tourists and generating income for the tourism industry.

CONCLUSION

Based on the identified semantic categories during the analysis of the deep interview transcripts, according to experts, the principal challenges and issues accompanying the tourism industry during the pandemic and wartime stages include substantial financial losses, bankruptcy of tour operators and travel agencies, emigration of skilled personnel from the tourism sector to foreign countries, inadequate state policies and support, inefficacy of existing legislation favoring monopolies, and lack of effective industry associations, unions, and organizations in addressing problems and safeguarding the rights of businesses operating within the tourism sector. The main marketing strategies of travel agencies and tour operators in response to the Covid-19 pandemic: transitioning to a remote work mode (online) to mitigate business expenses and ensure operational continuity; development of new itineraries and tour programs, transition from «package» tourism to individual; reorienting customers' previously deposited funds towards new tour offerings to accommodate changing travel plans and address cancellations or rescheduling due to pandemic-related disruptions; renting workplaces in offices for a certain period of time for customer service («co-working practice»). The prospects of post-pandemic and post-war recovery of tourism in Ukraine according to opinion of experts are reducing the tax burden on businesses in the tourism sector to foster its growth; enhancing the knowledge and legal expertise of specialists responsible for formulating policies within the tourism industry, enabling more effective and informed decision-making; developing military-related and solidarity tourism, particularly focusing on new tourist services, to provide support to the most impacted cities and villages in Ukraine due to the war, while creating unique and meaningful experiences for tourists; virtualization and digitization of tourism (particularly within the cultural sector) to enhance accessibility and provide immersive experiences for travellers.

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The Role of Creative Industries and Cultural Tourism: Case Studies, Challenges and impacts post pandemic

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In recent years, the role of creative industries, cultural precincts, and artists in placemaking has gained significant attention worldwide. This presentation aims to explore the specific context of New South Wales (NSW especially regional NSW, shedding light on the key points, issues, challenges, and benefits associated with the complex integration of creative industries and cultural development in the process of placemaking and cultural planning.

The presentation begins by examining the role of creative industries and their impact on placemaking and tourism during and post pandemic. It highlights the potential of creative industries as drivers of economic growth, job creation, and community development, emphasizing their ability to transform underutilized spaces into vibrant cultural hubs and urban regeneration. Case studies will showcase successful examples of cultural precincts in NSW, illustrating the positive impact they have on social and economic aspects of communities.

These benefits include enhanced social cohesion, improved physical and mental well-being, increased tourism, and cultural enrichment. The cultural and social planning processes foster a sense of belonging and pride, contributing to the overall liveability and attractiveness of the places.

Furthermore, the presentation discusses the integral role of artists and creativity in placemaking, specifically in the context of NSW and regional NSW. Artists often act as catalysts for community engagement, cultural production, and identity formation in a given place. The local involvement in the planning and design processes of cultural precincts help to infuse unique artistic perspectives, contributing to the authenticity and character of the place.

However, the presentation also addresses the key challenges and issues in leveraging creative industries and cultural precincts for placemaking in NSW. These include issues of funding, governance, sustainability, inclusivity, and community engagement. The barriers and constraints faced by artists and cultural organizations in accessing resources and spaces are identified, along with the need for effective policy frameworks and relevant support mechanisms.

Finally, the presentation sheds light on the numerous benefits of integrating creative industries and cultural precincts into placemaking in NSW and regional NSW. These benefits include enhanced social cohesion, improved physical and mental well-being, increased tourism, and cultural enrichment. The cultural and social planning processes foster a sense of belonging and pride, contributing to the overall liveability and attractiveness of the places. It encourages further research and exploration in this field to create more inclusive, resilient, and vibrant communities through the power of the arts and culture.

The presentation concludes by emphasizing the importance of strategic planning and collaboration and often the complex relationship between various stakeholders, including government bodies, community organizations, artists, and creative industries, in harnessing the full potential of creative industries and cultural precincts for successful placemaking in NSW.

Modelling and Forecasting Hospitality and Tourism Employment of Sri Lanka

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ABSTRACT

Tourism based employment plays a vital role in reducing poverty, social unrest, skill developments and more. With the rapid growth of the Hospitality and Tourism (H&T) industry of Sri Lanka over the past few decades, the tourism-based employments also increased, but experienced a significant decline in 2019 when demand for tourism collapsed due to the COVID 19 pandemic. Fortunes reversed in 2021, but it is still too early to assured that the growth of employment is returning to its previous rapid rate due to continuing politico-economic uncertainties. Therefore, it is a timely requirement to model and forecast the tourism employment of the country. The study utilized the annual total employment data for the period from 1982 to 2021 for pattern recognition. The Time series plot, the Auto Correlation Function (ACF) and the Partial auto correlation function (PACF) suggested that the Auto Regressive Integrated Moving Average (ARIMA) and Auto- Regressive Distributed Lag Model (ARDLM) would be suitable models for forecasting. The Anderson Darling normality test and the ACF's of residuals were used for model validation and the relative and absolute measurement of errors were used for selecting the best fitting model. The best fitting model, ARIMA (0, 2, 1) confirms the possibility of growth in the total employments.

Keywords*:* Tourism Employment, ARIMA, ARDLM

INTRODUCTION

Tourism is a fast-growing industry which provides many tangible and intangible benefits to the economy and society of destinations. It creates millions of jobs, accounting for 1 in 12 in 2010 (WTO, 2011) and 1 in 4 worldwide in 2019 (WTTC, 2022). The job opportunities are either direct or indirect, including service staff in public cities, restaurant suppliers, marketing agencies, accounting services, manufacturers, restaurant staff, childcare workers, grocery store jobs, clothing store jobs recreation and entertainment jobs (Sintayehu, & Raminder, 2020). This ensures prosperity and positive social impact, especially providing unique opportunities to females, minorities, and youths (WTTC, 2022). The total number of tourism employments in Sri Lanka amounted to 173,592 in 2019 and 175,990 in year 2020 (SLTDA, 2020).

Research Problem

The H&T industry of Sri Lanka showed a rapid growth until 2018, but collapsed significantly in 2019, with some signs of recovery in 2021. Increase of tourism demand causes increase of human resource and capital demand. When the demand increases, it is necessary to update and re-estimate the human resource and human capital (Armstrong, 2003). This can be achieved by finding suitable forecasting techniques. Despite of the importance, it was hard to find scholarly research for forecasting tourism employment in the H&T industry of Sri Lanka, especially under the COVID 19 pandemic followed by the politico-economic uncertainties. The study is focused to fill the knowledge gap.

Objective of the Study

To forecast the direct employment in the H&T industry of Sri Lanka.

METHODOLOGY

Annual tourism employment data of Sri Lanka for the period from 1982 to 2022 obtained from the Sri Lanka Tourism Development Authority (SLTDA) database. Pattern recognition of a data series paves the path for model selections, therefore, Time series plots, Auto Correlation Functions (ACF) and Partial Auto Correlation Functions (PACF) were used for the pattern recognition of the data series (Konarasinghe & Abeynayake, 2014; Konarasinghe, 2020). According to the recognized patterns, the ARIMA and ARDLM models were tested to forecast

employment in the tourism industry in Sri Lanka. The log transformed data were used for model fitting in order to confirm the model assumptions. In standard notation, the ARIMA and ARDLM models are as follows;

Auto-Regressive Integrated Moving Average (ARIMA)

$$\phi(B)(1-B)^d y_t = \theta(B)\varepsilon_t$$

Where; $\phi(B) = 1 - \phi_1 B - \phi_2 B^2 .... \phi_p B^p$

$\theta(B) - 1 - \theta_1 B - \theta_2 B^2 ..... \theta_p B^q$ (1)

ε_t = Error term, D = Differencing term

Auto-Regressive Models and Distributive Lag Model (ARDLM)

$$Y_t = \alpha + \beta_0 X_{t-1} + \beta_1 X_{t-2} + ... + \beta_n X_{t-n} + \lambda_0 X_{t-1} + \lambda_1 X_{t-2} + ... + \lambda_n X_{t-n} + U_t \quad (2)$$

The box plot confirmed that the series was outlier-free. The Anderson-Darling normality test and ACF were used for model validation. Forecasting ability of the models was assessed by relative and absolute measurements of errors; Mean Absolute Percentage Error (MAPE), Mean Square Error (MSE), and Mean Absolute Deviation (MAD) (Konarasinghe et al., 2015). The measurements of errors are;

$$MAPE = \frac{1}{n}\sum \left| \left(\frac{Y_t - F_t}{Y_t} \right).100 \right| \quad (3)$$

$$MAD = \frac{1}{n}\sum \left| \left(Y_t - F_t\right) \right| \quad (4)$$

$$MSE = \frac{1}{n}\sum \left(Y_t - F_t\right)^2 \quad (5)$$

Where; Y_t = Observed value of time t, F_t= Forecasted value of time t

RESULTS

Time series plot of total employment (Figure 1) in H&T industry of Sri Lanka shows an increasing trend with fluctuations up to 2009. Thereafter, it shows an exponential growth from 2009 to 2019, and dropped in 2019. Once again it shows an increasing trend from2020.

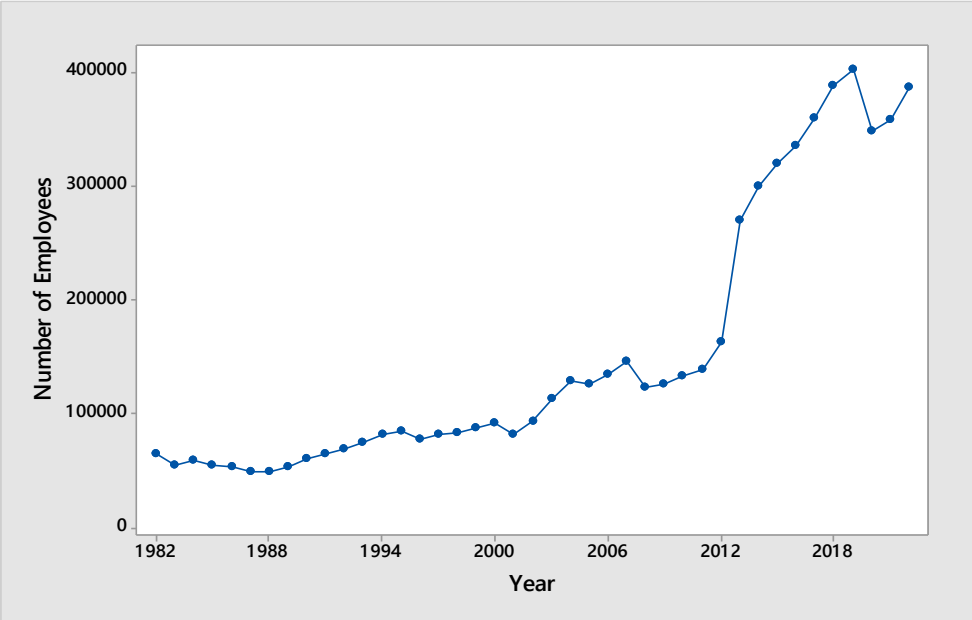

Figure 1: Time Series Plot of Employment: 1982-2021

Figure 2 is the ACF for employment. It confirms the trend of the series and suggest no cyclical or seasonal patterns. The significant lags of the series confirmed the weak stationary criterion of the series. Figure 3, the PACF of the series suggest the suitability of a MA (1) model.

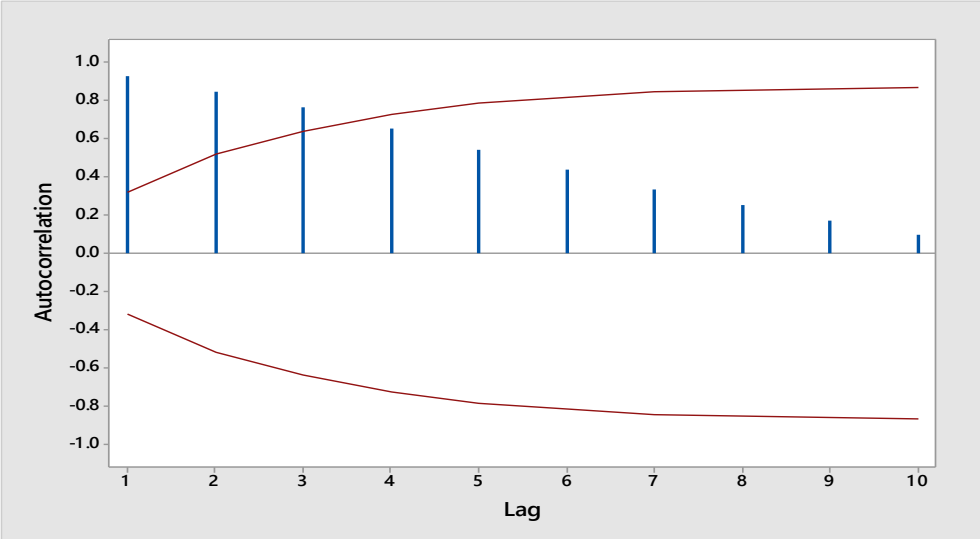

Figure 2: Autocorrelation Function (ACF)

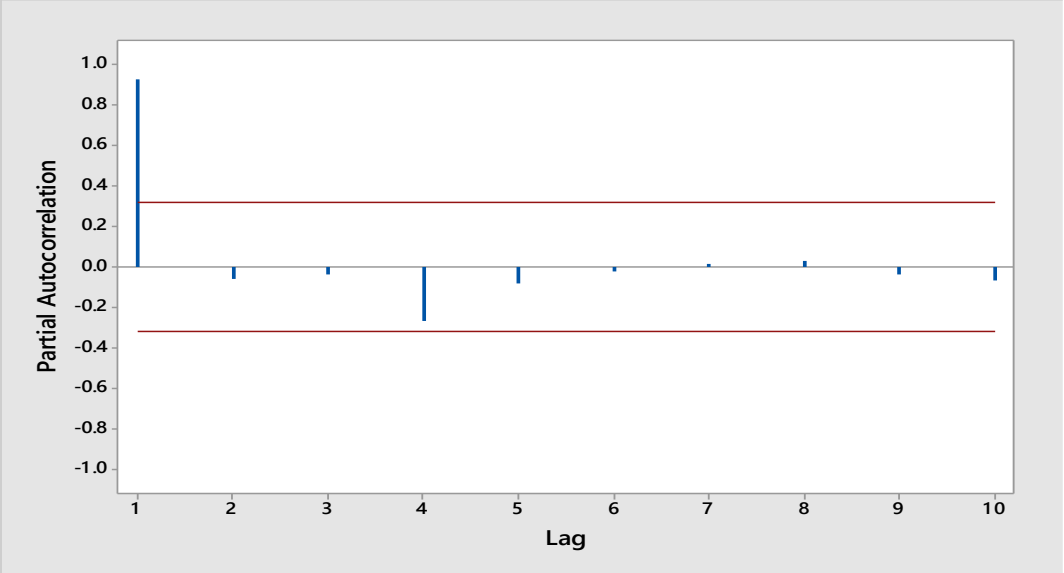

Figure 3: Partial Autocorrelation Function (PACF)

Testing ARIMA (p, d,q)

The ARIMA model was tested at different *p, d, q* values and the results of the best fitting model is given in Table 1.

Table 1: Model Summary of ARIMA

Model	Model Fitting		Model Verification	
ARIMA (0,2,1)	MAPE	0.568587	MAPE	2.66817
	MSE	0.006473	MSE	0.13085
	MAD	0.064549	MAD	0.33981
	Normality	P = 0.332		
	Independence of Residuals	Yes		

ARIMA (0, 2, 1) satisfied the model validation criterion, normality and independence of the residuals. This model included 1 moving average parameter, with a second difference. It

means the future employment depends on past errors of the employment series. The measurements of errors were extremely low under the fitting and verification.

Testing ARDLM

The number of lags is decided from the significant spikes of the ACF (Figure 2). The model was run with three lags and the summary of the best fitting model summary is given in Table 2.

Table 2: Model Summary of ARDLM

Model	Model Fitting		Model Verification	
$Y_t = 1.0877 Y_{t-1}$	MAPE	0.700518	MAPE	8.43155
	MAD	0.080905	MAD	1.07729
	MSE	0.013430	MSE	1.16639
	Normality	P= 0.073		
	Independence of Residuals	Yes		

The above ARDLM satisfied all the validation criterion, and the measurement of errors were very low. Figures 4 is the plot of Actual vs. Fits. It clearly shows that the pattern of fitted data of ARIMA and ARDLM follow the pattern of actual series. However, the deviation of ARIMA fits and the actual data is less than the deviation of ARDLM fits and the actual data. The plot of Actual vs. Forecast (Figure 5) also confirms the same. Hence the ARIMA (0,2, 1) is the most suitable model for forecasting.

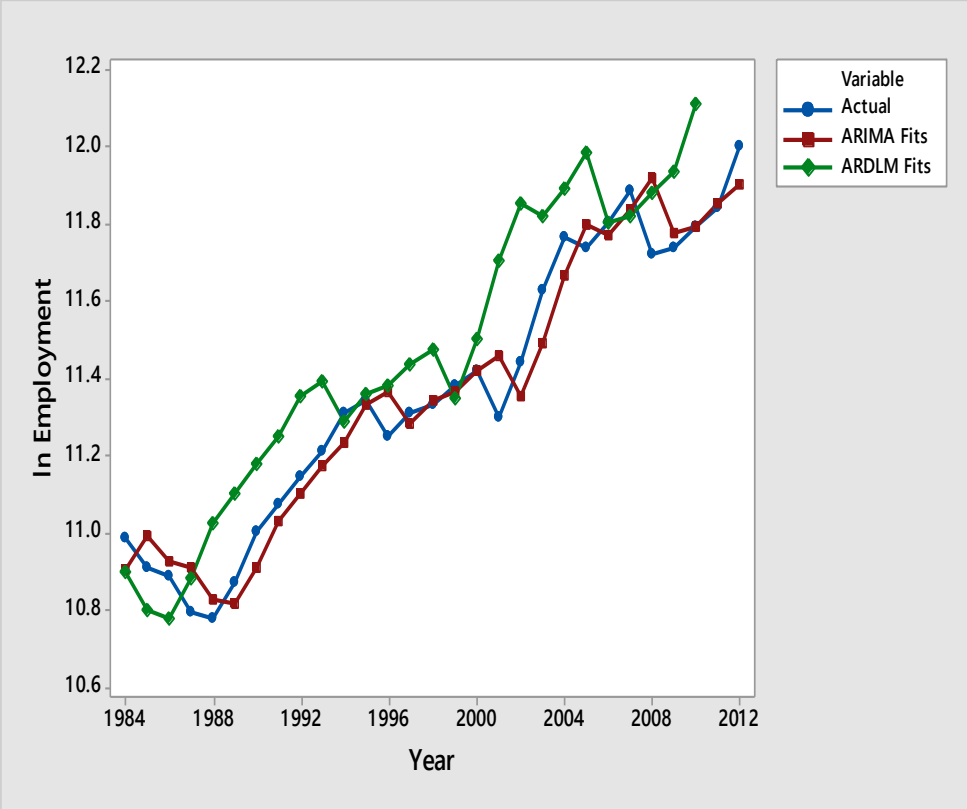

Figure 4: Actual vs. Fits

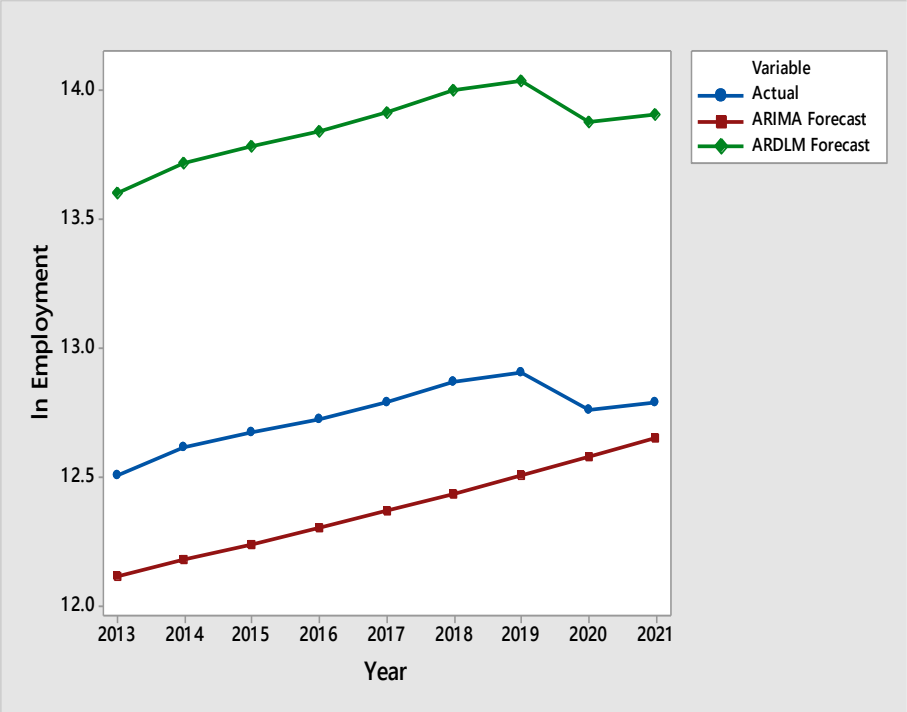

Figure 5: Actual vs. Forecast

CONCLUSION AND RECOMMENDATIONS

It is concluded that the ARIMA and ARDLM models are suitable for forecasting total employments in the H&T industry of Sri Lanka. Among them, the ARIMA (0, 2, 1) is the best fitting model. The results of the study can be used for strategy development in: human resource decision-making and skill development, cost reduction, customer service level improvement, increase profit margins, reduce risk and inefficiencies and improve management performances. Further, the results of the study could be a guideline for developing effective financial and human resource budgets, workforce prediction and workout human resource requirements.

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Revitalization of the Rural Periphery Through Transformative Tourism Geographies

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EXTENDED ABSTRCT

Evidently, the pandemic that took hold in 2020 has been catastrophic for international and domestic tourism visitation, and inadvertently turned the gaze toward rural and peripheral areas where the usually wide, open spaces and proximity to nature have proved to be a lure for city dwellers (Romagossa, 2020). The allure of the rural periphery is long established (Kordel, 2016; Clark & Chabrel, 2007), and the end the enforced tourism hiatus has given it a new, and in some cases, urgently needed lease on life. However, the appreciation of what is referred to as countryside capital (Eimermann, 2016), and the ensuing and renewed attention raises myriad concerns, especially the extent to which rural communities can absorb and adapt to the growing demands for what are often constrained provisions of housing, services, and amenities, among other exigencies.

This has manifested in many cases as threats to the way of life of incumbent residents, and on balance, contestations suggest that it might not be worth the imposition because of the transformed and heightened contest for space and amenity, and the ripple effects of this. While it is obvious that tourism is at the vanguard of the revived clamour for the rural idyll, unless *in situ* communities are active participants shaping the nature of this expansion, the capacity for developments that prioritise their interests will be constrained. Moreover, the social and ecological assets (for example water availability) of communities at the rural periphery, is what is prized and the extent to which tourism expansion puts this under strain, remains a pressing concern (Marzo-Navarro et al, 2015).

Apropos, and unsurprisingly, as the persistence of international border and wider travel restrictions (and its enduring impacts) have encouraged domestic and 'near home' travel, proximity tourism has emerged as a key driver for tourist visitation, often involving domestic or cross border travel, and to places within close reach via ground transport. Jeuring and

Haartsen (2017, p. 120) describe proximity tourism as vacationing near home or a type of tourism “promoted by a drive to behave responsibly by acting locally near home, enhancing one’s own regional economy, local culture and social networks”. This phenomenon was brought into stark relief in pandemic times as the desire to lessen chances of contagion intensified (Butler, Szili Hay & Cutler, 2022). In some countries like Japan, this renewed interest in the rural periphery has boosted attempts at employing tourism as a vehicle for rural revitalisation, and what have been sleepy backwaters for the most part, are now undergoing renewed interest (Cheer et al, 2022; Qu & Cheer, 2021). Queries and solid understandings as to how the resulting transformations are likely to play out, and the subsequent implications for the management and planning of tourism expansion, generally lags visitation growth.

Notwithstanding, the status quo of rural tourism and the challenges and opportunities faced remain formidable in the present where global recession looms, workforce shortages intensify, climate change induced effects necessitate adaptation, rural population decline, and its converse urbanization continues apace. The role that social capital plays in all of this reinforces the assertions made by Part et al (2015, p. 130) “community social capital makes important contributions to governance, especially in situations where the market and government fail to allocate resources because of lack of information to design and enforce beneficial exchanges”. Moreover, contestation and anxieties centred on the maintenance and protection of what are considered contexts with fragile ‘sense of place’ and ‘way of life’ resonates (Derrett, 2003). This is supported my McHenry (2009, p. 61) who argues, “the social wellbeing of a community, directly through tourism, income generation and employment opportunities, and indirectly by enhancing participation and creativity in public decision-making, strengthening community capacity, and strengthening identity and sense of place”.

How to promote and stimulate entrepreneurship and investment in the rural periphery from outside remains a formidable constraint (Ikonen, 2016; Yachin & Ioannides, 2019), particularly where local level capacity and buy-in is in short supply (Qu & Cheer, 2021). A key concern for communities at the rural periphery as Measham et al (2014) pose, is the extent to which they can shape their own futures, and by extension, adapt to externally derived headwinds. One other pressing concern is the “debate about smart rural development beyond broadband connectivity and the urban-rural digital divide” (Cowie et al., p. 174).

(This abstract is derived from a Call for Papers for a special issue in the journal Rural Society. The author of this abstract is the Guest Editor of the special issue which is to be published in 2024).

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Sustaining the Hospitality and Tourism Industry in Sri Lanka: A Descriptive Analysis of Past and Present trends for the Future

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ABSTRACT

Sri Lanka has been an attractive tourist destination for centuries, but a modern Hospitality and Tourism (H&T) industry was only established in the 1960s. Since then, the industry has played a vital role in the country's economy. However, the recent pandemic, along with recent politico-economic crisis, has had a significant negative impact on the country's H&T industry. This study aims to understand key aspects of the industry's past and present to provide some tentative insights into the future. The study reveals that inbound tourism has grown rapidly over the last decade but dropped significantly in 2019, with some signs of recovery in 2021. The top ten tourist source markets have undergone significant reordering. Indirect employment in the H&T sector has seen a significant decrease, while direct employment remains unchanged. Despite government's focus on attracting international tourists, it is domestic tourism that serves as the necessary bedrock of the industry.

Keywords: Hospitality & Tourism, International tourism, Domestic tourism

INTRODUCTION

Sri Lanka, known as the 'Pearl upon the brow of India,' lays claim to one of the longest documented histories in the world. The country is abundant with lush tropical forests, white sandy beaches, and unique panoramic landscapes. It is also home to seven world heritage sites, boasts a rich culture with numerous ethnic communities and a diversity of traditions, languages, and faiths (Konarasinghe, 2013).

Sri Lanka has been an attractive travel destination for centuries (SLEB, 2023). In 1960's tourism was recognized as an industry with the establishment of the Ceylon Tourist Board (SLTDA, 2023), however, its development was severely hampered by a civil war lasting from 1983 to 2009. Today, the hospitality and tourism (H&T) industry is one of the most significant drivers of growth and development in the Sri Lankan economy (Ranasinghe & Deyshappriya 2010, Kodituwakku, Wijesundara, & Hettiarachchi, 2015). It has been the third-largest foreign exchange earner for the country in recent years (SLTDA 2018, p.17; SLTDA 2019, p.12).

Despite the setback of a politico-economic crisis and COVID-19 restrictions, economic analysts believe that the industry has the potential to help pull the nation out of its current economic crisis (SLTDA 2022, Abeysinghe 2022). This study is focused on understanding the past and present of the H&T industry in Sri Lanka from several points of view and providing tentative insights into the future of the industry.

METHODOLOGY

The study utilizes secondary data obtained from the Sri Lanka Tourism Development Authority (SLTDA) for the period from 1985 to 2022. Data visualizations were used for the purpose of intuitive pattern recognition of: inbound tourism, the behavior of the top ten source markets, tourism employment, tourism accommodation, and the differences between the domestic and international tourism markets amid the COVID-19 pandemic.

RESULTS AND DISCUSSION

International Tourism Trends

Figure 1 displays the annual arrivals to Sri Lanka from 2002 to 2022. It reveals a slowly increasing trend with relatively minor fluctuations up to 2009. Thereafter, there is very rapid stable growth up to 2019, following the end of the civil war in 2009. From 2019 to 2021 there was a sudden precipitous collapse of international tourists visiting the country due to a combination of a politico-economic crisis and COVID-19 travel restrictions. Fortunes reversed in 2022, but it is still too early to assured that tourist growth is returning to its previous rapid rate due to continuing politico-economic uncertainties.

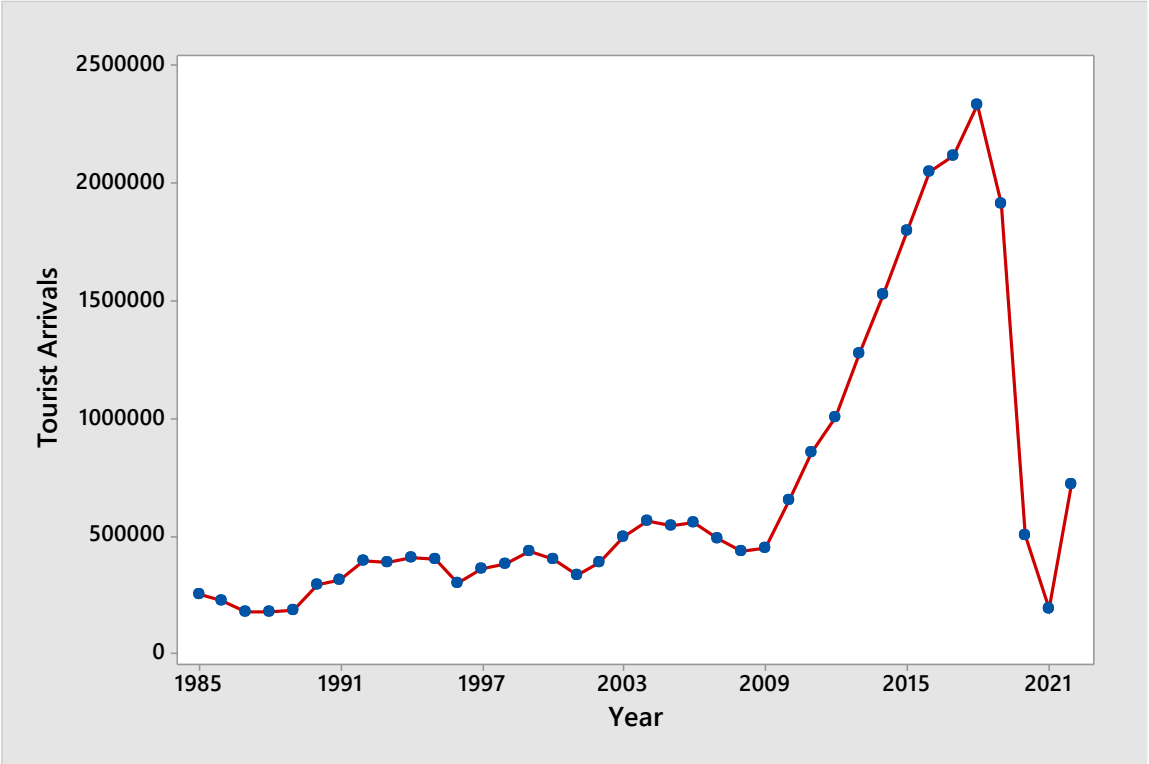

Figure 1: International Tourist Arrivals to Sri Lanka, 1985-2021

Western Europe and South Asia have been the main tourist source-markets over the last two decades (Konarasinghe, 2016; SLTDA: 2010 & 2020). Figure 2 illustrates the behavior of the top ten tourist source markets from 2017 to 2022 and how their positions have changed over this period. Despite the COVID-19 pandemic and Sri Lanka's politico-economic crisis, India remains the largest contributor, but China, the 2nd highest contributor in 2017, dropped to the 10th position in 2022, while Russia has taken the 2nd position. The UK, ranked 3rd in 2017 and 2018, became the 2nd highest contributor of tourists over 2019-2021, to then return to

3rd place again in 2022. Meanwhile, Germany consistently held 4th position throughout this period.

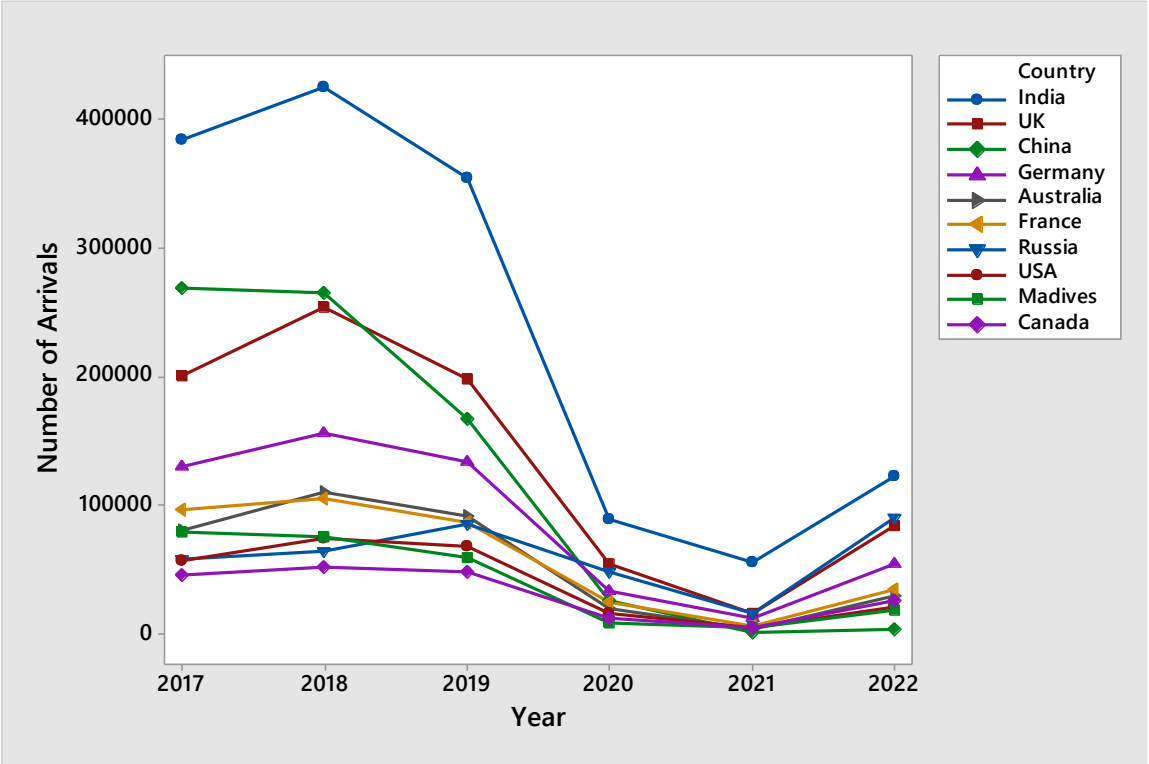

Figure 2: International Arrivals by Country of Origin, 2017-2022

Tourism Employment

Tourism-based employment in Sri Lanka consists of two categories: direct employment and indirect employment. Direct employment comes from hotels and restaurants, travel agents and tour operators, airlines, recreational facilities, tourist shops, guides, national tourist organizations, and state tourism administration. Indirect employment derives from associated retail trade (such as handicraft trade, gem and jewelry shops, liquor shops, laundries, etc.). The Hotels and Restaurant sector is the largest job creator, contributing 80% of the total tourism-based direct employment (SLTDA 2020).

Figure 3 displays a time series plot of direct and indirect employment from 1985 to 2019. As one would expect given the growth in demand shown in Figure 1, both types of employment increased over this period – initially slowly until 2009, and then after an adjustment period,

rapidly from 2012 to 2019. Indirect employment consistently exceeded direct employment, but experienced a significant decline in 2020 when demand for tourism collapsed.

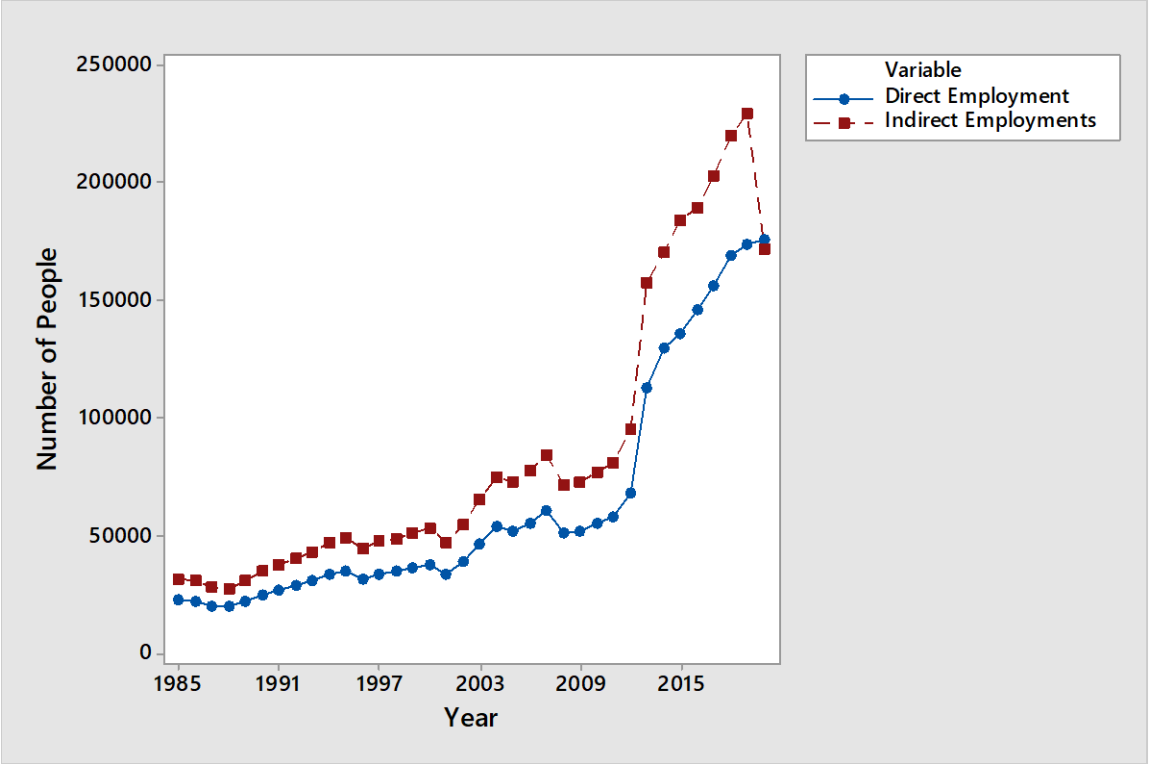

Figure 3: Tourism Employment, 1985-2020

Accommodation and Occupancy

Establishments that provide accommodation for visitors are divided into three broad categories: tourist hotels (classified, unclassified, boutique), supplementary establishments (guest/rest houses, home stay units, rented homes & apartments, heritage bungalows), and unregistered establishments with the SLTDA. At the end of the year 2020, the total number of establishments in the registered list of accommodation at SLTDA amounted ъ3,019 with 42,750 rooms (SLTDA 2020). The bar graph in Figure 4 shows that in 2020, 65% of the establishments are 'starred' hotels.

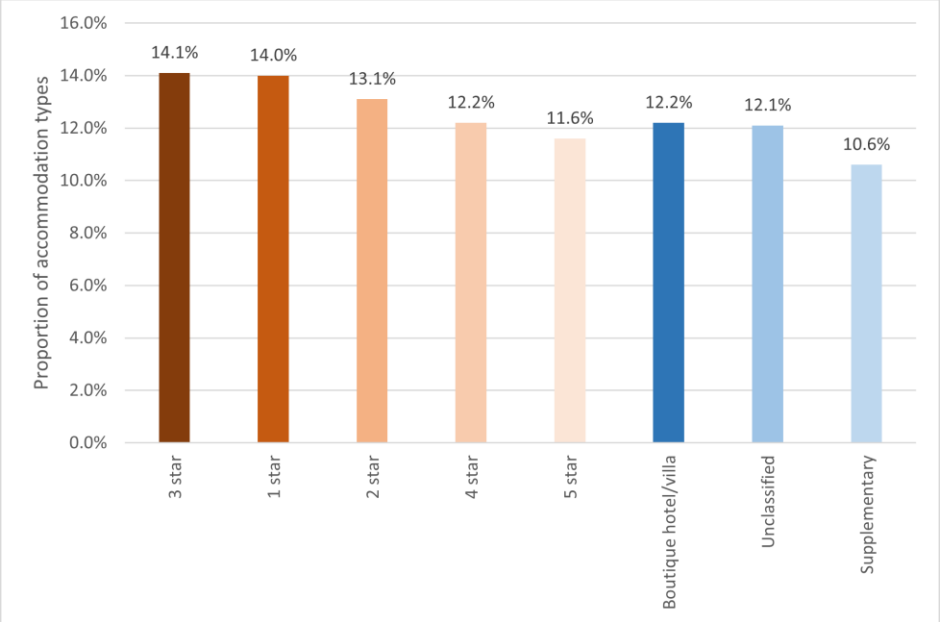

Figure 4: Types of Accommodation Establishments, 2020

Figure 5 displays the patterns of highly occupied tourist areas for the period 2005 -2019. The Colombo City region recorded the highest occupancy rates throughout, but showed a huge decline from 2005 to 2009 whereas the other regions exhibited the opposite trend over the same period (2005-2009). With the end of the civil war, all the regions showed spectacular growth in occupancy rates ranging from about 72% to 85% in 2010 and 2011. However, in 2012 occupancies declined and thereafter stabilized at around 70% to 78% for the period from 2012 to 2018.

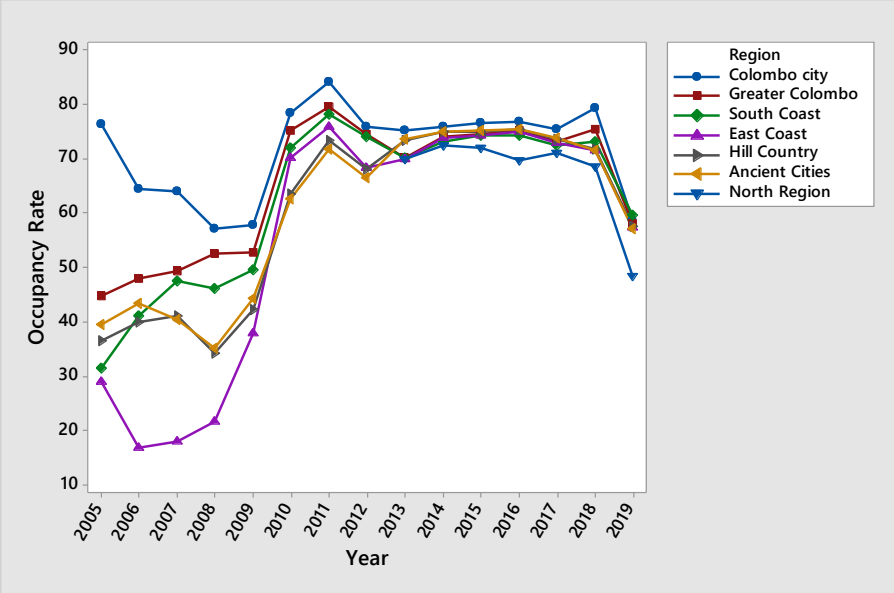

Figure 5: Occupancy Rates by Region, 2005-2019

The box-and-whisker plot (Figure 6) shows that the occupancy rates of all the regions over 2005-2019 are negatively skewed, indicate that accommodation establishments are failing to achieve their maximum capacities.

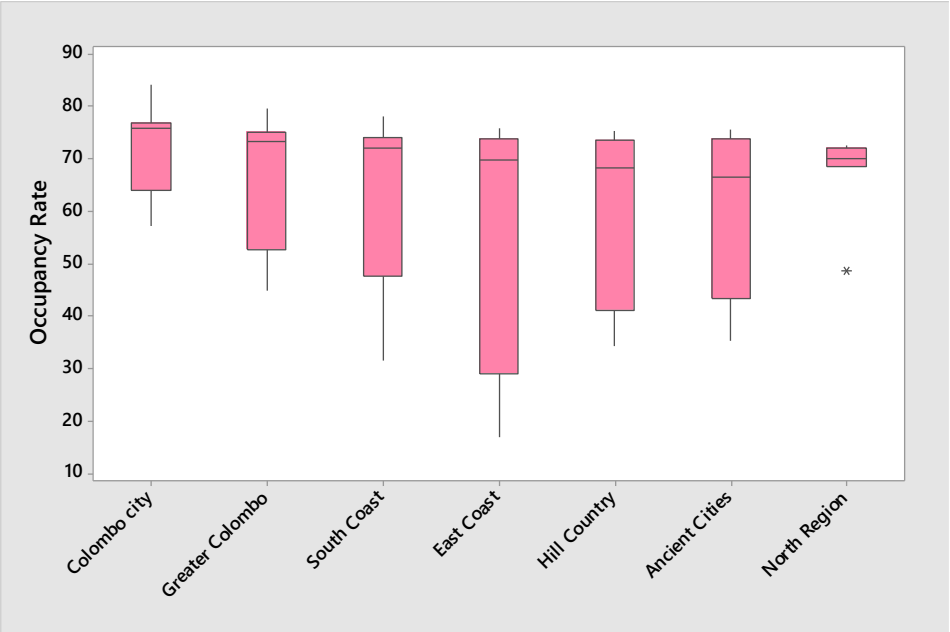

Figure 6: Box and Whisker Plot of Occupancy Rates by Region, 2005-2019

Domestic vs International Tourism

According to the tourism revenue data from the SLTDA annual reports, international tourism income was much higher than domestic tourism until the COVID-19 pandemic. However, this changed drastically in 2020. As shown in Figure 6, the number of domestic visitors to various attractions in Sri Lanka dwarfed that of international visitors in 2020.

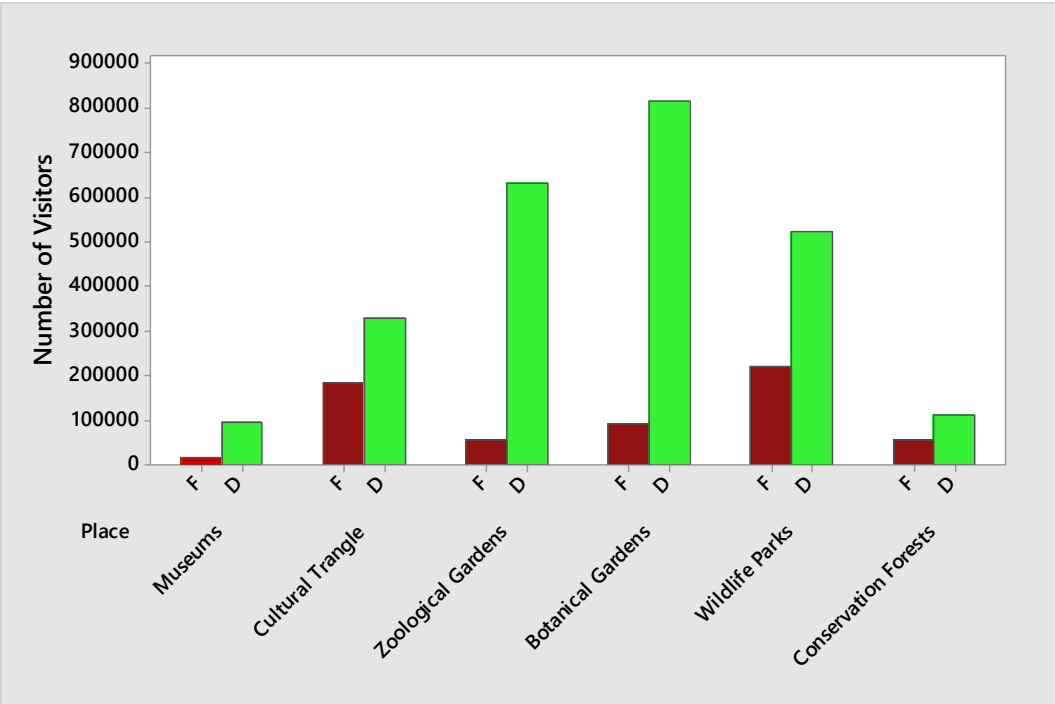

Figure 6: Foreign (F) vs. Domestic (D) Visitors to Some Attractions in Sri Lanka, 2020

CONCLUSIONS AND UNANSWERED QUESTIONS

The importance of the H&T industry to the economy of Sri Lanka is well understood. The international tourism sector showed remarkably rapid growth from 2009 until it collapsed in 2019 due to the COVID-19 pandemic and politico-economic unrest. However, the industry has shown some signs of recovery since 2022, although it is too soon to say whether growth will return to its previous rate. The crisis period resulted in an unusual change in the ordering of the top 10 foreign source markets. This begs for an explanation and gives rise to the question of whether this is a structural change or a temporary phenomenon. Furthermore, with respect to employment, although direct employment in H&T ceased to grow due to the crisis, it did not fall. By contrast, indirect employment has been severely negatively affected. Given this is likely to have impacted the poorest of the precariat, finding both an immediate and a long-term solution to this problem is imperative.

The majority of the accommodation establishments in Sri Lanka are 'star-grade' hotels, indicating that the country is fully capable of providing quality accommodation facilities to

visitors. Although occupancy rates are not low by international standards, they are nonetheless sub-optimal and as yet there is no account of the nature or reason for this inefficiency.

Finally, although the government has understandably focused on international tourism because it is a source of export revenue, the COVID-19 pandemic revealed how important *domestic* tourism is to the survival and sustainability of the Sri Lankan tourism industry (OECD 2020, UNWTO 2020). This is a critical time for both the public and private sectors to start to pay closer attention to the preferences of domestic tourists so as to better secure the future sustainability of the H&T industry in the event of another crisis.

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The mechanism of smart city development in the context of the Society 5.0 transition

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A smart economy ensures local business productivity and develops human capital. The tools of Society 5.0 are the driving force behind the development of smart cities along with the introduction of modern innovative technologies and the expansion of international cooperation.

The feasibility of creating and further developing smart cities is becoming more and more relevant every year.

The transformation from Industry 4.0 to Society 5.0 is connected with the transition from Cyber-Physiological Systems 4.0 to the use of Sensors 5.0 in order to obtain information from the human brain, its facial expressions, and the reaction of certain parts of the human body to stimuli. This is the local level. Smart City in Society 5.0 has a locality, territory, and community level. The development of Smart City is seen in integrating technology in various spheres of social life.

The basis of the research is the development of Society 5.0 as an interaction of Smart City at the level of "People - Sphere of Living" or "People - Noosphere". Thanks to this, it is planned to improve the scientific and methodological principles of Smart City functioning using the concept of "Industry 5.0" / "Society 5.0".

It is proposed to make a gradual transition from classic cities to Smart City design on the basis of Industry 4.0 and Industry 5.0. The most important thing is that Smart City is a need of the population and it allows to improve the quality and safety of life within the urban space.

For cities of the Smart level, a resource-saving ecosystem is urgent, which should minimize the consumption of resources by residents and infrastructure, and recycle waste, emissions and discharges as much as possible.

The principles of building a Smart City should provide for the stability of the functioning of all infrastructure facilities of the city under any conditions of external influences. This rule is called "antifragility".

The construction of a Smart City from "scratch" is carried out according to defined goals. These goals can be the comfortable living of the population or the functioning of a division of the corporation in a certain region. That is why the rule of "decentralization and autonomy" is important.

A component of Smart City is the transparency of open data ecosystems. Data is generated and processed by the city's infrastructure. The results of processing should improve the functioning of this city. The concept of ensuring data transparency according to the OGD (Open Government Data) technical standard is important.

Smartphone applications that integrate data from the city's infrastructure and provide People with information about transport, weather, energy supply, repair works, etc. are important. In general, we have the integration of information services in a large area with remote access.

For the efficient, prompt, high-quality provision of services in the Smart City, an association of companies is being created, which, in the mode of cooperation, develop and implement the necessary technologies in a short period of time with an appropriate level of quality. Building a Smart City based on the concept of Society 5.0 allows for sustainable development of the urban environment with maximum quality and safety of the population's life.

Acceleration of Technology Adoption Post-Covid: Lessons and Challenges from Tourism Sector in South Africa

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ABSTRACT

The aftermath of the COVID-19 pandemic has prompted a paradigm shift in the tourism industry, necessitating innovative approaches to ensure both safety and exceptional travel experiences. This research underscores the urgency for innovative approaches that address these evolving demands including adopting advanced technologies, contactless services, stringent health and hygiene protocols, personalized experiences to ensure visitor safety and many other approaches. Amidst these transformations, there is a resounding appeal for measures that adapt and revitalize South Africa's tourism sector, assuring both visitor safety and the promotion of long-term growth. Notably, integrating digital infrastructure and technologies emerges as a key driver behind the sector's recovery trajectory. This research sets out to undertake a comprehensive exploration, delving deeply into the complex relationship between adopting technology and revitalization South Africa's diverse tourism landscape. Against the backdrop of a world defined by post-pandemic realities, this study aims to uncover the mechanisms through which technology can contribute to reviving the nation's tourism sector. Employing a systematic review methodology, we synthesize pertinent peer-reviewed literature and case studies. This approach provided a comprehensive understanding of the multifaceted aspects of technology adoption within the specific context of South African tourism. The study concludes that South Africa's tourism sector stands at a crucial crossroads, poised to embrace technological advancements that not only enhance visitor safety but also drive enduring growth. Furthermore, the country has the potential to position itself as a resilient and innovative tourism destination, offering travelers secure, immersive, and unforgettable experiences in the post-COVID era.

Keywords: COVID-19, Tourism, Digital Transformation, South African Tourism, Technology Adoption.

INTRODUCTION

The COVID-19 pandemic has unleashed a seismic shift in the global tourism industry, compelling it to adapt swiftly to an altered reality (Smith et al., 2022). As travelers around the world yearned for both safety and exceptional experiences, the tourism sector confronted the urgent need for innovative approaches that would not only meet evolving demands but also ensure visitor well-being (Sigala et al., 2021). Research has consistently emphasized the urgency of these innovations, highlighting the adoption of advanced technologies, contactless services, stringent health and hygiene protocols, and personalized experiences as integral components of the industry's response to this unprecedented challenge (Chatzoglou et al., 2023). Within the intricate tapestry of global tourism, South Africa stands out as a vibrant and diverse destination with an eclectic array of attractions (Van der Merwe et al., 2022). Yet, the disruptions caused by the pandemic resonated deeply within its tourism sector, necessitating adaptive measures to revitalize and fortify the industry (Mbaiwa et al., 2020). Among these measures, the integration of digital infrastructure and technologies emerges as a paramount driver of the sector's recovery trajectory (Ribeiro et al., 2021). This research embarks on a comprehensive exploration, aiming to unravel the intricate relationship between technology adoption and the reinvigoration of South Africa's multifaceted tourism landscape.

In a world reshaped by post-pandemic realities, this study endeavors to uncover the mechanisms through which technology can contribute to the resurgence of South Africa's tourism sector. By employing a systematic review methodology, the study intends to synthesize a wealth of pertinent peer-reviewed literature and case studies (Buhalis et al., 2021). This approach is designed to provide a holistic understanding of the multifaceted facets of technology adoption within the unique context of South African tourism. This study is particularly significant as it delves into the immense challenges the pandemic posed to the tourism industry as well as the opportunities for the industry to innovate and transform (Gössling et al., 2021). In this context, South Africa's tourism sector finds itself at a critical position, where embracing technological advancements not only promises to enhance visitor safety but also holds the potential to catalyze long-term growth, making it a resilient and tech-savvy tourism destination.

The study is guided by the following objectives:

- To assess the extent of digital infrastructure development and technology integration in South Africa's tourism sector post-COVID.
- To analyze how digital tools such as high-speed internet, mobile apps, and contactless solutions are enhancing the overall travel experience for tourists
- To investigate the impact of technology adoption on visitor safety perceptions, destination choices, and tourism demand

THEORETICAL FRAMEWORK

Technology Acceptance Model (TAM)

The TAM framework has been widely recognized and validated as a theoretical model for explaining consumption behaviour in computer-mediated environments (Porter & Donthu, 2006; Bruner & Kumar, 2005). TAM is rooted in the theory of reasoned action (Fishbein & Ajzen, 1975) and is designed to assess an individual's acceptance of information technology. This model postulates that perceived usefulness (PU) and perceived ease of use (PEOU) are pivotal external factors that determine an individual's attitude toward using information technology. Perceived usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance," while perceived ease of use is defined as "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989, p. 320). TAM asserts that both PU and PEOU significantly influence an individual's attitude toward an object, and in turn, attitude, along with PU, influences behavioural intention sequentially. These external factors (PEOU and PU) essentially mirror individuals' beliefs regarding a specific technology (Huang, 2016).

The widespread adoption of TAM in various research domains can be attributed to its explanatory power and simplicity. It has been shown to be particularly effective in explaining over fifty percent of the variance in behavioural intentions ((Huang, 2016)). Moreover, TAM has demonstrated its adaptability by being extended and integrated with theories from different disciplines, including the field of tourism (Wu et al., 2020). Notably, TAM has been considered the most competent model for explaining the adoption of technological innovations (Yu Wang et al., 2020) and is widely utilized in studies related to technology adoption tendencies (Huang, 2016).

In the context of this study on the Acceleration of Technology Adoption Post-COVID in the tourism industry, TAM serves as a valuable theoretical framework. It allows for the exploration of how tourists and tourism practitioners perceived usefulness and perceived ease of use of technology influence their attitudes and intentions toward adopting technology solutions within the South African tourism sector in the post-COVID era. This framework has been successfully applied in various contexts, including online consumer behaviour, e-commerce, and travel decision-making, making it a robust choice to examine the role of technology adoption in the tourism industry's recovery and adaptation in South Africa.

METHODOLOGY

This study uses a systematic literature review on technology adoption within the tourism sector, with a particular focus on the post-COVID era. The study primarily concentrated on research conducted between 2021 and 2023 to ensure contemporary insights and relevance. A screening process was applied, guided by the following inclusion criteria:

- Temporal Range: Papers published between 2021 and 2023 were considered, allowing for a contemporary focus while capturing relevant developments in technology adoption in tourism and COVID era.
- Relevance: Articles with a semantic connection to the research area and containing the specified keywords were incorporated into the study.
- The search for relevant articles was conducted across various reputable database sources, namely Emerald, IEEE Explore, Science Direct, Google Scholar, Taylor and Francis, Springer, and the Web of Science. These databases were chosen for their wide coverage of academic research.

This methodological approach not only facilitated the construction of a comprehensive and rigorously chosen literature archive but also established a robust foundation for the subsequent analysis of technology adoption within South Africa's post-COVID tourism sector. It enabled the inclusion of the most current and relevant research findings, aligning seamlessly with the study's objectives and its temporal context (Mengist, Soromessa, & Legese, 2020).

RESULTS AND CONCLUSIONS

Innovative Approaches in Tourism Post-COVID:

The adoption of advanced technologies in the tourism sector has ushered in a new era of travel experiences, and this transformation has been particularly profound in the aftermath of the COVID-19 pandemic. Smith et al. (2023) highlight how technologies such as augmented reality, virtual reality, and artificial intelligence have redefined the way tourists engage with destinations. Travelers can now embark on virtual tours, explore attractions from the comfort of their homes, and receive personalized recommendations tailored to their preferences, all of which have become instrumental in reshaping the tourism landscape. Contactless services, as emphasized by Jones et al. (2020), have emerged as an indispensable aspect of ensuring traveller safety and confidence in the wake of the pandemic. Travelers are increasingly opting for contactless check-ins, digital payments, and touchless access to amenities to minimize physical contact during their journeys. This shift not only addresses health concerns but also enhances the overall travel experience by streamlining processes and reducing wait times. In response to the health crisis, the hospitality industry has adopted stringent health and hygiene protocols, as noted by Brown & Clark (2023). The integration of advanced technologies, contactless services, and stringent health measures not only enhances traveller safety but also revitalizes and evolves the tourism sector. As the world adapts to the challenges of the post-COVID-19 era, these elements will continue to shape the future of travel, offering tourists innovative, safe, and unforgettable experiences.

South Africa's Tourism Sector in the Pandemic Context:

South Africa, boasts a remarkable blend of cultural richness and natural beauty and has l positioned itself as a prominent tourist destination. The diverse attractions, from the iconic Table Mountain to the wildlife safaris in Kruger National Park, have consistently attracted tourists from across the globe (Smith & Johnson, 2019). However, the outbreak of the COVID-19 pandemic in 2020 shook the foundations of South Africa's thriving tourism industry. The country's reliance on international tourism became evident as it faced a staggering decline in tourist arrivals due to travel restrictions and safety concerns (Moodley & Naidoo, 2022). This sudden downturn had adverse economic effects, with tourism-related businesses struggling to survive amidst uncertainty and reduced visitor numbers.

To circumvent these unprecedented challenges, South Africa's tourism sector embarked on a journey of adaptation and revitalization. Recognizing the critical need to ensure tourists

safety, the government and industry stakeholders swiftly implemented comprehensive health and safety protocols (Jones et al., 2021). These measures encompassed rigorous cleaning practices, health screenings, and adherence to international standards to reassure visitors and rebuild trust. Additionally, to address the immediate need for tourism, a strategic shift towards promoting domestic travel was undertaken. Various initiatives, such as domestic tourism campaigns and discounts, were introduced to stimulate local tourism and provide a lifeline to struggling businesses (Jones et al., 2021). Concurrently, the industry explored innovative strategies to remain relevant in the eyes of international tourists. Digital tools and technology adoption, including virtual tours and digital marketing, played a pivotal role in keeping South Africa's diverse offerings visible to the world (Jones et al., 2021).

Digital Infrastructure Development in South African Tourism

The state of digital infrastructure in South Africa plays a pivotal role in shaping the tourism sector's future. South Africa, like many emerging economies, faces challenges in achieving innovative digital infrastructure (Smith et al., 2022). While investments in high-speed internet have been made to address this issue, disparities still exist, with urban areas enjoying better connectivity compared to remote regions (Moodley & Naidoo, 2022). The impact of these investments on the tourism sector is significant, as reliable internet connectivity is essential for various aspects of the tourist’s journey, from research and booking to navigation and sharing experiences (Makkar et al., 2022). Mobile apps have emerged as powerful tools for enhancing the travel experience by providing real-time information, convenience, and personalized services (Garcia & Davis, 2021). However, the effectiveness of these apps is closely tied to the availability of high-speed internet and digital infrastructure, making it imperative for South Africa to address these disparities for the benefit of both domestic and international tourists (Jones et al., 2021).

Technology Adoption and visitor experiences:

The adoption of technology in South African tourism has significantly transformed the way tourists experience the country's diverse attractions. Virtual reality (VR) and augmented reality (AR) technologies have emerged as powerful tools for showcasing South Africa's cultural and natural wonders. These immersive technologies allow prospective tourists to

explore historical sites, wildlife reserves, and scenic landscapes from the comfort of their homes, creating a sense of anticipation and excitement even before they set foot in the country (Smith et al., 2022). Real-time updates on safety measures, weather conditions, and nearby attractions through mobile apps empowers tourists with valuable information, enabling them to make informed decisions about their travel experiences. Location-based services further enrich the visitor experience by providing personalized recommendations and guiding tourists to hidden gems and off-the-beaten-path destinations (Garcia & Davis, 2021).

Challenges and Barriers in Technology Adoption

The adoption of technology in South African tourism, is growing; however, it faces a number of challenges and barriers that need to be addressed for sustainability. South Africa faces diverse challenges in terms of infrastructure limitations and digital divides (Makkar et al., 2022). Disparities in internet access, especially in rural and remote areas, pose a significant hurdle to the widespread adoption of technology. Bridging the digital divide through improved connectivity and accessibility is crucial to ensure that the benefits of technology adoption are equitable across the country. Additionally, there is a need for South Africa to enforce policies that facilitate the integration of technology into the tourism sector while safeguarding privacy and security (Bieger et al., 2020). Regulatory frameworks need to strike a balance between encouraging innovation and ensuring compliance with industry standards, particularly in areas related to data protection and cybersecurity. Lastly, resistance to change within the industry and among stakeholders is an impediment to technology adoption. Overcoming resistance requires comprehensive education and awareness campaigns to showcase the benefits and potential of technology in enhancing the tourism experience, improving safety, and increasing operational efficiency.

CONCLUSIONS

The COVID-19 pandemic has brought in a new era of rapid technological adoption and innovation within the global tourism industry, and South Africa's tourism sector, renowned for its cultural diversity and natural beauty, has been no exception to these transformative changes. This paper has explored the intricate connection between technology adoption and the rejuvenation of South Africa's tourism landscape in the post-COVID era. The

comprehensive literature review conducted in this study unveiled several significant findings. The study concludes that innovative approaches in tourism, driven by technology, have revolutionized the way tourists engage with destinations. Augmented reality, virtual reality, artificial intelligence, and contactless services have become integral facets of the travel experience, offering tourists safe, immersive, and unforgettable experiences. Additionally, South Africa's tourism sector, like its global counterparts, faced substantial challenges during the pandemic. However, the industry showcased remarkable adaptability by implementing rigorous health and safety protocols, promoting domestic tourism, and harnessing digital tools and technology adoption to remain visible to international tourists. Furthermore, technology adoption has profoundly impacted visitor experiences. Virtual reality and augmented reality technologies enable prospective tourists to explore South Africa's attractions remotely. Mobile apps offer real-time information, convenience, and personalization, enriching the overall visitor experience. Finally, the adoption of technology encounters a number of challenges and barriers, encompassing infrastructure limitations, digital divides, regulatory considerations, and industry resistance to change. Overcoming these hindrances is instrumental in sustaining and maximizing the advantages of technology adoption within South African tourism.

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Digital Transformation and Enterprise Labor Productivity

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ABSTRACT

The digital economy and digital transformation have a profound impact on social production methods, lifestyles, and social governance. Digital transformation has also brought revolutionary changes to the restructuring of global factor resources, reshaping the global economic structure, and changing the global competitive landscape. By introducing cases of digital transformation at the national, industrial, and regional levels during the construction of socialism with Chinese characteristics, this paper proposes the difficulties and transformation paths that may be encountered in the efficiency and performance of labor production during the digital transformation process of enterprises. It further explains that digital transformation can alleviate the financing difficulties of enterprises and strengthen internal governance to improve labor productivity.

The Digital Economy and Digital Transformation have a Profound Impact on Social Change

The digital economy is a new economy, new driving force, and new business form, which is triggering profound changes in the overall social and economic aspects. With the continuous progress and popularization of digital technology, the digital economy has become the main development direction of today's society. The ultimate foothold of the digital economy is the digital transformation of enterprises. As a new stage of information technology development, enterprise digital transformation emphasizes the comprehensive integration of core business processes and digital technology. The digital transformation of enterprises will constitute the development of digitalization in their respective industries, and the further development of digital industrialization will also empower and drive the acceleration of digital transformation of enterprises through more advanced digital technologies and services.

The speed of the digital economy.

At the main forum of the 2023 Global Digital Economy Conference, the "Global Digital Economy White Paper" released by the China Institute of Information and Communications showed that from 2016 to 2022, the scale of China's digital economy increased by 4.1 trillion US dollars, with an average annual compound growth rate of 14.2%. In 2022, China's digital economy output value has reached 50.2 trillion yuan, accounting for 41.5% of the entire GDP, and the growth rate has reached 10.3%. In 2022, China's GDP growth was 3%, and the growth rate of the digital economy is more than three times that of the entire economy. With the successive introduction of a series of institutional measures, China's digital economy has shown a vigorous development trend, becoming an important growth pole of the national economy, which fully demonstrates that the digital economy has gradually become a key driving force for economic growth. Looking globally, in some mature countries, the development speed of the digital economy is also very fast.

The wide radiation range of the digital economy.

The scope of digital economy radiation is unprecedented, from the aerospace industry to traditional industries such as catering, all of which are promoting digitization. The process of digitization is being driven very quickly. The traditional catering industry has undergone tremendous changes in its business and business models through digitization. Every industry in the national economy, every field and corner of people's lives are undergoing digital changes.

The depth of the impact of the digital economy. In general, the digital economy is becoming a key force in restructuring global factor resources, reshaping the global economic structure, and changing the global competitive landscape. From a micro perspective, every aspect of our lives cannot be separated from digitization, and without digitization, it will be difficult to move forward. Traveling and driving require digitization, and dining and dining require digitization.

THE FIELDS AFFECTED BY THE DIGITAL ECONOMY

In terms of production methods, the development of the digital economy has brought fundamental changes to traditional industries.

Traditional industrial production mainly relies on labor and material resources, while the digital economy relies more on technology and information resources. The application of digital technology can make the production process more efficient, intelligent, and automated, significantly improving production efficiency and quality, and reducing production costs. With the support of the big data technology system, the ideal state of on-demand production, cost reduction, and storage reduction is no longer a castle in the air. In the traditional economic era, the production method characterized by large machine production concentrated workers in a single factory, and workers were constrained to perform monotonous and repetitive work on assembly lines. In the digital economy production method, workers were scattered around the world, which also reflects the socialized characteristics of the digital economy production method. It can be seen powerful algorithm technology and replicable massive data resources not only reduce production and transaction costs, but also achieve multi-party collaboration in the field of social production, strengthen cooperation between workers, departments, and industries, and improve the quality of economic development.

In terms of lifestyle, the application of digital technology has made people's lives more convenient and efficient which has also led to significant changes in people's consumption needs.

Today, in the era of digital economy, with the application of big data technology system in various fields such as healthcare, health, education, transportation, etc., people's social life is facing comprehensive changes, among which the most comprehensive and intuitive manifestation is "online consumption". The digital economy has brought about disruptive changes in traditional consumption, and through third-party online platforms, consumers can be endowed with personalized, diverse, efficient and convenient shopping experiences. In the traditional sense, consumption tends to follow the logic of "production determines consumption", where consumers often choose to purchase based on the products provided by the producers, making it difficult to enjoy personalized services at the shopping level; In

the era of the digital economy, due to the existence of third-party online platforms, consumers can break regional restrictions and meet their personalized needs through online shopping.

In terms of governance, **the digital economy changes the operational and management methods of organizations.**

The widespread application of digital technology can improve the efficiency and informatization level of organizations. The government can provide more efficient public services through digital platforms and online services, achieving information exchange and rapid feedback between the government, citizens, and enterprises. The digital economy promotes transparency and fairness in governance, making government regulation more comprehensive, open, and transparent. Through digital data collection and analysis, the government can more accurately obtain social information, timely identify and solve problems. At the same time, the development of the digital economy has formed a ubiquitous, timely, and accurate way of information exchange, significantly reducing transaction costs such as information, evaluation, decision-making, supervision, and default, bringing a people-oriented governance and work approach. The digital economy has transformed the traditional employment model from "enterprise employee" to "platform individual", replacing the traditional management model with a self-organizing model, breaking the hierarchical structure from top to bottom, and maximizing the liberation of personal productivity; Promote the formation of flexible organizations, quickly respond to market demand and respond to environmental changes; Promote the formation of borderless organizations and build a cross industry, cross domain, and cross subject industrial ecosystem.

THE DIGITAL ECONOMY BECOMES A KEY FORCE IN TRANSFORMING SOCIETY AND REORGANIZING GLOBAL FACTOR RESOURCES.

The new economic model brings new globalization connotations, and the differences and competition in the endowment of innovation factors among countries will become the driving force of a new round of globalization. The development of the digital economy promotes closer communication among countries, not only promoting complementary sharing of scientific and technological innovation resources among countries, better integrating and optimizing global scientific and technological resources and factors, forming a strong source

of innovation, but also fully utilizing the comparative advantages of countries to reduce the costs and risks of scientific and technological innovation, Improve the overall efficiency and level of innovation.

Reshaping the global economic structure.

The development of the digital technology has made information transmission and communication more convenient and rapid, breaking regional restrictions and promoting the development of globalization. The rise of the digital economy has made it easier for businesses and consumers worldwide to communicate and cooperate, promoting the integration and development of the global economy.

Changing the global competitive landscape.

The traditional globalization model is mainly led by developed countries, with developing countries playing a lower role in the global value chain. The rise of the digital economy provides developing countries with the opportunity to enhance their competitiveness and participate in the process of globalization through the application of digital technology. The development of the digital economy has made the pattern of globalization more balanced and diversified.

DIGITAL CHINA CONSTRUCTION

National top-level design:

"Accelerating the construction of digital China" is a major national strategy in the new development stage and a key measure to build a new competitive advantage for the country. Since 2017, the "digital economy" has been continuously included in government work reports. The 2017 government work report proposed to promote the in-depth development of "Internet plus" and accelerate the growth of the digital economy. The 2018 government work report mentioned that efforts should be made to increase network speed and reduce fees, achieve full coverage of high-speed broadband in urban and rural areas, and expand the range of free internet access in public places; and assist in the construction of digital China.

The 2019 government work report proposed to strengthen the digital economy. The 2020 government work report proposes to create new advantages in the digital economy. The 2021 government work report once again emphasized the need to accelerate digital development and create new advantages in the digital economy. In the 2022 government work report, it was first proposed in a separate paragraph to promote the development of the digital economy and strengthen the overall layout of digital China construction. Among the nine key tasks, the digital economy is listed as the fourth key task, with a focus on building digital information infrastructure, promoting industrial digital transformation, accelerating the development of the industrial internet, and improving digital economic governance.

In addition to continuously improving its status in government work reports, the frequency, density, and intensity of policies related to the digital economy at the national level are also constantly increasing. **Table 1** summarizes the relevant policies introduced from 2017 to 2023. China's policies to promote the development of the digital economy have continuously shifted from being pragmatic, from framework policies to specific areas. The top-level design for the development of the digital economy has gone from directional to key areas, and the top-level design landscape for the development of the digital economy is constantly becoming clearer.

Table 1: Summary of China's Digital Transformation Policies

Date	Department	File
2017.11	the State Council	Guiding Opinions on Deepening "Internet plus Advanced Manufacturing Industry" and Developing Industrial Internet
2018.07	General Office of the CPC Central Committee，Ministry of Industry and Information Technology	Guidelines for Promoting Enterprise Cloud Implementation (2018-2020)
2019.05	the State Council	Outline of Digital Rural Development Strategy
2020.05	Ministry of Industry and Information Technology	Notice on Deepening the Comprehensive Development of Mobile Internet of Things
2021.03	The Fourth Session of the 13th National People's Congress	Outline of the 14th Five Year Plan and the Long Range Objectives for 2035
2022.03	The Fifth Session of the 13th National People's Congress	Government Work Report
2023.06	Ministry of Industry and Information Technology，the Ministry of Finance	Notice on Carrying out the Pilot Work of Digital Transformation of Small and Medium sized Enterprises in Cities

Strengthen Industry Integration:

The Ministry of Industry and Information Technology has issued the "14th Five Year Plan for the Integration of Industrialization and Industrialization" and the "Action Plan for Digital Transformation in Manufacturing Industry", formulated a roadmap for digital transformation in the industry, expanded to key industries such as raw materials, consumer goods, and safety production, and promoted the digital transformation and high-quality development of the economy and society.

Regional Policies for Implementation:

In June 2023, the Beijing Municipal People's Government issued a notice on the implementation of the "Implementation Opinions on Better Utilizing the Role of Data Elements to Further Accelerate the Development of the Digital Economy", clarifying the open development of the entire digital economy industry chain and international exchange and cooperation; Guangdong Province promotes the "Implementation Plan for Digital Transformation of the Manufacturing Industry (2021-2025)", which supports the digital transformation of the entire province with "one policy for one enterprise, one policy for one industry, one policy for one park, and one policy for one chain"; In July 2023, the People's Government of Zhejiang Province issued a notice on the Implementation Opinions on Promoting the High Quality Development of Platform Economy, proposing to enhance the platform's consumption creation ability, deepen the action of new digital life services, and further enrich the digital consumption market.

THE ROAD TO ENTERPRISE DIGITAL TRANSFORMATION: DIFFICULTIES VS. KEY TO TRANSFORMATION

The Difficulties of Digital Transformation

The report on the 2020 China Enterprise Digital Transformation Index, jointly launched by Accenture and other institutions, pointed out that **only 11%** of enterprises' digital investment translates into excellent business performance; In terms of utilizing real-time data to adjust and optimize production, **only 22%.** According to the 2021 China Enterprise Digital Transformation Index, **only 16% of** Chinese enterprises have achieved significant results in

implementing digital transformation**, with an average score of 54 points**. The digital transformation of enterprises in 2022 is still very severe. According to a report released by McKinsey, it is predicted that there is an approximately **80% probability that enterprises will fail** in their digital transformation. Digital transformation is not an overnight process, but a long-term and continuous iterative process that typically involves three stages: initial investment, mid-term iteration, and later output. Enterprises face the dilemma of "not transforming and waiting for death, transformation seeking death" due to their weak transformation ability, high transformation costs and unwillingness to transform, and long "pain period" of transformation and hesitancy to transform. The main difficulties faced by enterprises in implementing digital transformation include the following four points:

First - a large demand for funds and a long return period which can easily lead to funding gaps. Digital transformation is a long-term strategic action. From purchasing software and hardware to system operation and maintenance, from updating basic equipment to organizing human resources training, covering various aspects of enterprise production, operation, marketing, human resources, etc., continuous financial investment is required, and the return cycle is long. Often, the performance generated in the short term cannot fully cover the initial investment, causing managers to face significant performance pressure. Some companies are under pressure to reduce their investment in digital transformation and use it for their daily operations, resulting in far less investment in digital transformation. The research results of JD Digital Technology Research Institute show that the actual amount of digital investment in Chinese enterprises is at a low level. Nearly 70% of enterprises' digital transformation investment is less than 3% of annual sales, 42% of enterprises' digital transformation investment is less than 1% of annual sales, and only 14% of enterprises' digital transformation investment exceeds 5% of annual sales.

Second - the level of digital technology is low, making it difficult to integrate with business. One of the biggest weaknesses in traditional enterprise digital transformation is the lack of digital skills. Although traditional enterprises have rich production and operation experience, the level of informatization before digital transformation still remains in the stages of office automation and labor and personnel management such as word processing and financial management. After digital transformation, it takes a long time to adapt to the digital process to achieve human-machine collaboration. Due to the low level of digital technology, most

enterprises are still in the early stages of developing and applying big data, mainly focusing on limited scenarios such as precision marketing. They have failed to conduct predictive and decision-making analysis from the perspective of business transformation and have not explored the potential value of data assets at a deeper level. Some big data technology companies, although equipped with technology, lack a deep understanding of vertical applications in the industry, making it difficult for common architectures, algorithms, etc. to meet the actual needs of different enterprises, making it difficult to deeply integrate technology and business in a short period of time.

Third - the high cost of digital talent makes it difficult to form a stable professional team. The shortage of digital talent is a major weakness faced by enterprises in digital transformation and only professionals who master information technology will no longer be suitable. Digital transformation requires the support of "composite" talents, who must possess both business capabilities and digital concepts and skills. However, due to the long training cycle and high cost of digital talents, such "composite" talents are extremely scarce. Social recruitment also requires paying high salaries in order to attract or even retain such talents, which will exacerbate the financial pressure of enterprises, especially for small and medium-sized enterprises. In the absence of professional talent support, it is difficult for enterprises to fully explore and unleash the value of digital technology.

Fourth - prevent insufficient awareness and technological limitations which hide data security issues. Enterprises achieve intelligent production, precision marketing, and intelligent operation through data-driven approaches. In the process of digital transformation, big data technology will be used to mine structured and unstructured data information in the market to form databases for production decision-making and collaborative sharing. Some of these data are publicly promoted by enterprises, some are sensitive data such as internal production and finance, and some are personal privacy data of enterprise customers. Due to the negligent or malicious behavior of internal staff and even the malicious intrusion of external personnel, some unknown security threats can cause data security issues such as sensitive data leakage, non-desensitization, illegal access, and unauthorized use of sensitive data.

The Key to Digital Transformation

First - national policy support. Digital transformation is a large-scale transformation of the entire society that requires policy support from multiple aspects to proceed smoothly. Policies need to be optimized in areas such as data protection, information technology, market openness, talent cultivation, financial support, facility construction, and intellectual property protection. At the same time, continuity, timeliness, and effectiveness of policies are also very important to connect with market demand, promote digital transformation, and comprehensively build a new ecosystem of the digital economy.

Second - senior management support. In the digital era, market competition is becoming increasingly fierce which requires senior managers of enterprises to have sharp insights into the development of digital technology, emerging business models, and be able to adjust their development strategies at any time. Digitalization is not the work of the information department, it is led by the leader and participated by all personnel. If senior managers of enterprises have not yet realized the importance of digital transformation for enterprise development, and their willingness and enthusiasm for digital transformation are not high, then even with the support of external resources, the probability of successful digital transformation is relatively low.

Third - data management and utilization capabilities. The foundation of digital transformation is data. In various stages of design, production, marketing, inventory, management, and even decision-making, massive financial data and user data are needed to provide underlying support, transforming from the previous "dialogue between people" to "dialogue between people and data". Data driven enterprise business intelligence, digitization, and scientific decision-making. The data management and utilization capabilities presented by enterprises in data acquisition, analysis, application, processing, storage, and sharing are related to the digital transformation process. Once data quality is not up to standard or data leakage occurs, it will directly affect the quality and efficiency of enterprise digital transformation.

DIGITAL TRANSFORMATION OF ENTERPRISES AND LABOR PRODUCTIVITY

（1）Key indicators and variables (**Table 2)**: labor productivity, digital transformation, corporate growth, financing constraints, internal control, government subsidies, and R&D investment.

Table 2: Definition of each Variable

Variable	Definition
Labor Productivity(LP)	Growth brought about by technological advancements
Digital Transformation(DT)	Measure the degree of digital transformation of enterprises based on the frequency of digitalization related keywords appearing in the annual reports of listed companies
Enterprise Growth(Growth)	Growth=(Current year's operating revenue - previous year's operating revenue)/previous year's operating revenue
Financing Constraints(SA)	SA=-0.737Size+0.043Size2-0.04Age,
	Size=ln(Total assets/1 million), Age is the age of the enterprise
Internal Controls(In_con)	Adopting the "Internal Control Index of Chinese Listed Companies" of Shenzhen Dibo Company and logarithmizing the internal control index.
Government Subsidy Intensity(Gov_sub)	Gov_sub=The amount of government subsidies received by enterprises/total assets of enterprises
R&D Intensity(RD)	RD=R&D investment/operating income

(2）Digital transformation can significantly improve labor productivity in enterprises. From the perspective of the inherent attributes and external spatiotemporal differences of enterprises, the promotion effect of digital transformation on labor productivity is more obvious in the groups of state-owned enterprises, high-tech enterprises, and growing enterprises; **(Table 3)**

Table 3: The impact of digital transformation on labor productivity: Benchmark Regression + Dynamic Effects

Variable	Benchmark Regression		Dynamic Effects			
DT	0.0453***	0.0240***				
	-0.0095	-0.0084				
L1.DT			0.0281***			
			-0.0084			
L2.DT				0.0285***		
				-0.0091		
L3.DT					0.0299***	
					-0.0104	
L4.DT						0.0283**
						-0.0119

（3）Mechanism research has shown that digital transformation can improve labor productivity in enterprises through two paths: alleviating financing difficulties and strengthening internal governance. Especially, when enterprises receive government subsidies and increase their own research and development intensity, it can strengthen the boosting effect of digital transformation on labor productivity of enterprises; **(Table 4)**

Table 4: The External Transmission Mechanism of Digital Transformation on Labor Productivity: Financing Constraints and Internal Control Perspectives

Variable	LP	KZ	LP	ln_con	LP
DT	0.0240***	-0.0071***	0.0235***	0.0027***	0.0234***
	-0.004	-0.0013	-0.004	-0.0007	-0.0044
SA			-0.0640**		
			(-3.19)		
ln_con					0.4291***
					-10.55

（4）Enterprise management should maintain or enhance their awareness of digital transformation, and local governments should provide precise support for digital transformation, cultivate a team of digital talents, and ensure data security. **(Table 5)**

Table 5: Digital Transformation, Internal and External Support, and Labor Productivity

Variable	LP	LP
DT	0.0215***	0.0338***
	-0.005	-0.0073
DT×Gov_sub	0.4548**	
	-0.185	
Gov_sub	-3.3418***	
	-0.4302	
DT×RD		0.2370***
		-0.0724
RD		-2.9371***
		-0.1464

RESEARCH CONCLUSIONS AND POLICY RECOMMENDATIONS

First, management of enterprises should maintain or enhance their awareness of digital transformation. With the vigorous development of emerging technologies, the competition mode between enterprises has been overturned. Enterprises should attach great importance to digital transformation and use it to drive production vitality,

Second, local governments should provide precise support for digital transformation and enhance its substantive effectiveness. On the one hand, local governments should actively use digital technology to collect and identify enterprises with real digital transformation potential and feasible qualifications while providing precise support to target enterprises. On the other hand, government departments also need to use digital technology to conduct risk assessments on enterprises in advance, supervise and manage their behavior in real time afterwards, and ensure that government subsidy funds are effectively used, utilized, and produced.

Third, cultivate a digital talent team and promote the advancement of human capital structure. Enterprises should actively introduce intelligent employees to participate in production activities, pay attention to the working environment and skill training of existing senior talents, and also continue to introduce or learn from the odd job economy model and professional talent exchange and cooperation, optimize the internal talent structure of the enterprise, transform the human capital structure to advanced level, and improve the production efficiency of the enterprise.

TYPICAL CASES OF DIGITAL TRANSFORMATION

Case 1: Huawei

In 1998, Huawei began integrated product development for IPD and integrated supply chain ISC. From 2003 to 2013, Huawei was in the internationalization stage, and in 2003, Huawei launched a data center. In 2007, it began to launch data governance. Faced with the digital wave, Huawei officially launched its digital transformation in 2016. Huawei continues to improve its data management organization, establish data control and operation models, and work together with upstream and downstream enterprises in the industry chain to build a digital ecosystem and create new value in the industry. According to Huawei's 2021 Annual Report, benefiting from digital empowerment, Huawei's corporate business revenue in 2021 reached 10.4 billion yuan, a significant increase of 30% year-on-year. So far, Huawei has developed into one of the six major digital ecosystems. They are Kunpeng, Shengteng, Huawei Cloud, Hongmeng, HMS, and MDC for intelligent driving. Among them, the number of users upgrading HarmonyOS2 exceeds 120 million; more than 140,000 applications worldwide have integrated HMSCore; 90 global partners joining the MDC ecosystem; more than 10,000 Kunpeng certified solutions; more than 500 partners from Shengteng; and the total number of Huawei cloud developers has exceeded 2.3 million. Huawei collaborates with partners to implement and explore intelligent agent applications in over 600 scenarios, covering industries such as government and public utilities, transportation, industry, energy, finance, healthcare, and scientific research. Huawei has released 11 scenario-based solutions, integrating resources to efficiently serve customers. More than 700 cities and 267 Fortune Global 500 companies have chosen Huawei for digital transformation, and the number of service and operational partners has increased to over 6000.

Case 2: Midea

The Midea Group officially proposed a new strategy in 2011- "product leadership, efficiency driven, and global operations". This marked the beginning of Midea's digital transformation in 2012, spanning over a decade from digital 1.0 to 3.0, achieving a shift from simple scale growth to dual growth in scale and quality. Since the launch of digital transformation in 2012, Midea Group's total assets have increased from 92.6 billion in the same year to 422.6 billion in 2022,

and its revenue has increased from 134.1 billion to 345.7 billion; net profit increased from 6.7 billion to 29.6 billion; and the number of days for fund turnover has increased from 26 days to -2.5 days. After the successful implementation of Midea's digital transformation, Meiyun's digital intelligence business will be developed to assist in the digital transformation of the industry. Currently, Midea has served more than 300 companies worldwide including Huawei, Vanke, China Resources, Great Wall Motors, Yonghui Supermarket, Haitian, and Li Ning with an annual output value of nearly 1 billion yuan. Midea's digital transformation has also been recognized by domestic and foreign institutions and been successfully selected as one of Forbes China's top ten industrial digital transformation enterprises in 2021.

The digital transformation has entered the deep-water zone. The scope of transformation has expanded from a few departments to all departments, the speed of innovation has increased from pilot experiments to doubled innovation, the application of technology has isolated from a few to a large number of integrations, and the value embodiment has extended from the previous focus on efficiency and customer experience to group control, product services, business models, and social responsibility. In 2022, both globally and in China, over 50% of the economy (with China exceeding approximately 60 trillion yuan) is based on or influenced by digitization, and China's total expenditure on digital transformation from 2022 to 2026 will reach $2.38 trillion. Against the backdrop of the rapid development of the digital economy, enterprises are keeping up with the pace of the times, breaking through closed systems such as previously fixed business processes, promoting their own digital and intelligent development, consolidating the power of new technologies, and conducting digital transformation in all fields such as products, services, and organizational management will become the main trend.

Developing Economic Indicators for Universities As Part Of Regional Ecosystems

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Abstract

Universities have the potential to contribute greatly to the vibrancy of regional economic ecosystems, individually and collectively, given the significant resources they harness in terms of technology and talent development. However, the emergence of entrepreneurship programming is not always the result of university leaders reaching rational consensus; instead, it can be organic, political, or opportunistic resulting from a grant opportunity or the particular interest of an administrator or a faculty member. In order to achieve the objectives of this work, we have developed a representative index of the potential contribution of education to the development of a country. We have then created another index representative of the level of quality of life and well-being in each country. Finally, we have carried out a correlation analysis to measure the relationship between both aspects.

Keywords: Economic Indicators, Universities, Regional Ecosystems, Entrepreneurship

INTRODUCTION

Given the complexities of measuring universities' impact on regional development, there is a need to establish relevant metrics that sufficiently reflect their contributions. To construct relevant indicators, it is critical to understand the complex character of university operations and their relationships to entrepreneurial ecosystems, industry collaborations, government partnerships, and community participation (Huang-Saad et al., 2018). The objectives of this research paper are as follows:

1. Examining the contribution of universities to the national and regional economies by looking at the influence of localization of neighbouring countries.
2. Outlining the funding mechanisms for universities, emphasizing competitive and performance elements.
3. Addressing contemporary challenges in measuring university performance and determining institutional efficiency towards sustainable development of the region

THEORETICAL FRAMEWORK

The evolution of economies was marked by Malthusian Stagnation. In this period, technological progress and population growth were small by today's standards, especially in the average growth of income per capita. During the Sustained Growth Regime, the average growth rate of GDP per capita increased significantly with the decline in population growth. The acceleration in technological growth causes a rise in the demand for human capital. Unified Growth Theory (UGT) uses emerging human capital as a significant factor in the growth process. There are two factors of production: land and labour. The land is fixed, and the efficiency of labour is determined by the model, endogenously. The production function is:

$$Y_t = H_t^{\alpha} (A_t X)^{1-\alpha}$$

where H_t is efficiency units of labour. A_t is technological level. X is assumed as the land.

Valero and Van Reenen (2019) suggest a new model, which is mainly concerned with economic growth, the number of universities in a region, and the population of this region:

$$log(Y/L_{ic,t}) = \alpha_1 log(Uni_{ic,t}) + \alpha_2 log(Pop_{ic,t})$$

where $Y/L_{ic,t}$ is the level of GDP per capita, $Uni_{ic,t}$ is the number of universities, and $Pop_{ic,t}$ is the population for region *I*, in country *c*, and year *t*. With the mentioned model, research suggests that there is a significant and positive relationship between GDPs per capita and universities. Also, research suggests that the best measure of innovation production is the regional number of patents. It appears that university growth on GDP growth work via human capital and innovations, though the magnitude of these effects is small. It is suggested that these findings underestimate the long-run effect of universities on economic growth (Valero & Van Reenen, 2019).

SAMPLE AND METHODOLOGY

The study sample is made up of 67 countries around the world for which the necessary information was available to create the index. Data has been retrieved from two main sources and, for each country, the figure for the last year available has been included in our database.:

1. The World Bank Data and Research (2023), World Bank Statistics Database. URL: http://data.worldbank.org
2. World Data Center for Geoinformatics and Sustainable Development (2023), Sustainable Development Modeling. URL: http://sdi.wdc.org.ua/global/

Data structure of the *Index of potential contribution of education to economic development*:

The measurement of the potential contribution of education, with particular focus on higher education as well as innovation and research, which is many times developed in universities, to the development of countries has been carried out through the construction of an index that we have called the Index of Potential Realization of Education to Development, PRED. This

index is made up of the following 4 dimensions, which in turn are made up of a combination of indicators:

1. Indicator of human capital potential (Index of literacy rate; Index of provision by technicians; Index of provision by researchers).
2. Indicator of fullness of specialists with higher education (bachelor's level education index; master's level education index; Doctoral level education index).
3. Indicator of education funding (Index of financial provision of education; Index of government expenditure per student);
4. Indicator of innovative activity (Index of patent activity; Index of technical cooperation).

Dimension 1: Indicator of human capital potential $I_{HP.}$

The indicator of regional potential tries to identify the future competitiveness of the higher education sector in a country. It is made up of three indicators:

Indicator 1.1 Index of literacy rate I_{LRA} [1]. Indicator name "Literacy rate, adult total (% of people ages 15 and above)":

$$I_{LRA} = \frac{I_{LRA\_i} - \min(I_{LRA})}{100 - \min(I_{LRA})},$$

I_{LRA_i} – Literacy rate, adult total (% of people ages 15 and above) in the *i* country

We take 100% as a unit (although this value is not reached). We take the minimum value among all countries as zero.

Indicator 1.2 Index of provision by technicians I_{TRD} [1]. Indicator name "Technicians in R&D (per million people)":

$$I_{TRD} = \frac{I_{TRD\_i}}{\max(I_{TRD})},$$

I_{TRD_i} – Technicians in R&D (per million people) in the *i* country;

Indicator 1.3 Index of provision by researchers I_{RRD} [1]. Indicator name “Researchers in R&D (per million people)”:

$$I_{RRD} = \frac{I_{RRD\_i}}{\max(I_{RRD})},$$

I_{RRD_i} – Researchers in R&D (per million people) in the *i* country;

Dimension 2: Indicator of fullness of specialists with higher education $I_{FS.}$

The indicator of fullness of specialist with higher education tries to reflect the influence of the structure of the educational level of the population. It is made up by three indicators:

Indicator 2.1 Bachelor's level education index I_{BLE} [1]. Indicator name “Educational attainment, at least bachelor's or equivalent, population 25+, total (%) (cumulative)”:

$$I_{BLE} = \frac{I_{BLE\_i}}{\max\,(I_{BLE})},$$

I_{BLE_i}, – Educational attainment, at least Bachelor's or equivalent, population 25+, total (%) (cumulative) for *i* country

Indicator 2.2 Master's level education index I_{MLE}. [1]. Indicator name “Educational attainment, at least master's or equivalent, population 25+, total (%) (cumulative)”:

$$I_{MLE} = \frac{I_{MLE\_i}}{\max\,(I_{MLE})},$$

I_{MLE_i}, – Educational attainment, at least Master's or equivalent, population 25+, total (%) (cumulative) for *i* country.

Indicator 2.3 Doctoral level education index I_{DLE}. [1]. Indicator name “Educational attainment, at least Doctoral or equivalent, population 25+, total (%) (cumulative)”:)”:

$$I_{DLE} = \frac{I_{DLE\_i}}{\max\left(I_{DLE}\right)},$$

I_{DLE_i}, – Educational attainment, at least Doctoral or equivalent, population 25+, total (%) (cumulative) for *i* country.

Dimension 3: Indicator of education funding I_{EF}

The indicator of education funding tries to capture the role of public education funding on the potential of university systems to contribute to economic development. It is made up by 2 indicators.

Indicator 3.1 Index of financial provision of education I_{FPE} [1]. Indicator name “Government expenditure on education, total (% of GDP)”:

$$I_{FPE} = \frac{I_{FPE\_i}}{\max\left(I_{FPE}\right)},$$

I_{FPE_i}, – Government expenditure on education, total (% of GDP) in the *i* country

Indicator 3.2 Index of government expenditure per student I_{GES} [1]. Indicator name “Government expenditure per student, tertiary (% of GDP per capita)”:

$$I_{GES} = \frac{I_{GES\_i}}{max\left(I_{GES}\right)}/100,$$

I_{GES_i}, Government expenditure per student, tertiary (% of GDP per capita) in the *i* country

Dimension 4: Indicator of innovative activity I_{IA}

The indicator of innovative activity tries to measure contribution of innovation to economic growth and social progress. It is made up by 2 indicators.

Indicator 4.1 Index of patent activity I_{PAR}. [1] Indicators name “Patent applications, residents”, “Patent applications, nonresidents” and “Population, total”:

$$I_{PAC} = \frac{(I_{PAR\_i} + I_{PAN\_i})}{I_{POP\_i}} \Big/ \left(\frac{(\max(I_{PAR}) + \max(I_{PAN})}{\max(I_{POP})}\right),$$

I_{PAR_i} – Patent applications, residents in the *i* country;

I_{PAN_i} – Patent applications, nonresidents in the *i* country;

I_{POP_i} – Population, total in the *i* country;

I_{PAR_i} – Patent applications, residents;

I_{PAN_i} – Patent applications, nonresidents;

I_{POP_i} – Population, total;

This index determines the overall patent activity in the country. The sum of these patents shows both domestic innovation activity and the interest of non-residents in patenting in the country. In general, this indicates the desire of people to develop in this country.

Indicator 4.2 Index of technical cooperation I_{TCG}. [1] Indicator name “Technical cooperation grants (BoP, current US$)”:

$$I_{TCG} = \frac{I_{TCG\_i}}{\max(I_{TCG})},$$

I_{TCG_i} – Technical cooperation grants in the *i* country

DATA STRUCTURE OF THE *INDEX OF QUALITY OF LIFE OF COUNTRIES*

The second index we create is the index of quality of life and welfare of countries, IQUALIF. We introduce this index, rather than using the GDP per capita or other economic indicators, because development and sustainability is more than just economic figures and must also consider the quality of life of the population.

This index tries to measure the contribution of sustainable development to social progress and welfare of countries. It is made up by 2 indicators.

Indicator 1 Index of the quality of life I_{QLC} [2]. Indicator name "Quality of Life Component":

$$I_{QLC} = \frac{I_{QLC\_i}}{\max(I_{QLC})},$$

I_{QLC_i} – quality of life component in the *i* country

Indicator 2 Index of the quality of life I_{SLC} [2], indicator name "Security of Life Component":

$$I_{SLC} = \frac{I_{SLC\_i}}{\max(I_{SLC})},$$

I_{SLC_i} – security of life component in the *i* country

The weightings of the different dimensions and indicators of the *Index of potential realization of education to development* and the *Index of quality of life of countries* was carried out by means of a survey of a panel of experts from the universities of the different countries that form part of the GISU project (namely, Durban University of Technology - South Africa, Stellenbosch University – South Africa, National Technical University of Ukraine - Ukraine, Universidad Zaragoza – Spain, University of the West of England - UK, Western Sydney University - Australia, Guangzhou University - China, Middle East Technical University - Turkey. The final result of these weightings is shown in table 1.

Table 1: Weighting factors for indicators and indices

Indicator	Weight factor	Index	Weight factor
D1: Indicator of human capital potential	**0.141**	I_{LRA}	0.333
		I_{TRD}	0.212
		I_{RRD}	0.455
	Indicator weight		1,000

D2: Indicator of fullness of specialists with higher education	**0.263**	I_{BLE}	0.333
		I_{MLE}	0.375
		I_{DLE}	0.292
	Indicator weight		1
D3: Indicator of education funding	**0.282**	I_{FPE}	0.454
		I_{GES}	0.546
	Indicator weight		1
D4: Indicator of innovative activity	**0.316**	I_{PAR}	0.667
		I_{TCG}	0.333
	Indicator weight		1
D1 to D4 made up the PRED index			
IQUALIF: Quality of life index	1	I_{QLC}	0.5
		I_{SLC}	0.5
	Indicator weight		1
Indicators weight	1,000		

ANALYSIS OF RESULTS

The Index of the potential contribution of education to development, PRED index, is made up of 4 dimensions. Table 1 presents the results of those indicators, as well as the PRED Index and the index that measures the development of the countries analysed. Table 2 presents the descriptives of the partial indicator, the PRED index and the QUALIF index.

Table 2: Analysed data results

	Mean	**Std. Dev**	**N**
D1	0.155	0.096	67
D2	0.378	0.152	67
D3	0.511	0.146	67
D4	0.102	0.160	67
I_QUALIF	0.779	0.146	67
I_PRED	**0.297**	**0.086**	**67**

Once the overall index has been created it is necessary to observe its relationship with the development of the countries. As explained in the methodology, rather than considering just economic development, this index captures the quality of life of the countries. Table 3 presents the correlation between the partial dimensions and the two indices as well as the correlation between the two indices.

Table 3: Partial dimensions and indices

	D1	**D2**	**D3**	**D4**	**IPRED**	**IQUALIF**
D1	1	0.250*	0.631**	0.153	0.667**	0.644**
D2	0.250*	1	0.076	0.079	0.589**	0.640**

D3	0.631**	0.076	1	-0.099	0.555**	0.291*
D4	0.153	0.079	-0.099	1	0.602**	0.278*
IPRED	0.667**	0.589**	0.555**	0.602**	1	0.703**
IQUALIF	0.644**	0.640**	0.291*	0.278*	0.703**	1

All partial dimensions are significant and positively related to the QUALIF index, although to a lower extent than our PRED index. D1 and D2 are the most related to the quality of life. These results are discussed further in the next section.

CONCLUSION

The paper underscores various economic indicators for measuring universities' economic impact, including but not limited to job creation, income generation, research and development endeavours, and innovation. Additionally, it emphasised the importance of crafting appropriate methodologies for gauging universities' economic influence within regional ecosystems. This paper has also discussed the challenges associated with measuring the economic impact of universities, such as the difficulty of attributing causality and the need to account for external factors. Overall, the development of economic indicators for universities as part of regional ecosystems is critical in assessing the economic impact of universities on their surrounding communities.

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A Low-Cost Method for Genomic Profile Interpretation via Pathological Images Based on Tissue-Level Genomic Abnormality Identification Network

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ABSTRACT

Lung cancer, with over 2.2 million new cases in 2020, is the most common type of cancer. Gene sequencing technology has been employed to personalize healthcare plans and improve treatment outcomes. Despite its high cost and complexity, the global cancer genome profiling market is projected to generate more than $22 billion in revenue. However, the high price of gene sequencing technology and the complexity of its operation have greatly limited the popularity of cancer genome profiling. Therefore, to address the gap in primary medical market cancer genomic diagnosis, low-cost genome profile interpretation technology is gaining attention.

Genomic profiling can detect abnormalities that leave distinctive traces in histomorphology, accessible through Whole Slide Images (WSI). This allows for low-cost pathological WSI analysis instead of high-cost genome sequencing techniques, a method known as “image-to-genome”. “Image-to-genome” methods based on deep learning can handle smaller patches, yet suffer from memory overflow when processing tremendous WSIs. Some researches propose focusing on key local regions within WSI for analysis, but this results in loss of spatial relationship information. Recent studies suggest that graph structures can effectively represent spatial features. However, multiple tissues in the patch hinder the identification of tissue-level contours associated with genomic abnormalities. To address the above challenges, we propose a method for automatically interpreting cancer-associated genomic profiles at tissue-level regions. This method offers several advantages:

1. Reducing the cost of genome profile interpretation from $5,000 to less than $500.

In order that healthcare providers can offer genomic testing services at more competitive prices, our method uses pathological images to interpret the genomic profile. After a routine pathological examination, acquiring a pathological WSI only requires scanning and storing the stained sections. The process incurs less than $500 per image in storage, electric power, and labor resource consumption [7]. Comparatively, genome sequencing technology costs more than $5,000 [8], much higher than our method.

2. Reducing the pathologist experience requirement from 10 years to only 3 years.

Recognition of pathological images requires pathologists with nore then ten years of experience in the field. To reduce the cost of pathologist training, our method automatically provides pathological tissue-level hints to pathologists about genomic abnormalities on WSI. The genomic abnormalities hints can assist inexperienced pathologists in personalized diagnosis, alleviating the lack of pathologists in the primary market for personalized medicine.

3. Reducing equipment costs from million dollars to only thousands of dollars.

Equipment expenses for our method include the scanner and computer. In order to reduce the cost on WSI scanners, our method considers both spatial and morphological features of genomic phenotypes, and allows the algorithm to identify genomic abnormal regions on pathological images with only a few thousand dollars wsi scanner [9]. Concurrently, we have reduced the WSI input memory usage via an automatic region filtering module, allowing the method to work on inexpensive devices. Compared to genome sequencers over a million dollars, the cost of the equipment can reduce to a few thousand dollars.

In summary, our method develops genomic profile detection technologies, and creates new revenue streams for companies in the healthcare market.

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Demystifying Virtual Tourism-Tackling the pros and cons based on recent experiences

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ABSTRACT

Tourism is the backbone of many economies; economic growth, employment opportunities, and cultural awareness are some of the main benefits of the tourism sector. However, COVID-19 pandemic travel restrictions changed the whole dynamic of the tourism sector, leading to the closure of many tourist-operated businesses. Therewithal, the reduction of disposable income coupled with high inflation and exchange rates positioned the tourism sector in a turmoil state. Virtual Tourism (a type of tourism facilitated by leveraging high-tech virtual reality technologies) became a viable option for those enthusiastic tourists willing to explore their favourite destinations during the COVID-19 pandemic and post-pandemic as the industry is recovering.

Virtual Tourism (VT) is an alternative form of tourism, and it is here to stay. As such, as a novice notion, VT has attracted the attention of researchers over the past few years. The research to date has tended to focus on what entails VT and the challenges of VT. There is no common definition of VT, and the pros and cons of VT based on experience have yet to be explored.

The purpose of this exploratory research is to map the pros and cons of VT based on the experience of virtual tourists and use this knowledge to estimate the demand for VT. The knowledge of the demand for VT is deemed vital for those entrepreneurs and tour operators looking to embark on VT.

The primary aim of this research is to develop a model of the demand for VT based on the identified pros and cons of VT. This research has framed the following core contributory research questions to accomplish this aim: *what is the demand for VT during the COVID-19 pandemic and post-COVID-19 pandemic?* This question compares the demand for VT between the time of the COVID-19 pandemic and the COVID-19 pandemic. As many scholars have

averred, an understanding of the demand for a product is antecedent to the supply of the product. The guiding questions are as follows:

1. What was the demand for VT during the COVID-19 pandemic?
2. What is the demand for VT now (post-COVID-19 pandemic)?

These questions are answered through the testing of the following hypothesis.

Hypothesis: *The demand for VT tends to increase because of positive experiences during the COVID-19 pandemic.*

This hypothesis is divided into two following sub-hypotheses:

- *Hypothesis 1 (H1): The demand for VT was high during the COVID-19 pandemic.*
- *Hypothesis 2 (H2): The demand for VT has increased post-COVID-19 pandemic.*

A mixed research, semi-structured interviews, and a survey questionnaire is the appropriate approach for this research. The semi-structured approach is chosen because open-ended questions can generate more in-depth information needed to better understand the pros and cons of VT based on real experience. Content analysis will be used to analyse the semi-structured interview questions.

The survey questionnaire was chosen because of data accuracy, flexibility, and scalability. Non-parametric Mann-Whitney Rank test will be used through Excel to analyse the quantitative data. In addition to the Mann-Whitney Rank test, Cronbach's trial will be performed to check the reliability and validity of the questionnaires as a research instrument.

Demystifying Virtual Tourism-Tackling the pros and cons based on recent experiences

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Overview & Literature Review

- Virtual Tourism (VT) is an alternative form of tourism, and it is here to stay.
- There is no common definition of VT, and the pros and cons of VT based on experience have yet to be explored.
- The purpose of this exploratory research is to map the pros and cons of VT based on the experience of virtual tourists and use this knowledge to estimate the demand for VT.
- Absolute 21st-century ,a hike of technological advancement have not refrained from the ultimate rejuvenating experience of traveling around the world .

Core contributory research Questions to accomplish this aim

This research has framed the following core contributory research questions to accomplish the research aim:

- The guiding questions are as follows:
  - What was the demand for VT during the COVID-19 pandemic?
  - What is the demand for VT now (post-COVID-19 pandemic)?

These questions are answered through the testing of the hypothesis.

Hypothesis

VT tends to increase because of positive experiences during the COVID-19 pandemic

Hypothesis 1 (H1): The demand for VT was high during the COVID-19 pandemic.1

Hypothesis 2 (H2): The demand for VT has increased post-COVID-19 pandemic.

Appropriate Approach

- Mixed research
- Semi-structured interviews
- Survey questionnaire

Method

- ***Non-parametric Mann-Whitney Rank test***
- ***Cronbach's trial***
- ***Survey Questionnaire***

Non-parametric Mann-Whitney Rank test will be used through Excel to analyse the quantitative data

Cronbach's trial will be performed to check the reliability and validity of the questionnaires as a research instrument.

The survey questionnaire was chosen because of data accuracy, flexibility, and scalability.

Significance of research

- The knowledge of the demand for VT is deemed vital for those entrepreneurs and tour operators looking to embark on VT.
- The Practical implications.
- Provides insights for policy makers.
- Highlights the type of Virtual Tourism demanded and the popular virtual destinations.

Road Map

- Data collection is underway-Mid May
- Iterative literature review
- Publication timeframe-July

Measuring Willingness to Accept Social Robot's Recommendations (WASRR)

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Abstract

The next evolution of integrating social robots into the hospitality industry is to understand how social robots can influence consumers' preferences. Social robots are increasingly being used in the hospitality industry to provide services and recommendations. Recommendations have been shown to impact customer satisfaction and lead to higher sales. However, a lack of a measurement of willingness to accept social robot recommendations (WASRR) makes it difficult for managers to evaluate the usefulness of these recommendations to customers. How do consumers perceive the recommendations provided by social robots?

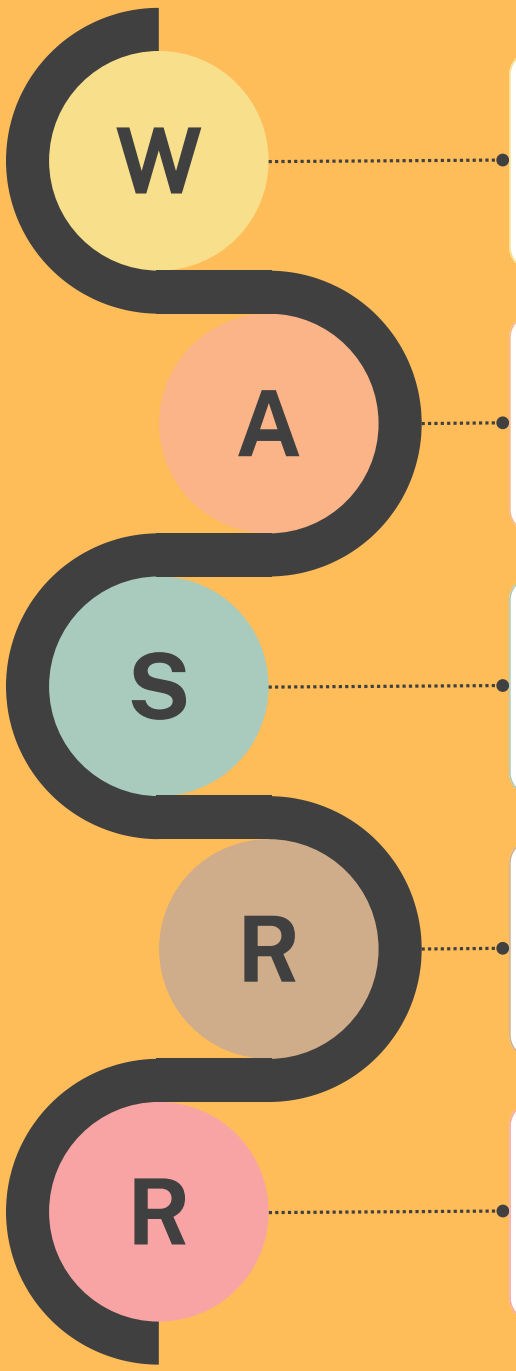
A review of the literature has shown there is a lack of empirical studies that define what willingness to accept social robots' (SR) recommendation means. Most papers either focus on using robot modalities to understand the acceptance of recommendations or are focused on system design. Consumers react differently to social robots compared to other technologies like virtual agents or chatbots and, thus, require a different measurement scale. While some research studies have examined the Willingness to Accept AI Recommendation Systems [14, 31], a lack of psychometric measures on this concept has limited scholars and managerial ability to understand the willingness of consumers' acceptance to accept social recommendations. Therefore, the research aims to develop a model to understand this phenomenon and proposes a scale having attitudes, subjective norms, the intention of manipulative intent, source credibility and empathy as the variables that will impact willingness to accept the recommendation and ultimately will impact the recommendation adoption. A scale will be developed using Churchill (1979) and Devillis (1991). This scale will be used to test the model, a 2 (high vs low involvement) x 2 (restaurant vs cafe) x 2 (human vs social robot) experimental research will be conducted (high involvement restaurant: fine dining restaurant vs. low-involvement restaurant: fast-food restaurant and 5-star hotels (high

involvement) vs budget hotels (low involvement)). The data will be collected using a convenience sampling method from university students.

A key contribution of the study is the development of the “Willingness to Accept Social Robots’ Recommendation (WASRR) scale and model. This will provide scholars and practitioners understanding of how social robots can influence consumers' preferences and decision-making in the hospitality industry. WASRR scale will provide a strong diagnostic assessment of the recommendations. The research findings will help managers integrate social robots in consumer service roles and provide recommendations for relevant services to create a more humanlike interaction. WASRR scale will help organisations improve customer satisfaction, efficiency, and productivity by deploying social robots to provide recommendations in industries facing labour shortages. Additionally, the WASRR scale will help assess the ability of social robots to provide recommendations.

MEASURING WILLINGNESS TO ACCEPT SOCIAL ROBOT'S RECOMMENDATIONS (WASRR)

Isha Kharub, Dr. Michael Lwin, Dr. Aila Khan, A/Prof Omar Mubin



WHAT?

Social robots are increasingly being used in the hospitality industry to provide services and recommendations. Recommendations have been shown to impact customer satisfaction and lead to higher sales.

WHY?

A lack of a measurement of willingness to accept social robot recommendations (WASRR) makes it difficult for managers to evaluate the usefulness of these recommendations to customers. How do consumers perceive the recommendations provided by social robots? Lack of empirical studies - lack of psychometric measures

HOW?

Develop a model to measure WASRR with attitudes, subjective norms, the intention of manipulative intent, source credibility and empathy as the variables that will impact willingness to accept the recommendation and ultimately will impact the recommendation adoption. Using Churchill (1979) and Devillis (1991).

WHERE?

The scale will be used to test the model, a 2 (high vs low involvement) x 2 (restaurant vs cafe) x 2 (human vs social robot) experimental research will be conducted (high involvement restaurant: fine dining restaurant vs. low-involvement restaurant: fast-food restaurant and 5-star hotels (high involvement) vs budget hotels (low involvement)). Convenience sampling. University students.

IMPACT?

Help scholars and practitioners understand how social robots can influence consumers' preferences and decision-making in the hospitality industry. A diagnostics assessment of recommendations and successful integration of social robots in consumer services. Improve customer satisfaction.

Social media marketing as a tool for promoting services in the tourism and hospitality industry

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ABSTRACT

The article shows that social networks have become an important way of social communication between producers and consumers of tourism and hospitality services. The emergence of social media has changed the media landscape and advertising models, as the audience has moved from the role of content recipients to its creators, distributors, and commentators. Social isolation and the introduction of restrictive quarantine measures to prevent the spread of COVID-19 have led to changes in digital user behavior and accelerated the process of introducing digital technologies into all stages of the formation, promotion, and consumption of tourism and hospitality products and services. Social networks have made online marketing an important part of the marketing activities of tourism and hospitality companies, turning the Internet user into an effective channel for transmitting and receiving information. The promotion of their services on the Internet by producers helps to find the necessary information aimed at developing tourist impressions and meeting consumer needs.

It is determined that the use of Internet marketing is one of the directions of optimization of marketing activities of enterprises in the tourism and hospitality industry. High-quality and attractive interactive content, unlike static content, helps to increase the depth of viewing, makes interaction with the audience closer, encourages the user to be active, arouses interest and prompts certain actions. Interactive content allows you not only to drive traffic to your commercial resource, but also to retain your online audience.

The article characterizes the Internet marketing tools and proves that their implementation and adaptation to the components of marketing policy allows the tourism and hospitality industry to increase staff productivity, improve the service system, reduce certain categories of costs, and increase competitiveness. The advantage of online marketing is interactivity, targeting accuracy, and the possibility of detailed analysis, which helps to maximize website conversion. Effective advertising using the maximum number of communication channels with the target audience ensures the recognition of services, brands, destinations, routes, programs and works to attract more consumers of tourism and hospitality services. The social media functionality allows you to predict results and track statistics, including knowing in advance the number of keyword queries, determining the traffic to advertising platforms and the profile of the target audience, and predicting the ratio of clicks and views of banners and contextual ads. Taking into account that each social network has its own target audience, considerable attention should be paid to content and, accordingly, a content plan should be developed for a particular social network.

It has been established that retargeting is an effective tool for finding and attracting an interested audience, an additional incentive and reminder, uniqueness, cross-device approach, a convenient ad serving channel with an effective ROI, which helps to increase revenue and reduce the cost of promoting products and services. Influencer marketing is an effective tool for increasing the recognition of products and services. It is proved that the use of marketing tools helps to increase the target audience, obtain additional channels for disseminating information and selling products and services, increase the efficiency of advertising activities and reduce their costs, improve the image of companies, expand communications with customers in real time, and simplify the consultation and booking process.

SOCIAL MEDIA MARKETING AS A TOOL FOR PROMOTING SERVICES IN THE TOURISM AND HOSPITALITY INDUSTRY

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Social networks have become an important way of social communication between producers and consumers of tourism and hospitality services. The emergence of social media has changed the media landscape and advertising models, as the audience has moved from the role of content recipients to its creators, distributors, and commentators.

Social networks have made online marketing an important part of the marketing activities of tourism and hospitality companies, turning the Internet user into an effective channel for transmitting and receiving information. The promotion of their services on the Internet by producers helps to find the necessary information aimed at developing tourist impressions and meeting consumer needs.

Internet marketing tools

- Search optimization (SEO)
- Contextual advertising
- Media advertising
- SMO and SMM
- Viral marketing
- Direct marketing using e-mails and RSS feeds

The advantages of internet marketing:

- interactivity;
- targeting accuracy;
- possibility of detailed analysis.

Effective advertising using the maximum number of communication channels with the target audience ensures:

- awareness of services, brands, destinations, routes, programs;
- helps to attract more consumers of tourism and hospitality services.

Opportunities for the development of tourism business using the capabilities of Instagram

- informing potential clients about activities and services in the most multimedia, active, visual, and easy-to-perceive form of photos and videos
- the ability to receive feedback from the audience, analyze the results and quickly adjust advertising messages, communicate with followers
- forming the company's image, increasing brand recognition, building communication with subscribers, and forming customer loyalty
- the use of tools for a thorough study of the target audience, starting from the standard age, gender, and location and down to such important details as the time spent on the network, reactions to the subject of posts, likes and comments of subscribers
- application of mechanisms for measuring activity efficiency in the form of statistics, comparative tables, graphs of various configurations and forms for selected periods

The use of marketing tools helps to:

- increasing the target audience;
- obtaining additional channels for disseminating information and selling products and services;
- increase the effectiveness of advertising activities and reduce their costs;
- improving the image of companies;
- expanding communications with customers in real time;
- simplifying the consultation and booking process.

Sedentary activities with social robots: A case study of older adults

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ABSTRACT

Australia's older population is forecasted to increase exponentially over the coming years. This projection posits an increase in the older population of 54% over the next 15 years, with over 1 in 5 Australians being over 65 by 2050. This will increase the mobility of older adults into assisted living facilities, requiring a subsequent increase in available healthcare workers. However, the healthcare industry projections have forecasted that approximately 65,000 workers will leave the sector per year.

Social isolation and loneliness are two persistent issues for older adults living in care. These concepts hold a strong connection with overall quality and quantity of life. The primary aim of this research project is to explore the role of social robots and solitary, sedentary activities in reducing social isolation and loneliness in older adults. This project aims to use social robots in the delivery of meaningful solitary, sedentary activities in aged care settings. Previous research has demonstrated the effectiveness of sedentary activities in minimising social isolation and loneliness. This project seeks to contribute to this research by employing a social robot to carry out sedentary activities among older adults in care settings.

Data collection will be undertaken in two phases:

Phase : Preliminary data collection will involve interviews and a moderated focus group with members of the Consumer Council (equivalent of an Advisory Board) at Liverpool Hospital's rehabilitation clinic. Insights gained from the interviews and focus groups will build the justification for further research and help design the next phase of data collection.

Phase 2: Secondary data collection will involve the deployment of the humanoid social robot PEPPER and the delivery of solitary, sedentary activities to a group of older adult participants

within a UnitingCare residential aged care facility. Responses will be collected from these participants after interacting with the social robot and engaging in solitary, sedentary activities.

This project will have an impact on several domains. By reducing social isolation and loneliness, the findings from this project have the potential to lessen the social, political, and economic burdens currently experienced in Australian society by the increasing volume of older adults. In particular, this project will contribute to the United Nations Sustainable Development Goals (UN SGD). These goals are at the basis of this research, seeking to address these concerns with technological interventions and meaningfully contribute to the aged care literature regarding improved quality of life for older adults worldwide. Subsequently, this will provide a respite for overburdened healthcare systems, positively impacting governmental, non-governmental and corporate interests that dedicate substantial funding to the disposition of older adults.

GLOSSARY OF TERMS

Loneliness: Self-reported state of being socially alone.

Social Isolation: Observed state of being socially detached from others.

Solitary, Sedentary Activities: Any activity completed while sitting or stationary.

Older Adult: An individual over the age of 65 years.

Pepper: A semi-humanoid, social robot designed for social interactions

Social Robot: A robot designed specifically for social interactions.

Assisted Living/Aged Care Setting: A clinical setting or home that provides care to an older person.

Consumer Council: An advisory board at Liverpool Hospital comprised of Clinicians who work with Older Adults and patients.

Sedentary Activities with Social Robots
A Case Study of Older Adults

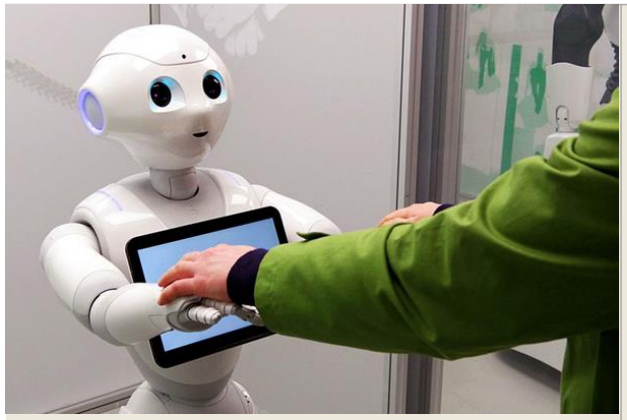
WESTERN SYDNEY UNIVERSITY
&
THE SCHOOL OF BUSINESS

Master of Research Project
James R. Sadler
Supervised by
Dr. Aila Khan

Seeking to improve the quality and quantity of life for older adults in assistive living settings through the use of Social Robots and Sedentary Activities

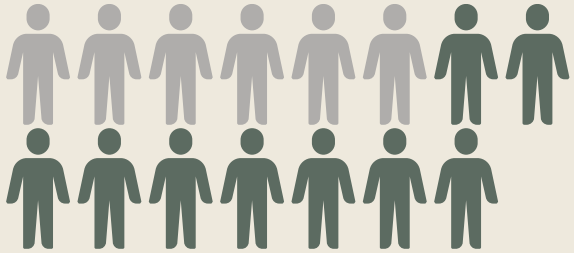
UNITINGCARE RESEARCH DEPARTMENT
&
UNITINGCARE RESIDENTIAL AGED CARE

THIS PROJECT IS SUPPORTED BY UNITINGCARE RESEARCH DEPARTMENT



01. Project Background

- By 2050, 1 in 5 Australians will be over the age of 65
- 65,000 Healthcare professionals will leave the industry each year
- Mobility into assisted living facilities will exponentially increase
- Moving into assisted living is a trying event for Older Adults
- Older Adults see a decreased quality & quantity of life in care



02. What are Social Robots & Sedentary Activities?

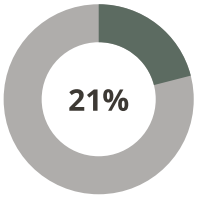
- Social robots are robotics designed for social interactions
- Their artificial intelligence (AI) capabilities can mimic social interactions
- Their use among older adults & children have demonstrated a marked improvement in social connectedness
- Sedentary activities are any seated activity a person may find meaningful.
- These could include puzzles, games, conversation, reading, religious prayer

03. Older Adults in Assisted Living

- Mobility into Assisted Living is a trying event for Older Adults
- They are detached from their usual routines, families & friends
- They can become socially isolated & lonely
- This decreases the overall quality & quantity of their lives

05. Helping Older Adults in Care

- Helping Older Adults is at the core of this project
- Use Social Robots to improve social connectedness
- Ameliorate Social Isolation & Loneliness in assisted living
- Seeking to Improve the quality & quantity of life for an increasing number of older adults living in care



By 2050, approximately 21% of Australians will be over the age of 65 & require care.

04. Aims & Methods

- Phase 1

Will seek the advisement & perspectives of a healthcare consumer council (AAA CAG) about Social Robot use among older adults

- Phase 2

Introduce the humanoid Social Robot PEPPER into a UnitingCare residential aged care facility to interact with the older adult residence

The Dynamic Role of Alternative Finance in Supporting Ukraine's Startup Resilience During Conflict

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ABSTRACT

The ongoing war in Ukraine has severely constricted access to traditional venture capital for technology startups. Even before Russia's 2022 invasion, analysts identified deficiencies in Ukraine's national venture investing infrastructure, with few institutional funds tailored to high-growth startups. Though startups have continued attracting rising annual investment amid wartime challenges, this activity remains concentrated amongst a limited number of mature firms like Grammarly and Preply that have taken the world by storm. With foreign capital flight and hesitancy from traditional financiers, early-stage ventures across Ukraine's broader entrepreneurial ecosystem face acute gaps in accessible risk capital needed for product development and expansion. This financing squeeze, arising amidst the turmoil of conflict, underscores the urgency of cultivating alternative funding channels and localized networks that can democratize access to capital across Ukraine's startup landscape. Yet emerging alternative financing mechanisms offer pathways to democratize funding access and catalyse an entrepreneurial rebound.

Ukraine's startup financing system critically centred on major hubs like Kyiv and Kharkiv before the war, with smaller cities lacking investment infrastructure. Overall venture capital has declined over 50% since Russia's invasion as geopolitical volatility deters high-risk investment. While global crowdfunding platforms have allowed some Ukrainian startups to raise international capital, these models often cater more to one-time consumer product launches rather than scalable technology company growth. Rewards-based platforms like Kickstarter typically rely on pre-purchases or pre-orders, which may not suit venture-backed startups' financing needs. Beyond reward-based crowdfunding, other alternative finance models

gaining traction globally include equity crowdfunding, peer-to-peer lending, microlending, and decentralized finance using blockchain and cryptocurrencies.

To catalyse the development of these models, the Ukrainian government could implement several supportive policies and incentives. These include tax incentives for startups and investors using alternative platforms, co-investment or loan guarantees to share risks, and regulatory sandboxes allowing controlled testing of new models. Stronger legal frameworks around equity crowdfunding and crypto-assets are needed to protect investors while enabling innovation.

Effective tailoring requires cultivating local Ukrainian crowdfunding platforms that align domestic investors with high-potential ventures regularly across funding rounds, not just one-off campaigns. Blending crowdfunding with emerging decentralised finance platforms based on blockchain and cryptocurrencies can further diversify and decentralise funding sources. Addressing limitations like pre-purchase requirements entails enabling equity-based crowdfunding and investor protections that allow individuals to buy startup shares while still providing adequate transparency, governance and oversight safeguards.

Calibrating international and local models means leveraging the strengths of each while addressing their weaknesses for Ukraine's context. This may mean integrating global reach and visibility with domestic investor relationships and startup due diligence. Ukraine-specific accelerators and incubators can play a key role in mentoring startups on optimally blending various alternative models tailored to their growth stage and industry. The key is building a layered financing ecosystem with multiple alternative models that provide startups with choices but also appropriate guidance on which options align with their fundraising needs and long-term vision. This tailored, hybrid approach can most effectively support technological innovation and growth through the challenging environment.

The Dynamic Role of Alternative Finance in Supporting Ukraine's Startup Resilience During Conflict

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Introduction

- In 2021, total VC and PE investment into Ukrainian startups reached a record $832M, up over 45% from 2020
- Seed and Series A funding hit new highs of $84M and $158M respectively, exhibiting growth of 100% and 30%
- However, since Russia's 2022 invasion, overall venture investment has declined over 50% amid geopolitical volatility
- This contraction in access to traditional startup financing necessitates strategic enablement of alternative models
- Emerging options like crowdfunding, microlending and crypto must be leveraged to provide urgently needed capital

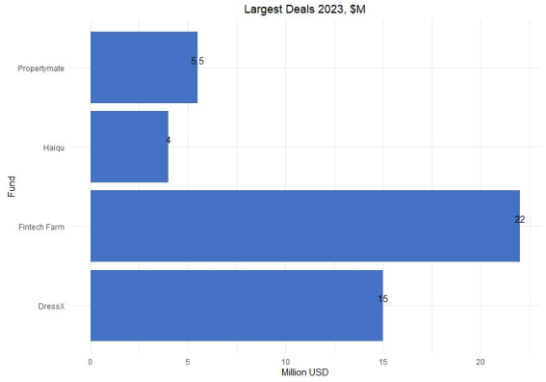
Source: InVentures

Methods

- Literature review of research on alternative startup financing models. Identifies knowledge gaps.
- Analysis of statistical data on venture vs. alternative investment volumes in Ukraine before and during the war.
- Case studies of successful applications of alternative models (crowdfunding, microlending, crypto) by startups globally.
- Interviews with Ukrainian startup founders, investors, and government stakeholders. Provides qualitative insights on current financing challenges/opportunities.

Ukraine's Startup Survival in a Time of Conflict

- Low "mortality" - out of 343+ startup investments by major funds surveyed, only 1 company fully shut down during the war so far (Seadora)
- New deals continue - 83+ investments made into Ukrainian startups after Feb 24, 2022 invasion, with 4 of top 5 most active funds being new entities (<2 years old)
- Existing investors restarting - Some funds like Digital Future, ICU Ventures resuming investing after pause in 2022 to focus on supporting portfolio
- Shift in strategies - Some funds like CIG radically shifting model, now only investing in projects with faster payback via dividends rather than high-growth stars



Source: InVentures

State of Startup Financing in Wartime Ukraine

- 28% of Ukrainian SMEs have expanded abroad since the war began, with 21% more planning to, but lack of financing and expertise are key barriers (Mastercard SME Index)
- As of early 2022, 84% of Ukrainian startups relied on bootstrapping as the main source of financing, with 31% also getting government grants from Ukrainian Startup Fund (USF)
- USF and the government now focused on providing $35K grants to military tech and other strategic startups for defense and rebuilding
- Some global tech companies like AWS, Google, Meta provided limited one-time Ukraine aid grants up to $100K, but these are not recurring startup funding
- International venture capital into the region increased from $1.4B to $3.2B in first half of 2022 vs 2021, though new foreign investors remain cautious
- Late stage Ukrainian startups like Preply, AirSlate and Unstoppable Domains raised rounds in $50M-$65M range in 2022
- Accelerators have been actively scouting Ukrainian startups, but often look for earlier stage ventures and acceptance rates are very selective (1-3%)

Emerging Alternative Platforms

- Reward-based crowdfunding successful for consumer products but limitations for tech startups
- Pre-purchase model doesn't fit recurring B2B SaaS startup revenue needs
- Equity crowdfunding allows investors to gain shares in startups at early stages
- Gaining traction in the US, UK, Europe as securities regulations evolve
- Allows recurring fundraising tied to company growth vs one-time campaigns
- Microlending platforms provide loans to individuals/small businesses, including founders
- Loans from $500 to $50,000 range based on limited collateral
- Useful for very early stage capital needs before revenue or investors
- Cryptocurrency platforms enable new models of decentralized fundraising
- Initial coin offerings (ICOs) exchange crypto coins for capital
- Increased risks around volatility, regulation, scams in crypto space
- DeFi protocols facilitate startup lending/borrowing without intermediaries

Policy Initiatives to Catalyze Ecosystem

- Tax incentives, co-investment funds, regulatory sandboxes
- Stronger legal frameworks for equity CF and crypto
- Tailoring Hybrid Ecosystem
- Cultivate local crowdfunding platforms aligned with startups
- Blend models to diversify capital and enable recurring financing
- Leverage global visibility with local relationships/diligence

Conclusions

- Hybrid financing ecosystems combining multiple alternative models can provide critical recurring capital access for Ukrainian startups amidst wartime constraints.
- Policy initiatives like tax incentives, legal frameworks, investor protections are essential to catalyze sustainable alternative funding markets.
- Local platforms tailored for Ukrainian startups, blending global reach and domestic relationships, represent the most viable financing path forward.

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Nothing but street trees - how contemporary planning practices will leave entire suburbs far below canopy cover targets

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ABSTRACT

Motivated by the capacity of urban trees to cool our cities buffering increased heat from climate change and urban heat, government organisations around the world have set goals for canopy cover, and Sydney is no different. The New South Wales Government aims to increase tree canopy cover across Greater Sydney to 40% by 2040. However, as a result of contemporary planning and development practice for the new suburbs built in Sydney's west, street trees will become the only effective form of urban green infrastructure that can reduce the risks related to rising urban heat and warming from climate change. So, how much street tree canopy cover can be expected in those suburbs

The trajectories of crown expansion of street trees have been established overseas. This important knowledge is underdeveloped in Australia, and entirely absent for native and introduced specimens planted into streets in western Sydney. To better understand what urban tree canopy cover can be expected, we measured tree and crown traits of more than 1,000 street trees. Trees belonged to 18 species, each represented by individuals that differed in age. For each species, we developed empirically based and robust crown expansion models.

We introduce the application of the models to estimate anticipated canopy cover in Sydney's urban sprawl for 2030 and 2040. The models were used to develop projections for a range of planting scenarios, including maximum cooling, 'business as usual' and others. Based on scenario outputs, we developed recommendations for optimal street tree planting composition. Most importantly, all model outputs show that relying solely on street trees to reach set canopy cover targets will fall short, and consequently, communities of these areas will be exposed to higher risks of urban heat.

Street trees in Western Sydney, Australia - will we ever have enough?

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Assoc Prof Sebastian Pfautsch Urban Studies Western Sydney University

Prof Nicky Morrison - Professor of Planning Western Sydney University Urban Living Futures

Dr Dom Blackham Mosaic Insights Senior Consultant

Assoc Prof Rachael Gallagher - Plant Conservation & Ecology, HIE

Canopy is important for cooling, but we have trouble retaining it

A canopy cover target of 40% by 2040 has been set for Greater Sydney, building from a 2018 cover of approximately 23%. Is this achievable?

Urban trees

- Urban trees can create 'cool islands' from the cooler air within and under vegetation canopies (Hamada et al. 2010)
- Street trees on Australian urban roadsides have the third-highest contribution to canopy after residential land and parkland (Hurley et al., 2020).

Canopy Cover Goals

- Motivated by the benefits of urban trees, cities worldwide set goals for canopy cover increase.
- Canopy targets have been set across Australia, often as a central component of planting programs which aim to grow and protect urban canopy (Ordóñez and Duinker, 2013).
- Residential streets with underground powerlines might aspire to accommodate up to 53% canopy cover, if planted with trees that make maximum use of available space (Gallagher Studio, 2021)

Canopy retention struggles

- Cities can struggle to accommodate the trees required to fulfil targets, and achieve net canopy growth (Croeser et al., 2020).
- Tree canopy cover is in decline throughout Australian cities (Hurley et al., 2020) in part because room for canopy on residential blocks has declined over time.
- A key example of a reduced suburban block is the private residential development estates that have spread throughout the north-west of Western Sydney since the 1990s (Blacktown City Council, 2020). Houses within these estates can be developed with guidelines that prescribe limited space for private trees on a residential block. The space left available for trees on residential blocks is thus very limited, and public trees become a main source of canopy.

Where limited space is available on private lots for trees, street trees can often offer the most immediate source of tree-related benefits for residents.

Mid-late 20th century — Current

Figure 1: The decline in the average area of a residential house lot in Greater Sydney. Image source Nearmap (2023).

Nearmap (Nearmap 2022), an Australian company that captures and provides subscription access to aerial data of select Australian urban areas multiple times annually since 2009, at a resolution of at least 5.5-7.5cm.

18 species across 40 years, used to model tree crown growth

Blacktown City Council (Blacktown) is the focus Local Government Area for this work. It is:

- A western strategic centre of the 'Central River City' section of the Greater Sydney Region Plan
- Currently, and is expected to continue to, experience rapid population growth and development (NSW Department of Planning and Environment, 2021)
- An example of contemporary urban development at the urban fringe zone, through green field conversion (Blacktown City Council, 2020).
- In 2014, Blacktown had approximately 19% canopy cover (Brent et al 2014), and this was down to 12.9% by 2020 (Hurley et al., 2020).

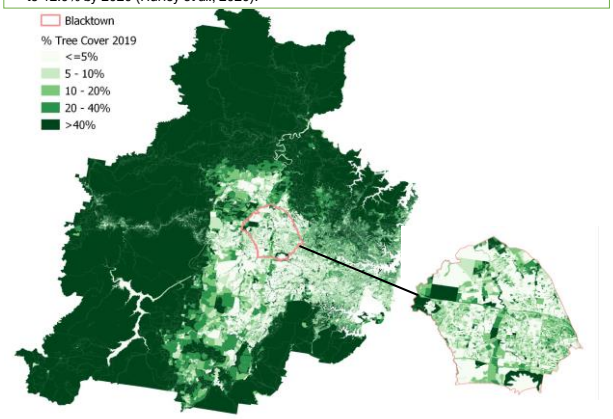


Figure: Percentage Tree Cover in 2019 within modified mesh blocks across Greater Sydney Region (Department of Planning and Environment, 2021).

Tree growth models are tools used in forestry to understand, anticipate and manage tree change and function.

Figure: 13 years of canopy growth on a Blacktown Greenfield development Source: Nearmap (2022)

To model street tree growth of Blacktown's street trees we:

- Measured Diameter at Breast Height (DBH), height, crown width and crown area for 18 of Blacktown's major street tree species
- Approximated the age of a tree by following its history with Nearmap and NSW historical aerial imagery

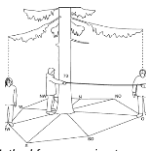


Figure: Method for measuring tree canopy area

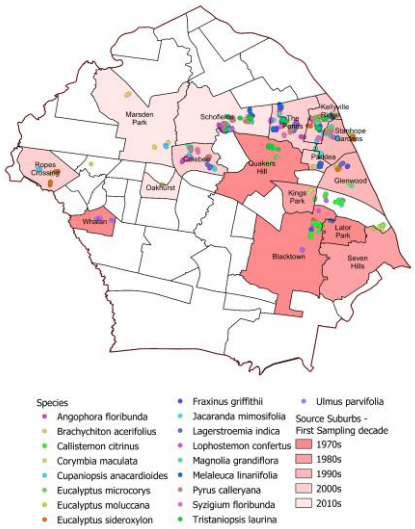
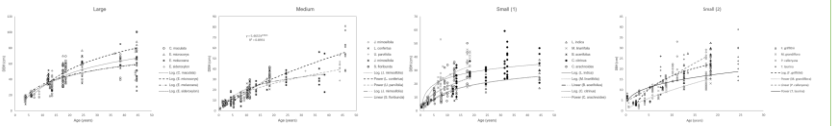


Figure: Focus street tree species and Blacktown suburbs where trees were measured

Three size categories were identified from 1,200 individual trees

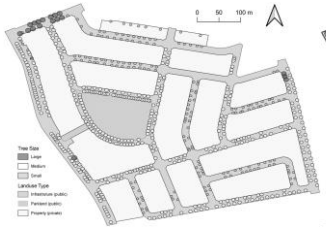
The 18 tree species were placed into three groups based on their maximum crown area. These groups were used in creating growth relationships for the street trees.



What does 20 years of growth look like in Blacktown Greenfield?

In a new Greenfield section of Schofields, Blacktown, the total canopy cover that might be expected from street trees is 9.32% by 2040.

Projected growth of street trees (QGIS)



Actual built form

Land type	Land Division	Area Covered (m²)	% of total area covered by canopy
Private	Residential	1591.41	0.9
Public	Recreational	1461.77	8.32
	Road and Verge	23570.46	25.82

The canopy coverage in public areas by street tree crowns is most substantial in road and footpath areas, where 25.82% is expected to be covered by 2040, assuming the growth of current street trees follows predictions of this work.

Key Take-aways

New residential developments within Western Sydney should expect to have limited canopy cover, despite extensive street tree planting

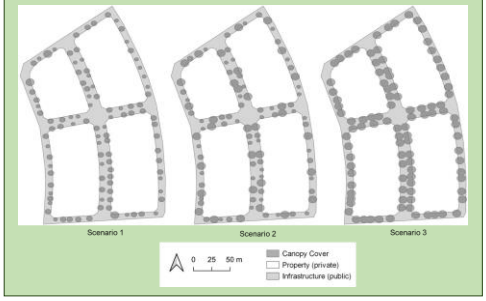
In four standard Greenfield residential blocks in Western Sydney, even where 100% of the street tree population involves large trees, the percentage canopy coverage only reaches 20% over 20 years by 2040.

There is very limited private

Using this data beyond our case study

Using our size grouping, we modelled growth on a hypothetical Blacktown greenfield site, planted with 100 trees in early 2020. By 2040, this is the growth we might expect for three scenarios:

	Scenario 1 : Composition reflective of street tree size composition seen in Schofields Precinct (3% larger, 64% medium, 35% small)	Scenario 2: near-equal composition of small, medium and larger trees (34% large, 33% medium 33% small)	Scenario 3: Maximum size (100% large trees)
Private (Property) cover	1.52%	2.73%	6.26%
Public – Infrastructure (Road and Verge) cover	25.12%	33.04%	52.18%
Total canopy cover	9.00%	12.33%	20.81%



Do we need to get more trees, particularly larger

Innovative Business Strategies in Response to COVID-19's Impact on Tourism

Wardle K., Link C., Panchapakesan U., Konarasinghe W.G. S., Lan Y.-C., Hall T., Zhou X., Duguay B., Bolard B., Bédard F., Sucheran R., Ferreira C., Caldeira A., Duc L.A., Thu N.H., Minh D.D., Korogodova O., Akimova O., Chernega O., Chukut S., Gavrysh L., Ishchenko A., Kukharuk A., Mazhara G., Shorobogatova N., Voitko S., & Yenin M.

ABSTRACT

The tourism industry represents one of the most important economic contributors globally, yet it is highly susceptible to disaster. In part owing to this susceptibility the COVID-19 pandemic has had and continues to have a profound and unprecedented impact on the hospitality and tourism sectors. Against the backdrop of a return to 'business-as-usual', attention has shifted to quantifying and qualifying the pandemic's effects on tourism. Problematically less attention has been directed at understanding how governments and private enterprise both might anticipate and better manage future crises. Designed as a comparative study between GISU member cities, the project aspired to understand current issues and identify steps towards an innovative approach to tourism business operations in response to the economic, social and environmental impacts of COVID-19

A mixed method design was employed as the overarching framework for this exploratory study to enhance comprehension of the complexities. The study was conducted between November 2022 and March 2023 with data obtained through desktop research, semi-structured interviews, and survey method. Networking and purposive sampling were selected to capture representation of innovative industry professionals and government representatives across the participating countries.

Resilience and innovation were identified as critical factors in the ability of hospitality and tourism organisations to remain operational, as well as to recover and rejuvenate from the impacts of the COVID-19 pandemic and related country specific crises. Examples of transformative resilience in the country reports from the outset of the pandemic were rare however found to be most enlightening with these participants demonstrating an entrepreneurial mindset and openness to explore possibilities. Most participants

demonstrated a conservative approach tending to pursue adaptive resilience introducing gradual changes and business concepts in response to changing circumstances

Despite consensus that Government interventions including economic stimulus packages and funded tourism recovery plans were vital in supporting sustainability of the tourism and hospitality industry, gaps in government policy and strategies were observed. Australia, Canada, and Portugal have projected strategies for 2030, along with South Africa's current timeline of 2024 whilst scant evidence exists for government supported tourism planning in China, Vietnam and Ukraine. Further government support for Destination Management Organisations was emphasised to help rebrand, build capacity, diversify and build international competitiveness. The critical importance for policy action was universal to support recovery and to transform the tourism sector by strengthening collaboration between government and the private sector and secure a robust and stable tourism sector that is resilient to future shocks.

Although this report is limited to presenting the results of a small-scale exploratory study, valuable insights have been garnered through the cross-country analysis. A larger more representative sample will be analysed to further interrogate the findings and to support the development of a tourism resilience and regenerative framework.

Innovative Business Strategies in Response to COVID-19's Impact on Tourism

Alliance of Guangzhou International Sister-City Universities

WESTERN SYDNEY UNIVERSITY

Research conducted: August 2022 March 2023

Australia

Canada

Portugal

Vietnam

China

Ukraine

South Africa

1. BACKGROUND

The tourism industry represents one of the most important economic contributors globally, yet it is highly susceptible to disaster.

In part owing to this susceptibility, the COVID-19 pandemic has had a profound and unprecedented impact on the hospitality and tourism sectors.

There is limited scholarship in the context of innovative business response and recovery strategies in the face of disasters such as the COVID-19 Pandemic.

2. AIMS

Examine the innovative business practices of the tourism and hospitality industry stakeholders/operators during the COVID-19 pandemic.

To ascertain the policy gaps and regenerative proposals from relevant government agencies in response to the COVID-19 impacts.

To foster an international research alliance and progress the development of an innovative tourism resilience and regenerative framework.

3. METHODOLOGY

Research Design
Mixed method inductive

Sampling
Networking Purposive

Population
T&H industry stakeholders

Instrument 1
Semi-structured Interview

Instrument 2
Qualtrics Survey

Data Analysis
SPSS-Statistical Nvivo thematic

Limitations - Small-scale exploratory study

4. COUNTRY DASHBOARD

5. FINDINGS

Comparative study between GISU member cities revealed:

- Impacts & duration of "tourism business" closure varied - Canada & China most never closed, large proportion closed for 5+ months in Portugal, South Africa & Vietnam
- New business opportunities & innovations were significantly higher in Canada, China & South Africa coming second & third respectively whilst Vietnam & Australia recorded the least
- Innovation was higher in Accommodation / Lodging and Tourism Experiences, the sectors closed for a longer period
- Government interventions & economic stimulus helped to navigate negative impacts; access and speed varied though between countries
- Limited consideration of innovation opportunities. Adaptive resilience approach saw gradual changes in response to changing circumstances.
- Transformative resilience observed in participants demonstrating an entrepreneurial mindset and openness to explore possibilities
- Virtual experiences and digitalisation approaches were popular in China & explored across other countries, dependent on the quality of 5G networks.

6. NEXT STEPS.....

- Seeking to expand the data set & recruit new GISU member institutes to this project
- To progress development of an innovative tourism resilience & regenerative framework

Contact Lead Researcher: Dr Karina Wardle k.wardle@westernsydney.edu.au

Alliance of Guangzhou International Sister City Universities (GISU Alliance) funded project including Western Sydney University (Lead) Australia, University of Quebec at Montreal, Canada, Guangzhou University, China, University of Coimbra, Portugal, Durban University of Technology, South Africa, Igor Sikorsky Kyiv Polytechnic Institute, Ukraine and the University of Economics Ho Chi Minh City, Vietnam.

Socio-Cultural Resistance to Women's Empowerment in The Public Sector In KSA

Nawal Alzahrani

Western Sydney University

ABSTRACT

Saudi Arabia ranks 146th out of 153 countries in terms of gender gaps in economic participation and opportunity, with only 21 per cent of women in the workforce. However, the percentage of women represented in the workforce does not exceed 25%, according to the (WEF's) Global Gender Gap Report 2020. In addition, throughout history, women have faced marginalization and discrimination in most parts of the Middle East (Offenhauer & Buchalter, 2005). As Most of these studies have been conducted in developed countries and use a Western perspective. Therefore, there is a lack of studies from the Middle East regions generally and Saudi Arabia particularly and very few studies have attempted to understand women's empowerment from the Eastern perspective. Thus, the aim of the research is to examine and discuss the extent to which It will how the socio-cultural resistance context impact women's empowerment in public organisations in Saudi Arabia.

ACADEMIC RESEARCH POSTER

Socio-Cultural Resistance to Women Empowerment in The Public Sector In KSA

AUTHORS

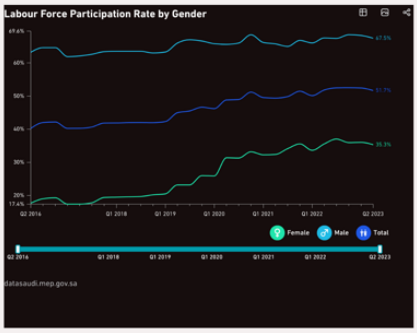
Nawal Alzahrani

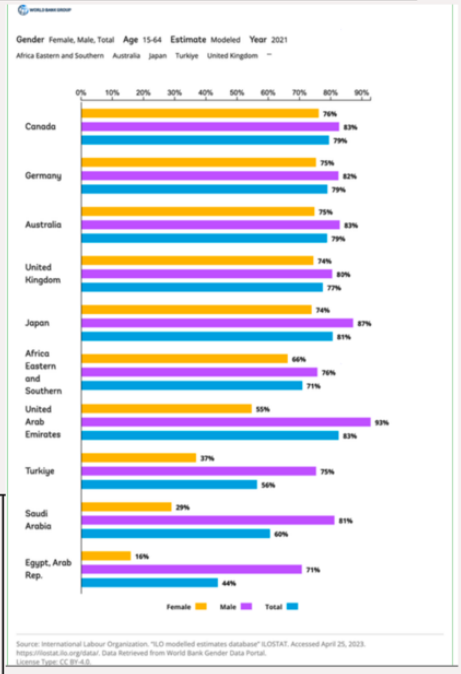
ABSTRACT

This research investigates how Saudi women workers resist, overcome, or negotiate the power dynamics and sociocultural resistance in the workplace in public institutions in Saudi Arabia.

INTRODUCTION

Despite attempts to improve and change some policies and the that-run projects the government which aims to support women's empowerment (Riyadh Chamber,2 2007), women's empowerment principles are still largely facing challenges in the Middle East and in Saudi society especially.





OBJECTIVE

The objectives of this research are to:
- Examine the extent of the impact of socio-cultural resistance on women's empowerment in public institutions in the Kingdom of Saudi Arabia.
- Investigate how Saudi women resist the power and socio-cultural in the workplace in the public sector.
- Identify how women working negotiate socio-cultural resistance in their workplaces.

METHODOLOGY

The research will use a qualitative case study approach. Data will be collected through semi-structured interviews with Saudi women working in a public sector organization in Saudi Arabia.

RESULTS

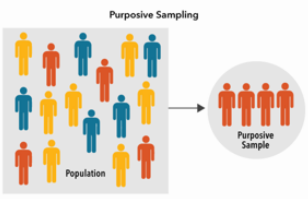
Preliminary findings suggest that socio-cultural resistance is a significant barrier to women's empowerment in the public sector in Saudi Arabia. Women face resistance from both male colleagues and from society at large. Some common forms of resistance include gender stereotypes and biases, discrimination in hiring, promotion, and pay, sexual harassment, and lack of support from family and community members.

CONCLUSION

This research is still ongoing, but the preliminary findings suggest that socio-cultural resistance is a significant barrier to women's empowerment in the public sector in Saudi Arabia. However, Saudi women are finding ways to resist and overcome this resistance.

ANALYSIS

Exploratory multi-case studies (Yin, 2003)



Three ministries as case studies
women working in the business discipline
Three public ministries in Different regions

RELATED LITERATURE

References can take up a lot of space, so cite only the key references used in the study.

Examining Employee Perception of a Social Robot Concierge Employed at a Bank

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ABSTRACT

Social robots have been employed in various frontline service settings, ranging from robot receptionists at department stores to robot nurses which aid the elderly. They have also been used as teaching assistants. Additionally, they have been utilized in the rural banking industry to assess their impact on customer satisfaction and loyalty. Furthermore, studies have examined customer acceptance of social robots in retail banking. However, there is a lack of studies examining employees' perceptions of social robots in the banking industry. It is important to understand employee perceptions as, ultimately, they will be collaborating with social robots to enhance customer satisfaction. Past research has suggested that employee collaboration with technology is key to a company's success. However, while social robots can help employees by enhancing their efficiency, they can also pose certain challenges. This study was conducted at a large bank in Australia to examine the perception of employees towards the social robot concierge employed at the bank. The robot was tasked with answering basic queries that employees would typically ask a human concierge, such as the location of the printer room, laptop borrowing process, or the café. Following their interaction with the robot, employees were invited to complete a survey, with a total of 120 responses collected.

The study utilized multiple regression analysis to test the relationship between employee perception of the bank's innovativeness and its impact on Net Promoter Score (NPS). Results showed that the use of social robots had a positive and innovative impact on the bank's image, and it was perceived as a preferred workplace for future employees. This, in turn, had a positive effect on the NPS. Moreover, employees felt at ease while conversing with the robot and were comfortable with robots that possess emotions, agreeing that social robots can assist people. The robot was regarded as friendly, kind, intelligent, trainable, attentive, and personable. The results prove that social robots will be a useful addition to a bank, especially

in a customer service environment. Deployment of social robots will lead to increased customer satisfaction and loyalty. This study is the first step towards understanding employee perception at a large bank in Australia after a short interaction. Future investigations should consider longitudinal studies to reveal the reasons behind these positive perceptions, potential shifts in perception over time, and the underlying causes of such shifts.

Examining Employee Perception of a Social Robot Concierge at a Bank

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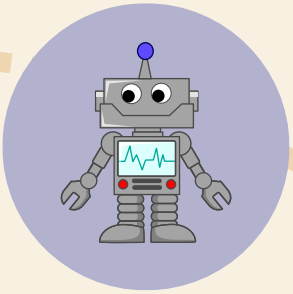
Social Robots in Services



They have been utilized in the rural banking industry to assess their impact on customer satisfaction and loyalty. Have also been used in other frontline service settings.

Research Gap

Lack of studies examining employees' perceptions of social robots in the banking industry. It is important to understand employee perceptions as, ultimately, they will be collaborating with social robots to enhance customer satisfaction. Past research has suggested that employee collaboration with technology is key to a company's success.

Research Study

Conducted at a large bank in Australia. The robot was tasked with answering basic queries that employees would typically ask a human concierge, such as the location of the printer room, laptop borrowing process, or the café. Following their interaction with the robot, employees were invited to complete a survey, with a total of 120 responses collected.

Data Analysis

Multiple regression to test the relationship between employee perception of the bank's innovativeness and its impact on Net Promoter Score (NPS). Use of social robots had a positive and innovative impact on the bank's image, and it was perceived as a preferred workplace for future employees. Employees felt at ease while conversing with the robot and were comfortable with robots that possess emotions, agreeing that social robots can assist people. The robot was regarded as friendly, kind, intelligent, trainable, attentive, and personable.

Significance

Results prove that social robots will be a useful addition to a bank, especially in a customer service environment. Deployment of social robots will lead to increased customer satisfaction and loyalty. This study is the first step towards understanding employee perception at a large bank in Australia after a short interaction.

Evaluation of the efficiency of sustainable development of transport and logistics systems

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ABSTRACT

Transport and logistics systems play an important role in ensuring the sustainable development of countries and regions. The World Bank's multi-stakeholder initiative "Sustainable Mobility for All" formulated the concept of sustainable mobility based on four priorities: Universal Access, Efficiency, Safety and Green Mobility. In the process of analyzing the indicators that make up the index of sustainable mobility, the hypothesis regarding the existence of the strongest connection between the index of sustainable mobility and the index of logistics efficiency was put forward and proved. The hypothesis was based on the logic of the development of the transport and logistics sector and the significant social and environmental importance of transport as a whole. Variables characterizing the level and dynamics of sustainable mobility in EU countries were selected for the study. According to the results of the Pearson correlation analysis, the hypothesis was confirmed and it was proved that the conditioning of the sustainable mobility index by the logistics efficiency factor is the strongest compared to other parameters of the model, even in the conditions of equivalence of the indicators that form the composite assessment of the index. Taking into account the European integration aspirations of Ukraine, further research was focused on studying the country's logistics efficiency data. Thanks to the normalization of indicators of logistics efficiency of Ukraine relative to the values of the sample for EU countries, recommendations are provided for the implementation of measures for the sustainable development of the transport and logistics sector in Ukraine. The ranking of components by the size of the gap with an orientation towards solving the problem of logistics efficiency allowed us to establish priorities in transport policy and business strategies.