RESEARCH
INSTITUTE

RESEARCH PROJECTS

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UNIVERSIDAD
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Presentation

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The Scientific Research Institute (Instituto de Investigación Científica, IDIC) at the University of Lima seeks to primarily develop research projects that can contribute to solving problems affecting the country, its companies and public institutions, as well as to public policy design. To this end, the university supports research projects through the Annual Research Call. Each project that is submitted is assessed by peers in terms of the quality of the proposals, through follow-up, coaching, and the resources granted by the IDIC. These resources include project funding, support for participation in national and international conferences, organization of training courses, collaboration for publishing papers in indexed journals, and administrative support for patenting new products at the National Institute for the Defense of Free Competition and the Protection of Intellectual Property (INDECOPI). In parallel to project execution, our different research groups are spaces for interdisciplinary dialog and the formulation of new projects and public policy proposals within the lines of research defined by the IDIC.

Herein, the projects that have won national research calls and which are funded through external grants from the public and private sectors deserve special mention; their social impact is high, and they engage researchers from other national and foreign universities, international research centers, public institutions, and private companies. These alliances and agreements are proof of researchers' efforts to develop collaborative projects and their networking actions.

As these projects progress, some students and graduates carry out pre-professional practices, while others perform their professional practice, thus becoming involved in the national research community by being a part of the IDIC. Senior researchers assume the commitment to guide and support junior researchers in the development of their thesis and research work.

This catalog compiles our current research projects and describes their individual objectives and relevance.

QUALITY OF LIFE AND WELL-BEING

Lines of Research:
Health | Education | Housing and Construction | Security and Violence

Challenges in mathematics teacher education from their expertise and conceptions

Research conducted in 2018 on secondary school mathematics teachers identified inadequacies in the specialized knowledge required for the teaching and learning of parabolas. The origin of these shortcomings was traced to their education in universities or higher education institutes, when addressing mathematical and didactic notions and concepts. Therefore, this study aims to assess the current math teaching and learning notions and conceptions on which will be the basis for future secondary education math teachers. At the end of this study, the researchers will be able to recommend items to act on for improving the quality of teacher education and contributing to the development of their professional skills.

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Implications of cardiac variability and emotional regulation on hedonic adaptation

Although it is commonly believed that better living standards may increase people's satisfaction, there is no direct relation between the two. One of the psychological factors that may explain this phenomenon is that happiness from any particular success decreases over time because of hedonic adaptation. This study seeks to explore whether physiological and cognitive responses (cardiac variability and emotional regulation, among others) correlate with hedonic adaptation. Within this context, a longitudinal study will be conducted on 250 college students from Lima. In addition, the mediating effect of the number of positive emotions in hedonic adaptation will be replicated and extended to its negative side as part of the experimental design.

Researcher

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Assessing message effectiveness in the prevention of chronic diseases: a view from the laboratory

Following a healthy lifestyle is one way of preventing chronic diseases. Based on the fact that parent behavior influences child behavior, this research project seeks to assess the impact of messages aimed at reducing the consumption of sweet or savory snacks and promoting the practice of walking at least 30 min daily. The study will focus on 200 overweight/

obese schoolchildren's parents. The authors will design and experimentally evaluate messages in a laboratory to observe their impact on heart rate and behavioral predictors to identify messages with a high probability of exerting a positive impact on fostering healthy lifestyles.

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Work-earned income and domestic violence in Peru: Does economic empowerment protect women against the risk of victimization?

This research project seeks to assess the relationship between a key aspect of a woman's economic empowerment (her work-earned income) and her risk of suffering domestic violence. In light of this, conflicting predictions and results may be found both at the theoretical and empirical levels: in some cases, higher income reduces violence, while, in others, the relationship is reversed. In Peru, this relationship has only been examined in general terms. To obtain more accurate data, this work estimates the impact of women's work-earned income against their risk of exposure to domestic violence and determines whether this impact changes according to income level and life cycle of the relationship. The methodology used includes merging databases such as ENDES and ENAHO 2008-2018 through individual statistical matching.

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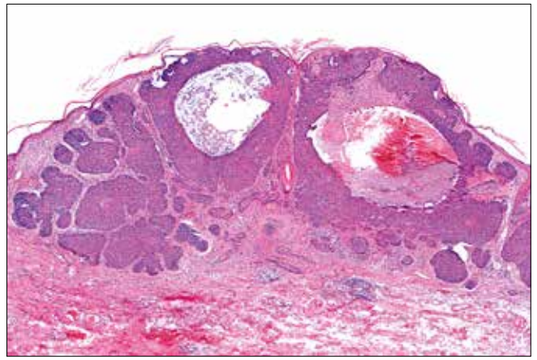
New platinum(II) complexes with thiophene-2-carbaldehyde thiosemicarbazone derivatives and their antibacterial and antitumor activities

Several thiophene thioemicarbazone derivatives and their metal complexes have been proven to inhibit the growth of different types of bacteria and tumors owing to cell membrane rupture or intercalation within DNA. Within the line of work developed by researchers a few years ago, this specific project proposes the preparation and biological assessment of platinum(II) complexes with thiophene-2-carbaldehyde thiosemicarbazone derivatives. These compounds will be characterized by masses, infrared, and nuclear magnetic resonance (1H, 13C), whereas biological tests will be performed against different types of bacteria and human tumor cell lines.



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Methodology for standardizing the design of ground surface foundations in the city of Pucallpa

The land around the Pucallpa area are prone to pronounced deformations, swellings, and contractions, which are not precisely compatible with the construction stage. This research project proposes a new methodology for standardizing the design of ground surface foundations in the city of Pucallpa, Ucayali, together with obtaining parameters from the laboratory results for the application of a construction model with soil behavior closer to reality. This study will provide results from the physical characterization and identification laboratory tests and consolidated orthometric and triaxial tests on samples molded by static compaction at the Geotechnical Laboratory of the University of Lima.

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Obesity as an Epidemic: Predictions from Mathematical Models

Because of the large number of people affected by it, obesity has expanded from a chronic disease to a full-scale epidemic. It has a significant impact on other diseases such as diabetes according to data from the World Health Organization and Pan American Health Organization. In the context of this complex situation, this study seeks to develop mathematical models that simulate the

temporary progress of obesity as an epidemiological process. The results of this study are expected to reveal the progress of obesity in our society, thus allowing the authors to forge predictions and to contribute to the work already performed by disease prevention agencies.

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Correpalabras: A digital application aimed at fostering interest in reading in second- and third-grade children

Developed in 2018, the Correpalabras digital application is an R&D and innovation project aimed at fostering second and third-grade children's interest in reading. The application was developed with support from the University of Lima IT Lab. After the primary stage, in which the prototype app was developed and a small-scale test was conducted in schools in Metropolitan Lima, a larger-scope pilot test was implemented, engaging 150 schools in the Lima-Provinces region. As both stages yielded positive results, this year's project seeks to perform the technological packaging of the application and to validate it throughout the country as well as in a foreign, Spanish-speaking location.

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Assessing habitability conditions in temporary emergency housing units: Three case studies in Peru

In Peru, temporary emergency housing presents several environmental, social, and economic problems. No impact study has been found on the materials used for building housing units with respect to the environmental aspect. As for the social aspect, the sociocultural characteristics of the population are usually not considered. Economically, these housing units often represent high costs for the government because of their lack of planning. This research project, which is jointly executed with the University of Bath (United Kingdom), assesses the current models used for building emergency housing units. It seeks to propose improvements in existing units as well as new prototypes responding to sustainability conditions as a contribution to the organization of a comprehensive response plan against natural disasters. The case studies will be conducted in the cities of La Libertad, Arequipa, and Iquitos.

Foto: Daniel Rondinel Oviedo

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Design of an affordable image recognition prototype for stimulating visually impaired children

According to a disability study conducted by the National Peruvian Institute of Statistics (INEI), visual impairment ranks second among the most common disabilities affecting the Peruvian population. Considering that this handicap may hinder people from enjoying a better quality of life, this study suggests that devices with intelligent hybrid systems may help improve the interaction

of visually impaired children or children having low vision with their surrounding environment. Therefore, this research project seeks to design and develop an affordable device, which uses hybrid systems to stimulate the senses of hearing and touch.

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COMMUNICATIONS AND CULTURE

Lines of Research:
Industries and Cultural Processes | Language and Speech | Psychometric Studies

Sample sizes for Polytomic Item-based Exploratory Factor Analysis

Self-report instruments are a popular method for operationalizing latent variables. Although several item formats may be used for these purposes, many rely on polytomic items as they generate more variance than dichotomous items. Within this context, in the present study, clear guidelines have been developed for selecting the proper sample size for an exploratory factor analysis, considering the

effect of the number of items per latent variable and the number of latent variables based on the sample size required to efficiently recover population parameters from instruments with polytomic items. This research study will establish a statistical basis for defining sample sizes, which may be applied in future psychometric research work to foster good factor analysis practices.

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Peruvian independent cinema: 2000–2018

This research study seeks to identify the narrative and stylistic characteristics of Peruvian independent cinema and to determine its production, distribution and exhibition methods, contributions to national cinema, potential capabilities, and main challenges to its continuity. Independent cinema is usually developed under low-budget conditions using non-classical narrative and stylistic proposals and screened outside the commercial multiplex system. Although it is still mostly self-managed, independent cinema production has seen an increase in Peru with up to 50 feature-length films, of which some have won national and international awards. Furthermore, the national production scope has also expanded to include not only the country's capital but also other regions such as Arequipa, Cusco, La Libertad, and Lambayeque.

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Phone-tainment: Smartphones and entertainment in the Lima Metropolitan Area

This research study seeks to assess how the youth in Lima uses smartphones for entertainment and leisure purposes. A qualitative study was conducted to identify consumption habits and describe their particular characteristics (e.g., frequency, spaces, and interests) based on the relations established among devices, content, and users. In this regard, the identification of the different constants and variations that may be recorded is critical along with an understanding along Bourdieu's line that people from a homogeneous social environment tend to share similar lifestyles because the resources, strategies, and methods they use to assess the world are also similar. This proposal is based on the findings from the 2018 "Seeking Digital Viewers: Deferred Consumption and Second Screens" study.

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Magda Portal and Blanca Varela: *Proof of Being and Waltzes and Other False Confessions*

This research study counterposes the poetry anthologies of two renowned Peruvian poets— *Proof of Being* (1965) by Magda Portal and *Waltzes and Other False Confessions* (1964-1971) by Blanca Varela. The analysis of the two works is grounded in three perspectives: comparative rhetoric, gender approach, and the theory of power discourse. Interdiscursive analysis is used for the comparative rhetoric perspective. In the gender approach, the notion of gender will be assimilated as a performative act. Finally, discourse control mechanisms will be studied in the power discourse. Using this framework, the present study seeks to verify through an interdiscursive analysis how Portal and Varela criticize the androcentric symbolic order and question hegemonic discourse control.

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Mapping the Peruvian news media

This project is part of the Worlds of Journalism Study (WJS) global research network, which assesses current journalism practices. The WJS is currently in the preparation stage for its third round of fieldwork, scheduled to commence in 2020. This project seeks to lay the groundwork for Peru's participation in the WJS.
This project compares the current state of Peruvian journalism against its regional peers. The first stage seeks to set forth a baseline for the operating conditions of journalism, both at the national and regional levels. As specific objectives, several research studies have been planned around the organization of media groups.

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Kids Online Peru: Digital practices, opportunities, and risks from the perspective of Peruvian children and adolescents

Initiated in April 2018, this project is part of the international Kids Online project. It aims to identify the different practices that take place when children and adolescents interact with the internet and digital media. The interactions may be viewed as opportunities or risks on the basis of their positive or negative consequences on children and adolescents's well-being and the exercise of their rights. The evidence that is collected is expected to serve as the input for proposing public policies in corresponding sectors such as education, transportation and communications, women and vulnerable populations, and justice. After the conclusion of the preliminary phase of the project, the quantitative component will be implemented this year, providing a broad overview of Peruvian children and adolescents and their digital practices.

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A study of media competence among Lima school teachers and students

Media competence is defined as a set of skills learned to interact with the media in a critical and creative manner. In times of intense information mediation, this competence is a necessary condition for fully exercising citizenship rights. This project assesses school teachers and students' level of media competence in Lima, measures their current status, and contributes to the design of specific training strategies for their improvement. This analysis will consider the type of management used at the school as well as participants' gender, age, and socioeconomic level as variables for the calculation of possible correlations.

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Twitter, streaming, and investigative journalism on corruption in Peru

In Peru, the 1990s were characterized by the onset of digital journalism and the modernization of traditional media. However, very few academic works describe the evolution of digital media over the last 28 years. Therefore, this study seeks to assess the use and impact of Twitter, streaming videos, and digital research platforms on Lima's virtual press during the corruption scandal that broke out in the country in 2018. Through the analysis of news content and in-depth interviews with web journalists, the author suggests that these media along with sources and channels are redefining the role of journalism in Peru amid political and social unrest.

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Computational thinking: Design and construction of a prototype for the development of digital literacy among Peruvian schoolchildren

This research project discusses the relations among education, development, and information and communication technologies, which present educational challenges and opportunities requiring clear ideas regarding the nature of digital media, pedagogies, and appropriate application. The present study seeks to define a methodology and to implement an educational application at the

secondary school level, framed within the demands and limitations of our environment. This paper addresses two possibilities: one for arithmetic, using the Turing machine, and another for 2D and 3D charts using generative grammars. Both solutions foster creative computational thinking in visual and interactive modes, without the shortcomings of traditional programming languages.

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Representation of Lima in 20th-century Peruvian literature (1905–1976)

This study proposes a comprehensive analytical outlook on Peruvian narrative production from the early 20th century to the mid-1970s, with representation of space (particularly, the city of Lima) and its treatments and appropriations in writings as its central theme. The paper examines novels, short stories, essays, and journalistic chronicles, in which different treatments of space are proposed, thus reflecting on and processing the many social, cultural, urban, and political transformations the city has undergone over the years through fiction. This assessment identifies the different methods used for configuring both public and private space in the selected texts, as well as the different modes of space appropriation, taking into account the relationship the different narrators and the many individual and collective characters establish with space in these literary works.

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Murals as agents of public space transformation: communication, art, and community participation

During the last decade, murals have proliferated in large city avenues, tourist districts, and shopping malls, but limited information has been collected on why numerous neighborhoods in less economically-favored districts are also rapidly adopting muralism. The present study interviews artists, residents, and members of local organizations in an attempt to understand the inspirations and common ground between muralists and community groups, who are jointly adopting art as a strategy to transform different urban environments. Throughout this process, this new form of recovery of public spaces will be photographed in a fragmented and crowded cityspace filled with small urbanizations, human settlements, and peri-urban areas often relegated by official authorities.

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FOR THE IDIC, INCORPORATING YOUNG STUDENTS AND GRADUATES INTO RESEARCH GROUPS IS PARAMOUNT FOR CONDUCTING SUSTAINED AND PROJECTED STUDIES.

RIGHTS, GOVERNMENT, AND DEMOCRACY

Lines of Research:
Citizenry | Gender | Political Processes | Public Management | Government Reform

Monitoring system for the execution of international environmental commitments assumed by the Peruvian government and their impact in the international arena: obligations, competences, and transparency

This research project aims to create an analytical repository of the different environmental treaties that Peru has signed, the obligations acquired thereunder, and the authorities accountable for their compliance. This study seeks to offer a virtual platform to public officials, to aid in mapping and charting progress in the fulfillment of the obligations acquired by the

Peruvian government; and the general public, who are interested in knowing the commitments acquired and the entities that oversee their compliance and in measuring their progress. This work is expected to help the State prevent the dissipation of accountabilities when it comes to implementing international agreements.

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From robotics to roboethics: legal issues and fundamental rights in the face of technological advances

What are the legal matters that must be envisioned with respect to recent advances in robotics and the concerns arising from roboethics? Robotics has been extended to areas in which important yet controversial developments have been made such as in medical treatment or guidance at airports; the present study is focused on the interest of legislators and legal experts in the subject. Furthermore, it will respond to the aforementioned question by identifying important legal aspects, while giving primacy to the fundamental rights of individuals and to leveraging the best possible social use of technology. There is a need for further regulation in the area, as well as for the creation of clear ethical and legal standards.

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Dialog between Sources: Private and Public Contracts and the Need for Interdisciplinary Insights

In Peru, there is a historical divide between private and public law, which has been often leveraged for academic purposes and by legal operators in different professional fields. Should the divide in the studying of disciplines with common roots without a dialog between their sources continue? This project will assess the need for a dialog between sources in both contracting methods. For these purposes, their individual legal natures will be addressed, while examining whether there is any common legal ground between these contract types, as well as whether an absolute separation is required when reviewing private and public contracts. In addition, With regard to the related legal figures used in contracts with the government and between private parties, the ways in which the administrative doctrine and jurisprudence have addressed them must also be discussed.

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Contributions of Lacanian psychoanalysis to feminist theories

Since its emergence, psychoanalysis and, in particular, the work of Jacques Lacan has often been regarded as having laid important groundwork for feminist theorists. However, there is currently no study in Peru that discusses the works of Lacanian psychoanalysts and feminist scholars on this subject. This qualitative research study will rely on in-depth interviews with representatives of the field to unveil the contributions that Lacanian psychoanalysis has made to feminist theorization. Through these results, the author contributes to a better understanding of phenomena such as changing gender roles and identity in our times, as well as problems such as violence against women and reluctance in accepting gender equality.

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Citizens and police: A study of the mobilization of legal resources for the consolidation of rule of law

Knowing and obeying the law are fundamental for strengthening the rule of law. However, there are factors that may hinder its proper development. Cooperation between citizens and the police is a key factor for reducing criminality in societies with a fragile rule of law; this study focuses on Lima, the capital of Peru, to assess the views of its citizens with respect to law and order (legal conscience) and

their relation with the citizen action of resorting to the State and its institutions to file suits and claims (legal mobilization). This work is part of the line of studies that research why some people avoid using the legal system (distrust, corruption, inefficiency, process complexities, etc.).

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International Contract Law in the 21st century (hard or soft law)

This research study examines whether the arbitration system applicable to international agreements provides relevant responses to international trade challenges in the 21st century. The paper also addresses the question of whether the connection criteria established in Peruvian private international law are adequate, modern, and efficient and whether they provide enough legal predictability and certainty to businesses operating under foreign legal systems. In this regard, the author discusses the essence of the law, interprets doctrine on the subject, and examines the way in which law operators approach disputes. This analysis is complemented by a comparative approximation to international agreement regulations in Latin American (1994 Mexico Convention) and European (Rome I Regulations) countries.

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The Bicentennial at School: Independence in the Peruvian and Chilean school textbooks published during the 2010–2018 period

Several Latin American countries are at the threshold of celebrating the bicentennial of their independence; this study examines the manner in which history school textbooks address the independence of these countries from Spain. Some of the proposed research questions are as follows: what version of the independence of Peru and Chile do these school textbooks teach while commemorating the bicentennial? How are the Peruvian and Chilean independence stories similar or different? In general terms, does the history of Peruvian and Chilean independence taught at schools contribute to promoting integration between these two countries as well as fostering a culture of peace? For these purposes, the most common textbooks published by foremost publishing houses used in public and private schools in both countries will be assessed.

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Impact of political risk on private investment in Peru from 1990 to 2018

Private investment depends on external factors such as mineral ore prices and internal factors such as political risk. However, internal factors are not considered a decisive variable for private investment as long as they occur under a democratic regime. Otherwise, political risk becomes a significant variable. This paper seeks to determine whether this risk has been a determining variable for Peruvian private investment within the study period. The study also addresses whether the political risk under non-democratic (1990–2000) and democratic (2000–2018) regimes substantially impacted Peruvian private investment. Finally, it examines the impact exerted by risk outliers.

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Populism in Social Networks: Scope and acceptance of populist and extremist political discourse among the young citizens of Lima

This research study assesses the influence exerted on young voters in Lima by populist and extremist political messages posted on social networks such as Facebook and Twitter. The proposal is based on the fact that according to recent research, these networks have become the ideal platform for disseminating biased and false information because they are highly prone to becoming viral within a short time.

This study uses surveys as per the "monopoly of truth" methodology to discriminate between radical-left or right-wing posts from content created by ordinary citizens and political supporters to gain evidence of the phenomenon of post truth and the degree of virality that extremist discourses may acquire.

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A treaty on the Statute of Limitations and Repose

The statute of limitations and repose is a long-standing legal institution. After discussing the modern development of the general theory on which these legal concepts are based, the author highlights the assumptions of imprescriptibility and non-expiration that jurisprudence has been warning about beyond the typical assumptions expressly provisioned in any regulation. In this field of research, discussing the new contractual trends and determining how social needs warrant a reframing of the effects of time become critical. Therefore, this work seeks to revisit current regulations and consolidate doctrine to examine the statute of limitations and repose in light of recent comparative law and local jurisprudence theories.

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BUSINESS DEVELOPMENT

Lines of Research:
Business Strategies and Behavior | Finance and Investment Projects | Marketing and Consumer Behavior | Business Integration and Associations

Analysis of Peruvian market constraints on PPP from private initiatives: The standpoint of incentives and preferences of private actors

Certain public-private partnership (PPP) instruments, such as private initiatives, are acknowledged as an important channel for the provision of infrastructure and public services. However, the results of the processes are yet to match expectations. This project aims to identify and assess the aspects that condition the participation of private actors in the private initiative market in Peru. Current processes for the formulation and execution of Private Initiatives and how they can encourage market participation will also be addressed. For these purposes, information on critical success factors and their influence on participation decisions will be collected through surveys and interviews. Likewise, cases that help contrast the perceptions and opinions shown will be reviewed.

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An analysis of the transfer of the Theory of Consumption for building a sense of belonging

Part of brand success lies in the relationships forged with their existing and future customers. In fact, this process is rooted in providing clear insight on how people use and relate to the brand. At the same time, the social need to be accepted and experience a sense of belonging is important for everyone. Within this context, this study seeks to verify the theoretical proposal by Arias and Otnes that

characterizes consumption as a channel for belonging and whether it may be transferred to the consumption practices exhibited by young Lima residents. For these purposes, data will be collected through in-depth semi-structured interviews targeted at University of Lima students.

Researcher
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The impact of international physical distribution on the competitiveness of Peruvian lucuma exports

Currently, agricultural businesses must face growing international competition which increases even more with certain products, such as lucuma. This research attempts to determine how the lack of knowledge related to international physical distribution and operational failures may affect the profitability of exporting this Peruvian fruit. Likewise, the authors plan to develop a new and

competitive distribution plan that may add value to the product and, in turn, reap benefits for domestic lucuma producers. In this light, remaining competitive in exports is critical, guaranteeing revenue and profitability for the Prolúcuma association, which exerts an indirect impact on the country with greater inflow of foreign exchange.

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The effects of MILA stock exchange integration: An analysis of short and long-term volatilities

The Latin American Integrated Market (MILA) is the most important integration process experienced by the Chilean, Peruvian, Colombian, and Mexican stock exchanges with the expectation of increasing the financial depth of these participating countries. However, one aspect which has yet to be assessed is whether or not this process has exerted an influence on a fundamental parameter for the financial development of these four countries: return volatility. The study seeks to cover this need through a GARCH-MIDAS analysis of the return from the MILA stock exchange indexes, which will make it possible to identify what economic, financial, and institutional factors affect short and long-term volatility of these stock exchanges.

Researcher
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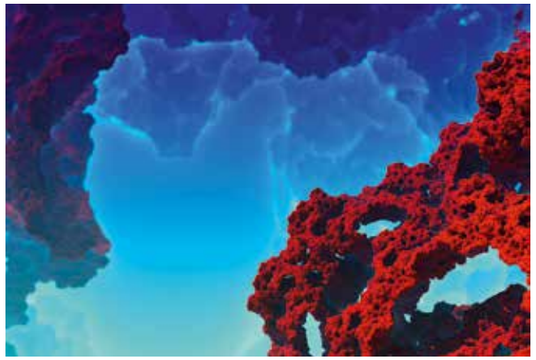
PRODUCTIVITY AND EMPLOYMENT

Lines of Research:
Innovation: Technologies and Products | Work and Growth | Industrial Development

A Methodology for using Drones to Survey Underwater Surfaces

Accurate methods are required to survey land surfaces properly. However, the surveying of submarine surfaces or Bathymetry has only been incipiently and sparsely developed in Peru. This study proposes a new methodology that leverages the latest technological advances integrated into drones for surveying underwater surfaces to provide relevant and quality information for the adequate monitoring of the regions affected by human and natural interactions. Hence, this project is expected to surpass traditional bathymetry by comprising emitting sound waves, capturing feedback signals, and processing information to chart submarine surfaces.



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Industrial escalation of ASEAN and Pacific Alliance resource-rich countries

The pricing cycle of commodities in the first decade of the twenty-first century favoured exports from countries with abundant natural resources. However, reducing export dependence on a few goods with low processing level still remains an issue in several economies. In light of this, this research attempts to identify why some economies with abundant natural resources

are trapped in the initial links of global value chains and what would be the alternatives for scaling to stages of greater value addition. These results are expected to support the need for designing specific industrial policies that extend local linkages through global value chains.

Researcher
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GIS and remote sensing techniques for the assessment of vulnerabilities and seismic risks in urban areas

There is a strong and intrinsic connection between the most recent geomatic methodologies and incident management. The integrated development of these two fields in modern engineering is mutually useful as they forge the virtuous synergy required by a country, such as Peru. Generally, this research aims at evidencing how consolidated geomatic techniques may be used to extract

information of considerable interest to estimate parameters for vulnerability models. These estimates will be further improved by additional database searches and a more accurate calibration of all the parameters used. To better understand the contributions from geomatic techniques, the project will also discriminate the phases that characterize the engagement of all organizations involved.

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Assessment and determination of the Okun coefficient in Peru from 2000 to 2017

Based on the premise that unemployment causes poverty and constrains the development of a country, this research explores the relationship between employment and the national product, estimating the Okun coefficient from 2000 to 2017. This indicator is important in an economy like Peru because it determines how much our product should grow to absorb human resources in the employment market. In addition to assessing the link between economic growth and unemployment levels, the unemployment levels will be adjusted against informal employment levels, the Okun coefficient will be estimated for the study period, and the study will discuss whether the deviations in unemployment levels from their natural rates are temporary.

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NATURAL RESOURCES AND THE ENVIRON MENT

Lines of Research:
Biodiversity By-products| Water, Soil and Air | Environment | Eco-Efficiency and Clean Technologies

Synthesis of anodic photocatalysts and their potential application for degrading histamines from fish processing plant wastewater

There are multiple sources of contamination by persistent organic nitrogen compounds in aqueous media that are generally harmful to living beings. Therefore, efficient and low-cost treatments must often be implemented to reduce the concentration of these pollutants. Therefore, this study aims to synthesize nanostructured films from TiO2, WO3, and Bi2O3 semiconductors on FTO conductive glass using electrodeposition and dip-coating techniques. Consequently, this project is expected to achieve an oxidative degradation of the histamine found in the wastewater produced by fish processing plants. This degradation will be monitored via UV–visible spectroscopy and HPLC liquid chromatography to identify any intermediate compounds that could either form or remain without degrading.

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Prototype proposal for the adsorption of CO_2 generated by cement industries

This project proposes the development of a prototype to adsorb carbon dioxide (CO_2) as an affordable mitigation alternative for the greenhouse gases generated by the cement industry during clinker production. Hence, we plan to synthesize metal–organic frameworks in the laboratory to leverage their high surface area, porosity, and chemical stability, which deems them as suitable for the purposes herein. Further, solvothermal and electrochemical deposition methods will be used for synthesizing titanium and copper matrices, characterized by techniques, such as DRX, FTIR, SEM, and TEM. Likewise, this work also assesses their adsorption capacity, together with the kinetics governing this phenomenon.

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Effects of stakeholders on solid-waste separation behavior at home

According to data from the Peruvian Ministry of the Environment (MINAM), the country recycles only 4% of the 7 million tons of waste it produces each year. In Peru, particularly in Lima, solid waste management remains one of the most critical problems for municipalities, wherein the informal sorting and recovery of inorganic waste and its recycling is of great importance. This study

seeks to identify ways in which stakeholders such as local governments, NGOs, and recyclers can influence the solid-waste sorting behavior in Lima's homes to better guide public policy actions to recover the largest possible amount of waste suitable for reuse.

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Study of carbonaceous materials modified with bentonite clays for their application in seawater desalination using the capacitive deionization technique

This project studies the new, more stable and efficient nanostructured carbonaceous materials modified with bentonite clays for their application as capacitor cell electrodes in seawater desalination systems. This is supplemented by using Peruvian clays as materials that favour ionic diffusion on electrode surfaces during the capacitive adsoption of ions. The work includes preparation and physical, chemical, and electrochemical characterizations, together with using a laboratory-scale capacitive deionization cell to assess the improvements provided by the material to conventional deionization cells.

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Manufacturing nanocellulose-gum-clay composite pellets for the removal of methylene blue

The textile industry, among others, discharges aqueous pollutants, which are harmful to water bodies, and its removal requires expensive and specific treatments. In turn, the agricultural activity in our country represents a source of organic waste, which may be reused. For example, the processing of tara, a small leguminous tree used in Peru for the production of gum, face powder, and tanninsgenerate transformable waste. Within this context, this research study proposes the preparation of nanocellulose pellets from tara gum waste and activated clay for the removal of methylene blue discharged by the textile industry.

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Design and construction of a ferrate(VI) ion-based Autonomous Water Treatment Plant powered by photovoltaic panels

An advanced water treatment unit powered by solar energy is an advantageous solution for remote areas with high solar irradiation, such as mining towns, operations, and environmental liabilities. This unit must be autonomous, which implies an automated sequential control of the water purification processes and independence from the electrical grid. Therefore, this project proposes the design and construction of an autonomous and compact water treatment unit, which uses electrochemically-generated ferrate(IV) ions integrated into a system to dose the ions based on changing water requirements, adjusting pH levels, removing pollutants, and producing water whose quality can be adjusted to different needs: generation of drinking water or wastewater treatment.

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Streamlining the preparation of chitosan nanoparticles charged with indole-3-acetic acid by ultrasonication to improve their performance and stability

From the results of the 2018 research and using the ultrasound and lyophilization equipment recently acquired by the University of Lima, a new technique will be developed for generating stability, smaller nanoparticles, and a distribution of finer nanoparticle sizes. These factors are important in the stable and controlled release process of biologically active molecules, such as indole-3-acetic

acid, a common plant hormone. The project is expected to contribute in increasing agricultural production and decreasing the use of fertilizers and hormones, whose waste accumulation leads to environmental pollution and public health problems.

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AT THE UNIVERSITY OF LIMA, RESEARCH PROJECTS SEEK TO GENERATE NEW KNOWLEDGE AIMED AT PROPOSING PUBLIC POLICIES, WHICH MAY IMPROVE THE QUALITY OF LIFE OF PERUVIANS IN GENERAL.

RESEARCH PROJECTS FUNDED BY GRANTS

Replacing the conventional treatment of fish pumping water with electrocoagulation technologies to reach MPLs at a lower cost

The pumping water generated from moving fish via boats to fishmeal processing plants usually contains a high proportion of suspended solids and fats. In fact, to reach the maximum permissible limit (MPL), this water often requires treatment with chemical agents and other synthetic polymers. However, along with negatively impacting costs, these agents and polymers promote the recovery of poor-quality low-

value solids with high metal content. This study aims to use electrocoagulation technology to treat fish pumping water and reach MPLs at a lower cost, avoiding the use of chemicals and favouring the recovery of better quality solids, which can be used in food-related and agricultural applications of greater value.

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Walter Neyra Ascón (Independent)

Funding
National Program of Innovation in Fishing and Aquaculture (PNIPA)

MonipezApp: Monitoring prototype for streamlining artisan fishing processes in real time to improve artisan fisherman productivity at the Chorrillos cove

The MonipezApp project aims to develop a system to help artisan fishermen identify, in real time, the location of schools of fish in fishing zones through aerial and amphibious drones and a SONAR. Based on the Internet of Things, this project will also document the fishing production and guarantee the sustainable use of hydrobiological resources. Likewise, the authors will employ artificial intelligence techniques for image analysis and Big Data analytics. The work will be divided into four stages: a) a participatory analysis of system requirements; b) equipment testing and calibration; c) deployment and testing of the integrated system in the fishing zone; and d) information systematization and technology turnover to artisan fishermen.

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Funding
National Program of Innovation in Fishing and Aquaculture (PNIPA)

Food marketing aimed at children: a collaborative study steered by policy in Argentina, Bolivia, Guatemala, and Peru

This project examines the influence exerted by food marketing on children and adolescents at the individual, social, and physical levels in Argentina, Bolivia, Guatemala, and Peru. It is based on the concept of foodscapes, which include various media that disseminate information about food such as print media, television, internet, kiosks, grocery stores, schools, and home. This project develops a multicomponent research strategy in the abovementioned countries focusing on food advertising aimed at children and adolescents to foster changes in policies aimed at reducing obesity in children. The study is expected to increase knowledge on the marketing of food products while raising awareness on the subject and encouraging the implementation of effective policies.

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Funding
International Development Research Center (IDRC)

A semi-automatic spinning line prototype for standardizing alpaca fibre yarn to improve the competitiveness levels of artisan producers in the Puno area

Even when industrial alpaca fibre product exports have experienced a sustained increase in the last two years, the fate of artisan products has been quite different. In this sense, the production chain of the artisan industry lacks competitiveness owing to its weak capacity for effectively transforming fibre into yarn or garments, which constrains the exportable supply. To address this issue, this project proposes the development of a semi-automatic spinning line for the production of standardized alpaca fibre yarn to boost artisan productivity in the Puno area. Therefore, the authors conduct an assessment of the production processes used for manufacturing artisan yarn and a characterization of alpaca fibre. Further, a prototype of the spinning line equipment will also be designed and built.

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Funding
National Fund for Scientific/ Technological Development and Technological Innovation (Fondecyt)

Improving trout farming water quality using pellets made from Peruvian scallop and prawn waste to remove heavy metals

This research study proposes manufacturing pellets from chitin extracted from prawn exoskeletons and Peruvian scallop shells, mixed with tara gum. These pellets will adsorb the pollutants (Cu, Pb, and Zn) present in fish farm waters in the department of Junín, wherein this project will be developed. These pellets will be used as water filters that will adsorb pollutants before contacting the trout, thereby improving the quality of fish farm waters and harvesting better trout for human consumption.

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Funding
National Program of Innovation in Fishing and Aquaculture (PNIPA)

Transforming freshwater prawn-farming waste into balanced tilapia feed and polymers for coating seeds used in organic agriculture

One of the characteristics of a sustainable industry is its ability to leverage industrial scrap and transform it into valuable resources, thus preventing waste and negative environmental impacts. For example, freshwater prawn farming, which exported 20,441 tons of products in 2016, produces between 35% and 45% organic waste containing protein and chitin among other substances. Thus, this project will use biotechnological tools to leverage waste from prawn production and transform it into inputs for new production processes; these processes generate high-quality protein used to manufacture fish feed, such as tilapia, trout, and salmon, and polymers used in agricultural activities.

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Funding
National Program of Innovation in Fishing and Aquaculture (PNIPA)

SPONSORED RESEARCH STUDIES

An automatic system for measuring and assessing respirator use in the mining industry: a contribution to reduce pneumoconiosis cases in the country

This project proposes the implementation of an automatic system for assessing respirator use in mines through electronic devices. These devices will be installed in the respirator to continuously monitor the pressure within the apparatus, thus letting employers and workers objectively know the effective protection level provided by these respirators. The system comprises an electronic device and a computer application for assessing the signals emitted by the personal protection equipment piece. The algorithm included in the computing platform will analyse the pressure signals captured and determine the use factor for each worker per day, displaying average values and trends during the 14-day evaluation period.

Researchers
Carmen Inés Julián Moreno (Draeger Peru SAC)
Eduardo Toledo Ponce (University of Lima)
David Ponce Enríquez (independent co-researcher)

Funding
Draeger Peru SAC

Technical and commercial validation of using Pulmomina prototype as a tool for the prevention and diagnosis of pneumoconiosis in mining populations

The Pulmomina prototype is a technological package comprising a workstation with equipment, procedures, and data analysis. This project expects to validate the Pulmomina prototype as a tool for the prevention and diagnosis of pneumoconiosis through the standardization of automated tests and processes to diagnose interstitial lung diseases in the mining population. In addition, the project includes the development of a computer platform to obtain screening test results and perform clinical evaluations of patients at risk. Once validated, the Pulmomina prototype will be offered to mining and industrial companies as an on-site respiratory evaluation service for workers exposed to various pollutants.

Researchers
Luis Alejandro Galliani Castro (Draeger Peru SAC)
Eduardo Toledo Ponce (University of Lima)

Funding
Draeger Peru SAC

Revaluation of agri-foods from the Peruvian biodiversity

This research project aims to select fruits, seeds, and tubers from the Peruvian biodiversity, with potential antioxidant activities, and polyunsaturated fatty acids in theirs husks and seeds and use them to produce nano/microencapsulated functional and nutraceutical foods.

Funding
The Institute of Fats, Sevilla (Higher Council for Scientific Research [CSIC], Spain)

Researchers
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Nancy Chasquibol Silva (University of Lima)
Gabriela Gallardo (co-researcher, National Institute for Industrial Technology [INTI], Argentina)

RESEARCH GROUPS

The IDIC welcomes research groups who, as per the definition given by Concytec, embody “a group of people who work together as a team to jointly conduct research in a given topic, which may include one or more related disciplines”. As of 2019, these are as follows:

Exponential Technologies Research Group

A research group focusing on technology-based business solutions that innovate, transfer technology, train value chain actors, and educate highly specialized human resources in exponential technologies.

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- Edwar Aguilar Ascón
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Thesis Writer (Graduate)
- Miguel Ángel Chicchón

Thesis Writers (Undergraduate)
- Renato Montenegro Ayo
- Américo Alberto León Chávez
- Diego Miguel Torres Esquerre

Oils, Fats, Functional Foods, and Nutraceuticals Research Group

This group has revalued agrifoods from the biodiversity of Peru through the application and dissemination of scientific and technological knowledge to produce functional ingredients as a contribution to the food industry and to functional foods and nutraceutical markets.

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- Nadia Mulinacci (University of Florence, Italy)
- Gloria Pascual Chagman (National Agrarian University - La Molina)

Technological Solutions for Environmental Problems Research Group

This group is dedicated to finding solutions to environmental issues through the use of new technologies, renewable energy, and new materials with emphasis on water treatment for agricultural use and human consumption.

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Communications and Education Research Group

The group focuses on matters related to communications, education, young people, and technologies in order to propose policies linking public and private institutions and the university in an attempt to strengthen national education.

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Ibero-American Scientific Marketing Research Group

This group seeks to generate a collaborative marketing research space with Ibero-American professionals as well as to build bridges between academia, the business sector, and public institutions.

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- Miguel Reyes (University of Valle, Colombia)
- Nidia Roa (University of Ibagué, Colombia)
- Paula García (University of Ibagué, Colombia)
- Ingrid Yate (University of Ibagué, Colombia)

Communications and Health Research Group

This group focuses on understanding the role that communication plays in people's health; it aims to contribute to the advancement of knowledge in the field and to influence public policy.

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Interdisciplinary Study Group on School Texts, Society, and Educational Practices

The group studies the contents of school history textbooks used in Latin American countries with special emphasis on those used in Peru and Chile to teach about Latin American independence and to foster integration between the two countries.

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INTERDISCIPLINARY DIALOG BETWEEN RESEARCHERS FOR A UNIFIED PERSPECTIVE ON THE PROBLEMS FACED BY THE COUNTRY

UNIVERSIDAD
DE LIMA

Research Projects 2019
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