



Universidad
Rey Juan Carlos

TESIS DOCTORAL

Predicción y Valoración del Éxito Profesional Objetivo y Subjetivo de los graduados: Caso de Estudio UTEQ

Autor:

Roberto Pico Saltos

Directores:

JAVIER GARZÁS
ANDRÉS REDCHUK

**Programa de Doctorado en Tecnologías de Información y
Comunicaciones
Escuela Internacional de Doctorado**

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Con mucho cariño dedico
la tesis doctoral a mi hermano mayor
Luis Gabriel (+), quien ha sido eje motor,
fuente de mi inspiración
en mi vida cotidiana y profesional.

RESUMEN

El éxito profesional es un constructo social que permite conocer al individuo y algunos aspectos de su vida académica y trayectoria profesional. Con estos aspectos las personas obtienen un determinado grado de satisfacción personal y profesional. Por esta razón, las universidades aplican programas de seguimiento de sus graduados con la finalidad de conocer las fortalezas y debilidades de los graduados y su formación académica. En el contexto empresarial, es necesario comprender que motiva al individuo para la obtención del éxito profesional desde el enfoque extrínseco e intrínseco, en función de los cambios trascendentales del mercado laboral implicados por la globalización.

Esta tesis doctoral tiene como principal objetivo contribuir en la estimación del éxito profesional objetivo y subjetivo a través de la teoría de investigaciones académicas, análisis de variables objetivas y subjetivas, modelos matemáticos y algoritmo de naturaleza evolutiva para los graduados de la Universidad Técnica Estatal de Quevedo, Ecuador.

Para el cumplimiento del objetivo propuesto, esta tesis se encuentra organizada en cuatro capítulos: i) Capítulo I concreta la fundamentación teórica o estructura intelectual del estudio a través de las tendencias de investigación del éxito profesional, ii) Capítulo II establece el éxito profesional de graduados universitarios de UTEQ, iii) Capítulo III muestra un análisis empírico de la incidencia del programa Alumni en la predicción del éxito profesional de graduados UTE y iv) Capítulo IV analiza y discute los resultados generales. Además, presenta las conclusiones de esta investigación.

Los resultados muestran la colaboración del éxito profesional en 76 países a través de 3106 investigadores, 1369 artículos publicados en 691 journals. Evaluación del éxito profesional de graduados de un país en vías de desarrollo (Ecuador) mediante la valoración de variables objetivas y subjetivas. Donde el

67.1% de los profesionales encuestados se autoperciben exitosos; pero también, muestran un grado de insatisfacción intrínseca. Finalmente se estima el éxito profesional mediante un modelo de predicción a través de un algoritmo genético relacionado con parámetros de seguimiento a graduados con una confiabilidad aceptable del 87.61%.

ABSTRACT

Professional success is a social construct that allows knowing the individual and some aspects of their academic life and professional career. With these aspects, people obtain a certain degree of personal and professional satisfaction. For this reason, universities apply follow-up programs for their graduates to know their strengths and weaknesses and their academic training. In the business context, it is necessary to understand what motivates the individual to obtain professional success from the extrinsic and intrinsic approaches, depending on globalisation's transcendental changes in the labour market.

The main objective of this doctoral thesis is to contribute to the estimation of objective and subjective professional success through the theory of academic research, analysis of objective and subjective variables, mathematical models and an algorithm of an evolutionary nature for graduates of the State Technical University of Quevedo, Ecuador.

This thesis organises into four chapters: i) Chapter I specifies the study's theoretical foundation or intellectual structure through research trends of professional success, ii) Chapter II sets out the professional success of UTEQ college graduates, and iii) Chapter III shows an empirical analysis of the incidence of the Alumni program in predicting the professional success of UTEQ graduates and iv) Chapter IV analyses and discusses the general results. In addition, it presents the conclusions of this research.

The results show the collaboration of professional success in 76 countries through 3106 researchers and 1369 articles published in 691 journals. Evaluation of the professional success of graduates from a developing country (Ecuador) through assessing objective and subjective variables. 67.1% of the professionals surveyed perceive themselves as successful but also show a degree of intrinsic dissatisfaction. Finally, professional success is estimated using a prediction

model through a genetic algorithm related to graduate follow-up parameters with acceptable reliability of 87.61%.

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Introducción: Estructura intelectual del éxito profesional

Introducción: Estructura intelectual del éxito profesional

1.1. Estructura intelectual del éxito profesional y estado de la cuestión

La importancia del estudio del éxito profesional de los graduados ha sido discutida por diversos investigadores desde los años 80 (Ummatqul Qizi, 2020), y desde diferentes disciplinas académicas como la gestión, negocios, educación, psicología, economía, estudios de género, medicina, entre otros (Baghestanian & Popov, 2014; Buckley et al., 2000; H. Gunz et al., 2011; Hay & Hodgkinson, 2006; Judge et al., 2009; Orser & Leck, 2010a; Ramaswami et al., 2010; Vera & Hucke, 2009).

Estas disciplinas académicas abordan el éxito profesional en función de sus propios intereses y con diversos enfoques. En el área de gestión, es indispensable para las empresas conocer cómo sus empleados perciben el éxito profesional y sus aspiraciones; aplicar una cultura organizativa para mejorar los conflictos laborales-familiares, igualdad de género e implementar programas de formación para sus empleados (Rowley et al., 2016; Y. Shen et al., 2015). En el ámbito de la educación universitaria, se ha demostrado una relación positiva entre el logro de la carrera profesional y el impacto educativo de la administración de negocios, el incremento de elegir estudiar este campo de los negocios internacionales se debe a la globalización (Schworm et al., 2017a). El campo de la psicología, se enfoca en la relación del éxito profesional y la personalidad, las buenas actitudes laborales y autocontrol interno conllevan a resultados positivos en el ámbito laboral (Lau & Shaffer, 1999). En la medicina, el éxito profesional ha sido estudiado en el ámbito de la enfermería para conocer la percepción del éxito profesional de las enfermeras clínicas. Un buen grado de satisfacción laboral de las enfermeras está ligado a su trayectoria profesional positivamente (Dan et al., 2018; Li et al., 2014). Países como China (Dan et al., 2018; Li et al., 2014), Irán (Asghari et al., 2021),

Turquía (Sönmez et al., 2021) han enfocado sus estudios en el éxito profesional de las profesionales de enfermería debido a su importancia como recurso humano en los sistemas sanitarios. La versatilidad del éxito profesional ha permitido ser investigado desde diversas disciplinas.

En la empresa, los estudios del éxito profesional permiten reconocer a las empresas sus debilidades, promoviendo la cultura organizativa, implementación de programas de formación y desarrollo, igualdad de género, flexibilidad para el trabajo y familia (Ballout, 2007). Tanto los vínculos externos como internos y la personalidad proactiva pueden ayudar a los individuos a ascender dentro de la organización. Encontrar los predictores individuales y organizativos que contribuyen al éxito profesional de los empleados constituye un aspecto importante tanto para las organizaciones como para los individuos, debido a que los empleados satisfechos con la carrera son más comprometidos con el rendimiento laboral (Tremblay et al., 2014).

En el enfoque individual, la idiosincrasia del individuo en conjunto con los atributos, la personalidad, la motivación, encaminan la dirección profesional y el desarrollo de estrategias para alcanzar los objetivos tanto a nivel personal como profesional produciendo satisfacción con la vida y consigo mismo (Giraud et al., 2019; H. P. Gunz & Heslin, 2014). Los vínculos interpersonales que el individuo establece con su entorno se expresan en experiencias que conducen a mejorar comportamientos profesionales, y por ende la calidad del trabajo (Dyess et al. 2015). En las investigaciones, adicionalmente se incluye las variables sociodemográficas que reflejan los antecedentes demográficos y sociales de cada individuo. Aplicar los conocimientos y destrezas que posee cada persona en el trabajo fomenta la construcción de la identidad, fortalecimiento de aptitudes, surgimiento de nuevas habilidades y creación de vínculos de compañerismo.

La relación trabajo-familia indica que las responsabilidades familiares influyen en el ámbito laboral y en el éxito profesional, desde una perspectiva psicológica

con preocupaciones sobre la relación entre carreras y otras actividades importantes de la vida. Un equilibrio entre la satisfacción entre el trabajo y la vida constituye un indicador importante en el éxito general para la carrera (Beigi et al., 2017). El estado civil, la paternidad/maternidad y el entorno doméstico presentan impacto en el progreso de la carrera (Koekemoer et al., 2020). Mantener las relaciones laborales y personales en un grado positivo es objetivo relevante tanto a nivel individual, organizativo y gubernamental.

Otros estudios se han enfocado en las diferencias de género y éxito de la carrera. Tanto hombres como mujeres perciben de diferente manera al éxito profesional. En el caso de las mujeres, su satisfacción profesional está relacionada con el éxito subjetivo (Orser & Leck, 2010a). También se relaciona el género con el equilibrio trabajo-familia, ese equilibrio puede transformarse en conflicto para las mujeres debido a los roles de maternidad y otro tipo de presiones donde las oportunidades de alcanzar el éxito profesional son interrumpidas por la desigualdad de condiciones por parte de las empresas y la sociedad (Mayrhofer et al., 2008). Ciertos grupos de minorías de raza o etnia han manifestado sentirse excluidos por oportunidades laborales (Fouad & Byars-Winston, 2005). Algunos países como Canadá, Estados Unidos, Brasil, México entre otros, han mostrado interés por la influencia del género en el éxito de carrera (Orser & Leck, 2010a; Punnet et al., 2007).

En el entorno universitario, el éxito profesional se encuentra enfocado en sus graduados utilizando indicadores objetivos y subjetivos. Estos enfoques permiten que las universidades y las empresas exploren este constructo, buscando establecer que la carrera profesional sea sostenible y exitosa a largo plazo (Binh & Nguyen, 2020). El éxito de la transición de la universidad a la vida laboral requiere que los graduados sean capaces de emplear su educación y sus competencias académicas, pensamiento crítico y habilidades de colaboración y comunicación, en contextos reales de la vida laboral (Costa & McCrae, 2008). La

educación universitaria es uno de los indicadores objetivos del éxito profesional, manifestado en la calidad de la formación recibida.

Las universidades en la búsqueda del nivel de excelencia no deben enfocarse exclusivamente en formar profesionales, sino establecer vínculos a largo plazo con los graduados y monitorearlos desde el momento que ingresan al mundo laboral por medio programas de seguimiento. El seguimiento a graduados (Alumni) en las Instituciones de Educación Superior (IES) se ha incrementado notablemente y ha cobrado una gran importancia en los últimos años (Gaebel et al., 2012; Jeffreys, 2007), generando impacto a nivel institucional, nacional e internacional. La información útil que provee el seguimiento a graduados, estudia la calidad de los conocimientos obtenidos en su etapa de formación, la cualificación del docente, el nivel de la tecnología, la satisfacción de los graduados con sus carreras, la investigación científica, la empleabilidad y desempleo de los graduados y la satisfacción del empleador con la calidad de la formación de los graduados (Avramkova et al., 2021). Uno de estos, el análisis del problema del desempleo es uno de los más preocupantes a nivel de las IES y de gobiernos. Que los graduados de una IES tengan altos niveles de desempleo, se encuentra relacionado al individuo en función de sus cualidades, habilidades y capacidades (Presti et al., 2021). Estos resultados contribuyen a mejorar la calidad de la educación superior fomentando el desarrollo de las competencias académicas que pueden adquirir los estudiantes, minimizar la deserción y poner en ejecución los recursos, empleando nuevas técnicas en el marco de la vida laboral (Robinson, 2004; Tuononen et al., 2019).

El seguimiento a los graduados en cuanto al éxito profesional debería considerar como un complemento dar un seguimiento al profesional en su etapa de preparación universitaria. Iniciando con el motivo que le llevó elegir la universidad (especialidad deseada); durante su etapa de formación, al conocer la satisfacción del estudiante con el proceso educativo, las habilidades técnicas

aprendidas, y la responsabilidad de la universidad con el estudiante. Así como conocer de cerca el mercado laboral y la demanda de profesionales (Avramkova et al., 2021).

De acuerdo con lo anteriormente expuesto, el éxito profesional es un tópico que requiere ser estudiado y analizado a gran profundidad. Pero ¿qué es el éxito profesional?; según Judge et al. (1995), se define como “los resultados psicológicos positivos o los logros relacionados con el trabajo que el individuo ha acumulado como producto de sus experiencias laborales”. Otra definición empleada usualmente en el marco conceptual del éxito de carrera es “la acumulación de resultados laborales y psicológicos positivos derivados de las experiencias laborales” (Seibert et al., 1999, 2001). Unos años después, Arthur et al. (2005), define al éxito profesional como la consecución de resultados deseables relacionados con el trabajo en cualquier momento de las experiencias laborales de una persona a lo largo del tiempo. De acuerdo a un reciente artículo se busca sintetizar estas diferentes perspectivas sobre el éxito profesional al establecer una definición “acumulación de logros positivos de las personas, reales y percibidos, como resultado de sus experiencias laborales” (Pico-Saltos, Carrión-Mero, et al., 2021a, p. 1).

El constructo del éxito profesional ha sido considerado desde diferentes perspectivas. Los investigadores Ng et al. (2005a) mencionan variables predictoras del éxito profesional a través de cuatro marcadores como el capital humano, mentoría organizativa, rasgos personales y atributos sociodemográficos. Otros autores consideran los recursos educativos (actividades extracurriculares, mentoría y autoeficacia), laborales (habilidades, supervisión) y personales (rasgos individuales, motivación) que influyen en la carrera y en la percepción de la misma (Higgins et al., 2008; Rode et al., 2008; Vermeulen & Schmidt, 2008). En los últimos años, los investigadores Koekemoer et al. (2020) proponen otros factores como: la relación del trabajo con la familia,

las experiencias laborales positivas y psicológicas que se encuentran entrelazadas con el vínculo familiar.

En el éxito profesional, la mayoría de los investigadores han considerado que es fundamental estudiarlo por medio de dos enfoques: objetivo y subjetivo.

El éxito profesional objetivo, extrínseco o externo ha sido estudiado desde el surgimiento de esta teoría (Li et al., 2014). Se basa en la evaluación de los logros que pueden ser observados, evaluados y verificados por terceras personas o la sociedad mediante índices extrínsecos como el salario, nivel jerárquico, promociones y el prestigio profesional (Dries et al., 2008; Judge et al., 2010; Y. Shen et al., 2015).

En contraste, el éxito subjetivo, intrínseco o interno surge de la necesidad de conocer la perspectiva idiosincrásica o interna del individuo (Akkermans & Tims, 2017). Este enfoque se define como la percepción de los logros del individuo hacia experiencias profesionales, o la relación trabajo-vida. Algunos indicadores comprenden la satisfacción de la carrera, perspectivas del futuro, y la satisfacción laboral (Hay & Hodgkinson, 2006; Heslin, 2005). Es considerado el enfoque más importante del éxito profesional, que conduce a la consecución de las metas trazadas, confianza en sí mismo y, por consiguiente, al éxito profesional objetivo.

La satisfacción laboral es un reto para las universidades como para las organizaciones (Beigi et al., 2018; Binh & Nguyen, 2020). La satisfacción con el trabajo forma parte de la satisfacción general que involucra la realización de objetivos personales en la formación educativa, el desarrollo profesional y en el círculo familiar (Tuononen, 2019). Cuando las empresas u organizaciones promueven recursos laborales para sus trabajadores, están invirtiendo en mayor productividad y eficacia, el ambiente de trabajo contará con profesionales y empleados motivados y satisfechos, estos sentimientos positivos se reflejan en el

éxito profesional subjetivo, ya que la satisfacción laboral es una predictora importante de dicho enfoque.

De acuerdo con lo expuesto en relación con el éxito profesional y su desarrollo en el ámbito laboral, académico y personal nos genera algunas interrogantes: **a)** ¿Es posible analizar el éxito profesional en países en vías de desarrollo?; **b)** ¿Es posible determinar el éxito profesional de un graduado por medio de los programas de seguimiento por parte de la universidad?; **c)** ¿Cuáles son los factores más importantes para determinar el éxito profesional con enfoque subjetivo y objetivo? **d)** ¿Cuáles son las aportaciones más importantes y las nuevas en el mundo académico con respecto al éxito profesional? **e)** ¿Es posible que, mediante la aplicación de un modelo de predicción de algoritmo genético y herramientas matemáticas, se plantee un modelo óptimo del éxito profesional de graduados en la UTEQ?

La presente tesis doctoral expone respuestas a estas interrogantes, que han sido fundamentadas desde un enfoque teórico y empírico. Lo que ha permitido una contribución al mundo académico y a la sociedad.

1.2.Objetivos

El objetivo principal se basa en realizar una contribución al mundo académico sobre el desarrollo de la teoría del éxito profesional en un país en vías de desarrollo. Esto permite establecer los siguientes objetivos:

- 1) Analizar la estructura intelectual del campo del conocimiento sobre el éxito profesional utilizando métodos bibliométricos.
- 2) Determinar las variables más importantes del éxito profesional subjetivo y objetivo en el contexto en un país en vías de desarrollo, específicamente en la región de Sudamérica.

- 3) Analizar la percepción del graduado universitario sobre su éxito profesional y satisfacción de carrera.
- 4) Proponer un modelo de predicción del éxito profesional, mediante el análisis, extracción y optimización evolutiva de variables objetivas y subjetivas para la determinación de la incidencia del sistema de seguimiento de graduados en una institución de educación superior.

1.3. Metodología y el papel de las publicaciones

La figura 1 muestra un esquema metodológico de este estudio, basado en tres etapas principales que corresponden a los artículos publicados. Las etapas son: 1) Tendencias de investigación del éxito profesional. 2) Éxito Profesional en egresados universitarios y 3) Incidencia del programa ALUMNI en la predicción del éxito profesional objetivo y subjetivo.

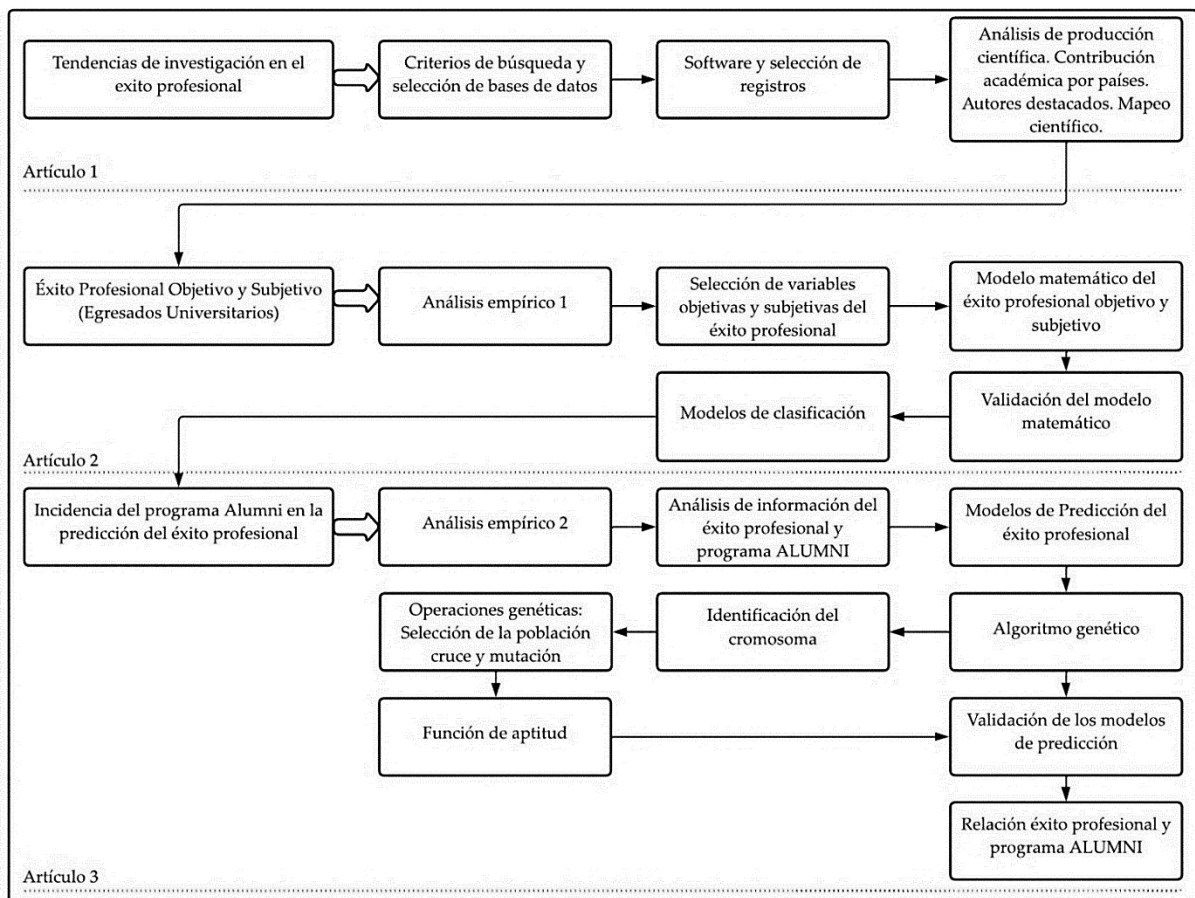


Figura 1. Enfoque metodológico del estudio.

1.3.1. Metodología

Tendencias de investigación del éxito profesional

En esta etapa se realizó una revisión sistemática del campo de conocimiento de la investigación, mediante un análisis bibliométrico (Tranfield et al., 2003; Fahimnia et al., 2015). Se estableció: búsqueda de criterios, selección de bases de datos, selección de software y registros, y el análisis de resultados (análisis de producción científica, contribución académica por países, autores destacados y mapeo científico).

Éxito profesional en egresados universitarios

Se realizó el primer análisis empírico a través de la selección de 51 variables del éxito profesional. Variables objetivas como encontrar el primer trabajo en menos de un año de egresado, graduarse en el menor tiempo posible, poseer casa propia, nivel de formación profesional de los padres, entre otras (Buddeberg – Fischer et al., 2008; Nabi, 1999; Stamm & Buddeberg – Fischer, 2011; Xu & Payne, 2014). Variables subjetivas como reconocimiento de fortalezas y limitaciones, control propio de emociones, persuasión en el trabajo y satisfacción con los conocimientos adquiridos en la universidad (Juez et al., 1999; Romanelli et al., 2006; Gattiker & Larwood, 1986).

Además, se realizó la discretización de variables para transformarlas de variables continuas a categóricas, a través de la escala de Likert con medidas de 1 a 5 (Gerli et al., 2015). Para la construcción de la función de éxito profesional se utilizó un modelo basado en el criterio de expertos, asignando un nivel de importancia a las variables. Para el modelo matemático se consideraron 29 predictores objetivos y 22 subjetivos.

Finalmente, la construcción de los modelos de clasificación estima si un graduado es exitoso objetiva y subjetivamente. Los modelos de clasificación se aplicaron utilizando algoritmos de aprendizaje de clasificación de Weka para la validación objetiva y subjetiva del modelo matemático de éxito profesional (Renú et al.,

2013; Altalhi et al., 2017). Los algoritmos utilizados son: árbol de modelo logístico, árbol J48, árbol forestal y aleatorio (Shi, 2007).

Incidencia del programa Alumni en la predicción del éxito profesional

Para el segundo análisis empírico se realizó un análisis de información de los parámetros que intervienen en el programa Alumni, según los estándares de calidad de educación superior de las universidades y escuelas politécnicas del Ecuador, y manuales de recomendaciones del seguimiento de egresados en instituciones de educación superior de América Latina y Europa (Orozco et al., 2020; Saltos et al., 2016; Schomburg, 2004; Tirado et al., 2015). Posterior a esto, se consideran los registros de egresados del programa Alumni de la Universidad Estatal de Quevedo (UTEQ). Se construye un algoritmo genético basado en la interpretación de un cromosoma (graduado) y un conjunto de genes (variables objetivas y subjetivas del éxito profesional) que generaron modelos de predicción del éxito profesional, a través de operaciones genéticas, como selección de población, cruce y mutación (Reddy et al., 2020; Chen, 2020; Luo et al., 2020; Protopopova & Kulik 2020; D' Angelo & Palmieri, 2021).

La función de aptitud consideró los mejores individuos. La validación de los modelos de estimación del éxito profesional se realizó mediante el análisis estadístico que consideró las métricas: media, desviación estándar, intervalos de confianza y nivel de confianza. Con la finalidad de establecer una relación entre el éxito profesional y el programa Alumni (Alade et al., 2019; Panwar 2021; Abreu, 2019).

1.3.2. Papel de cada publicación

Esta tesis está estructurada por tres capítulos que corresponden al compendio de artículos científicos de alto impacto relacionados a la investigación referente al campo de conocimiento. Cada capítulo muestra el desarrollo de un artículo

científico referente al éxito profesional. La Figura 2 presenta la estructura del compendio de artículos con sus temáticas y objetivos correspondientes.

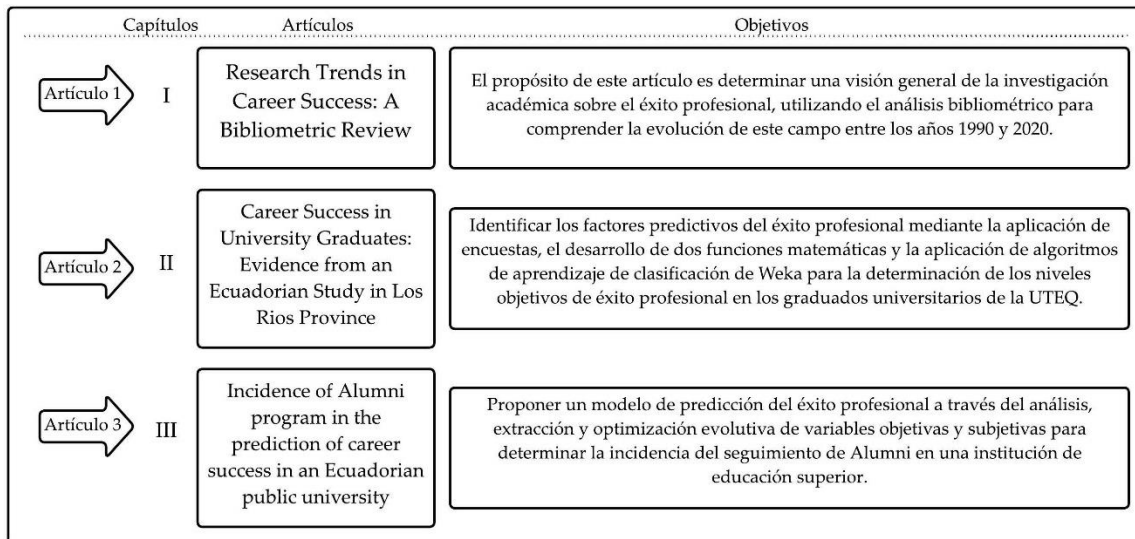


Figura 2. Estructura de la tesis.

Capítulo I: Tendencias de investigación sobre el éxito profesional: Una revisión bibliométrica

El capítulo uno está conformado por un artículo científico basado en la revisión de las tendencias de investigación referente al éxito profesional. En este trabajo, surgieron las siguientes preguntas de investigación: (1) ¿Cuáles son las tendencias del éxito profesional? (2) ¿Qué autores han tenido mayor impacto en el campo del éxito profesional? y (3) ¿Cuál es la estructura intelectual de esta base de conocimientos sobre el éxito profesional? Los resultados de este artículo muestran la tendencia de crecimiento exponencial de este campo científico, las principales contribuciones de autores, instituciones, aportes internacionales y estructura intelectual de esta línea de investigación. Este análisis permitió comprender la estructura del campo de estudio mediante las áreas de estudio relacionadas con el número de citas según las revistas de referencia, evaluando 1369 artículos, 691 revistas y 3106 autores.

Capítulo II: El éxito profesional de los graduados universitarios: Evidencia de un estudio ecuatoriano en la provincia de Los Ríos

El capítulo dos, presenta un segundo artículo basado en el análisis empírico del éxito profesional de graduados de la universidad pública ecuatoriana UTEQ. Se planteó la pregunta de investigación: ¿Será posible establecer una metodología que reúna aspectos objetivos y subjetivos para evaluar el éxito profesional de un egresado universitario? Los hallazgos mostraron dos funciones matemáticas que estiman el éxito profesional objetivo y subjetivo. El algoritmo árbol modelo logístico presenta un 76,09% de instancias clasificadas correctamente, este algoritmo se adaptó mejor a los factores objetivos predictivos del éxito. Mientras que, para los factores subjetivos del éxito profesional, el algoritmo árbol forestal aleatorio presentó un 94,59% de instancias clasificadas correctamente. El nivel de clasificación del éxito objetivo y subjetivo se planteó en tres niveles: i) exitoso, ii) moderadamente exitoso y iii) fracaso. Donde 50 graduados universitarios clasificaron en la categoría de éxito, 318 en moderadamente exitosos y 180 en la categoría de fracaso.

Capítulo III: Incidencia del programa Alumni en la predicción del éxito profesional en una universidad pública ecuatoriana

El capítulo tres, trata sobre la incidencia del seguimiento a graduados (Alumni) en la predicción del éxito profesional de los graduados UTEQ. En este estudio se formuló la pregunta de investigación: ¿Es posible que, mediante la aplicación de un modelo de predicción de algoritmo genético y herramientas matemáticas, se plantee un modelo óptimo del éxito profesional de graduados en la UTEQ? Los resultados muestran modelos de predicción del éxito profesional a través de un algoritmo genético con operaciones de selección, cruce y mutación de individuos, donde un cromosoma y un conjunto de genes representan un graduado y variables objetivas y subjetivas del éxito profesional respectivamente. Las variables objetivas conllevan una mayor influencia en el modelo predictivo. Mientras que, las variables subjetivas revisten importancia dependiendo de las

características del individuo y sus esquemas de valores o metas por alcanzar. Se recomienda a las universidades implementar en su estructura un sistema de monitoreo de sus graduados, permitiendo adaptaciones a la malla curricular en temas técnicos estratégicos y éticos humanos.

1.4. Datos generales de los artículos

Las figuras 3 – 5 muestran la información general de los artículos, como el título, autores y coautores, filiaciones institucionales, editores académicos, revista, DOI y fechas de recibido, aceptación y publicación de los artículos científicos.

Research Trends in Career Success: A Bibliometric Review

by Roberto Pico-Saltos ^{1,2} Paúl Carrión-Mero ^{3,*} Néstor Montalván-Burbano ^{3,4,5} Javier Garzás ¹ and Andrés Redchuk ¹

¹ Department of Statistics and Operations Research, Rey Juan Carlos University, 28933 Madrid, Spain
² Faculty of Engineering Sciences, Quevedo State Technical University, Quevedo 120304, Ecuador
³ Centro de Investigaciones y Proyectos Aplicados a las Ciencias de la Tierra (CIPAT), ESPOL Polytechnic University, Guayaquil 9015863, Ecuador
⁴ Department of Economy and Business, University of Almería, Citra, Sacramento s/n, La Cañada de San Urbano, 04120 Almería, Spain
⁵ Innovation, Management, Marketing and Knowledge Economy Research I2Maker, ESPOL Polytechnic University, Guayaquil 9015863, Ecuador
* Author to whom correspondence should be addressed.

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Received: 31 March 2021 / Revised: 16 April 2021 / Accepted: 16 April 2021 / Published: 21 April 2021

Figura 3. Información general del primer artículo.

Career Success in University Graduates: Evidence from an Ecuadorian Study in Los Ríos Province

by Roberto Pico-Saltos ^{1,2,*} Lady Bravo-Montero ^{3,*} Néstor Montalván-Burbano ^{3,4,5} Javier Garzás ¹ and Andrés Redchuk ¹

¹ Department of Statistics and Operations Research, Rey Juan Carlos University, 28933 Madrid, Spain
² Faculty of Engineering Sciences, Quevedo State Technical University, Quevedo 120304, Ecuador
³ Centro de Investigaciones y Proyectos Aplicados a las Ciencias de la Tierra (CIPAT), ESPOL Polytechnic University, Guayaquil 9015863, Ecuador
⁴ Department of Economy and Business, University of Almería, Ctra. Sacramento s/n, La Cañada de San Urbano, 04120 Almería, Spain
⁵ Innovation, Management, Marketing and Knowledge Economy Research I2Maker, ESPOL Polytechnic University, Guayaquil 9015863, Ecuador
* Authors to whom correspondence should be addressed.

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Figura 4. Información general del segundo artículo.



Figura 5. Información general del tercer artículo.

1.5. Información de las revistas científicas

Las figuras 6 a 9 muestran la evaluación Journal Citation Reports, el impact factor y la evaluación Scopus del journal Sustainability y Applied Science.

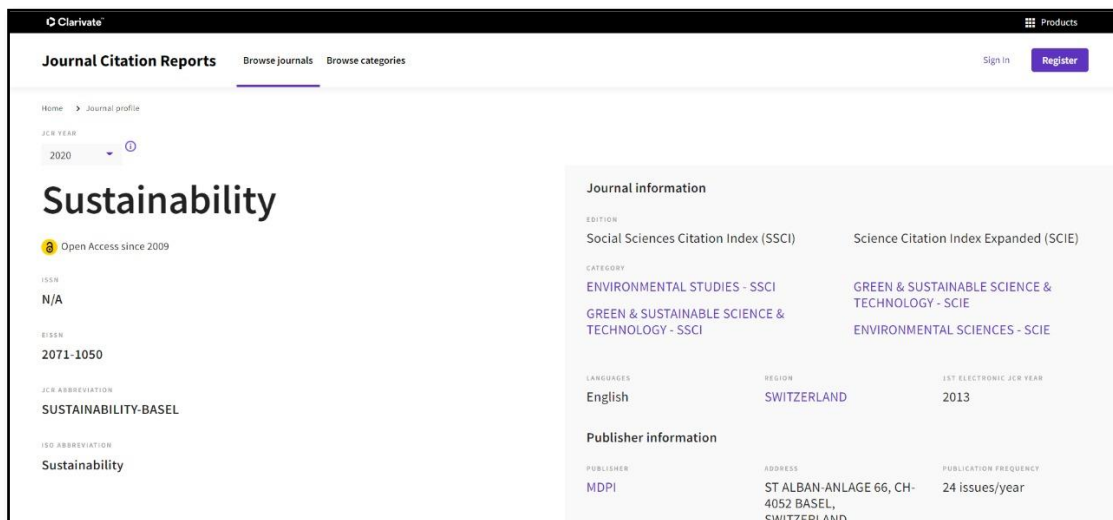


Figura 6. Evaluación Journal Citations Reports de Sustainability.

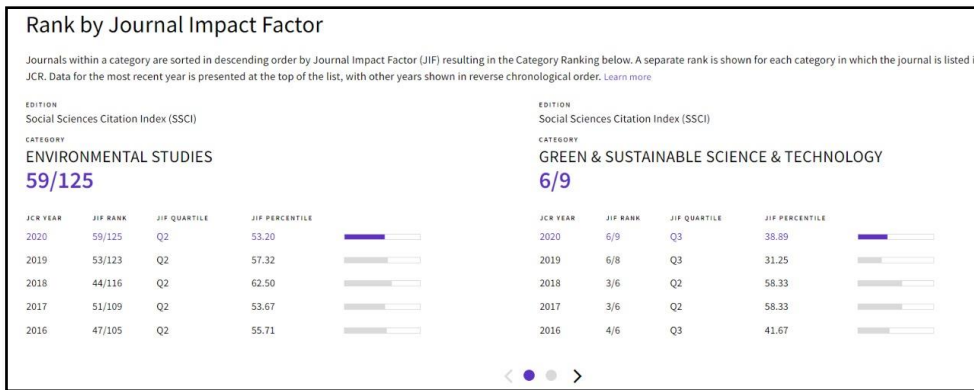


Figura 7. Impact factor de Sustainability.

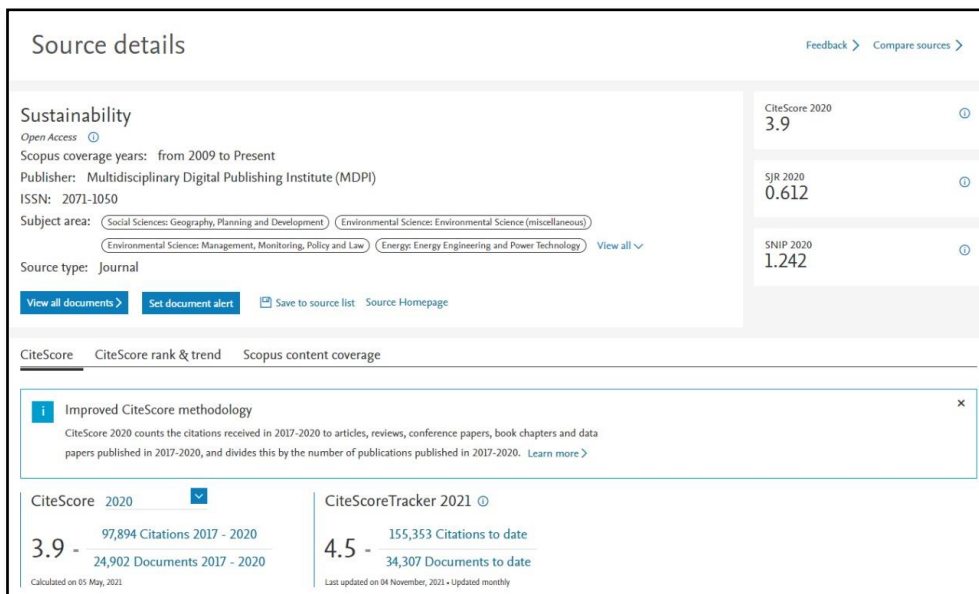


Figura 8. Evaluación Scopus de Sustainability.

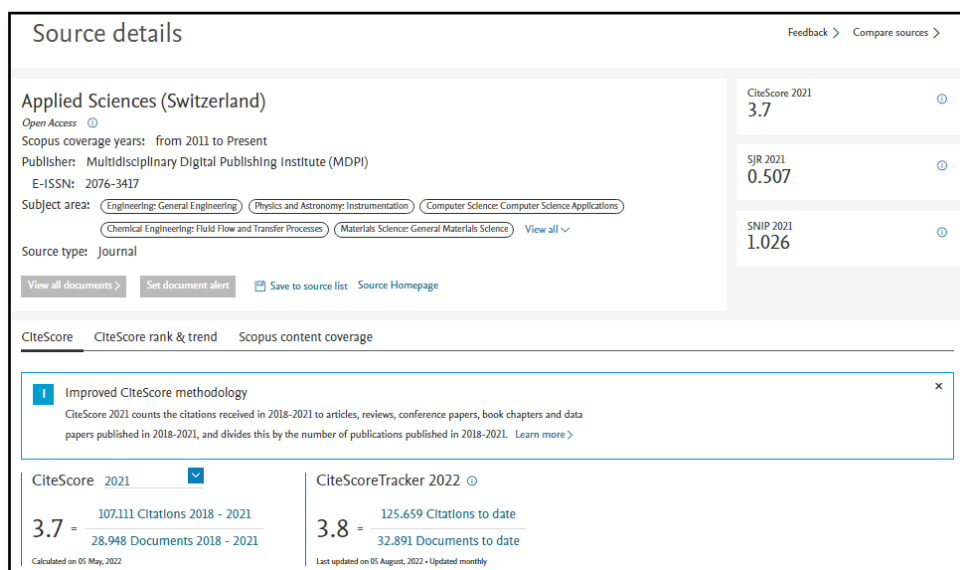


Figura 9. Evaluación Scopus de Applied Science.

Capítulo I: Tendencias de investigación sobre el éxito profesional: Una revisión bibliométrica

Capítulo I: Tendencias de investigación sobre el éxito profesional: Una revisión bibliométrica

Artículo 1: Research Trends in Career Success: A Bibliometric Review



Article

Research Trends in Career Success: A Bibliometric Review

By Roberto Pico-Saltos ^{1,2}, Paúl Carrión-Mero ^{3,*}, Néstor Montalván-Burbano ^{3,4,5}, Javier Garzás ¹ and Andrés Redchuk ¹

¹ Department of Statistics and Operations Research, Rey Juan Carlos University, 28933 Madrid, Spain

² Faculty of Engineering Sciences, Quevedo State Technical University, Quevedo 120304, Ecuador

³ Centro de Investigaciones y Proyectos Aplicados a las Ciencias de la Tierra (CIPAT), ESPOL Polytechnic University, Guayaquil 9015863, Ecuador

⁴ Department of Economy Economy and Business, University of Almería, Citra, Sacramento s/n, La Cañada de San Urbano, 04120 Almería, Spain

⁵ Innovation, Management, Marketing and Knowledge Economy Research I2Maker, ESPOL Polytechnic University, Guayaquil 9015863, Ecuador

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(This article belongs to the Special Issue Wellbeing in Education, Career, and Work: Current Contributions from Emotional Intelligence and other Non-Cognitive Constructs to the Psychology of Sustainability)

Abstract: The purpose of this article is to provide an overview of academic research on professional success, using the bibliometric analysis to understand the evolution of this field between the years 1990 and 2020. The information was obtained from the publications indexed in the Scopus database, under a rigorous bibliometric process that comprises five parts: (i) criteria search of the field, (ii) selection of database and documents, (iii) inclusion and selection criteria, (iv) software and data selection, and (v) analysis and results. The results show professional success as a scientific discipline in full exponential growth, which allows us to consider the main contributions of authors, institutions, and international contributions, as well as to consider the main themes that have shaped the intellectual structure of the subject through their visualization using bibliometric maps of co-citation and co-occurrence, which combined showed eight main

lines of research. The results obtained allowed us to identify patterns of convergence and divergence in various topics, which allows obtaining current and diverse information on the state of the research field's art

Keywords: *professional success; objective success factors*

1. Introduction

Interest in researching career success has increased in the last 30 years, and this is also due to the increase in the number of graduates from higher education institutions [1]. This is why managers need to maintain a link between the university and their former students since the quality of their training process is related to their success in the labour market [2]. As a result of the monitoring of graduates, experts in the field of education and the labour market indicate that there is a considerable percentage of students who are not working in their specialties, which translates into job dissatisfaction [3].

Professional success starts from the etymological meaning of the word "success", which comes from the Latin "exitus" which means exit, a final and satisfactory result of a task [4]. Professional success is known as the accumulated positive achievements of people, real and perceived, as a result of their work experiences [5,6,7,8]. This definition shows the need to divide the analysis of success into extrinsic or objective components [8,9,10] and intrinsic or subjective of the individual [6,11,12]. Objective career success is evaluated in terms of salary and promotions [12]; while subjective success refers to the evaluation of the individual's own criteria on the progress of the career [13]. To achieve success, a balance of four dimensions is necessary: personal, professional, business, and family [14].

In this field of study, the factors that influence professional success have been related [15]. Objective factors include good salary [16], age [17], labour promotion [18], recognition [19], work in a prestigious company, leadership [20], and teamwork [21]. On the other hand, the main subjective factors are the following: achieving happiness [22], gender [23], professional and job satisfaction [24], emotional intelligence [25], fulfilment of goals [5], and ethical behaviour [26]. These factors are the main variables attributed to professional success and have been studied throughout the literature [7,27,28].

Professional success is related to various areas of knowledge, including the influence of gender. When competing with men in the chosen field of training, the professional problems faced by women were analysed while still fulfilling the main role of mother and wife [29]. Successful women serving as corporate directors in Canadian companies are recognized due to their high level of training, entrepreneurial experience, and having reached a high occupational level [30].

Additionally, it is recognized that self-confidence, good communication skills, and academic improvement courses are the most important factors for success and professional advancement [31]. Good command of communication

is essential for achieving the personal and professional success of students in the future [32]. In a study aimed at professionals in business, informatics, and engineering, attached to the Master's in Information Systems (MIS), of the University of the State of California, it is showed that professional success does not depend exclusively on technical skills in computer science but also communication and interpersonal skills [33].

In the industrial sector, graduates of engineering programs who achieve professional success possess effective communication and information skills [34]. In industrial health management, the factors that increase economic income do not affect life satisfaction. The only predictor of satisfaction is feeling safe while working outside of their home organizations [35].

The field of medicine shows that medical teachers who dedicate more than 50% of their time to clinical care have less time in tutoring. This contributes to notable differences in the promotion and greater dissatisfaction with academic medicine [36]. Mentoring is considered a key factor in professional development, and it has been shown that people who have received tutoring present greater opportunities for promotion, higher salary, and professional satisfaction [37].

On the other hand, intelligence quotient (IQ) and, consequently, high undergraduate grades influence the rate of increase in income over the long term and do not influence the starting salary [38]. Human resource development needs to apply new means to assess professional development. Therefore, both objective and subjective factors must be included because traditional assessment methods are inadequate for capturing change and progress [39]. Finally, previous undergraduate internships' participation generates advantages in early career success, which includes: less time to obtain the first position, higher salary, and general job satisfaction [40].

Research in the field of career success has been strengthened in recent years. However, a global analysis of the issue has not been carried out. Bibliometric studies are a recently used research tool for analysing scientific activity in a specific field of study [41,42]. The bibliometric analysis allows one to quantitatively evaluate the impact of the research, recognizing past particularities and critical points in the present, in order to suggest research trends [43].

Thus, in this field of study on professional success, the following research questions arose: (1) What are the trends in professional success? (2) Which authors had the greatest impact in the field of professional success? and (3) What is the intellectual structure of this professional success knowledge base?

This study aims to carry out a bibliometric analysis by collecting information from the Scopus database to understand the intellectual structure and trends on professional success.

This article is made up of four main sections: First, following the introduction, the materials and methods section are presented, which describes the database used, as well as the search predictors used. The second section

describes the research's outstanding results, showing the trends and new research lines. Third, there is the discussion, where the main relationships between the different results presented are summarized. Finally, the fourth section includes the conclusions of the investigation. It is worth mentioning that **supplementary material** is added where secondary tables are included. Finally, a section of the references used in this research is added.

2. Materials and Methods

Analysing an academic field requires meticulous work on the researcher's part, allowing the researcher to deepen and increase knowledge. This is achieved by using a rigorous and formal procedure that allows the process to be reproduced and made transparent, called a systematic review of the literature [44,45]. This rigorous process is characteristic of bibliometric analyses [46,47].

Bibliometrics is considered a research field, which allows analysing scientific production and its performance according to its authors, countries, institutions, and journals [48,49,50]. That is, it allows for the studying of the structure of an academic discipline or area of knowledge [51]. These analyses are complemented with visualization maps, called bibliometric maps or scientific maps, allowing one to observe the structures and their connections of the various investigations, disciplines, and research fields [52,53].

These bibliometric studies have allowed the study in various fields of knowledge such as business and management [54,55,56], education [57,58], geoscience [59,60].

In this study, a systematic process was established (see **Figure 1**): (i) criteria search of the field, (ii) selection of database and documents, (iii) inclusion and selection criteria, (iv) software and data selection, and (v) analysis and results.

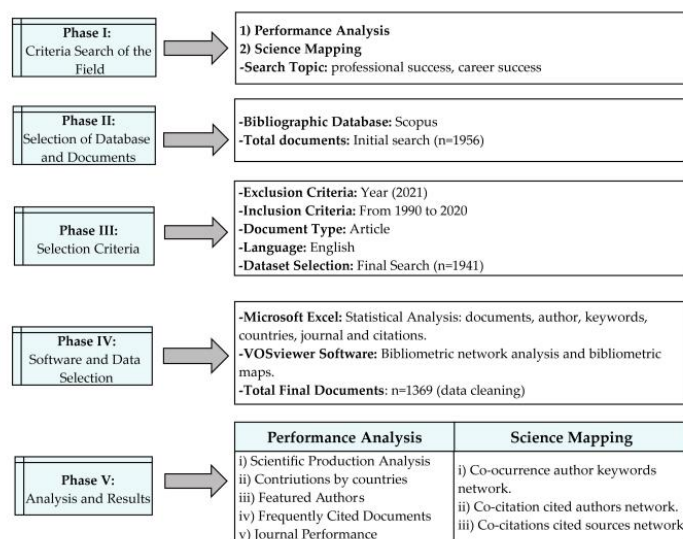


Figure 1. Methodological Scheme

2.1. Criteria Search of the Field

This research seeks to assess the conceptual evolution of the research topic through a combination of two approaches: (i) performance analysis and (ii) science mapping [52]. The first, performance analysis, allows one to evaluate the impact of publications by contrasting information that relates these documents to related authors, countries, and institutions. The second approach is bibliometric mapping, also called science mapping, which is a graphic representation that allows for the visualizing and identifying of the structure of the field of study and its relationships with the main research topics [52,60].

These analyses require identifying the field of study; therefore, it is necessary to use descriptors that allow it to be limited. For this purpose, the terms used were “professional success” [61,62] and “career success” [63,64], which have been used interchangeably by researchers in this area.

2.2. Selection of Database and Documents

In bibliometric studies, it is necessary to use a source or database that is reliable and of quality to proceed to extract the required information. The Scopus database is selected due to its (i) wide coverage of journals in most fields of knowledge; (ii) high-quality standards (for example, indicators such as Scimago Journal Rank); (iii) tools for data visualization and analysis; and (iv) easy access to your references [65,66,67].

The data were extracted from the Scopus database in January 2021, using the mentioned descriptors and a combination of widely accepted variables in bibliometrics related to “titles, abstract, and keywords”, allowing one to obtain the following topic search: (TS) = (TITLE-ABS-KEY (“Professional success”) OR TITLE-ABS-KEY (“career success”)). In the initial search, 2937 documents were obtained.

2.3. Selection Criteria

In this third phase, criteria were established which made it possible to refine the information obtained, the documents published between the years 1991–2020 were considered in order to analyse the intellectual structure of the field of study of the last three decades, and 2021 was excluded because it was the year in course. It was limited to scientific articles since they are considered the most representative of scientific activity due to their visibility, impact, and knowledge certified by blind peers [68,69], and 1956 articles were obtained from this restriction.

The data obtained from Scopus were downloaded in CSV format (comma-separated values), displaying information on the scientific production of the field of study, such as the authors and their affiliations, title and year of publication,

keywords, and abstract, among others, which are considered relevant. This bibliographic information must be reviewed and refined, eliminating duplicate files or errors in the records [70], and 15 articles were discarded among erroneous and duplicate documents; that is, a base of 1941 articles was obtained.

Additionally, a manual analysis of the selection of articles was carried out by the authors. This selection made it possible to obtain an inclusion criterion for articles that meet a definition of professional success proposed by the author Judge [64] "The real or perceived achievements that people have accumulated as a result of their work experiences." The authors made this selection, who independently carried out the manual refinement of the documents, a procedure that ensures the quality of the information by reducing outliers [53,71]. As a result, a database of 1369 articles was obtained related to the study topic; that is, the 572 articles that did not meet the established definition and scope of the study were eliminated.

2.4. Software and Data Selection

Next, we proceed to the selection of the software to be used based on the data selection. Excel software has been used for data cleaning and performance analysis corresponding to the results section [72]. About the analysis of the structure of the field of study, bibliometric maps were constructed using the VOSviewer software, version 1.6.16 (University of Leiden-Netherlands), which allows for the formation and visualization of a bibliographic network, using graphs of two dimensions [73]. This software has been used in other studies in various areas of knowledge [74,75,76,77].

2.5. Analysis and Results

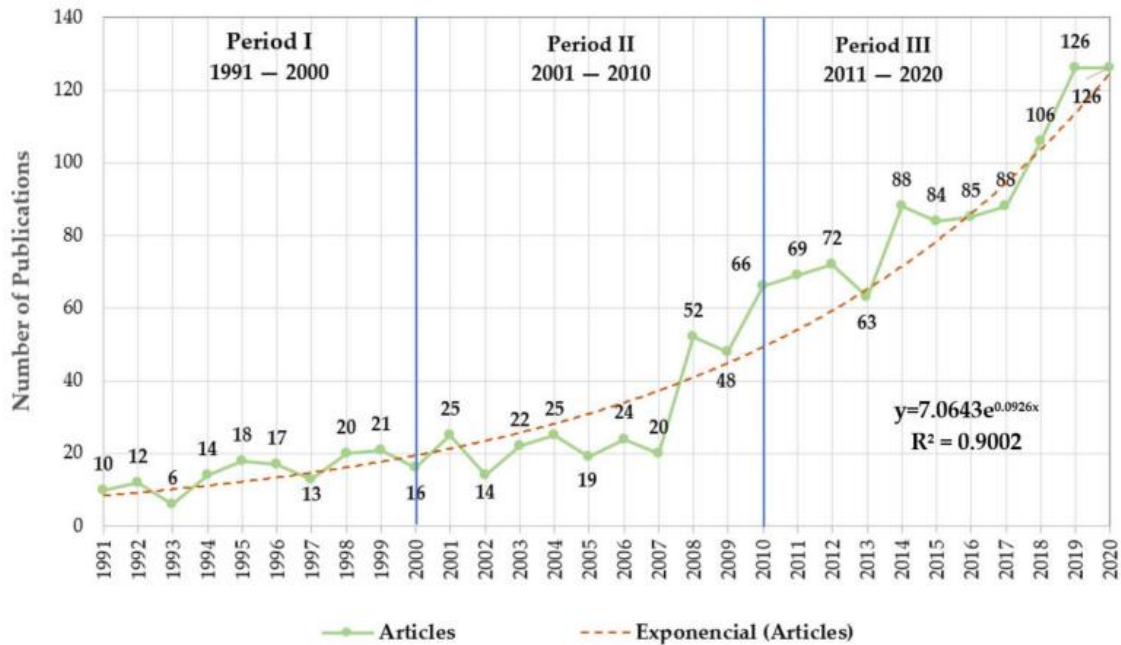
Data analysis is done in two stages. The first is a statistical analysis of the data, which allows for the performance analysis of the intellectual structure, considering the growth patterns of publications and the contributions made by the main countries, universities and authors, and the renowned journals in the field of study [52]. The second corresponds to the analysis of the intellectual structure through the construction of bibliometric maps. The co-occurrences of author and co-citation words (authors and journals) are examined, allowing for a broad understanding of the structure to be obtained for the field of study [55,78,79].

3. Results

3.1. Performance Analysis

3.1.1. Scientific Production Analysis

A total of 1369 scientific articles, indexed in Scopus, reveal a constant growth in the last three decades (1991–2020), showing a growing interest in the academy’s part (see Figure 2). For analysis purposes, it was divided into three time periods: introduction (1991–2000), growth (2001–2010), and maturity (2011–2020)



2020).

Figure 2. Growth of scientific production relating to professional success.

Period I-Introduction (1991–2000): During this period, 147 articles were published, representing 10.74% of all publications on this subject, with 8196 citations. Some initial research focused on professional success and gender relations, analysing from the professional trajectory [80], cognitive ability [81], and social and personal attributes [82], as well as work style and job satisfaction [24]. Later studies continued the study of professional success from an individual approach with the organization, examining human capital [83,84], personality [8,64], individual, family and organizational differences [11], and motivational variables [85]. Other studies propose political influence [7], being protected or having a mentor [86], social achievements [19], or rewards related to job promotion and salary increases [27]. Finally, studies related to subjectivity–objectivity [4,87], objective (extrinsic), and subjective (intrinsic) success [8,64] were developed.

Period II-Growth (2001–2010): Greater development of the study field is exhibited, with 315 documents (23.01%), allowing 17,529 citations to be obtained. In this period, investigations were carried out that were related to professional success with personality [5,87,88,89], employability of the professional [90,91], and job or professional assistance networks [92,93]. Other authors considered some influences that can modify professional success when examining the value

of mentoring and the actions of mentors [94,95,96] professional self-efficacy [97], professional attitude [98], the value of work [99], or ethical behaviour [26]. Situations related to the individual as a professional are also examined, considering happiness [100] or physical stature [101].

Period III-Maturation (2011–2020): A significant increase in the number of publications is observed, from 315 in period II to 907 publications in this period, representing 66.25% of the total number of publications and 11,530 citations. During this period, studies were developed that relate professional success to work activity, considering employability [102], professional adaptability as a psychosocial resource [103,104,105], flexible professional practices [106], or vocation and labour commitment [107]. Other researchers studied the relationship between professional success in the individual through their personality roles [108], narcissism [109], dispositional positive affect [110], their behaviour in professional networks [111], gender [23], or their culture of origin and place of reception [61]. Some variables related to the individual's career were also considered, such as factors of professional success, investigating mobility and employability [112], the perception of career management [113], career advancement [18], or the impact of a tutor on their work activities [114,115]. In recent years, it has been considered to study professional shocks as unexpected events in the professional career [116], the genetics of the individual linked to their education [117], creative cognition [118], the impact of international work experience [119], or happiness, considering that they can receive higher income and exhibit better performance [22]. Other studies looked at subjective career success through professional proactivity [120] and leadership [20].

Additionally, Price's law has been used for the productivity analysis of a field of study [121,122,123], which determined that it fits an exponential growth model ($y = 7.0643e^{0.0926x}$) where the value of $R^2 = 0.9002$ (see Figure 2).

3.1.2. Contributions by Countries

The contribution of the different countries was established considering the affiliation of the authors of the articles. The results show the collaboration of 76 countries. Table 1 shows the 15 main countries that have contributed to this field of study, from Europe (8), Asia (4), America (2), and Oceania (1).

The United States leads the ranking of the most influential countries with 603 documents and 23,628 citations. This is due to the importance that the field of study has generated in recent years when considering labour resources and their demands related to personal satisfaction and professional success [124]. The second-place corresponds to the United Kingdom with 133 documents and 3915 citations. The third and fourth places correspond to Canada and Germany, respectively. Belgium has the highest average citations (45.20) of the group.

Table 1. Top 15 countries by the number of articles

Ranking	Country	Documents	Citations	Average Citations
1	United States	601	23,689	229,691
2	United Kingdom	133	3915	101,569
3	Canada	93	1609	58,473
4	Germany	87	2462	89,419
5	Australia	75	1421	45,053
6	Netherlands	61	2267	66,417
7	China	58	701	69,785
8	Spain	36	367	33,966
9	Switzerland	36	822	31,396
10	France	35	789	47,363
11	Malaysia	29	219	36,997
12	South Korea	28	188	33,891
13	Belgium	25	1130	43,236
14	Hong Kong	21	786	27,398
15	Italy	21	172	28,852

This cooperation between countries needs to be analysed using science maps. For this purpose, the VOSviewer software was used, identifying those who have made at least five contributions to professional success. Figure 3 shows the bibliographic coupling analysis of countries, exhibiting 38 nodes (countries) in six clusters and maintaining 688 links of relationships. The strength of cooperation can be seen in the width of the links. The United States is the central nucleus, presenting 37 collaborative relationships (links), with greater intensity than Germany, Canada, France, the United Kingdom, and Australia. Whereas the United Kingdom frequently collaborates with the United States, China, and Canada. Countries with a reduced number of collaborations, such as Nigeria, Argentina, and Brazil, are shown.

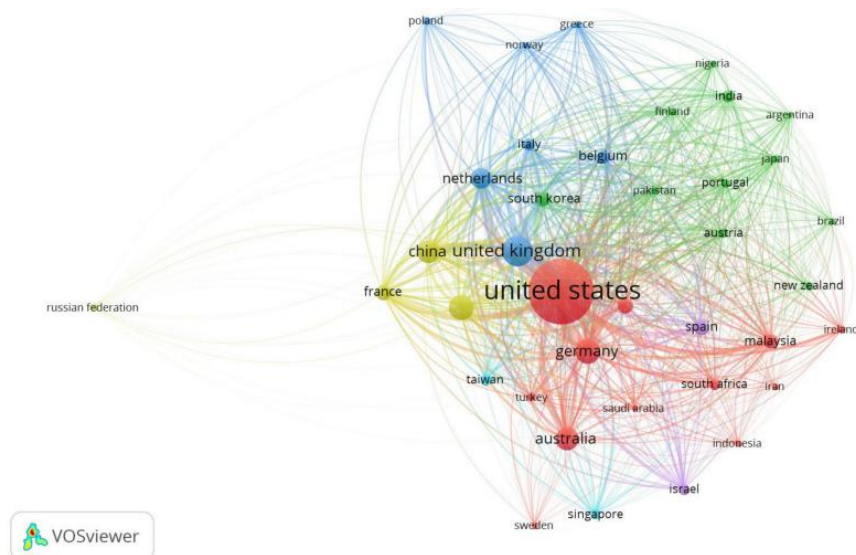


Figure 3. Bibliographic coupling of countries

Next, Figure 4 shows a map that includes the 76 countries contributing to the study topic. The 15 most prominent countries are distinguished by colours and number of publications. Countries that have not posted about career success are shown in white.

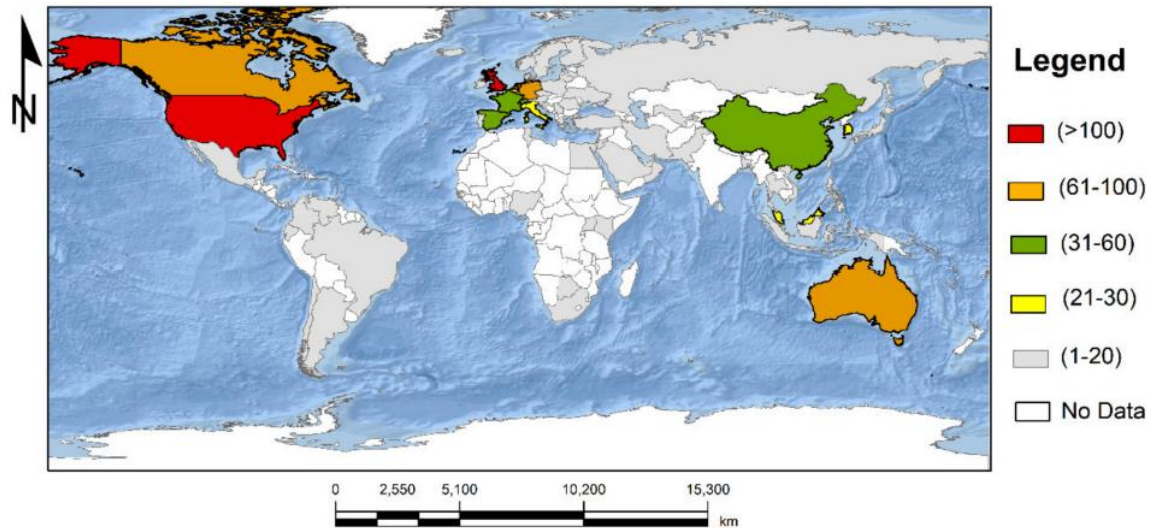


Figure 4. Main contributing countries map in career success.

3.1.3. Featured Authors

In the professional success study, the 1369 articles have been written by 3106 authors. Authors who mostly present a single publication (87.99%), two publications (8.15%), three publications (1.74%), and four or more (2.12%). In Table 2, the three authors with the highest production are shown, Judge T.A. (3837 citations), Kraimer M.L. (3478 citations), and Seibert S.E. (3016 citations). These authors belong to the United States.

Four works are highlighted in the top 15 of most cited documents (see Table 3) and published in the journals *Personnel Psychology*, *Journal of Applied Psychology*, and *Journal of Vocational Behavior*. The most representative author is Timothy A. Judge, from Fisher College of Business (United States), with 14 articles. The second author with the highest number of publications is Daniel M. Spurk from the University of Bern (Switzerland), where his representative works have been carried out with Andrea E. Abele, from the Friedrich-Alexander-Universität Erlangen-Nürnberg [97,125,126,127,128].

Table 2. Top 15 most cited authors

Author	Institution	Country	Documents	Citations	H-Index
Judge T.A.	Fisher College of Business	United States	14	3837	89
Spurk D.	University of Bern	Switzerland	14	695	19
Zhou W.	Renmin University of China	China	12	241	10
Baruch Y.	Southampton Business School	United Kingdom	11	330	42
Burke R.J.	Schulich School of Business	Canada	11	165	53
Abele A.E.	Friedrich-Alexander-Universität Erlangen-Nürnberg	Germany	10	650	32
Bozionelos N.	Emlyon Business School	France	10	502	22
Hirschi A.	University of Bern	Switzerland	10	241	29
Blickle G.	Universität Bonn	Germany	9	207	21
Van Der Heijden B.I.J.M.	Universiteit Gent	Belgium	9	861	40
Buddeberg-Fischer B.	Rehabilitation Clinic Seewis (GR)	Switzerland	8	339	25
Kraimer M.L.	Rutgers University-New Brunswick	United States	8	3478	30
Orpen C.	The Business School at BU	United Kingdom	8	206	20
Otto K.	Philipps-Universität Marburg	Germany	7	49	14
Seibert S.E.	Rutgers University-New Brunswick	United States	6	3016	21

3.1.4. Frequently Cited Documents

To assess a field of study, it is necessary to consider documents based on the citations obtained [122]. The scientific production of professional success (1369 articles) presents 37,255 citations. Table 3 shows the publications which are part of the 15 most cited documents on professional success and represent 1.09% of the total.

The article with the highest number of citations is published by Seibert S.E., Kraimer M.L., and Liden R.C. in 2001 in the *Academy of Management Journal*.

Table 3. Top 15 most cited documents on the subject of career success.

R	Authors	Year	Article Title	Citations	References
1	Seibert S.E., Kraimer M.L., Liden R.C.	2001	A social capital theory of career success	1221	[63]
2	Judge T.A., Higgins C.A., Thoresen C.J., Barrick M.R.	1999	The big five personality traits, general mental ability, and career success across the life span	1062	[64]
3	Judge T.A., Cable D.M., Boudreau J.W., Bretz R.D., Jr.	1995	An Empirical Investigation of the Predictors of Executive Career Success	766	[83]
4	Seibert S.E., Kraimer M.L., Crant J.M.	2001	What do proactive people do? A longitudinal model linking proactive personality and career success	738	[87]
5	Seibert S.E., Grant J.M., Kraimer M.L.	1999	Proactive personality and career success	723	[8]
6	Nosek B.A., Spies J.R., Motyl M.	2012	Scientific Utopia: II. Restructuring Incentives and Practices to Promote Truth Over Publishability	552	[129]
7	Van Der Heijde C.M., Van Der Heijden B.I.J.M.	2006	A competence-based and multidimensional operationalization and measurement of employability	450	[90]
8	Parasuraman S., Purohit Y.S., Godshalk V.M., Beutell N.J.	1996	Work and family variables, entrepreneurial career success, and psychological well-being	438	[130]
9	Eby L.T., Butts M., Lockwood A.	2003	Predictors of success in the era of the boundaryless career	436	[131]
10	Judge T.A., Cable D.M.	2004	The effect of physical height on workplace success and income: Preliminary test of a theoretical model	398	[101]
11	Bretz R.D., Judge T.A.	1994	Person-organization fit and the theory of work adjustment: Implications for satisfaction, tenure, and career success	369	[132]
12	Fuller Jr. B., Marler L.E.	2009	Change driven by nature: A meta-analytic review of the proactive personality literature	332	[88]
13	Spangler W.D.	1992	Validity of questionnaire and TAT measures of need for achievement: Two meta-analyses	327	[19]
14	Seibert S.E., Kraimer M.L.	2001	The Five-Factor Model of Personality and Career Success	322	[5]
15	Rothwell A., Arnold J.	2007	Self-perceived employability: Development and validation of a scale	310	[91]

R: Ranking.

This study shows that social resources positively affect professional success, based on three main advantages offered by the network: career sponsorship and access to information and resources [63]. Followed by the article published in 1999 in the journal *Personnel Psychology*, in this article, the relationship of the personality model traits, based on five factors and mental faculty, with professional success, was analysed [64]. Finally, the third most cited article was the one published in 1995, in the journal *Personnel Psychology* by Judge et al. [83], where it was already considered that certain variables intervene in professional success, both objective (salary and ancestry) and subjective (job satisfaction and professional satisfaction). Other articles that have generated more than 300 citations are displayed in the table in question.

3.1.5. Journal Performance

This analysis allows an overview of the field of study to be obtained by knowing the journals in which the various documents and fields of knowledge have been published [50]. The subject of professional success has been considered by 691 journals, where the 15 most important ones represent 25.64% of the scientific production and have 50.49% of the citations. Table 4 shows the 15 most important journals based on the number of publications, along with performance indicators: Citescore, Scimago journal rank (SJR), and source-normalized impact per paper (SNIP).

Table 4. Top 15 most cited journals on the research field.

Journals	Articles	Citations	Citescore	SJR	SNIP	H-Index
Journal of Vocational Behavior	90	7103	6.3	2.210	2.551	141
Career Development International	80	1763	3.6	1.052	1.600	56
International Journal of Human Resource Management	34	822	5.5	1.263	1.885	107
Journal of Career Development	27	504	3.1	0.564	1.356	41
Journal of Career Assessment	14	349	4.1	1.119	1.694	56
Frontiers in Psychology	12	62	3.2	0.914	1.200	95
Human Resource Management	11	658	8.5	2.322	3.094	87
Journal of Applied Psychology	11	2030	10.7	6.423	3.692	269
Journal of Occupational and Organizational Psychology	11	611	5.1	1.774	2.092	106
Journal of Managerial Psychology	11	428	3.9	1.046	1.542	74
Journal of Organizational Behavior	11	1132	9.7	3.606	3.273	164
Human Relations	10	300	7.1	2.519	3.043	124
Journal of Management Development	10	194	3.2	0.516	1.207	55
Personnel Psychology	10	2968	2	0.351	0.597	133
Personnel Review	9	417	3	0.841	1.458	67

The most important journal based on its production is the *Journal of Vocational Behavior* (90 publications), whose research areas are career choice, professional development, and career adjustments throughout professional life. The second and third places are occupied by *Career Development International* (80) and *International Journal of Human Resource Management* (34). Based on its citations, the *Journal of Vocational Behavior* is the most cited (7103), followed by the *Journals Personnel Psychology* (2968) and *Journal of Applied Psychology* (2030). Based on CiteScore's performance indicators, the most prominent journal in the *Journal of Applied Psychology* (10.7) has the highest H-Index (269). Followed by the *Journal of Organizational Behavior* with 9.7 from Citescore and 164 from H-Index. Regarding the prestige of the journals (SJR), the most important is the *Journal of Applied Psychology*, *Journal of Organizational Behavior*, and *Human Relations*.

3.2. Science Mapping

3.2.1. Co-occurrence Network of Author Keywords

This bibliometric analysis represents the connection between the keywords, forming a network where those that appear more frequently in the study subject are indicated, thus allowing one to examine concepts (keywords) and themes

(grouped concepts in clusters). This analysis was run with the VOSviewer software, which generates a visual and multidimensional representation of the data [59,133].

A total of 2777 keywords were obtained from the database, of which 116 remained in the documents with an occurrence of at least five times. These various topics were divided into 10 groups (see Table S1 in the Supplementary Materials section). Figure 5 represents these eight groups, with 92 nodes, 675 links, and a total link strength of 1290. The term “career success” has 276 occurrences and a relationship with 71 terms; it is in Group 3 (blue colour) as the most relevant word.

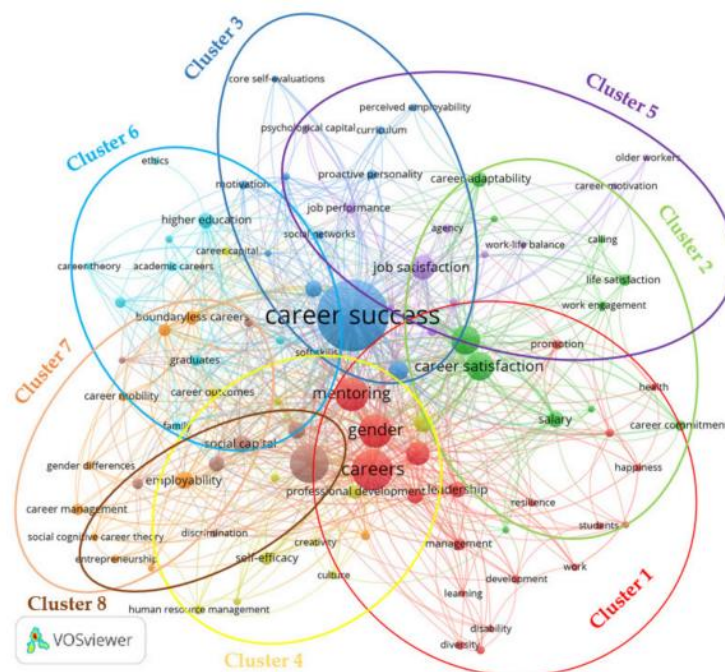


Figure 5. Co-occurrence network of author keywords.

According to the number of nodes (20), the most extensive research area is cluster 1, coloured red, as shown in Figure 5. This class is called: ‘Career and Gender’, since the two terms of the highest co-occurrences are career and gender, with 108 and 76 co-occurrences. In this area, authors such as Sosik study the relationships between orientation to learning goals, transformational leadership, and professional success expectations [134]. Much of the choice of occupation is attributed to the types of occupations considered suitable for men and women [135].

Otherwise, it seeks to generate information about the factors that influence women’s disadvantageous workplace position [136]. Currently, according to Jang studies, gender measured the link between domestic office chores and promotion in such a way that the relationship was statistically revealing for men but not for women [137]. From the evaluation of the relationship between having a mentor and objective professional results, having a mentor is associated with

better professional advancement results [133]. Mentoring is a professional partnership between a mentor who cooperates with her professional experience with an apprentice to train him with similar problems [138].

According to the number of nodes (11), the second most extensive research area is cluster 2, coloured green: 'Objective and Subjective Career Success'. Currently, there is a difference between objective and subjective professional success; external persons value the former according to the level of work, income, status, salary, and occupation [139]. On the other hand, subjective career success is a subjective construct that interprets individual employees' success. It was evidenced that the person-work adjustment intervenes in the relationship between perceived professional support and subjective professional success [140]. In recent years, the effects of emotional and social competencies on the boundless career and objective career success have been investigated [141].

The third research area is cluster 3, with 13 nodes (blue), as shown in Figure 5. This cluster is called 'Career Success', since this term has 276 occurrences and is led by the authors Seibert S.E., with 1221 citations [63], Judge T.A. with 1062 citations [64], Nosek B.A, with 552 citations [129], and Van Der Heijde C.M. with 450 citations [90], which shows a growing interest in this line of research. The authors of this group have provided several studies, such as Parasuraman, which analyses work and family variables involved in career success and psychological well-being [130]. On the other hand, the theory of labour adjustment is explored, showing the relationship between person-organization adequacy and professional success [132].

Cluster 4 (yellow), made up of 11 nodes, represents the fourth research area, 'Emotional Intelligence' since this term is the one with the highest co-occurrence in this cluster (27). Regarding emotional intelligence, it is considered one of the main qualifiers for professional success [142]. Likewise, a high degree of emotional intelligence indicates a high business potential, which leads to greater professional success [143]. It examines three professional competencies (perceived job satisfaction, perceived internal marketability, and perceived external marketability), recognized as predictors of success in the borderless career [131] and has 436 citations. Subsequently, the relationship between structural empowerment, innovative behaviour, self-efficacy, and professional success is proposed [144].

The fifth research area is cluster 5 (purple), made up of 11 nodes called 'Job Satisfaction'. In this cluster, in Drewery's research, objective and subjective indicators are attributed to professional success; within the subjective ones, job satisfaction is included [145]. Likewise, wellbeing, life goals, and values must be considered to achieve job satisfaction [146]. On the other hand, human resources are essential to identify the factors that affect job performance [147]. Finally, the attribution of the perception of evaluation centre workers regarding their job satisfaction and organizational commitment is investigated, which is one of the key elements for predicting work behaviour [148].

Cluster 6 (light blue) represents the sixth research area, made up of 10 nodes, and is called: 'Higher Education' because it is the term with the highest occurrence (20) in this class. According to Ummatqul, higher education graduates require managing, in addition to professional skills and soft skills, including the ability to communicate, coordinate, work under pressure, and solve problems [1]. Likewise, Trolian mentions that the frequency of student–teacher interaction is positively related to students' attitudes towards professional success [149].

The seventh research area corresponds to cluster 7 (orange); it is composed of 10 nodes and acquires the name of 'Employability', as it is the term with the highest occurrence. Thus, it is manifested that the employability skills profile (ESP) includes personal management, academic, and teamwork, which could increase the probability of professional success [150]. Likewise, the link between graduates' perceptions of their employability and professional success is evaluated [21]. Perceived employability is considered the variable that can measure the link between individual protein professional attitude, organizational learning practices, and professional success [151].

The eighth research area corresponds to cluster 8 (brown), made up of 8 nodes, called 'Career Development'. With accelerated economic, social, and technological changes, social skills are considered an absolute necessity to achieve a successful career [152]. Academics determined that graduates' employability and professional development are the characteristics that limit professional success [153].

3.2.2. Cited authors Co-Citation Network

This bibliometric analysis facilitates the structuring of a research field, resulting in more active study areas and emerging trends [50,154,155]. The analysis emphasizes the most prominent authors in this line of professional success research, and they are related through citation records [53,60]. The proposed bibliometric network construction was carried out with VOSviewer, using a similarity measure called association strength to analyse the co-citation data [78]. The professional success information base has 55,015 cited authors, of which 814 presented at least 20 citations. After cleaning the data, 764 were obtained with at least 20 citations. Table 5 includes the 15 authors with the highest number of citations, and Figure 6 shows the author's co-citations map, which contains 6 clusters, 764 nodes, 174,073 links, and a total link strength of 1,556,004.

Table 5. Top 15 most cited authors.

Ranking	Author	Citations	Total Link Strength	Country	Affiliation
1	Judge, T.A.	1044	72,460	United States	Fisher College of Business
2	Hall, D.T.	825	52,462	United States	Questrom School of Business
3	Arthur, M.B.	688	42,638	United States	Suffolk University
4	Eby, L.T.	608	41226	United States	The University of Georgia
5	Kraimer, M.L.	575	42,599	United States	Rutgers University–New Brunswick
6	Feldman, D.C.	550	36,412	United States	Terry College of Business
7	Greenhaus J.H.	481	28,938	United States	LeBow College of Business
8	Seibert, S.E.	473	33,726	United States	Rutgers University–New Brunswick
9	Ng, T.W.H.	317	23,111	Hong Kong	The University of Hong Kong
10	Bretz, R.D.	416	24,930	United States	Mendoza College of Business
11	Ferris, G.R.	361	33,093	United States	Florida State University
12	Liden, R.C.	361	28,532	United States	University of Illinois at Chicago
13	Baruch, Y.	359	24,775	United Kingdom	University of Southampton
14	Boudreau, J.W.	341	22,979	United States	USC Marshall School of Business
15	Cable, D.M.	326	21,715	United Kingdom	London Business School

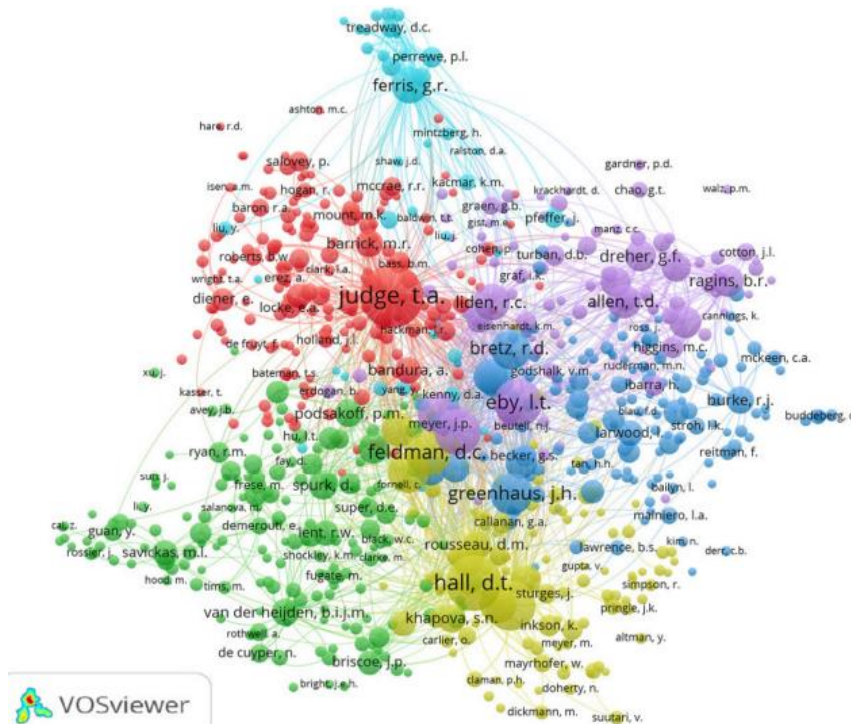


Figure 6. Co-citation cited authors network.

The intellectual structure of the field of professional success provided by the various approaches of the authors’ co-citations was analysed through network analysis. Cluster 1 (red), ‘Predictors of Career Success’, comprises 195 authors, led by Judge, T.A. (1044), who is one of the most prominent authors and is linked to 762 authors; Barrick, M.R. (208), is related to 727 authors and Bandura, A. (193) which is related to 717 authors. In this cluster, according to Judge, he suggested that demographic, human capital, motivational, and organizational variables exhibit a notable change in objective professional success and professional satisfaction [83]. Subsequently, Judge also analysed the relationship between general mental ability (GMA) and extrinsic career success. As a result, people

with high GMA had greater growth in extrinsic success because they achieved more education, job training and moved to more challenging jobs [156].

Cluster 2 (green), 'Proactive Personality and Career Success', comprises 175 authors, led by Crant, J.M. (249), which is related to 741 authors; Spurk, D. (226), who relates to 722 authors and Van Der Heijden, B.I.J.M. (202) who is related to 622 authors. Seibert's study stands out in this class, where a model was developed that relates proactive personality and professional success through four behavioural and cognitive mediators [87]. On the other hand, Abele suggested that professional success valued as objective professional achievements is indirectly positively related to life satisfaction, which is regularized by various subjective evaluations of success [128]. Finally, Van der Heijden admitted an employability model that optimizes career success in two age groups: for young people, employability ratings are related to objective career success outcomes. In people over 40 years of age, self-rated employability was positively related to promotions throughout professional life [157].

Cluster 3 (blue), 'Career Management', comprises 144 authors, led by Greenhaus, J.H. (481), which is related to 758 authors; Bretz, R.D. (416) linked to 760 authors and Boudreau, J.W. (341) also related to 760 authors. In this cluster, Chang empirically examined women workers' development networks and how their attributes intervene in their subjective professional success [158]. On the other hand, Bretz raised the theory of work adjustment (TWA) that relates to the person-environment adaptation and the satisfaction regarding the permanence in work [132]. Finally, Fuller extended previous career success models to include five-factor personality model traits and various extrinsic and intrinsic career success dimensions [89].

Cluster 4 (yellow), 'New Directions in Career Theory', comprises 116 authors, led by Hall, D.T. (825), which is related to 755 authors; Arthur, M.B. (668), which is related to 754 authors; Feldman, D.C. (550) related to 758 authors. Hall's research excels, examining the experiences of high-level professionals who, by reducing their workload, could achieve more favourable professional and family outcomes [159]. Finally, Beigi contributes to the work-family literature through the study of the work-family interface (WFI) around professional success [160].

Cluster 5 (purple), 'Mentoring in Career Success', comprises 94 authors, led by Eby, L.T. (608), which is related to 761 authors; Kraimer, M.L. (575), which is also related to 761 authors and Seibert, S.E. (473) related to 761 authors. In this cluster, Eby evaluated three career success criteria (perceived job satisfaction, perceived internal marketability, and perceived external marketability) considered as predictors of career success [131]. The short-term benefits of mentoring were explored (better job performance, recognition from others, rewarding experience, and loyal support base), announcing the long-term results of the mentor's career success, work attitudes, and behavioural intentions for the future mentor [161].

Cluster 6 (light blue), 'Work Effectiveness', comprises 40 authors, led by Ferris, G.R. (361), which is related to 665 authors; Perrewé, P.L. (118), which is related to 590 authors and Pfeffer, J. (104) related to 642 authors. In this class, an investigation by Jawahar stands out, which analysed data obtained from supervisors of professional employees to demonstrate the influence of task and contextual performance on work promotion judgments [162]. According to Perrewé, there is still evidence of unfair treatment in organizations based on the female gender, which is why the implications for stress and wellbeing at work were discussed, and ways of dealing with the deficiency of political skills in women were proposed [163].

3.2.3. Scientific Cited Sources Co-Citation Network

This type of analysis allows for the understanding of the field of study's structure by observing the related study areas according to the number of citations shared in the reference journals [164,165]. In the formation of this network, 345 sources were considered, which had at least 20 citations. The 15 main journals considered by their highest number of citations are observed in Table 6.

Table 6. Top 15 of the most cited sources.

Ranking	Source	Citations	Total Link Strength
1	<i>Journal of Vocational Behavior</i>	3285	123,291
2	<i>Journal of Applied Psychology</i>	2591	109,959
3	<i>Academy of Management Journal</i>	1806	79,296
4	<i>Journal of Organizational Behavior</i>	1726	71,863
5	<i>Personnel Psychology</i>	1387	61,486
6	<i>Journal of Management</i>	983	47,266
7	<i>Career Development International</i>	838	34,509
8	<i>Journal of Personality and Social Psychology</i>	822	37,840
9	<i>Academy of Management Review</i>	710	33,172
10	<i>International Journal of Human Resource Management</i>	564	26,115
11	<i>Human Relations</i>	547	25,063
12	<i>Psychological Bulletin</i>	476	22,701
13	<i>Journal of Occupational and Organizational Psychology</i>	405	18,544
14	<i>Administrative Science Quarterly</i>	403	19,052
15	<i>American Psychologist</i>	341	15,483

In Figure 7, the cited sources co-citation network is shown, composed of five clusters (groups of journals) and 345 nodes (journals), which are distinguished by colour, showing 19,558 relationships between journals (links) and a total link strength out of 672,588.

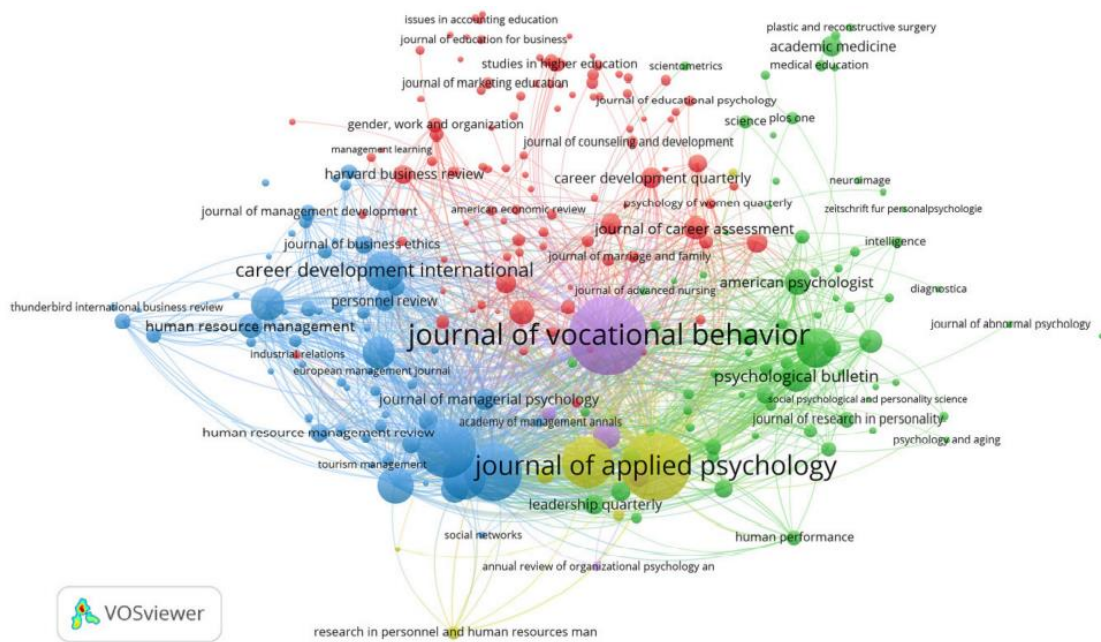


Figure 7. Co-citation cited sources network.

Cluster 1 (red) ‘Sociology and Professional Development’, with 100 journals, led by the *American Sociological Review* (322), a Q1 journal from the United States, with an H-Index of 185, related to 223 journals and which is responsible for publishing topics of interest in sociology in general, research that advances the understanding of social processes, and methodological reforms. Second, the *Journal of Career Assessment* (303), a Q1 journal from the United States, with an H-Index of 56, related to 221 journals and publishes on vocational psychology, showing new research on behaviour career and the job. Finally, *Career Development Quarterly* (230), a Q2 journal from the United States, with an H-Index of 49, is linked to 224 journals and contains publications about counselling, professional development, work, and professional education.

Cluster 2 (green) ‘Interpersonal Relations and Scientific Psychology’, includes 73 journals, led by the *Journal of Personality and Social Psychology* (822), a Q1 journal from the United States, with an H-Index of 351, related to 236 journals, and it publishes in three sections: (i) attitudes and social cognition, (ii) interpersonal relationships, and (iii) personality processes and individual differences. Second, *Psychological Bulletin* (476), a Q1 journal from the United States, with an H-Index of 296, related to 232 journals and publishes evaluative and integrative reviews on scientific psychology topics, considering both qualitative (narrative) and quantitative reviews. (meta-analysis). Third, *American Psychologist* (341), a Q1 journal from the United States, with an H-Index of 219, linked to 233 journals and publishes high-impact articles, including empirical reports, meta-analyses, and academic reviews on science, education, and science.

Cluster 3 (blue) ‘Theory of Management and Organizational Behavior’, includes 57 journals, led by the *Academy of Management Journal* (1806), a Q1 journal from the United States, with an H-Index of 304, related to 236 journals

and publishes practical investigations that demonstrate, expand, or build the theory of management and favour its practice. Second, the *Journal of Organizational Behavior* (1726), a Q1 journal from the United States, with an H-Index of 164, related to 239 journals and is responsible for publishing research on organizational behaviour and all associated topics through levels of individual, group, and organizational study. Third, the *Journal of Management* (983), a Q1 journal from the United States, with an H-Index of 208, also linked to 239 journals and publishes articles on phenomena at the micro-, meso- and macro-scale of the workplace.

Cluster 4 (yellow) 'Psychology in the Labor Field', made up of eight journals, led by the *Journal of Applied Psychology* (2591), a Q1 journal from the United States, with an H-Index of 269, related to 241 journals, in charge of publishing on empirical and theoretical studies that help to understand cognitive, motivational, affective, and behavioural psychological phenomena in work and organizational environments. Secondly, a Q1 journal from the United States, *Personnel Psychology* (1387), with an H-Index of 133, linked to 239 journals and includes publications on psychology focused on people in the workplace, covering topics related to human resource management and organizational behaviour mainly.

Cluster 5 (violet) 'Career Choice and Work Psychology' contains five journals, led by the *Journal of Vocational Behavior* (3285), a Q1 journal from the United States, with an H-Index of 141, related to 238 journals and publishes articles that contribute ground-breaking insights into the fields of career choice, career development, and job adjustment. Finally, the *Journal of Occupational and Organizational Psychology* (405), a Q1 journal from the United States, with an H-Index of 106, linked to 235 journals and publishes mainly on industrial, organizational, occupational, vocational, and personal psychology, behavioural aspects, and cognitive factors of labour relations and human factors.

4. Discussion

For more than 150 years, issues related to professional success have been partially studied. However, for this analysis, we have considered articles from 1990 in which a formal definition of this topic is already included [4] and its progressive evolution until 2020. To know future trends in professional success, it was observed that the most relevant studies in the period 1991–2000 had addressed the five major personality traits [64], the predictors of professional success [84], and the influence of political behaviour on the professional success [7], among others. Later, the second period (2001–2010) focused on the theory of professional success [64], employability [90,91], personality effects to achieve professional success [90], objective and subjective professional success [97,125,166,167,168], gender, and mentoring in career success [169,170,171,172]. Finally, in the period (2011–2020), gender [23,173], benefits of mentoring

[114,174], and factors that determine professional success [175,176] were mainly studied.

Seventy-six countries contribute to this field of study, with the United States, the United Kingdom, and Canada standing out, with more than 60 publications. The United States has three authors from the top 15 of the most cited authors, who come from Fisher College of Business (Judge T.A.) and Rutgers University–New Brunswick (Kraimer M.L. and Seibert S.E). Regarding the most representative journals, two areas predominate management development and psychology. The intellectual structure of professional success has been analysed under three parameters of the science mapping section. In the first place, the analysis of co-occurrence according to author keywords, represented in (Figure 5), where it is observed that the most relevant term is ‘Career Success’, with 276 co-occurrences in the database. In addition, it is related to 71 of the 92 terms analysed. It is worth mentioning that this term has a strong link with ‘Career’ (Cluster 1), ‘Gender’ (Cluster 2), and ‘Career Development’ (Cluster 8) mainly.

Second, the co-citation cited authors (see Figure 6) analysis shows the emerging lines of research about professional success. Cluster 1 (red), ‘Predictors of Career Success’, Cluster 2 (green), ‘Proactive Personality and Career Success’, Cluster 3 (blue), ‘Career Management’, Cluster 4 (yellow), ‘New Directions in Career Theory’, Cluster 5 (purple), ‘Mentoring in Career Success’, and Cluster 6 (light blue), ‘Work Effectiveness’.

Third, the bibliometric map of co-citation by sources (see Figure 7) reflects the three outstanding journals: (i) *Journal of Vocational Behavior*, (ii) *Journal of Applied Psychology*, and (iii) *Academy of Management Journal*. These journals are from the United States. It is worth mentioning that the most cited article of the 1369 articles in the database was published in the *Academy of Management Journal* and reached 1221 citations. However, some documents within the 15 most cited publications have been published in *Personnel Psychology* and *Perspectives on Psychological Science*.

5. Conclusions

This study provides a bibliometric study of scientific articles related to professional success, which have been indexed in the Scopus database from 1991 to 2020. The analysis of scientific production shows the exponential growth in publications on this subject (see Figure 2), which was addressed in three periods: (i) 1991–2000, (ii) 2001–2010, and (iii) 2011–2020, where 147, 315, and 907 articles have been published, respectively. The first record from 1991 is titled “Career Paths and Career Success in the Early Career Stages of Male and Female MBAs” by authors Cox T.H. and Harquail C.V. in the *Journal of Vocational Behaviour*. Interest in this topic is evident in the last three years since it went from 106 articles in 2018 to 126 articles in 2019 and 2020. Delimiting the largest scientific

production in North America, Europe, and Oceania (see Figure 4), which agrees with the analysis of bibliographic coupling by countries (Figure 3), the following countries stand out: the United States, the United Kingdom, and Canada, with 601, 133, and 93 articles, respectively.

The spatial distribution of publications on professional success is directly related to the most cited documents. In the first place, there is the publication of the author Seibert S.E. [5], which reached 1221 citations and was published jointly with Kraimer M.L., Liden R.C. The second most cited publication was that of Judge T.A. [64] and reached 1062 citations. Finally, the third most cited document was also the author Judge T.A. [83], which reached 766 citations. This type of analysis allows for the understanding of the field of study's structure by observing the related study areas according to the number of citations shared in the reference journals. This article facilitates the understanding of professional success's intellectual structure, considering the scientific production, geographical distribution, and contribution of the most cited journals, authors, and documents. In this sense, 1369 articles, 76 countries, 691 journals, and 3106 authors have been evaluated.

Considering the results that intervene in the analysis by science mapping. In the first instance, the analysis of the co-occurrence network by author keywords, which is represented by eight clusters (research areas) and 92 nodes (topics), where the most relevant topic was 'Career Success', which coincides with the name of the research area (Cluster 3). The remaining research areas are related to: 'Career and Gender'; 'Objective and Subjective Career Success'; 'Emotional Intelligence'; 'Job Satisfaction'; 'Higher Education'; 'Employability'; and 'Career Development'.

Second, the network of co-citations, according to authors, is made up of six groups that represent the various issues related to professional success: 'Predictors of Career Success' (Cluster 1); 'Proactive Personality and Career Success' (Cluster 2); 'Career Management' (Cluster 3); 'New Directions in Career Theory' (Cluster 4); 'Mentoring in Career Success' (Cluster 5); and 'Work Effectiveness' (Cluster 6). The most representative author is Judge T.A., located in Cluster 1 and is related to 754 of the 762 items analysed.

Third, the network of co-citations by scientific journals includes five clusters, which show the fields of knowledge that have been developed in the career success area: 'Sociohydrology and Professional Development' (Cluster 1); 'Interdisciplinary Relations and Social Psychology' (Cluster 2); 'Theory of Management and Organizational Behaviour' (Cluster 3); 'Psychology in the Labor Field' (Cluster 4); and 'Career Choice and Work Psychology' (Cluster 5). The most prominent journal in this area is the *Journal of Vocational Behavior*, which contains highly representative articles [5,88,130,177].

Regarding the methodological approach of this work, the following limitations are presented: (i) using a single database (Scopus), which, despite being a recognized and commonly used database in academia, may exclude some

significant contributions in other databases (Web of Sciences and Dimensions, among others); in addition, (ii) that only articles were reviewed; and (iii) documents in English, which despite being one of the most used languages and important contributions on professional success, can be excluded. The bibliometric approach is reliable and has been used by researchers worldwide in several studies, including [178,179,180]. The study required the use of some descriptors related to career success to obtain adequate information regarding the subject studied. These descriptors were subjected to a triangular search (title–abstract–keywords), where the title of the document helps to recognize the central focus of the study and the importance that the authors give to the topic; this is complemented by the use of the abstract and keywords to broadening this approach, based on research related to the term.

Supplementary Materials: The following are available online at <https://www.mdpi.com/article/10.3390/su13094625/s1>, Table S1: Results of the co-occurrence network of author keywords.

Author Contributions

Conceptualization, P.C.-M., N.M.-B., and R.P.-S.; methodology, P.C.-M., N.M.-B., and R.P.-S.; writing—original draft preparation, P.C.-M., N.M.-B., and R.P.-S.; writing—review and editing, P.C.-M., N.M.-B., R.P.-S., J.G., and A.R.; supervision, P.C.-M. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest

The authors declare no conflict of interest

References

1. Ummatqul Qizi, K.N. Soft skills development in higher education. *Univers. J. Educ. Res.* 2020, *8*, 1916–1925. [Google Scholar] [CrossRef]
2. Pacáková, Z.; Jindrová, A. Information Benefit of Graduates Follow-up Surveys. *J. Effic. Responsib. Educ. Sci.* 2011, *4*, 129–141. [Google Scholar]
3. Oplatka, I.; Mimon, R. Women principals’ conceptions of job satisfaction and dissatisfaction: An alternative view? *Int. J. Leadersh. Educ.* 2008, *11*, 135–153. [Google Scholar] [CrossRef]
4. Aryee, S.; Chay, Y.W.; Tan, H.H. An Examination of the Antecedents of Subjective Career Success Among a Managerial Sample in Singapore. *Hum. Relat.* 1994, *47*, 487–509. [Google Scholar] [CrossRef]
5. Seibert, S.E.; Kraimer, M.L. The Five-Factor Model of Personality and Career Success. *J. Vocat. Behav.* 2001, *58*, 1–21. [Google Scholar] [CrossRef]
6. NG, T.W.H.; Eby, L.T.; Sorensen, K.L.; Feldman, D.C. Predictors of Objective and Subjective Career Success: A Meta-Analysis. *Pers. Psychol.* 2005, *58*, 367–408. [Google Scholar] [CrossRef]
7. Judge, T.A.; Bretz, R.D. Political Influence Behavior and Career Success. *J. Manag.* 1994, *20*, 43–65. [Google Scholar] [CrossRef]
8. Seibert, S.E.; Crant, J.M.; Kraimer, M.L. Proactive personality and career success. *J. Appl. Psychol.* 1999, *84*, 416–427. [Google Scholar] [CrossRef]
9. Gattiker, U.E.; Larwood, L. Subjective career success: A study of managers and support personnel. *J. Bus. Psychol.* 1986, *1*, 78–94. [Google Scholar] [CrossRef]
10. Kirchmeyer, C. Determinants of Managerial Career Success: Evidence and Explanation of Male/Female Differences. *J. Manag.* 1998, *24*, 673–692. [Google Scholar] [CrossRef]

11. Peluchette, J.V.E. Subjective Career Success: The Influence of Individual Difference, Family, and Organizational Variables. *J. Vocat. Behav.* 1993, 43, 198–208. [Google Scholar] [CrossRef]
12. NG, T.W.H.; Feldman, D.C. Subjective career success: A meta-analytic review. *J. Vocat. Behav.* 2014, 85, 169–179. [Google Scholar] [CrossRef]
13. Cope, P.M. The Women of “Who’s Who”: A Statistical Study. *Soc. Forces* 1928, 7, 212–223. [Google Scholar] [CrossRef]
14. Heslin, P.A. Conceptualizing and evaluating career success. *J. Organ. Behav.* 2005, 26, 113–136. [Google Scholar] [CrossRef]
15. Raluy Alonso, Á. El concepto estadounidense de “éxito” frente a su homónimo español: Dos visiones sociológica, semántica y etimológicamente diferentes. *ELUA. Estud. Lingüíst. Univ. Alicant.* 2012, 269–288. [Google Scholar] [CrossRef]
16. Canal Domínguez, J.F.; Rodríguez Gutiérrez, C. Universidad pública frente a universidad privada: ¿qué efectos tiene sobre el éxito profesional de los universitarios españoles?/A Public University or a Private University: What Effect does this Choice have on the Professional Success of Graduates in S. *Rev. Esp. Investig. Sociol.* 2020, 169. [Google Scholar] [CrossRef]
17. Delgado, A.; Saletti-Cuesta, L.; López-Fernández, L.A.; Toro-Cárdenas, S.; Luna del Castillo, J.d.D. Professional Success and Gender in Family Medicine. *Eval. Health Prof.* 2016, 39, 87–99. [Google Scholar] [CrossRef]
18. Tlaiss, H.; Kauser, S. The importance of wasta in the career success of Middle Eastern managers. *J. Eur. Ind. Train.* 2011, 35, 467–486. [Google Scholar] [CrossRef]
19. Spangler, W.D. Validity of questionnaire and TAT measures of need for achievement: Two meta-analyses. *Psychol. Bull.* 1992, 112, 140–154. [Google Scholar] [CrossRef]
20. Kim, M.; Beehr, T.A. Can Empowering Leaders Affect Subordinates’ Well-Being and Careers Because They Encourage Subordinates’ Job Crafting Behaviors? *J. Leadersh. Organ. Stud.* 2018, 25, 184–196. [Google Scholar] [CrossRef]
21. Niu, Y.; Hunter-Johnson, Y.; Xu, X.; Liu, T. Self-Perceived Employability and Subjective Career Success: Graduates of a Workforce Education and Development Program. *J. Contin. High. Educ.* 2019, 67, 55–71. [Google Scholar] [CrossRef]
22. Walsh, L.C.; Boehm, J.K.; Lyubomirsky, S. Does Happiness Promote Career Success? Revisiting the Evidence. *J. Career Assess.* 2018, 26, 199–219. [Google Scholar] [CrossRef]
23. Crompton, R.; Lyonette, C. Women’s Career Success and Work-life Adaptations in the Accountancy and Medical Professions in Britain. *Gender Work Organ.* 2011, 18, 231–254. [Google Scholar] [CrossRef]

24. Goh, S.C. Sex differences in perceptions of interpersonal work style, career emphasis, supervisory mentoring behavior, and job satisfaction. *Sex Roles* 1991, 24, 701–710. [Google Scholar] [CrossRef]
25. De Haro, J. *El Papel de la Inteligencia General, la Personalidad y la Inteligencia Emocional en el Éxito Profesional al Inicio de la Carrera*; Universidad de Alicante: San Vicente del Raspeig, Spain, 2014. [Google Scholar]
26. Koh, H.C.; Boo, E.H.Y. The link between organizational ethics and job satisfaction: A study of managers in Singapore. *J. Bus. Ethics* 2001, 29, 309–324. [Google Scholar] [CrossRef]
27. Judiesch, M.K.; Lyness, K.S. Left Behind? The Impact of Leaves of Absence on Managers' Career Success. *Acad. Manag. J.* 1999, 42, 641–651. [Google Scholar] [CrossRef]
28. Forest, J.; Mageau, G.A.; Sarrazin, C.; Morin, E.M. "Work is my passion": The different affective, behavioural, and cognitive consequences of harmonious and obsessive passion toward work. *Can. J. Adm. Sci. Rev. Can. Sci. Adm.* 2011, 28, 27–40. [Google Scholar] [CrossRef]
29. Robinson, D.A.G.; Reilly, B.A. Women Engineers: A Study of Educational Preparation and Professional Success. *J. Eng. Educ.* 1993, 82, 78–82. [Google Scholar] [CrossRef]
30. Pinelli, T.E.; Barclay, R.O.; Kennedy, J.M. Workplace communications skills and the value of communications and information use skills instruction-engineering students' perspectives. In Proceedings of the 1995 IEEE International Professional Communication Conference. IPCC 95 Proceedings. Smooth Sailing to the Future; IEEE: Savannah, GA, USA, 1995; pp. 161–165. [Google Scholar]
31. Burke, R.J.; Kurucz, E. Demographic Characteristics of Canadian Women Corporate Directors. *Psychol. Rep.* 1998, 83, 461–462. [Google Scholar] [CrossRef]
32. Morreale, S.P.; Pearson, J.C. Why Communication Education is Important: The Centrality of the Discipline in the 21st Century. *Commun. Educ.* 2008, 57, 224–240. [Google Scholar] [CrossRef]
33. Costa, P.T.J.; McCrae, R.R. *NEO PI-R. Revised Neo Personality Inventory and NEO Five-Factor Inventory (NEO-FFI)*; Psychological Assessment Resources: Odessa, FL, USA, 2008. [Google Scholar]
34. Khan, M.B.; Kukalis, S. MIS professionals: Education and performance. *Inf. Manag.* 1990, 19, 249–255. [Google Scholar] [CrossRef]
35. Wiggins, C.; Bowman, S.Y. Career Success and Life Satisfaction for Female and Male Healthcare Managers. *Hosp. Top.* 2000, 78, 5–10. [Google Scholar] [CrossRef] [PubMed]
36. Buckley, L.M.; Sanders, K.; Shih, M.; Hampton, C.L. Attitudes of Clinical Faculty About Career Progress, Career Success and Recognition, and Commitment to Academic Medicine. *Arch. Intern. Med.* 2000, 160, 2625. [Google Scholar] [CrossRef]

37. Knouse, S.B. Virtual mentors: Mentoring on the internet. *J. Employ. Couns.* 2001, 38, 162–169. [Google Scholar] [CrossRef]
38. Afarian, R.; Kleiner, B.H. The relationship between grades and career success. *Manag. Res. News* 2003, 26, 42–51. [Google Scholar] [CrossRef]
39. McDonald, K.S.; Hite, L.M. The Next Generation of Career Success: Implications for HRD. *Adv. Dev. Hum. Resour.* 2008, 10, 86–103. [Google Scholar] [CrossRef]
40. Gault, J.; Redington, J.; Schlager, T. Undergraduate Business Internships and Career Success: Are They Related? *J. Mark. Educ.* 2000, 22, 45–53. [Google Scholar] [CrossRef]
41. Cobo, M.J.; Martínez, M.A.; Gutiérrez-Salcedo, M.; Fujita, H.; Herrera-Viedma, E. 25years at Knowledge-Based Systems: A bibliometric analysis. *Knowl. Based Syst.* 2015, 80, 3–13. [Google Scholar] [CrossRef]
42. Li, T.; Ho, Y.-S.; Li, C.-Y. Bibliometric analysis on global Parkinson's disease research trends during 1991. *Neurosci. Lett.* 2008, 441, 248–252. [Google Scholar] [CrossRef] [PubMed]
43. Van Eck, N.J.; Waltman, L. Citation-based clustering of publications using CitNetExplorer and VOSviewer. *Scientometrics* 2017, 111, 1053–1070. [Google Scholar] [CrossRef]
44. Tranfield, D.; Denyer, D.; Smart, P. Towards a Methodology for Developing Evidence-Informed Management Knowledge by Means of Systematic Review. *Br. J. Manag.* 2003, 14, 207–222. [Google Scholar] [CrossRef]
45. Fahimnia, B.; Sarkis, J.; Davarzani, H. Green supply chain management: A review and bibliometric analysis. *Int. J. Prod. Econ.* 2015, 162, 101–114. [Google Scholar] [CrossRef]
46. Herrera-Franco, G.; Montalván-Burbano, N.; Carrión-Mero, P.; Apolo-Masache, B.; Jaya-Montalvo, M. Research Trends in Geotourism: A Bibliometric Analysis Using the Scopus Database. *Geosciences* 2020, 10, 379. [Google Scholar] [CrossRef]
47. Keathley-Herring, H.; Van Aken, E.; Gonzalez-Aleu, F.; Deschamps, F.; Letens, G.; Orlandini, P.C. Assessing the maturity of a research area: Bibliometric review and proposed framework. *Scientometrics* 2016, 109, 927–951. [Google Scholar] [CrossRef]
48. Do Prado, J.W.; de Castro Alcântara, V.; de Melo Carvalho, F.; Vieira, K.C.; Machado, L.K.C.; Tonelli, D.F. Multivariate analysis of credit risk and bankruptcy research data: A bibliometric study involving different knowledge fields (1968–2014). *Scientometrics* 2016, 106, 1007–1029. [Google Scholar] [CrossRef]
49. Merigó, J.M.; Blanco-Mesa, F.; Gil-Lafuente, A.M.; Yager, R.R. Thirty Years of the International Journal of Intelligent Systems: A Bibliometric Review. *Int. J. Intell. Syst.* 2017, 32, 526–554. [Google Scholar] [CrossRef]

50. Montalván-Burbano, N.; Pérez-Valls, M.; Plaza-Úbeda, J.; Foroudi, P. Analysis of scientific production on organizational innovation. *Cogent Bus. Manag.* 2020, 7, 1745043. [Google Scholar] [CrossRef]
51. Ma, R.; Ho, Y.-S. Comparison of environmental laws publications in Science Citation Index Expanded and Social Science Index: A bibliometric analysis. *Scientometrics* 2016, 109, 227–239. [Google Scholar] [CrossRef]
52. Cobo, M.J.; López-Herrera, A.G.; Herrera-Viedma, E.; Herrera, F. An approach for detecting, quantifying, and visualizing the evolution of a research field: A practical application to the Fuzzy Sets Theory field. *J. Informetr.* 2011, 5, 146–166. [Google Scholar] [CrossRef]
53. Zupic, I.; Čater, T. Bibliometric Methods in Management and Organization. *Organ. Res. Methods* 2015, 18, 429–472. [Google Scholar] [CrossRef]
54. Maldonado-Erazo, C.P.; Álvarez-García, J.; del Río-Rama, M.d.l.C.; Correa-Quezada, R. Corporate Social Responsibility and Performance in SMEs: Scientific Coverage. *Sustainability* 2020, 12, 2332. [Google Scholar] [CrossRef]
55. Chandra, Y. Mapping the evolution of entrepreneurship as a field of research (1990–2013): A scientometric analysis. *PLoS ONE* 2018, 13, e0190228. [Google Scholar] [CrossRef]
56. Abad-Segura, E.; de la Fuente, A.B.; González-Zamar, M.-D.; Belmonte-Ureña, L.J. Effects of Circular Economy Policies on the Environment and Sustainable Growth: Worldwide Research. *Sustainability* 2020, 12, 5792. [Google Scholar] [CrossRef]
57. Durán-Sánchez, A.; de la Del Río-Rama, M.C.; Álvarez-García, J.; García-Vélez, D.F. Mapping of scientific coverage on education for Entrepreneurship in Higher Education. *J. Enterp. Communities People Places Glob. Econ.* 2019, 13, 84–104. [Google Scholar] [CrossRef]
58. Hallinger, P.; Nguyen, V.-T. Mapping the Landscape and Structure of Research on Education for Sustainable Development: A Bibliometric Review. *Sustainability* 2020, 12, 1947. [Google Scholar] [CrossRef]
59. Herrera-Franco, G.; Montalván-Burbano, N.; Carrión-Mero, P.; Jaya-Montalvo, M.; Gurumendi-Noriega, M. Worldwide Research on Geoparks through Bibliometric Analysis. *Sustainability* 2021, 13, 1175. [Google Scholar] [CrossRef]
60. Briones-Bitar, J.; Carrión-Mero, P.; Montalván-Burbano, N.; Morante-Carballo, F. Rockfall Research: A Bibliometric Analysis and Future Trends. *Geosciences* 2020, 10, 403. [Google Scholar] [CrossRef]
61. Tadmor, C.T.; Galinsky, A.D.; Maddux, W.W. Getting the most out of living abroad: Biculturalism and integrative complexity as key drivers of creative and professional success. *J. Pers. Soc. Psychol.* 2012, 103, 520–542. [Google Scholar] [CrossRef]

62. Romanelli, F.; Cain, J.; Smith, K.M. Emotional Intelligence as a Predictor of Academic and/or Professional Success. *Am. J. Pharm. Educ.* 2006, *70*, 69. [Google Scholar] [CrossRef] [PubMed]
63. Seibert, S.E.; Kraimer, M.L.; Liden, R.C. A Social Capital Theory of Career Success. *Acad. Manag. J.* 2001, *44*, 219–237. [Google Scholar] [CrossRef]
64. Judge, T.A.; Higgins, C.A.; Thoresen, C.J.; Barrick, M.R. The Big Five Personality Traits, General Mental Ability, and Career Success across the Life Span. *Pers. Psychol.* 1999, *52*, 621–652. [Google Scholar] [CrossRef]
65. Mongeon, P.; Paul-Hus, A. The journal coverage of Web of Science and Scopus: A comparative analysis. *Scientometrics* 2016, *106*, 213–228. [Google Scholar] [CrossRef]
66. Del Río-Rama, M.; Maldonado-Erazo, C.; Álvarez-García, J.; Durán-Sánchez, A. Cultural and Natural Resources in Tourism Island: Bibliometric Mapping. *Sustainability* 2020, *12*, 724. [Google Scholar] [CrossRef]
67. Meseguer-Sánchez, V.; Abad-Segura, E.; Belmonte-Ureña, L.J.; Molina-Moreno, V. Examining the Research Evolution on the Socio-Economic and Environmental Dimensions on University Social Responsibility. *Int. J. Environ. Res. Public Health* 2020, *17*, 4729. [Google Scholar] [CrossRef]
68. Álvarez-García, J.; Durán-Sánchez, A.; del Río-Rama, M.C. Systematic bibliometric analysis on Kaizen in scientific journals. *TQM J.* 2018, *30*, 356–370. [Google Scholar] [CrossRef]
69. Maldonado-Erazo, C.P.; Álvarez-García, J.; del Río-Rama, M.C.; de la Durán-Sánchez, A. Scientific Mapping on the Impact of Climate Change on Cultural and Natural Heritage: A Systematic Scientometric Analysis. *Land* 2021, *10*, 76. [Google Scholar] [CrossRef]
70. Najmi, A.; Rashidi, T.H.; Abbasi, A.; Travis Waller, S. Reviewing the transport domain: An evolutionary bibliometrics and network analysis. *Scientometrics* 2017, *110*, 843–865. [Google Scholar] [CrossRef]
71. Caputo, A.; Marzi, G.; Pellegrini, M.M.; Rialti, R. Conflict management in family businesses. *Int. J. Confl. Manag.* 2018, *29*, 519–542. [Google Scholar] [CrossRef]
72. Salmerón-Manzano, E.; Manzano-Agugliaro, F. Worldwide Research on Low Cost Technologies through Bibliometric Analysis. *Inventions* 2020, *5*, 9. [Google Scholar] [CrossRef]
73. Van Eck, N.J.; Waltman, L. Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics* 2010, *84*, 523–538. [Google Scholar] [CrossRef] [PubMed]
74. Payán-Sánchez, B.; Belmonte-Ureña, L.J.; Plaza-Úbeda, J.A.; Vazquez-Brust, D.; Yakovleva, N.; Pérez-Valls, M. Open Innovation for Sustainability or Not: Literature Reviews of Global Research Trends. *Sustainability* 2021, *13*, 1136. [Google Scholar] [CrossRef]

75. Velasco-Muñoz, J.; Aznar-Sánchez, J.; Belmonte-Ureña, L.; Román-Sánchez, I. Sustainable Water Use in Agriculture: A Review of Worldwide Research. *Sustainability* 2018, *10*, 1084. [Google Scholar] [CrossRef]
76. Chernysh, Y.; Roubík, H. International Collaboration in the Field of Environmental Protection: Trend Analysis and COVID-19 Implications. *Sustainability* 2020, *12*, 384. [Google Scholar] [CrossRef]
77. León-Castro, M.; Rodríguez-Insuasti, H.; Montalván-Burbano, N.; Victor, J.A. Bibliometrics and Science Mapping of Digital Marketing. In *Proceedings of the Marketing and Smart Technologies*; Rocha, Á., Reis, J.L., Peter, M.K., Cayolla, R., Loureiro, S., Bogdanović, Z., Eds.; Springer Singapore: Singapore, 2021; pp. 95–107. [Google Scholar]
78. Md Khudzari, J.; Kurian, J.; Tartakovsky, B.; Raghavan, G.S.V. Bibliometric analysis of global research trends on microbial fuel cells using Scopus database. *Biochem. Eng. J.* 2018, *136*, 51–60. [Google Scholar] [CrossRef]
79. Hinojo-Lucena, F.-J.; Aznar-Díaz, I.; Cáceres-Reche, M.-P.; Romero-Rodríguez, J.-M. Artificial Intelligence in Higher Education: A Bibliometric Study on its Impact in the Scientific Literature. *Educ. Sci.* 2019, *9*, 51. [Google Scholar] [CrossRef]
80. Cox, T.H.; Harquail, C. V Career paths and career success in the early career stages of male and female MBAs. *J. Vocat. Behav.* 1991, *39*, 54–75. [Google Scholar] [CrossRef]
81. Dreher, G.F.; Bretz, R.D. Cognitive ability and career attainment: Moderating effects of early career success. *J. Appl. Psychol.* 1991, *76*, 392–397. [Google Scholar] [CrossRef]
82. Russo, N.F.; Kelly, R.M.; Deacon, M. Gender and success-related attributions: Beyond individualistic conceptions of achievement. *Sex Roles* 1991, *25*, 331–350. [Google Scholar] [CrossRef]
83. Judge, T.A.; Cable, D.M.; Boudreau, J.W.; Bretz, R.D. An Empirical Investigation of the Predictors of Executive Career Success. *Pers. Psychol.* 1995, *48*, 485–519. [Google Scholar] [CrossRef]
84. Baroudi, J.J.; Igbaria, M. An Examination of Gender Effects on Career Success of Information Systems Employees. *J. Manag. Inf. Syst.* 1994, *11*, 181–201. [Google Scholar] [CrossRef]
85. Wayne, S.J.; Liden, R.C.; Kraimer, M.L.; Graf, I.K. The role of human capital, motivation and supervisor sponsorship in predicting career success. *J. Organ. Behav.* 1999, *20*, 577–595. [Google Scholar] [CrossRef]
86. Collins, P.M. Does Mentorship among Social Workers Make a Difference? An Empirical Investigation of Career Outcomes. *Soc. Work* 1994. [Google Scholar] [CrossRef]
87. Seibert, S.E.; Kraimer, M.L.; Crant, J.M. What do Proactive People do? A Longitudinal Model Linking Proactive Personality and Career Success. *Pers. Psychol.* 2001, *54*, 845–874. [Google Scholar] [CrossRef]

88. Fuller, B.; Marler, L.E. Change driven by nature: A meta-analytic review of the proactive personality literature. *J. Vocat. Behav.* 2009, *75*, 329–345. [Google Scholar] [CrossRef]
89. Boudreau, J.W.; Boswell, W.R.; Judge, T.A. Effects of Personality on Executive Career Success in the United States and Europe. *J. Vocat. Behav.* 2001, *58*, 53–81. [Google Scholar] [CrossRef]
90. Van Der Heijde, C.M.; Van Der Heijden, B.I.J.M. A competence-based and multidimensional operationalization and measurement of employability. *Hum. Resour. Manag.* 2006, *45*, 449–476. [Google Scholar] [CrossRef]
91. Rothwell, A.; Arnold, J. Self-perceived employability: Development and validation of a scale. *Pers. Rev.* 2007, *36*, 23–41. [Google Scholar] [CrossRef]
92. Forret, M.L.; Dougherty, T.W. Networking behaviors and career outcomes: Differences for men and women? *J. Organ. Behav.* 2004, *25*, 419–437. [Google Scholar] [CrossRef]
93. Wolff, H.-G.; Moser, K. Effects of networking on career success: A longitudinal study. *J. Appl. Psychol.* 2009, *94*, 196–206. [Google Scholar] [CrossRef]
94. Underhill, C.M. The effectiveness of mentoring programs in corporate settings: A meta-analytical review of the literature. *J. Vocat. Behav.* 2006, *68*, 292–307. [Google Scholar] [CrossRef]
95. Ensher, E.A.; Thomas, C.; Murphy, S.E. Comparison of traditional, step-ahead, and peer mentoring on protégés' support, satisfaction, and perceptions of career success: A social exchange perspective. *J. Bus. Psychol.* 2001, *15*, 419–438. [Google Scholar] [CrossRef]
96. Day, R.; Allen, T.D. The relationship between career motivation and self-efficacy with protégé career success. *J. Vocat. Behav.* 2004, *64*, 72–91. [Google Scholar] [CrossRef]
97. Abele, A.E.; Spurk, D. The longitudinal impact of self-efficacy and career goals on objective and subjective career success. *J. Vocat. Behav.* 2009, *74*, 53–62. [Google Scholar] [CrossRef]
98. De Vos, A.; Soens, N. Protean attitude and career success: The mediating role of self-management. *J. Vocat. Behav.* 2008, *73*, 449–456. [Google Scholar] [CrossRef]
99. Erdogan, B.; Kraimer, M.L.; Liden, R.C. Work Value Congruence and Intrinsic Career Success: The Compensatory Roles of Leader-Member Exchange and Perceived Organizational Support. *Pers. Psychol.* 2004, *57*, 305–332. [Google Scholar] [CrossRef]
100. Boehm, J.K.; Lyubomirsky, S. Does Happiness Promote Career Success? *J. Career Assess.* 2008, *16*, 101–116. [Google Scholar] [CrossRef]
101. Judge, T.A.; Cable, D.M. The Effect of Physical Height on Workplace Success and Income: Preliminary Test of a Theoretical Model. *J. Appl. Psychol.* 2004, *89*, 428–441. [Google Scholar] [CrossRef]

102. De Vos, A.; De Hauw, S.; Van der Heijden, B.I.J.M. Competency development and career success: The mediating role of employability. *J. Vocat. Behav.* 2011, *79*, 438–447. [Google Scholar] [CrossRef]
103. Rudolph, C.W.; Lavigne, K.N.; Zacher, H. Career adaptability: A meta-analysis of relationships with measures of adaptivity, adapting responses, and adaptation results. *J. Vocat. Behav.* 2017, *98*, 17–34. [Google Scholar] [CrossRef]
104. Zacher, H. Career adaptability predicts subjective career success above and beyond personality traits and core self-evaluations. *J. Vocat. Behav.* 2014, *84*, 21–30. [Google Scholar] [CrossRef]
105. Koen, J.; Klehe, U.-C.; Van Vianen, A.E.M. Training career adaptability to facilitate a successful school-to-work transition. *J. Vocat. Behav.* 2012, *81*, 395–408. [Google Scholar] [CrossRef]
106. Leslie, L.M.; Manchester, C.F.; Park, T.-Y.; Mehng, S.A. Flexible Work Practices: A Source of Career Premiums or Penalties? *Acad. Manag. J.* 2012, *55*, 1407–1428. [Google Scholar] [CrossRef]
107. Xie, B.; Xia, M.; Xin, X.; Zhou, W. Linking calling to work engagement and subjective career success: The perspective of career construction theory. *J. Vocat. Behav.* 2016, *94*, 70–78. [Google Scholar] [CrossRef]
108. Fang, R.; Landis, B.; Zhang, Z.; Anderson, M.H.; Shaw, J.D.; Kilduff, M. Integrating Personality and Social Networks: A Meta-Analysis of Personality, Network Position, and Work Outcomes in Organizations. *Organ. Sci.* 2015, *26*, 1243–1260. [Google Scholar] [CrossRef]
109. Westerman, J.W.; Bergman, J.Z.; Bergman, S.M.; Daly, J.P. Are Universities Creating Millennial Narcissistic Employees? An Empirical Examination of Narcissism in Business Students and Its Implications. *J. Manag. Educ.* 2012, *36*, 5–32. [Google Scholar] [CrossRef]
110. Baron, R.A.; Hmieleski, K.M.; Henry, R.A. Entrepreneurs' dispositional positive affect: The potential benefits—And potential costs—of being “up”. *J. Bus. Ventur.* 2012, *27*, 310–324. [Google Scholar] [CrossRef]
111. Spurk, D.; Kauffeld, S.; Barthauer, L.; Heinemann, N.S.R. Fostering networking behavior, career planning and optimism, and subjective career success: An intervention study. *J. Vocat. Behav.* 2015, *87*, 134–144. [Google Scholar] [CrossRef]
112. Chudzikowski, K. Career transitions and career success in the ‘new’ career era. *J. Vocat. Behav.* 2012, *81*, 298–306. [Google Scholar] [CrossRef]
113. Guan, Y.; Zhou, W.; Ye, L.; Jiang, P.; Zhou, Y. Perceived organizational career management and career adaptability as predictors of success and turnover intention among Chinese employees. *J. Vocat. Behav.* 2015, *88*, 230–237. [Google Scholar] [CrossRef]

114. Stamm, M.; Buddeberg-Fischer, B. The impact of mentoring during postgraduate training on doctors' career success. *Med. Educ.* 2011, *45*, 488–496. [Google Scholar] [CrossRef]
115. Dashper, K. Challenging the gendered rhetoric of success? The limitations of women-only mentoring for tackling gender inequality in the workplace. *Gender Work Organ.* 2019, *26*, 541–557. [Google Scholar] [CrossRef]
116. Blokker, R.; Akkermans, J.; Tims, M.; Jansen, P.; Khapova, S. Building a sustainable start: The role of career competencies, career success, and career shocks in young professionals' employability. *J. Vocat. Behav.* 2019, *112*, 172–184. [Google Scholar] [CrossRef]
117. Belsky, D.W.; Domingue, B.W.; Wedow, R.; Arseneault, L.; Boardman, J.D.; Caspi, A.; Conley, D.; Fletcher, J.M.; Freese, J.; Herd, P.; et al. Genetic analysis of social-class mobility in five longitudinal studies. *Proc. Natl. Acad. Sci. USA* 2018, *115*, E7275–E7284. [Google Scholar] [CrossRef] [PubMed]
118. Chen, Q.; Beaty, R.E.; Wei, D.; Yang, J.; Sun, J.; Liu, W.; Yang, W.; Zhang, Q.; Qiu, J. Longitudinal Alterations of Frontoparietal and Frontotemporal Networks Predict Future Creative Cognitive Ability. *Cereb. Cortex* 2018, *28*, 103–115. [Google Scholar] [CrossRef] [PubMed]
119. Suutari, V.; Brewster, C.; Mäkelä, L.; Dickmann, M.; Tornikoski, C. The Effect of International Work Experience on the Career Success of Expatriates: A Comparison of Assigned and Self-Initiated Expatriates. *Hum. Resour. Manag.* 2018, *57*, 37–54. [Google Scholar] [CrossRef]
120. Smale, A.; Bagdadli, S.; Cotton, R.; Dello Russo, S.; Dickmann, M.; Dysvik, A.; Gianecchini, M.; Kaše, R.; Lazarova, M.; Reichel, A.; et al. Proactive career behaviors and subjective career success: The moderating role of national culture. *J. Organ. Behav.* 2019, *40*, 105–122. [Google Scholar] [CrossRef]
121. Andreo-Martínez, P.; Ortiz-Martínez, V.M.; García-Martínez, N.; de los Ríos, A.P.; Hernández-Fernández, F.J.; Quesada-Medina, J. Production of biodiesel under supercritical conditions: State of the art and bibliometric analysis. *Appl. Energy* 2020, *264*, 114753. [Google Scholar] [CrossRef]
122. Carrión-Mero, P.; Montalván-Burbano, N.; Paz-Salas, N.; Morante-Carballo, F. Volcanic Geomorphology: A Review of Worldwide Research. *Geosciences* 2020, *10*, 347. [Google Scholar] [CrossRef]
123. Solla-Price, D.; John, D. *Little Science, Big Science*; Columbia University Press: New York, NY, USA, 1963. [Google Scholar]
124. Kraimer, M.L.; Greco, L.; Seibert, S.E.; Sargent, L.D. An Investigation of Academic Career Success: The New Tempo of Academic Life. *Acad. Manag. Learn. Educ.* 2019, *18*, 128–152. [Google Scholar] [CrossRef]

125. Abele, A.E.; Spurk, D. How do objective and subjective career success interrelate over time? *J. Occup. Organ. Psychol.* 2009, *82*, 803–824. [Google Scholar] [CrossRef]
126. Abele, A.E.; Spurk, D.; Volmer, J. The construct of career success: Measurement issues and an empirical example. *Zeitschrift Arbeitsmarktforsch* 2011, *43*, 195–206. [Google Scholar] [CrossRef]
127. Abele, A.E.; Spurk, D. The dual impact of gender and the influence of timing of parenthood on men's and women's career development: Longitudinal findings. *Int. J. Behav. Dev.* 2011, *35*, 225–232. [Google Scholar] [CrossRef]
128. Abele, A.E.; Hagmaier, T.; Spurk, D. Does Career Success Make You Happy? The Mediating Role of Multiple Subjective Success Evaluations. *J. Happiness Stud.* 2016, *17*, 1615–1633. [Google Scholar] [CrossRef]
129. Nosek, B.A.; Spies, J.R.; Motyl, M. Scientific Utopia: II. Restructuring Incentives and Practices to Promote Truth Over Publishability. *Perspect. Psychol. Sci.* 2012, *7*, 615–631. [Google Scholar] [CrossRef]
130. Parasuraman, S.; Purohit, Y.S.; Godshalk, V.M.; Beutell, N.J. Work and Family Variables, Entrepreneurial Career Success, and Psychological Well-Being. *J. Vocat. Behav.* 1996, *48*, 275–300. [Google Scholar] [CrossRef]
131. Eby, L.T.; Butts, M.; Lockwood, A. Predictors of success in the era of the boundaryless career. *J. Organ. Behav.* 2003, *24*, 689–708. [Google Scholar] [CrossRef]
132. Bretz, R.D., Jr.; Judge, T.A. Person–Organization Fit and the Theory of Work Adjustment: Implications for Satisfaction, Tenure, and Career Success. *J. Vocat. Behav.* 1994, *44*, 32–54. [Google Scholar] [CrossRef]
133. Waltman, L.; van Eck, N.J.; Noyons, E.C.M. A unified approach to mapping and clustering of bibliometric networks. *J. Informetr.* 2010, *4*, 629–635. [Google Scholar] [CrossRef]
134. Sosik, J.J.; Godshalk, V.M.; Yammarino, F.J. Transformational leadership, learning goal orientation, and expectations for career success in mentor–protégé relationships: A multiple levels of analysis perspective. *Leadersh. Q.* 2004, *15*, 241–261. [Google Scholar] [CrossRef]
135. Broadbridge, A.; Parsons, E. Gender and career choice. *Career Dev. Int.* 2005, *10*, 80–97. [Google Scholar] [CrossRef]
136. Dubbelt, L.; Rispens, S.; Demerouti, E. Gender discrimination and job characteristics. *Career Dev. Int.* 2016, *21*, 230–245. [Google Scholar] [CrossRef]
137. Jang, S.; Allen, T.D.; Regina, J. Office Housework, Burnout, and Promotion: Does Gender Matter? *J. Bus. Psychol.* 2020. [Google Scholar] [CrossRef]
138. Abiddin, N.Z. Developings an Informal Mentoring Relationship in Career Advancement and Psychosocial of Young Graduate Entrepreneurs for

- Human Resource Development. *Res. J. Appl. Sci.* 2013, 8, 321–329. [Google Scholar] [CrossRef]
139. Koekemoer, E.; Crafford, A. Exploring subjective career success using the Kaleidoscope Career Model. *SA J. Ind. Psychol.* 2019, 45. [Google Scholar] [CrossRef]
 140. Kong, Y.-Y.; Yang, B. The perceived career support, protean career orientation, and subjective career success: Multiple mediating effects of person-job fit and career self-management in the workplace. *Int. J. Adv. Sci. Technol.* 2019, 28, 174–182. [Google Scholar]
 141. Gerli, F.; Bonesso, S.; Pizzi, C. Boundaryless career and career success: The impact of emotional and social competencies. *Front. Psychol.* 2015, 6. [Google Scholar] [CrossRef] [PubMed]
 142. Vani, M.; Sankaran, H.; Praveen Kumar, S. The Need for Integrating Emotional Intelligence as an Essential Skill for Graduates with Special Reference to Employability of Engineering Graduates. *Int. J. Innov. Technol. Explor. Eng.* 2019, 8, 1104–1106. [Google Scholar] [CrossRef]
 143. Frenzel, J.E. Exploration of the entrepreneurial orientation and trait emotional intelligence in practicing pharmacists. *J. Am. Pharm. Assoc.* 2020, 60, 723–728.e2. [Google Scholar] [CrossRef] [PubMed]
 144. Dan, X.; Xu, S.; Liu, J.; Hou, R.; Liu, Y.; Ma, H. Relationships among structural empowerment, innovative behaviour, self-efficacy, and career success in nursing field in mainland China. *Int. J. Nurs. Pract.* 2018, 24, e12674. [Google Scholar] [CrossRef]
 145. Drewery, D.W.; Sproule, R.; Pretti, T.J. Lifelong learning mindset and career success: Evidence from the field of accounting and finance. *High. Educ. Ski. Work. Learn.* 2020, 10, 567–580. [Google Scholar] [CrossRef]
 146. Abdiraiymova, G.; Biekenov, K.; Burkhanova, D.; Serikzhanova, S. The Career Development Experience of Young Academics in Kazakhstan. *Russ. Educ. Soc.* 2019, 61, 1–16. [Google Scholar] [CrossRef]
 147. Ansaripour, S. The Role of Job Performance on Career Success and Self-esteem of Staff. *J. Clin. Diagn. Res.* 2017. [Google Scholar] [CrossRef]
 148. Jin, J. The role of assessment centers in job satisfaction and organizational commitment: A case of the Korean government. *Int. J. Hum. Resour. Manag.* 2018, 29, 1588–1608. [Google Scholar] [CrossRef]
 149. Trolan, T.L.; Jach, E.A.; Archibald, G.C. Shaping Students' Career Attitudes toward Professional Success: Examining the Role of Student-Faculty Interactions. *Innov. High. Educ.* 2020. [Google Scholar] [CrossRef]
 150. Leroux, J.A.; Lafleur, S. Employability Skills: The demands of the workplace. *Vocat. Asp. Educ.* 1995, 47, 189–196. [Google Scholar] [CrossRef]
 151. Kiong, T.P.; Yin-Fah, B. C Exploring factors towards career success in Malaysi. *Int. Bus. Manag.* 2016, 10, 3936–3943. [Google Scholar]

152. Fragoulis, I.; Phillips, N. Social Skills for Successful Career Development. *Rev. Eur. Stud.* 2011, 3. [Google Scholar] [CrossRef]
153. Healy, M.; Hammer, S.; McIlveen, P. Mapping graduate employability and career development in higher education research: A citation network analysis. *Stud. High. Educ.* 2020, 1–13. [Google Scholar] [CrossRef]
154. Zhang, X.; Yu, Y.; Zhang, N. Sustainable supply chain management under big data: A bibliometric analysis. *J. Enterp. Inf. Manag.* 2020. ahead of printing. [Google Scholar] [CrossRef]
155. White, H.D.; Griffith, B.C. Author cocitation: A literature measure of intellectual structure. *J. Am. Soc. Inf. Sci.* 1981, 32, 163–171. [Google Scholar] [CrossRef]
156. Judge, T.A.; Klinger, R.L.; Simon, L.S. Time is on my side: Time, general mental ability, human capital, and extrinsic career success. *J. Appl. Psychol.* 2010, 95, 92–107. [Google Scholar] [CrossRef] [PubMed]
157. Van der Heijden, B.I.J.M.; de Lange, A.H.; Demerouti, E.; Van der Heijde, C.M. Age effects on the employability–career success relationship. *J. Vocat. Behav.* 2009, 74, 156–164. [Google Scholar] [CrossRef]
158. Chang, J.; Baek, P.; Kim, T. Women’s Developmental Networks and Career Satisfaction: Developmental Functions as a Mediator. *J. Career Dev.* 2020, 089484531990000. [Google Scholar] [CrossRef]
159. Hall, D.T.; Lee, M.D.; Kossek, E.E.; Heras, M. Las Pursuing Career Success while Sustaining Personal and Family Well-Being: A Study of Reduced-Load Professionals over Time. *J. Soc. Issues* 2012, 68, 742–766. [Google Scholar] [CrossRef]
160. Beigi, M.; Wang, J.; Arthur, M.B. Work–family interface in the context of career success: A qualitative inquiry. *Hum. Relat.* 2017, 70, 1091–1114. [Google Scholar] [CrossRef]
161. Eby, L.T.; Durley, J.R.; Evans, S.C.; Ragins, B.R. The relationship between short-term mentoring benefits and long-term mentor outcomes. *J. Vocat. Behav.* 2006, 69, 424–444. [Google Scholar] [CrossRef]
162. Jawahar, I.M.; Ferris, G.R. A Longitudinal Investigation of Task and Contextual Performance Influences on Promotability Judgments. *Hum. Perform.* 2011, 24, 251–269. [Google Scholar] [CrossRef]
163. Perrewé, P.L.; Nelson, D.L. The Facilitative Role of Political Skill. *Organ. Dyn.* 2004, 33, 366–378. [Google Scholar] [CrossRef]
164. Diez-Martin, F.; Blanco-Gonzalez, A.; Prado-Roman, C. Research Challenges in Digital Marketing: Sustainability. *Sustainability* 2019, 11, 2839. [Google Scholar] [CrossRef]
165. Dong, D.; Chen, M.-L. Publication trends and co-citation mapping of translation studies between 2000 and 2015. *Scientometrics* 2015, 105, 1111–1128. [Google Scholar] [CrossRef]
166. NG, T.W.H.; Feldman, D.C. Human capital and objective indicators of career success: The mediating effects of cognitive ability and

- conscientiousness. *J. Occup. Organ. Psychol.* 2010, 83, 207–235. [Google Scholar] [CrossRef]
167. Kirchmeyer, C. The different effects of family on objective career success across gender: A test of alternative explanations. *J. Vocat. Behav.* 2006, 68, 323–346. [Google Scholar] [CrossRef]
168. Wiese, B.S.; Freund, A.M.; Baltes, P.B. Subjective Career Success and Emotional Well-Being: Longitudinal Predictive Power of Selection, Optimization, and Compensation. *J. Vocat. Behav.* 2002, 60, 321–335. [Google Scholar] [CrossRef]
169. O’Neil, D.A.; Hopkins, M.M.; Bilimoria, D. Women’s Careers at the Start of the 21st Century: Patterns and Paradoxes. *J. Bus. Ethics* 2008, 80, 727–743. [Google Scholar] [CrossRef]
170. Bozionelos, N. Mentoring provided: Relation to mentor’s career success, personality, and mentoring received. *J. Vocat. Behav.* 2004, 64, 24–46. [Google Scholar] [CrossRef]
171. O’Neil, D.A.; Bilimoria, D. Women’s career development phases. *Career Dev. Int.* 2005, 10, 168–189. [Google Scholar] [CrossRef]
172. Valcour, P.M.; Tolbert, P. Gender, family and career in the era of boundarylessness: Determinants and effects of intra- and inter-organizational mobility. *Int. J. Hum. Resour. Manag.* 2003, 14, 768–787. [Google Scholar] [CrossRef]
173. Jolly, S.; Griffith, K.A.; DeCastro, R.; Stewart, A.; Ubel, P.; Jagsi, R. Gender Differences in Time Spent on Parenting and Domestic Responsibilities by High-Achieving Young Physician-Researchers. *Ann. Intern. Med.* 2014, 160, 344–353. [Google Scholar] [CrossRef] [PubMed]
174. Ghosh, R.; Reio, T.G. Career benefits associated with mentoring for mentors: A meta-analysis. *J. Vocat. Behav.* 2013, 83, 106–116. [Google Scholar] [CrossRef]
175. Chen, M.-H.; Chang, Y.-Y.; Lo, Y.-H. Creativity cognitive style, conflict, and career success for creative entrepreneurs. *J. Bus. Res.* 2015, 68, 906–910. [Google Scholar] [CrossRef]
176. Bozionelos, N.; Bozionelos, G.; Kostopoulos, K.; Polychroniou, P. How providing mentoring relates to career success and organizational commitment. *Career Dev. Int.* 2011, 16, 446–468. [Google Scholar] [CrossRef]
177. Gibson, D.E. Role models in career development: New directions for theory and research. *J. Vocat. Behav.* 2004, 65, 134–156. [Google Scholar] [CrossRef]
178. Mao, N.; Wang, M.-H.; Ho, Y.-S. A Bibliometric Study of the Trend in Articles Related to Risk Assessment Published in Science Citation Index. *Hum. Ecol. Risk Assess. An Int. J.* 2010, 16, 801–824. [Google Scholar] [CrossRef]

179. Ellegaard, O.; Wallin, J.A. The bibliometric analysis of scholarly production: How great is the impact? *Scientometrics* 2015, *105*, 1809–1831. [Google Scholar] [CrossRef]
180. Ahmad, P.; Asif, J.A.; Alam, M.K.; Slots, J. A bibliometric analysis of Periodontology 2000. *Periodontology 2000* 2020, *82*, 286–297. [Google Scholar] [CrossRef] [PubMed]

**Capítulo II:
El éxito profesional de los
graduados universitarios:
Evidencia de un estudio
ecuatoriano en la provincia
de Los Ríos**

Capítulo II: El éxito profesional de los graduados universitarios: Evidencia de un estudio ecuatoriano en la provincia de Los Ríos

Artículo 2: Career Success in University Graduates: Evidence from an Ecuadorian Study in Los Rios Province



Article,

Career Success in University Graduates: Evidence from an Ecuadorian Study in Los Rios Province

by Roberto Pico-Saltos ^{1,2,*}, Lady Bravo-Montero ^{3,*}, Néstor Montalván-Burbano ^{3,4,5}, Javier Garzás ¹ and Andrés Redchuk ¹

¹ Department of Statistics and Operations Research, Rey Juan Carlos University, 28933 Madrid, Spain

² Faculty of Engineering Sciences, Quevedo State Technical University, Quevedo 120304, Ecuador

³ Centro de Investigaciones y Proyectos Aplicados a las Ciencias de la Tierra (CIPAT), ESPOL Polytechnic University, Guayaquil 9015863, Ecuador

⁴ Department of Economy and Business, University of Almería, Citra, Sacramento s/n, La Cañada de San Urbano, 04120 Almería, Spain

⁵ Innovation, Management, Marketing and Knowledge Economy Research I2Maker, ESPOL Polytechnic University, Guayaquil 9015863, Ecuador

* Author to whom correspondence should be addressed.

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Abstract: Career success and its evaluation in university graduates generate growing interest in the academy when evaluating the university according to its mission and social mandate. Therefore, monitoring university graduates is essential in measuring career success in the State Technical University of Quevedo (UTEQ, acronym in Spanish). In this sense, this article aims to identify the predictive career success factors through survey application, development of two mathematical functions, and Weka's classification learning algorithms application for objective career success levels determination in UTEQ university graduates. Researchers established a methodology that considers: (i) sample and data analysis, (ii) career success variables, (iii) variables selection, (iv) mathematical functions construction, and (v) classification models.

The methodology shows the integration of the objective and subjective factors by approximating linear functions, which experts validated. Therefore, career success can classify university graduates into three levels: (1) not successful, (2) moderately successful, and (3) successful. Results showed that from 548 university graduates sample, 307 are men and 241 women. In addition, Pearson correlation coefficient between Objective Career Success (OCS) and Subjective Career Success (SCS) was 0.297, reason why construction models were separately using Weka's classification learning algorithms, which allow OCS and SCS levels classification. Between these algorithms are the following: Logistic Model Tree (LMT), J48 pruned tree, Random Forest Tree (RF), and Random Tree (RT). LMT algorithm is the best suited to the predictive objective career success factors, because it presented 76.09% of instances correctly classified, which means 417 of the 548 UTEQ university graduates correctly classified according to OCS levels. In SCS model, RF algorithm shows the best results, with 94.59% of instances correctly classified (518 university graduates). Finally, 67.1% of UTEQ university graduates are considered successful, showing compliance with the university's mission.

Keywords: *career success; objective and subjective career success factors; classification learning algorithms;*

1. Introduction

Being a successful professional is an aspiration of college students [1]. It, for many, means getting a job with a reputable company [2] and earning a good salary [3]. However, some professionals who meet these goals do not consider themselves successful because the economic aspect does not necessarily influence their perception of career success [4,5].

Career success is defined as the achievement of individual happiness [6,7] and is contextualized in four dimensions: personal, professional, business, and family [8], with a certain degree of temporality [9]. In the professional field, success in the professional career is bilateral [10]. It is considered as a social construction rather than an objective reality [11,12]. Career success has been widely studied in recent years [8]. Various conceptions were presented based on the values of the human being [5,13,14], who constantly seek self-development [15,16]. That is why obtaining an integral definition is a complex task. Recently, it is related to objective positive achievements and their perception, based on work experience [17].

Career success is addressed in different fields of science, such as administration [14,18,19], organization and work [20,21], education [22,23], vocational psychology [24,25,26,27], and human resources [28]. In general, the success of professional career measures in terms of external (objective) and internal (subjective) criteria. Objective criteria refer to real or observable aspects [29,30,31]. In contrast, subjective criteria are subject to individual personality traits [32].

In the literature, career success presents different approaches depending on its area of knowledge, making its quantification and efficiency difficult [31]. Some predictive variables of the objective career success are salary [33], employment status [34], hierarchical level in the company [35], age [36], and leadership [37]. On the other hand, subjective career success factors include job or salary

satisfaction, career adaptability, and personality traits [24,38,39]. These factors can substitute for the meaning of subjective career success [14,38,40,41,42].

For this reason, it is essential to analyze career success in greater depth. Determining the level of success or the probability that a professional can be successful can be done employing an output (dependent) variable produced by a series of independent variables. For this, it is necessary to have some tool that allows the monitoring of university graduates to measure the level of career success according to the influence of the intervening variables regarding the degree of relative importance in career success. Furthermore, it is relevant to conceptualize the objective and subjective results of an individual in her career. Therefore, the research question purposed is: Will it be possible to establish a methodology that brings together objective and subjective aspects for assessing the career success of a university graduate, which approximates their condition and recognized status?

This article aims to identify the predictive career success factors through survey application, development of two mathematical functions, and Weka's classification learning algorithms application for subjective and objective career success levels determination in UTEQ university graduates. This identification makes it possible to reduce data dimensionality, correlation, and career success prediction to be more accurate. Furthermore, it seeks to establish the most influential variables of subjective and objective professional success to improve the career success prediction accuracy.

Experts group and a high hierarchical level are considered a set of career success attributes to define those attributes of greater significance. Subsequently, two mathematical functions will measure the Objective Career Success (OCS) and Subjective Career Success (SCS) levels. These functions will analyze success from the data obtained from the follow-up of university graduates (alumni). Finally, the proposal was validated to verify its performance. The results confirm that the functions obtained can be applied to databases of graduates, allowing to segment and characterize graduates according to their career success level.

2. Research Context

UTEQ university locates in Los Ríos province (Ecuador), as shows Figure 1. This university began its activities on 22 January 1976, as an extension of the "Luis Vargas Torres" university. After multiple efforts by the Quevedo community, the UTEQ creation was on 1 February 1984, with the Faculty of Agricultural Sciences.

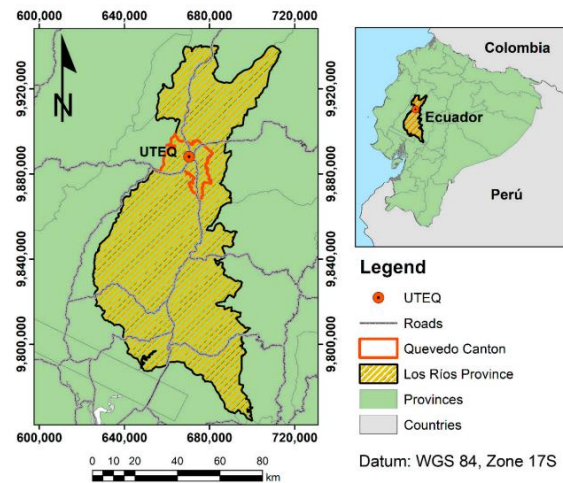


Figure 1. Study area location.

Nowadays, there are 15 engineering degrees (e.g., Agroindustries, Forestry, among others) and 5 bachelor's degrees: (e.g., Nursing, Ecotourism, among others), with approximately 10,000 students taking part, with a graduation rate of 48%. Currently, UTEQ has accreditation from the Higher Education Quality Assurance Council (CACES), a government body that regulates the operation of universities in the country.

2.1 Literatura Review

This section is essential for career success variables selection because there are many career success predictors. The researchers' goal is to determine the most crucial career success predictive factors used in the literature review.

Career success is an important research topic in management [43,44,45] and psychology [46,47,48]. In addition, career success is the real or accumulated achievements of the individual over time [38,49], which respond to a historical and cultural process [50,51]. Similarly, Arthur et al. [52] consider that career success is achieving desirable results related to long-term work activity. Getting success in the race allows the individual to obtain a sense of identity and meaning [19], happiness by obtaining work satisfaction [53,54], personal well-being and success of the company [55,56]. In short, it shows the interaction between individuals, organizations, and society based on a variety of behaviors and practices [27].

According to Gattiker and Larwood [57], career success is a construct consisting of five factors related to work, interpersonal relationships, finances, business hierarchy, and aspects of life. Danziger and Wiener [58,59] relates to career success based on competencies (technical and managerial), independence, creativity, service, challenges, and lifestyles. According to Parker and Chusmir [60], it is related to six factors of status, contribution to society, family relationships, personal and professional fulfilment, and security. So too, Judge et

al. [61] studied dispositional characteristics by relating mental capacity and personality, using five factors. Finally, Dyke and Murphy [62] related four factors around its meaning: balance, relationships, recognition, and material success.

In the literature, initial investigations consider two approaches: subjective and objective [38,57,63,64] or extrinsic and intrinsic [27,65,66]. However, in the first studies on career success, only objective success was analyzed, ignoring subjective success for several decades. These approaches (objective and subjective) differ in their concept [41,52], and therefore, there was a criterion to analyze it independently [14]. Over the years, some authors have considered using these criteria together [61,66,67,68,69]. Finally, Big Five personality traits were included to explain subjective career success factors [70,71,72].

2.1.1 Objective Career Success Variables

Objective Career Success (OCS) considers tangible and directly observed, measurable, and verifiable by impartial third person career success facets [8,47,55]. Some researchers consider the OCS based on quantifiable criteria that may be available to the human resources area of the company. The variables considered in this study are the following:

First, “remuneration” refers to the economic income that an individual receives within an organization [27,69]. Remuneration includes salary, bonuses, and other cash compensation; it is one of the most used variables in the career success literature [31,73]. Remuneration is a notable indicator in contemporary society [74]. Some authors consider a good salary as a material success [62], wealth and status when obtaining a salary increase [60], equitable pay and fair income [57,75], financial security [58] and economic rewards [65].

Second, the variable “job promotion” increases the company’s job level responsibilities [47] or the material reward due to work [38]. This variable considers an organizational perspective, evaluating their hierarchical position and promotions received [44]. Other studies show it as the development of opportunities (job success), and promotion opportunities (Hierarchical success) [57], recognition [45,75,76], hierarchical level [65,77], and the number of promotions received [64]. Third, this article considers “education” as the investment that would represent the future income of the professional. Therefore, it uses to determine the rates of return on this investment [78,79].

Finally, this study considers other variables, such as: “finding the first job in less than a year of graduation” [80]; “graduate in the shortest time possible”; and “have your own house” [63]; “good level of parents professional training” [81,82]; “influence of marital status on career success” [83,84]; “school type in secondary education” [63]; and “emotional-financial support from parents” [81].

Under this research approach, the hypothesis is the following:

Hypothesis 1 (H1). *Is it possible to obtain an effective objective career success classification model to identify successful professionals using the predictors obtained from the research instrument?*

2.1.2 Subjective Career Success Variables

Subjective career success (SCS) measures subjective, internal, or extrinsic criteria [52,68]. SCS is the perception that individuals have about their careers and measured in terms of satisfaction [8,56]. It also represents an individual self-assessment of their careers [57,85]. The central element is the person and not the organization for which they work [71]. SCS is the most important determinant of career success [65,86], since it allows the individual to acquire greater security, motivation, and the pursuit of development goals, which will lead to objective career success [42]. Some researchers who contributed to the development of the subjective career success considered the following variables:

First, *“professional vitality”* is a characteristic of consistent work with work done with passion, strength, and satisfaction [87]. Self-perceived vitality implies how the individual fits into the organization [28,88]. Next, *“satisfaction with life”* is one of the dimension variables of work well-being [89], which considers that the greater the well-being at work, the greater the satisfaction [90]. On the other hand, *‘professional satisfaction’* is related to the variables of business sponsorship such as training, development opportunities, mentoring and career support [44]. Other authors consider it relates to rank and salary [68,69] and one of the dimensions of job well-being [89].

“Goals fulfilment” is achieved when the person feels self-confident and motivated [42]. Persistence and being organized are related to goal setting, allowing them to be scrupulous in their work activities [27]. Employees interact and present competitive goals in this work environment, positively evaluating their organization [28,53]. On the other hand, *“satisfaction with helping society”* is also considered one factor for success in life [60,91]. Some authors consider this satisfaction part of interpersonal affections [31], service [58,59,92]. According to Parker and Chusmir [60], contributing to society means helping others or being useful. It represents making a difference and promoting workplace wellness. In the company, the satisfaction of helping with the occupation and job performance are the contributors to the occupational status [8,38].

The *“organizational hierarchy”* is one of the components of career success in terms of the company’s position as responsibility and power [8]. Work experience provides knowledge and experience related to the career, allowing the person to achieve hierarchy in the organization [46]. Grimland et al. [28] consider the organizational hierarchy as external progress in the career. Recently, Rossenkhan et al. [93] consider that this hierarchy is part of the sequential process of success, constituted by success in interpersonal relationships, work, hierarchy, and finances. The *“identification with work”* is important because it considered this

variable a signifier for life [19]. In some cultures, professional benefits inculcate that do not include remuneration, fostering a sense of fraternity, significance, and identification with an organization [8].

The “*financial success*” represents the perception of success based on the financial rewards obtained [46] and represents the high income of the individual compared with their peers in similar jobs [57,94]. This variable is the result of hierarchical, work and interpersonal success [93]. On the other hand, “*success at work*”, which is related to feeling successful in the professional carry out a career, was also considered. Other authors consider that job satisfaction does not lead to career success when it represents a high cost for the individual in terms of family relationships, health, or personal values [8], not fitting into the organization when accessing a new job [48].

The “*interpersonal success*” represents the interpersonal skills or social competence that allows the individual’s employability in an organization [48]. In work activities that require high interpersonal skills, there is a positive relationship between agreeableness and job performance [46,47]. Likewise, “*teamwork*” is considered as the ability to be available and to be able to collaborate for a group in which a team spirit is strengthened [95]. In certain work activities, teamwork is essential since cooperation between people can develop career success [61].

The “*optimism*” is an indispensable element when it is tasted in solitary activities [53]. This variable presents a positive correlation with the levels of occupation, salaries, and work success [27]. The “*achievement*” represents the success of a career, which is slightly related to academic achievement [48]. According to Judge et al. [38], achievement orientation allows labor promotions. On the other hand, Heslin [8] considered that people with professional guidance not only consider as an achievement the monetary without promotions in the structure of the organization. Finally, this study considered other minor variables such as: “*recognizing strengths and limitations*” [61,96]; the “*own control of emotions*” [61,96]; “*persuasion at work*” [57,61,96], and “*satisfaction with the knowledge acquired at the university*” [97,98].

For this success type, researchers have defined the following hypothesis:

Hypothesis 2 (H2). *Is it possible to obtain an effective subjective career success classification model to identify successful professionals using the predictors obtained from the research instrument?*

3. Method

This study contemplates a rigorous six-phase process (see **Figure 2**), which allows establishing the objective and subjective career success: (i) sample and data analysis; (ii) career success variables; (iii) variables selection; (iv) mathematical functions construction; and (v) classification models.

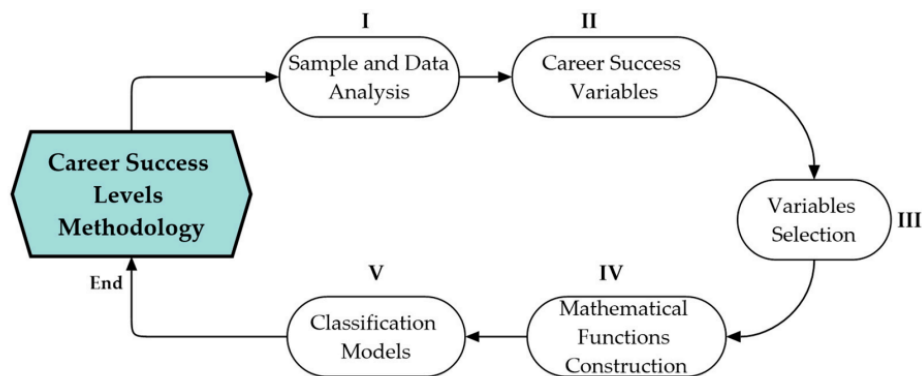


Figure 2. Methodological scheme.

3.1. Sample and Data Analysis

Periodic surveys are the evaluation instrument used to analyze the academic quality of higher education institutions [99,100]. This methodology is used in 98% of the universities in the United States [101,102]. Which is why a survey was constructed to follow-up professional graduates who have completed their studies for at least one year. Systematic follow-up studies of university graduates allow measuring graduates' performance in the labor market, their levels of job-related satisfaction, and possibilities. In addition, it is possible to have direct information on the expectations of employers at the job skills [103].

The self-administered survey directed at UTEQ graduates was the research method selected. The population comprised 2079 graduates, and researchers decided to study all of them. The data collection process was between June and December 2017. During this period, the total population was contacted on up to three occasions by email. This process ended with the receipt of 561 questionnaires, of which 548 were considered valid, representing a response rate of 26.35%. The survey responses were tracked by email control messages every month and a half. As a result, researchers worked with a sample of 548 UTEQ university graduates, comprising a study period between 1990 and 2017.

Sampling techniques are classified into "probability" and "non-probability" samples. For this study, the researchers chose the probability sampling method, which present three main properties: (1) The sampling units' selection is random; (2) each potential sampling unit has a known probability of being selected for the sample, which is different from zero; and (3) it is possible to identify all potential samples of a given size, that can be extracted from the population before the actual selection process begins [104,105]. Probability sampling method allows the investigator to generalize the findings of the sample to the target population (i.e., statistical inferences) [106,107]. This method includes: (i) simple random sampling, (ii) systematic random sampling, (iii) stratified random sampling, (iv) cluster sampling, among others.

Stratified sampling was applied because the population from which the sample was drawn is not a homogeneous group. This method allows obtaining a meaningful representation of the sample [108]. The stratified probability sampling method allows to determine the objective career success and subjective career success levels. Career success levels of university graduates are classified into three categories: successful, moderately successful and unsuccessful.

3.2. Career Success Variables

As a result of literature review 51 variables were selected as career success predictor variables, divided into two mean groups: 29 objective career success variables (see Table 1), and 22 subjective career success variables.

Table 1. Variables or factors selected to objective career success.

N°	Objective Career Success Variables	References
R1	Job concerning the professional training field studied (third level degree)	[58,60,62,63,73,74]
E2	Diplomas, masters or doctorates	[63,78,79]
E3	A high degree of participation in research, development and innovation	[78-80]
E4	High level of knowledge of Information and Communication Technologies	[78-80]
R5	A correct choice of professional career	[58,60,62,73,74,83]
R6	Have a good salary	[30,58,60,62,73,74,109]
LP7	Have a good hierarchical level in the company	[44,47,57,64,65,110]
LP8	Work in a prestigious company or institution	[38,44,47,57,64,65,80]
LP9	Job experiences related to previous studies	[38,44,47,57,64,65,111]
E10	Have a high level of foreign language knowledge	[78,79,111]
LP11	Age or time allows for professional development	[38,44,47,57,64,65,112]
E12	Have graduated from the university with good grades	[63,78,79]
O13	Finding the first job in less than a year of graduation	[80]
O14	Graduate in the shortest time possible	[63]
R15	Monthly household income level	[58,60,62,73,74,111]
O16	Have own home	[63]
O17	Good level of professional training of parents	[81,82]
LP18	Attitude person, building their self-esteem	[38,44,47,57,64,65,84]
LP19	Personal and professional satisfaction	[38,44,47,57,64,65,113,114]
O20	Influence of marital status on career success	[83,84]
O21	Type of secondary school (fiscal, private)	[63]
E22	Have graduated with excellent grades from high school	[78,79,84]
E23	Practice ethical principles and values	[78,79,115,116]
O24	Emotional and financial support from parents	[81]
LP25	Have good interpersonal relationships and leadership	[38,44,47,57,64,65,113,117]
LP26	Be a good practitioner of spiritual principles	[38,44,47,57,64,65,84]
LP27	Coaching and conflict management	[38,44,47,57,64,65,118]
LP28	Possess emotional intelligence	[38,44,47,57,64,65,117,119]
E29	University of higher education	[63,78,79]

Note: Remuneration: R; labor promotion: LP; education: E, and other variables: O.

Table 2 includes the most prominent subjective success variables. These indicators are operationalized and considered factors such as job and life satisfaction [120,121].

Table 2. Variables or factors selected to subjective career success.

N°	Subjective Career Success Variables	References
1	Professional vitality: energy during work	[8,28,39,87,88,90]
2	Satisfaction with life: life close to the ideal	[8,39,89,90,121]
3	Professional satisfaction: satisfaction with career success	[8,39,42,44,65,89,90]
4	Goals fulfilment: achieve professional career goal	[8,27,28,42,53,122]
5	Satisfaction with helping society: career success is the personal satisfaction and the contribution of work to the society	[8,31,38,58–60,91,122,123]
6	Organizational hierarchy: satisfaction with organizational hierarchy	[8,28,46,57]
7	Identification with work: job, meaning to my existence and identity	[8,18,19,124,125]
8	Financial success: earn as much as person think the work is worth	[8,46,57,93,126]
9	Hierarchical success: satisfaction with promotions	[57,124,126]
10	Interpersonal success: confidence from my superior at work	[46–48,57,97]
11	Success at work: feel supported by administration	[8,48,57,126]
12	Success at work: liking for the job that person does	[8,48,57,90,121,123]

3.3. Variables Selection

Study variables discretization was carried out to transform them from continuous to categorical variables using the Likert scale, measured from 1 to 5. Then, this criterion applies to career success and objective career success variables. After that, career success variables analyzed each variable's relative importance or weight, defined as (wi). Knowing variable weights allows calling them according to their relative importance for each client (expert), showing the key factors to improve quality [95].

Methodology lets career success assessment through 50 surveys aimed at highly experienced professionals, who validated career success variables assigning weights for each variable considered. Expert professionals sample considered professionals with more than 15 years in the professional practice, high income, and managerial positions, such as company managers, entrepreneurs, university authorities, executives, and researchers. In addition, an expert from the Catholic Church also contributed to his experience regarding the attributes that best define career success.

Experienced professionals' ages vary between 38 and 60 years, with an average of 46.3 years and a standard deviation equal to 3.2. Consequently, each variable average requires Pareto analysis application, ordering each variable from highest to lowest according to importance degree. The Pareto analysis applies to both mathematical models (objective career success and subjective career success).

3.4. Mathematical Functions Construction

Career success functions construction used a model based on experts' criteria, who assigned a level of importance to the variables. Therefore, this phase consists of implementing two functions to measure Objective Career Success (OCS) and Subjective Career Success (SCS), respectively. For that reason, it considered the 51 variables of career success previously described, and the attributes with the greatest weight are selected. It matches with the most relevant

variables to consider professionals as successful. For example, customer service and quality are inherent issues in education, so it proposed to use the linear quality of service indicator to measure the career success [127].

There are different methods to determine the weights of each career success predictor. In this study, the method that distributes 1 point (100%) among the applied attributes was selected. However, method reliability must be adjusted according to the type of survey data because the number of variables is large [128,129,130]. Survey application as an interview helps minimize the number of variables. Therefore, it is necessary to read all attributes, organize a list in decreasing order of preference, and assign the weights of the variables until giving a total of one point or 100% and were applied to the 548 university graduates. Measuring and evaluating the quality of undergraduate or graduate programs and student satisfaction is a relatively new topic [131,132,133]. Therefore, higher education programs are growing as a proportion in the education market, so they are evaluated for their quality [134].

Service quality measurement began many years ago, and it became a driving force in the business world [135]. Interest in quality has spread to the public sector and higher education institutions [136], such as universities [137,138,139]. The quality of services is the product of the reorganization and re-establishment of new principles in higher education institutions; both education and training are imperative for survival in a competitive environment [127].

In the student-customer concept, Ritzer's approach [140] considers the student as any buyer who demands a good service. Applying this concept of the student as customer to measure its qualities, it must be considered the concept of product/service in university education [141]. According to the European Foundation for Quality Management (EFQM) [142], the product is defined in terms of value added to the student's knowledge, skills, and personal development [143]. The product quality is linked to the process quality. Therefore, assessing the quality of the product in teaching entails analyzing the quality of the educational processes and identifying its key elements [144,145].

Quality measurement in graduate education has used such a tool as an option to measure the level of career success of university graduates. There is a population of clients n , and the vector whose elements are the Q_i (perceived quality of a given service) by the i client of the population is called Q . It is common to assume that the customer's evaluation will be a function of different k , $X_1 \dots X_k$ quality attributes that determine the overall evaluation of the service. The vector whose elements are $X_{i1} \dots X_{ik}$ is called X_i . The evaluation of the career success attributes carried out by the professional i of the group of experts. So, career success CS_i CS_i definition is on the base of these attributes:

$$CS_i = f(X_{i1} \dots X_{ik})$$

To measure the service quality or career success used the linear approximation indicator [146] through the following expression:

$$CS_i = \sum_{j=1}^k (w_{ij}X_{ij})$$

In the matrix W , w_{ij} coefficients are the weights defined by each professional in the experts group (i). These weights are positive and must add up to one:

$$w_{ij} \geq 0 \quad \forall j \geq 0 \quad \forall i, \forall j$$

$$\sum_{j=1}^k w_{ij} = 1 \quad \forall i \quad i = 1, \dots, 50 \quad j = 1, \dots, 20$$

X_j : objective career success attribute.

These weights are the relative importance of X_i 's attribute in determining the OCS of the relatively successful professional [146]. For each professional surveyed (i) there is an objective career success function. Additionally, with the 29 OCS attributes, it is necessary to know the average degree of importance of each one. Therefore, it is required to obtain the means of each attribute:

$$\bar{k}_i = \frac{\sum_{j=1}^n w_{ji}}{n}$$

\bar{k}_i = the average weight assigned by the expert's group to the OCS attribute x_i ;
 w_{ji} = the weight assigned by experienced professional (i) to attribute x_{ij} ;
 n = 50 professionals surveyed.

3.4.1. Objective Career Success Function

The objective career success function is defined considering 29 success factors and it is defined by the following equation (Equation (1)).

$$OCS_i = f(x_1, \dots, x_n) = \sum_{i=1}^n (\bar{k}_i x_i) \quad \begin{matrix} \bar{k}_i \geq 0 & \forall i \\ \sum_{i=1}^n \bar{k}_i = 1 & \forall i \end{matrix} \quad (1)$$

where,

OCS_i = OCS level achieved by the individual i ;
 n = number of objective career success variables;
 \bar{k}_i = average weights of each predictor of career success (positive values);
 x_i = objective assessment for the individual (i) to the performance of an OCS attribute.

3.4.2. Subjective Career Success Function

The subjective career success function defines considering 22 success factors (Equation (2)). For this, a survey questionnaire conducted for 50 expert professionals, including the question “The successful professional is the one who”, requesting to distribute 100 points among the attributes of subjective career success.

$$SCS_i = f(y_1, \dots, y_n) = \sum_{i=1}^n (\bar{k}_i y_i) \quad \begin{matrix} \bar{k}_i \geq 0 & \forall i \\ \sum_{i=1}^n \bar{k}_i = 1 & \forall i \end{matrix} \quad (2)$$

where,

SCS_i = SCS level achieved by the individual (i);
 n = number of subjective career success variables;
 \bar{k}_i = average weights of each predictor of career success (positive values);
 y_i = subjective assessment for the individual (i) to the performance of an SCS attribute.

3.5. Classification Models

With the collected data about objective and subjective career success, classification models construction estimates whether a university graduate can be objectively and subjectively be successful. Career success variables discretization was divided into three categories (successful, moderately successful, and unsuccessful). The discretization intervals were obtained from experts criteria on the distribution of the variables. There are some mathematical methods to validate the variables of professional success. Initially, researchers tested with factor analysis, but it did not work as it presented a very low correlation. Therefore, classification models were applied using Weka’s classification learning algorithms for subjective and objective career success mathematical model validation.

This study performed a multivariate analysis using Waikato Environment for Knowledge Analysis (WEKA), developed by the University of Waikato, New Zealand, in 1993. The 3.8.1 Windows version was used in this article. This software comprises a Java libraries group that use machine learning and data mining algorithms, presenting an intuitive interface to analyze large volumes of data [147,148]. This program allows the application of multivariate algorithms to

the data set and analyze the effect produced by the variables that measure career success. In addition, this allows to relate the variables to each other and the class variables of the career success. However, these interpretations must be made individually without considering the career success function variables. Weka allows adequate handling of the data, allowing its analysis, modelling, and predictivity. Furthermore, it is considered one of the open-source data mining tools with the highest performance and functionality [149]. Weka covers standard data mining tasks such as preprocessing, classification, regression, clustering, and association rules [137,138], and it is used in various academic disciplines [150,151,152]. Many classification techniques are similar to the predictive accuracy basis, speed, robustness, scalability, and interpretability criteria [153]. For example, in data mining classification tree is a supervised learning algorithm [154]. Four Weka classification learning algorithms were used to career success modelling validation: (i) Logistic Model Tree (LMT), (ii) J48 pruned tree, (iii) Random Forest Tree (RF), and (iv) Random Tree (RT) [155].

Select attribute supervised technique was used in this study, and the technique uses the CFS Subset Evaluator criterion function and Best First Decision tree (BF) classification method. Best First decision tree nodes are expanded by using best-first-order method. The impurity is default in all the nodes and all the impurities are reduced by using best node. Best first tree has many attributes, and root nodes are placed based on those attributes [156]. Best First Decision tree allows choosing the best attributes associated with the career success variables. Weka selected three objective career success variables (age, company type, and the company economic sector). Objective career success is strongly related to age; the over 31 years and threshold of the successful are from 35 to 45 years. Company type is the “public sector”, and the economic sector is “educational”.

4. Results

4.1. Survey Results

This study considered a random sample of 100 of the 548 university graduates. Consequently, objective career success levels of university graduates will be classified into three categories: successful (n_3), moderately successful (n_2), and unsuccessful (n_1), as shown in **Table 3**. The distribution of the sample size by the proportional method among the strata described below:

$$100 = k \times 548 \Rightarrow k = \frac{100}{548}$$

Table 3. Sample size for the objective career success strata.

Success Level	Sample Size	Total
$n_1 = \text{not successful}$	$n_1 = \frac{100}{548} \times (N_1) = \frac{100}{548} \times 180$	$n_1 = 33$
$n_2 = \text{moderately successful}$	$n_2 = \frac{100}{548} \times (N_2) = \frac{100}{548} \times 318$	$n_2 = 58$
$n_3 = \text{successful}$	$n_3 = \frac{100}{548} \times (N_3) = \frac{100}{548} \times 50$	$n_3 = 9$

Success probability (p) was calculated to define the career success levels. If p is greater than or equal to 0.8, then it is successful (n_3). If p is between 0.5 and 0.8, it is moderately successful (n_2). Finally, if $p < 0.5$, then it is not successful (n_1). The three were responsible for the follow-up to graduates compared with the value determined by the success functions. The success represented when at least two of those responsible for monitoring graduates coincide with each function. Results are related to professionals' achievements before, during, and after their time at the university and professionals perceptions.

4.2. Career Success Variables Assignment

The average order importance analysis by determining objective career success factors through adapted Pareto criterion (relation 70–30%) application. As a result, it was selected the most relevant variables to define the OCS linear function by weights redistributing in such a way that their sum reaches unity. From the Pareto criterion application, 30% of the accumulated variables represent the 68.4% cumulative weight of the objective career success factors. It means that only nine variables are the most representative OCS factors (see **Table 4**).

Table 4. Pareto analysis application for objective career success.

OCS Factors	\bar{k}_i	\bar{k}_i Accumulated	$w_i = \frac{\bar{k}_i}{68.4\%}$
x_1 . Work about your professional training	13.0%	13.0%	19.1%
x_2 . Level of academic improvement	9.6%	22.6%	14.0%
x_3 . Level of participation in I & D + I	8.9%	31.5%	12.9%
x_4 . Information Technology Knowledge	7.6%	39.0%	11.1%
x_5 . Choose the right professional degree the first time	6.4%	45.4%	9.4%
x_6 . Income—Salary	6.4%	51.8%	9.3%
x_7 . Company hierarchical level, professional achievements	5.7%	57.5%	8.3%
x_8 . I work in a prestigious company or institution	5.6%	63.1%	8.2%
x_9 . Work-studies relationship in the training process	5.3%	68.4%	7.7%

From the 22 subjective career success variables, adapted Pareto criterion (60–40%) was applied to select the most significant weights variables ($w_i > 10.7\%$). As

a result, seven variables were selected by adapted Pareto criterion application (see **Table 5**).

Table 5. Pareto analysis application for subjective career success.

SCS Factors	\bar{k}_i	\bar{k}_i Accumulated	$w_i = \frac{k_i}{56.3\%}$
Y ₁ .—He likes the job he does	10.9%	10.9%	19.4%
Y ₂ .—Satisfaction with your career success achieved	9.0%	19.9%	16.1%
Y ₃ .—Job satisfaction and contribution to society	8.8%	28.7%	15.6%
Y ₄ .—Persistence in the objectives achievement	8.6%	37.6%	15.2%
Y ₅ .—Scope of the goal set in your professional career	6.8%	44.1%	12.0%
Y ₆ .—The effort to achieve a standard of excellence	6.1%	50.2%	10.9%
Y ₇ .—Work gives meaning to your existence and identity	6.1%	56.3%	10.8%
Total	100%	100%	100%

4.3. Career Success Mathematical Functions

4.3.1. Objective Career Success Function

Objective career success function definition was based on the new selected variables according to Pareto criterion. As a result, the equation is the following:

$$OCS = f(x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8, x_9) = \sum_{i=1}^9 w_i x_i$$

$$OCS = 0.191x_1 + 0.140x_2 + 0.129x_3 + 0.111x_4 + 0.094x_5 + 0.093x_6 + 0.083x_7 + 0.082x_8 + 0.077x_9$$

Objective career success function evaluation at its maximum and minimum values represents the following values $f(5,5,5,5,1,5,5,5,5)$ and $f(1,1,1,1,0,1,1,1,1)$, depending on the information of each of the graduates OCS will be in the interval $OCS \in [0.91; 4.54]$.

4.3.2. Subjective Career Success Function

This same procedure, but with Pareto analysis in 60–40% relationship, ordered according to degree importance from highest to lowest was applied to define the SCS function described below.

$$SCS = f(y_1, y_2, y_3, y_4, y_5, y_6, y_7) = \sum_{i=1}^7 w_i y_i$$

$$SCS = 0.194y_1 + 0.161y_2 + 0.156y_3 + 0.152y_4 + 0.120y_5 + 0.109y_6 + 0.108y_7$$

Subjective career success function evaluation at its maximum and minimum possible values represents these values $f(5,5,5,5,5,5,5)$ and $f(1,1,1,1,1,1,1)$, respectively. So, according to the information of each of the graduates, the subjective career success will be within the interval $\in SCS \in [1; 5]$. As a result, OCS scores are in the range between [0.91, 4.54] (variables weight scale from 1 to 5) and the range between [1,5] for the subjective career success. The methodology validation required the collaboration of three people in charge of monitoring university graduates. As a result of the survey and the assignment of weights of all variables analyzed for OCS and SCS, nine variables were selected for OCS and seven variables for SCS.

4.4. Career Success Levels

The evaluation functions results of OCS and SCS to UTEQ university graduates sample allowed classifying the graduates as “successful”, “moderately successful”, and “unsuccessful” (see Table 6). In the descriptive analysis data, results of the functions were contrasting, made value judgments, and differences of each group of graduates were highlighted.

Table 6. A rating scale for objective career success.

Category	Value	Criterion—Success Level	Function Interval
Successful	2	$f \geq (4.54)$ (80%)	$3.632 \leq f < 4.54$
Moderately successful	1	$(4.54) (80\%) < f \leq (4.54)$ (50%)	$3.632 \leq f < 2.27$
Unsuccessful	0	$f < (4.54)$ (50%)	$f < 2.27$

Note: f: career success function.

Table 7 contains successful, moderately successful, and unsuccessful objectively professionals number by the academic unit. Results show that 9.1% of professionals are successful, 58% moderately successful, and 32.8% are unsuccessful. Successful professionals belong to the oldest academic units degrees such as agrarian (30%), livestock (24%), and environmental (18.2%). The most successful careers degrees are forest engineering, animal science, agricultural business administration, systems and software, and agronomy. In this group, computer systems stand out, which despite the low technological development of the region in the last 20 years, had a significant boom. About 9.1% represent objectively successful graduates; 58% moderately successful; and 32.8% are objectively unsuccessful (see Table 7).

Table 7. Objective career success by faculties.

OCS Level	Faculties/Academic Units							Total
	E	B	A	L	E	S	La	
0	50	66	16	10	19	17	2	180
1	79	109	34	29	36	30	1	318
2	9	3	15	12	11	0	0	50
Total	138	178	65	51	66	47	3	548

Note: 0 = unsuccessful, 1 = moderately successful and 2 = successful. Faculties: Engineering (E); Business (B); Agrarian (A); Livestock (L); Environmental (E); Semi-presential (S) and Law (La).

Subjective career success levels are represented in Table 8, it shows the number of “successful”, “moderately successful”, and “unsuccessful” professionals, subjectively with their respective percentages per academic unit. About 9.1% represent successful graduates; 58% moderately successful; and 32.8% are unsuccessful.

Table 8. Subjective career success by faculties.

SCS Level	Faculties/Academic Units							Total
	E	B	A	L	E	S	La	
0	0	4	1	0	0	0	0	5
1	79	89	26	18	30	26	1	269
2	67	79	41	39	31	15	1	274
Total	113	132	53	44	47	32	1	548

Note: 0 = unsuccessful, 1 = moderately successful and 2 = successful. Faculties: Engineering (E); Business (B); Agrarian (A); Livestock (L); Environmental (E); Semi-presential (S); and Law (La).

4.5. Mathematical Models Validation

4.5.1. University Graduates Tracking

A random sample of 100 university graduates was selected for validating the career success functions. As a result, 74.6% represent objective career success and 70.3% subjective career success. According to functions and acceptance, at least two of three results are required for leaders, followers, or graduates.

Pearson correlation coefficient between objective career success and subjective career success was 0.297, and significance of 0.000. It means that the OCS and SCS functions have a low correlation, which corroborates with meta-analysis studies showing that the variables should be treated independently if they have correlations of less than 0.30. [157,158]. For that reason, objective and subjective career success mathematical models were validated separately.

Table 9 shows that 38 of the 50 graduates classified as successful objectively are also successful subjectively, and it represents 76% of coincidence. The remaining 12 graduates are successful objectively but moderately successful

subjectively, and none of them was successful objectively, and unsuccessful subjectively.

Table 9. Career success levels.

Levels	0 (SCS)	1 (SCS)	2 (SCS)	Total
0 (OCS)	33	87	60	180
1 (OCS)	0	144	174	318
2 (OCS)	0	12	38	50
Total	33	243	272	548

Note: 0 = unsuccessful, 1 = moderately successful and 2 = successful.

From the 318 graduates classified as moderately successful objectively, 174 feels successful subjectively and 144 represents moderately successful subjectively. From the 180 graduates classified as unsuccessful objectively, 60 are also successful subjectively, 87 are moderately successful subjectively, and 33 are unsuccessful subjectively. In general, from the 548 university graduates sample, 180 were classified as successful objectively and subjectively, 318 are moderately successful objectively and subjectively, and 50 are successful objective and subjectively.

4.5.2. Career Success Classification Models

Four classification models (LMT, J48 pruned, RF, and RT) were applied using Weka classification learning algorithms application allowed to validate objective career success mathematical model. The Logistic Model Tree (LMT) algorithm creates a tree with binary and multiclass target variables, numeric and missing values [112]. MT uses a logistic regression tree and produces a single tree-shaped result containing binary divisions into numeric attributes [159].

The pruned tree J48 is the implementation of the decision tree C4.5 [160,161]. According to Dangare and Apte [162] they are models of class construction from records that contain class labels. The pruned tree J48 uses a decision tree algorithm to find the possible behavior of the attribute vector for an array of instances. The algorithm generates rules for predicting objective variables and shows the missing values present in the model and the output [163].

In recent years, Random Forest Tree (RF) [164] has received increasing interest from academia due to its excellent classification results and processing speed [165]. RF is considered a decision tree set classifier where a sample can be selected multiple times or cannot be selected [166]. It shows better predictions in other methods, especially decision trees [167]. Finally, Random Tree (RT) is an algorithm that randomly extracts a tree from a set of possible trees, uniformly distributed since they have the same probability of being sampled [166,168]. A clustering of RT can successfully describe the given input [9].

As a result, for objective career success model LMT algorithm shows the best results, with 76.09% (417 university graduates) of Correctly Classified Instances

(CCI), as shown in Table 10. Moreover, J48 pruned tree has the 74.09% of CCI, which represents 406 university graduates. Random Forest Tree (RF) has 69.53% of CCI (381 university graduates). Finally, the Random Tree (RT) has 59.48% of CCI, it means 326 university graduates.

Table 10. Objective career success classification model validation.

Algorithm	KS	MAE	RMSE	CCI (%)	Average ROC Area
Logistic Model Tree (LMT)	0.513	0.2574	0.344	76.0949	0.543
J48 pruned tree	0.472	0.2465	0.351	74.0876	0.805
Random Forest Tree (RF)	0.3499	0.3059	0.383	69.5255	0.392
Random Tree (RT)	0.2396	0.2853	0.501	59.4891	0.232

Note: Kappa Statistic (KS); Mean Absolute Error: (MAE); Root Mean Squared Error (RMSE); and Correctly Classified Instances (CCI).

In subjective career success model RF algorithm shows the best results, with 94.59% (518 university graduates) of CCI, as shown in Table 11. Furthermore, LMT tree shows 94.37% of CCI, which represents 516 university graduates. J48 pruned tree has 89.41% of CCI (489 university graduates). Finally, the Random Tree (RT) has 80.63% of CCI, it means 441 university graduates.

Table 11. Subjective career success classification model validation.

Algorithm	KS	MAE	RMSE	CCI (%)	Average ROC Area
Logistic Model Tree (LMT)	0.8881	0.0564	0.1732	94.3694	0.892
J48 pruned tree	0.7886	0.0923	0.2528	89.4144	0.690
Random Forest Tree (RF)	0.8921	0.1144	0.2038	94.5946	0.749
Random Tree (RT)	0.6133	0.1253	0.3431	80.6306	0.575

Note: Kappa Statistic (KS); Mean Absolute Error: (MAE); Root Mean Squared Error (RMSE); and Correctly Classified Instances (CCI).

5. Discussion

Job satisfaction is related to professional satisfaction, although they are different constructs. The professional satisfaction is more associated with the emotional reaction about the current job. Otherwise, professional satisfaction is a broader reflection on satisfaction with the past, present, and future work as a whole [169]. External factors such as prestige, power, money, and progress influence the meaning of career success [9]. However, career success is sometimes considered a balance between professional and personal life [170,171]. That goes beyond of objective career success criteria [172,173].

The measuring discretized of the objective career success variables was according to the five-points Likert scale. For example, salary was measured in intervals or ordinal variables, academic improvement courses, and hierarchical

levels. However, these forms of measurement could generate a partial loss of information [174]. Otherwise, asking the graduate to report an accurate and sensitive figure, such as salary, can promote socially desirable responses [175]. Therefore, interval or ordinal measures may be more valid. The subjective career success variables also were collected on this scale to homogenize the calibration of our instruments. In addition, the evaluation of subjective career success is considered, which is made by the university graduate himself, "self-referential evaluation" [42].

Among the study's limitations, there is a lack of validation of the self-referential results with those of other reference persons who know about the benefits of psychological achievements in the graduate's career success [5]. As well as the relationship between age and career success [176]. It is possible that the graduate, out of complacency, overstates his status as subjective career success. Social comparisons have affective consequences [177,178,179]. Another limitation was social context and geographic environment which should have been considered in the study because this study was carried out in an eminently agricultural region and suffers from sustained agro-industrial development located in Latin America. This differs from other related studies developed in first world countries. In addition, in Latin America, job types are mostly full-time and not part-time, which allows them to have financial freedom. Differences in these social contexts must consider in a proper career success study because that could influence in career success definition described by experts.

Within the article advantages, data collection on the objective and subjective career success was independent. Therefore, there is no affection on information quality since the survey was very extensive. However, a possible correlation between these two constructs (OCS and SCS) is not ruled out. In addition, identifying career success predictors and establishing the concept itself is becoming more relevant in vocational and organizational career research [70,180]. Satisfaction with career success differs according to different career development models [181,182]. This study provides empirical evidence of this variance, further refining the construct of university graduates career development. Employers and employees are interested in why some people are more successful than others. Consequently, employees have begun to rely on predictive career success factors that help them promote their career success [183].

Future research lines could analyze correlations degrees and existing associations of psychological determinants (subjective variables) and economic determinants (objective variables) together with the objective and subjective success functions, trying to determine a single process, reaching similar results in other samples. However, item numbers addressed in this study suggest that the pattern of results is solid and can be generalized to different contexts.

6. Conclusions

Researchers designed a methodology to measure objective and subjective career success. This methodology uses a survey as measuring instrument. Study's sample consists of 548 university graduates, which was a non-probabilistic sample. Survey's questionnaire received 25.18% of responses from engineering degree students, 32.48% in business and administrative area; 11.86% agronomy; 9.30% livestock; 12.04% environmental; 8.60% blended organizational business; and 0.55% law.

From 548 university graduates 307 are men, it represents 56.02% of the sample, and 241 are women. As a result, 60% of university graduates who achieve both types of career success (OCS and SCS) are men and the remainder are women. University graduates ages vary between 25 and 55 years (mean = 37.2 years and standard deviation = 8.2). From 548 university graduates, the 99.4% are Ecuadorians and 38.9% are married. Employability rate was 93.6%, and 56.2% of university graduates work in jobs related with their studies. According to university graduates location, 91.9% were from Los Ríos province, place where UTEQ university is located, and the remaining were from Guayas province. Otherwise, 91.4% of university graduates belong to the face-to-face study modality and the blended modality. It demonstrates the relationship between the OCS and SCS variables, which together measure career success levels.

In career success functions construction, a selection of the most significant variables by experts discretion and Pareto criterion analysis organizing variables from the greatest weight or relevance was necessary. These functions applied linear functions definition, where 50 professionals validated the career success predictors meaning. As a result, 29 OCS factors and 22 SCS factors were analyzed. These two linear functions represent the career success mathematical models: objective career success function and subjective career success function respectively.

Career success (objective and subjectively) categorization level was distributed in three levels: (i) successful, (ii) moderately successful, and (iii) unsuccessful. As a result, there are 50 university graduates classified in successful category, 318 in moderately successful, and 180 in an unsuccessful category. According to experts, in the career success mathematical functions validation from a sample of 50 university graduates, 38 were classified as successful (objective and subjectively), 12 had high objective success and low subjective success. Despite the extrinsic achievements (objective career success), it still leaves professionals with a feeling of dissatisfaction. Therefore, they will continue to strive each day to achieve their intrinsic satisfaction or subjective career success. Some academic units have a relatively higher objective and subjective success ranges, simultaneously. For example, agricultural faculties 34.2% and livestock 23.7%. While 7.9% in semi-presential business faculty and 0% in law's faculty.

Regarding to career success levels, “moderately successful objectively” is one that reaches a certain level of success from the first year of their professional career. In this context, 43% of university graduates have their own home. Otherwise, the 80.4% of university graduates choose rightly the career related to their study. This category corresponds preferably to systems engineering degrees (17.7%); business management (10.4%); forestry (10.4%); and authorized public accounting (9.5%). About their work experiences during university studies, 41.8% were unrelated or not at all, and 46.6% of them have a fourth level degree. However, 28.5% took only short courses and 76.6% have a high and very high knowledge in computer utilities.

University graduates categorized as moderately successful (77.2%) generally work in low and middle hierarchical positions in their organizations. Average salary for a moderately successful professional is 1657 USD (United States Dollar); mostly 1501 to 3000 USD. In this category (moderately successful), the 88.3% do not have production and development in research, median household income is 2087 USD, and 45.3% of household income is between 1501 and 3000 USD.

First, career success mathematical models validation consists of three responsible for monitoring graduates of the UTEQ university, who assessed the functions of a proportional stratified subsample of 100 graduates. It was correctly classified in objective career success function; 72.5% of graduates and 82.2% in subjective career success. Therefore, the instrument used to determine the SCS demonstrates appropriate psychometric properties, reliability, and validity. Second, four Weka’s learning classification algorithms were applied for mathematical models validation.

As a result, LMT algorithm was selected in objective career success mathematical model evaluation, which showed 76.09% well-classified instances. While, in subjective career success mathematical model evaluation showed the best results with the Random Forest Tree algorithm application, which represents 94.59% well-classified instances. Similarly, it was evidenced that the learning models were more effective in estimating subjective success than for the objective (higher values in the indicators), which means that subjective information is more descriptive of success than objective.

Experts focus group suggests that OCS is guaranteeing when the university graduate meets the following conditions, in the next order of priority: (1) Perform their duties related to their professional field (19.1%); (2) their academic training is as high as possible (14%); (3) greater participation in research and development; and (4) greater knowledge of ICTs. Monthly remuneration (money) and hierarchical level in the organization are part of the role, but they are not the most important in meeting graduates’ aspirations for success. For subjective career success experts suggest the university graduates require the following conditions: (1) They like the work they do (19.4%); (2) satisfied with the success achieved in their professional career (16.1%); (3) feel personal

satisfaction and contribute their work to society (15.6%); and (4) they are persistent in achieving their goals despite obstacles (15.2%).

The study's main contribution was that objective and subjective mathematical functions validation was proved in an Ecuadorian university, which has a certain coastal socio-economic environment, giving new research lines for career success modelling in similar contexts (developing countries), in another universities or even master programs focused on university graduates tracking, adapting with their own factors.

Author Contributions

Conceptualization, L.B.-M., N.M.-B. and R.P.-S.; methodology, N.M.-B., L.B.-M. and R.P.-S.; writing—original draft preparation, L.B.-M., N.M.-B. and R.P.-S.; writing—review and editing, L.B.-M., N.M.-B., R.P.-S., J.G. and A.R.; supervision, R.P.-S. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest

The authors declare no conflict of interest.

References

1. Karimova, N. Soft Skills Development in Higher Education. *Univers. J. Educ. Res.* 2020, *8*, 1916–1925. [Google Scholar] [CrossRef]
2. Spangler, W.D. Validity of questionnaire and TAT measures of need for achievement: Two meta-analyses. *Psychol. Bull.* 1992, *112*, 140–154. [Google Scholar] [CrossRef]
3. NG, T.W.H.; Feldman, D.C. Subjective career success: A meta-analytic review. *J. Vocat. Behav.* 2014, *85*, 169–179. [Google Scholar] [CrossRef]
4. Kirchmeyer, C. Determinants of managerial career success: Evidence and explanation of male/female differences. *J. Manag.* 1998, *24*, 673–692. [Google Scholar] [CrossRef]
5. Seibert, S.E.; Crant, J.M.; Kraimer, M.L. Proactive personality and career success. *J. Appl. Psychol.* 1999, *84*, 416–427. [Google Scholar] [CrossRef] [PubMed]
6. Serarols i Tarrés, C.; Padilla Meléndez, A. Las Características del Empresario y el Éxito de las Empresas puramente digitales. *Trib. Econ.* 2006, *833*, 155–176. [Google Scholar]
7. Acosta, C.R.; García, J.A.C.; Peña, A.L.M. Mariana Marcelino Aranda Estudio Cualitativo de la Percepción de Éxito en Estudiantes Universitarias. *Diotima Rev. Científica Estud. Transdiscipl.* 2016, *1*, 39–55. [Google Scholar]
8. Heslin, P.A. Conceptualizing and evaluating career success. *J. Organ. Behav.* 2005, *26*, 113–136. [Google Scholar] [CrossRef]
9. De Haro, J. *El Papel De La Inteligencia General, La Personalidad Y La Inteligencia Emocional En El Éxito Profesional Al Inicio De La Carrera*; Universidad de Alicante: San Vicente del Raspeig, Spain, 2014. [Google Scholar]
10. Hall, D.T.; Chandler, D.E. Psychological success: When the career is a calling. *J. Organ. Behav.* 2005, *26*, 155–176. [Google Scholar] [CrossRef]
11. Adamson, S.J.; Doherty, N.; Viney, C. The Meanings of Career Revisited: Implications for Theory and Practice. *Br. J. Manag.* 1998, *9*, 251–259. [Google Scholar] [CrossRef]

12. Collin, A.; Young, R.A. Constructing career through narrative and context: An interpretative perspective. *Interpret. Career Hermeneut. Stud. Lives Context* 1992, 1, 1–12. [Google Scholar]
13. Aryee, S.; Chay, Y.W.; Tan, H.H. An Examination of the Antecedents of Subjective Career Success among a Managerial Sample in Singapore. *Hum. Relat.* 1994, 47, 487–509. [Google Scholar] [CrossRef]
14. Judge, T.A.; Bretz, R.D. Political Influence Behavior and Career Success. *J. Manag.* 1994, 20, 43–65. [Google Scholar] [CrossRef]
15. Fadiman, J.; Frager, R. *Teorías De La Personalidad*, 2nd ed.; Oxford University Press: Mexico City, Mexico, 2001. [Google Scholar]
16. Maslow, A.H. Some Theoretical Consequences of Basic Need-Gratification. *J. Pers.* 1948, 16, 402–416. [Google Scholar] [CrossRef]
17. Pico-Saltos, R.; Carrión-Mero, P.; Montalván-Burbano, N.; Garzás, J.; Redchuk, A. Research Trends in Career Success: A Bibliometric Review. *Sustainability* 2021, 13, 4625. [Google Scholar] [CrossRef]
18. Judiesch, M.K.; Lyness, K.S. Left Behind? The Impact of Leaves of Absence on Managers' Career Success. *Acad. Manag. J.* 1999, 42, 641–651. [Google Scholar] [CrossRef]
19. Forest, J.; Mageau, G.A.; Sarrazin, C.; Morin, E.M. "Work is my passion": The different affective, behavioural, and cognitive consequences of harmonious and obsessive passion toward work. *Can. J. Adm. Sci. Rev. Can. des Sci. l'Adm.* 2011, 28, 27–40. [Google Scholar] [CrossRef]
20. Wayne, S.J.; Liden, R.C.; Kraimer, M.L.; Graf, I.K. The role of human capital, motivation and supervisor sponsorship in predicting career success. *J. Organ. Behav.* 1999, 20, 577–595. [Google Scholar] [CrossRef]
21. Melamed, T. Career success: An assessment of a gender-specific model. *J. Occup. Organ. Psychol.* 1996, 69, 217–242. [Google Scholar] [CrossRef]
22. Cameron, S.W.; Blackburn, R.T. Sponsorship and Academic Career Success. *J. High. Educ.* 1981, 52, 369–377. [Google Scholar] [CrossRef]
23. Weidman, J.C.; Darla, J.T.; Stein, E.L. *Socialization of Graduate and Professional Students in Higher Education: A Perilous Passage?* ERIC Clearinghouse on Higher Education: Washington, DC, USA, 2001; ISBN 0-7879-5836-0.
24. Erdogan, B.; Kraimer, M.L.; Liden, R.C. Work Value Congruence and Intrinsic Career Success: The Compensatory Roles of Leader-Member Exchange and Perceived Organizational Support. *Pers. Psychol.* 2004, 57, 305–332. [Google Scholar] [CrossRef]
25. Parasuraman, S.; Purohit, Y.S.; Godshalk, V.M.; Beutell, N.J. Work and Family Variables, Entrepreneurial Career Success, and Psychological Well-Being. *J. Vocat. Behav.* 1996, 48, 275–300. [Google Scholar] [CrossRef]
26. Maurer, T.J.; Chapman, E.F. Ten years of career success in relation to individual and situational variables from the employee development literature. *J. Vocat. Behav.* 2013, 83, 450–465. [Google Scholar] [CrossRef]

27. Boudreau, J.W.; Boswell, W.R.; Judge, T.A. Effects of Personality on Executive Career Success in the United States and Europe. *J. Vocat. Behav.* 2001, *58*, 53–81. [Google Scholar] [CrossRef]
28. Grimland, S.; Vigoda-Gadot, E.; Baruch, Y. Career attitudes and success of managers: The impact of chance event, protean, and traditional careers. *Int. J. Hum. Resour. Manag.* 2012, *23*, 1074–1094. [Google Scholar] [CrossRef]
29. Jaskolka, G.; Beyer, J.M.; Trice, H.M. Measuring and predicting managerial success. *J. Vocat. Behav.* 1985, *26*, 189–205. [Google Scholar] [CrossRef]
30. Judge, T.A.; Hurst, C. Capitalizing on one's advantages: Role of core self-evaluations. *J. Appl. Psychol.* 2007, *92*, 1212–1227. [Google Scholar] [CrossRef] [PubMed]
31. Dries, N.; Pepermans, R.; Carlier, O. Career success: Constructing a multidimensional model. *J. Vocat. Behav.* 2008, *73*, 254–267. [Google Scholar] [CrossRef]
32. Arthur, M.B.; Rousseau, D.M. A Career Lexicon for the 21st Century. *Acad. Manag. Perspect.* 1996, *10*, 28–39. [Google Scholar] [CrossRef]
33. Canal Domínguez, J.F.; Rodríguez Gutiérrez, C. A Public University or a Private University: What Effect Does This Choice Have on the Professional Success of Graduates in Spain? *Rev. Española Investig. Sociol.* 2020, *169*, 21–40. [Google Scholar] [CrossRef]
34. Gutteridge, T.G. Predicting Career Success of Graduate Business School Alumni. *Acad. Manag. J.* 1973, *16*, 129–137. [Google Scholar] [CrossRef]
35. Tlaiss, H.; Kauser, S. The importance of wasta in the career success of Middle Eastern managers. *J. Eur. Ind. Train.* 2011, *35*, 467–486. [Google Scholar] [CrossRef]
36. Delgado, A.; Saletti-Cuesta, L.; López-Fernández, L.A.; Toro-Cárdenas, S.; de Luna del Castillo, J.D. Professional Success and Gender in Family Medicine. *Eval. Health Prof.* 2016, *39*, 87–99. [Google Scholar] [CrossRef] [PubMed]
37. Kim, M.; Beehr, T.A. Can Empowering Leaders Affect Subordinates' Well-Being and Careers Because They Encourage Subordinates' Job Crafting Behaviors? *J. Leadersh. Organ. Stud.* 2018, *25*, 184–196. [Google Scholar] [CrossRef]
38. Judge, T.A.; Cable, D.M.; Boudreau, J.W.; Bretz, R.D. An Empirical Investigation of the Predictors of Executive Career Success. *Pers. Psychol.* 1995, *48*, 485–519. [Google Scholar] [CrossRef]
39. Zacher, H. Career adaptability predicts subjective career success above and beyond personality traits and core self-evaluations. *J. Vocat. Behav.* 2014, *84*, 21–30. [Google Scholar] [CrossRef]

40. Goh, S.C. Sex differences in perceptions of interpersonal work style, career emphasis, supervisory mentoring behavior, and job satisfaction. *Sex Roles* 1991, 24, 701–710. [Google Scholar] [CrossRef]
41. Greenhaus, J.H.; Parasuraman, S.; Wormley, W.M. Effects of Race on Organizational Experiences, Job Performance Evaluations, and Career Outcomes. *Acad. Manag. J.* 1990, 33, 64–86. [Google Scholar] [CrossRef]
42. Abele, A.E.; Spurk, D. How do objective and subjective career success interrelate over time? *J. Occup. Organ. Psychol.* 2009, 82, 803–824. [Google Scholar] [CrossRef]
43. Guo, W.; Wang, L.; Wang, N. Research on the impact of career management fit on career success. *Asia Pacific J. Hum. Resour.* 2021, 59, 279–304. [Google Scholar] [CrossRef]
44. Van den Born, A.; van Witteloostuijn, A. Drivers of freelance career success. *J. Organ. Behav.* 2013, 34, 24–46. [Google Scholar] [CrossRef]
45. Bagdadli, S.; Gianecchini, M. Organizational career management practices and objective career success: A systematic review and framework. *Hum. Resour. Manag. Rev.* 2019, 29, 353–370. [Google Scholar] [CrossRef]
46. Bozionelos, N. The relationship between disposition and career success: A British study. *J. Occup. Organ. Psychol.* 2004, 77, 403–420. [Google Scholar] [CrossRef]
47. Seibert, S.E.; Kraimer, M.L. The Five-Factor Model of Personality and Career Success. *J. Vocat. Behav.* 2001, 58, 1–21. [Google Scholar] [CrossRef]
48. Hogan, R.; Chamorro-Premuzic, T.; Kaiser, R.B. Employability and Career Success: Bridging the Gap Between Theory and Reality. *Ind. Organ. Psychol.* 2013, 6, 3–16. [Google Scholar] [CrossRef]
49. Spurk, D.; Hofer, A.; Kauffeld, S. Why does competitive psychological climate foster or hamper career success? The role of challenge and hindrance pathways and leader-member-exchange. *J. Vocat. Behav.* 2021, 127, 103542. [Google Scholar] [CrossRef]
50. Young, R.A.; Collin, A. Introduction: Constructivism and social constructionism in the career field. *J. Vocat. Behav.* 2004, 64, 373–388. [Google Scholar] [CrossRef]
51. Benson, G.S.; McIntosh, C.K.; Salazar, M.; Vaziri, H. Cultural values and definitions of career success. *Hum. Resour. Manag. J.* 2020, 30, 392–421. [Google Scholar] [CrossRef]
52. Arthur, M.B.; Khapova, S.N.; Wilderom, C.P.M. Career success in a boundaryless career world. *J. Organ. Behav.* 2005, 26, 177–202. [Google Scholar] [CrossRef]
53. Boehm, J.K.; Lyubomirsky, S. Does Happiness Promote Career Success? *J. Career Assess.* 2008, 16, 101–116. [Google Scholar] [CrossRef]
54. Koekemoer, E.; Olckers, C.; Nel, C. Work–family enrichment, job satisfaction, and work engagement: The mediating role of subjective

- career success. *Aust. J. Psychol.* 2020, 72, 347–358. [Google Scholar] [CrossRef]
55. Verbruggen, M. Psychological mobility and career success in the ‘New’ career climate. *J. Vocat. Behav.* 2012, 81, 289–297. [Google Scholar] [CrossRef]
 56. Gordon, S.E.; Shi, X. (Crystal). The well-being and subjective career success of workaholics: An examination of hospitality managers’ recovery experience. *Int. J. Hosp. Manag.* 2021, 93, 102804. [Google Scholar] [CrossRef]
 57. Gattiker, U.E.; Larwood, L. Subjective career success: A study of managers and support personnel. *J. Bus. Psychol.* 1986, 1, 78–94. [Google Scholar] [CrossRef]
 58. Danziger, N.; Valency, R. Career anchors: Distribution and impact on job satisfaction, the Israeli case. *Career Dev. Int.* 2006, 11, 293–303. [Google Scholar] [CrossRef]
 59. Wiener, Y.; Vardi, Y. Relationships between Organizational Culture and Individual Motivation—A Conceptual Integration. *Psychol. Rep.* 1990, 67, 295–306. [Google Scholar] [CrossRef]
 60. Parker, B.; Chusmir, L.H. Motivation Needs and Their Relationship to Life Success. *Hum. Relat.* 1991, 44, 1301–1312. [Google Scholar] [CrossRef]
 61. Judge, T.A.; Higgins, C.A.; Thoresen, C.J.; Barrick, M.R. The Big Five Personality Traits, General Mental Ability, and Career Success Across the Life Span. *Pers. Psychol.* 1999, 52, 621–652. [Google Scholar] [CrossRef]
 62. Dyke, L.S.; Murphy, S.A. How We Define Success: A Qualitative Study of What Matters Most to Women and Men. *Sex Roles* 2006, 55, 357–371. [Google Scholar] [CrossRef]
 63. Nabi, G.R. An investigation into the differential profile of predictors of objective and subjective career success. *Career Dev. Int.* 1999, 4, 212–225. [Google Scholar] [CrossRef]
 64. Hennequin, E. What “career success” means to blue-collar workers. *Career Dev. Int.* 2007, 12, 565–581. [Google Scholar] [CrossRef]
 65. Sturges, J. What it Means to Succeed: Personal Conceptions of Career Success Held by Male and Female Managers at Different Ages. *Br. J. Manag.* 1999, 10, 239–252. [Google Scholar] [CrossRef]
 66. Sutin, A.R.; Costa, P.T.; Miech, R.; Eaton, W.W. Personality and career success: Concurrent and longitudinal relations. *Eur. J. Pers.* 2009, 23, 71–84. [Google Scholar] [CrossRef] [PubMed]
 67. Otto, K.; Roe, R.; Sobiraj, S.; Baluku, M.M.; Garrido Vásquez, M.E. The impact of career ambition on psychologists’ extrinsic and intrinsic career success. *Career Dev. Int.* 2017, 22, 23–36. [Google Scholar] [CrossRef]
 68. Spurk, D.; Hirschi, A.; Dries, N. Antecedents and Outcomes of Objective Versus Subjective Career Success: Competing Perspectives and Future Directions. *J. Manag.* 2019, 45, 35–69. [Google Scholar] [CrossRef]

69. Dose, E.; Desrumaux, P.; Bernaud, J. Effects of Perceived Organizational Support on Objective and Subjective Career Success via Need Satisfaction: A Study Among French Psychologists. *J. Employ. Couns.* 2019, *56*, 144–163. [Google Scholar] [CrossRef]
70. Urquijo, I.; Extremera, N.; Azanza, G. The Contribution of Emotional Intelligence to Career Success: Beyond Personality Traits. *Int. J. Environ. Res. Public Health* 2019, *16*, 4809. [Google Scholar] [CrossRef]
71. Wille, B.; De Fruyt, F.; Feys, M. Big Five Traits and Intrinsic Success in the New Career Era: A 15-Year Longitudinal Study on Employability and Work-Family Conflict. *Appl. Psychol.* 2013, *62*, 124–156. [Google Scholar] [CrossRef]
72. Sundstrom, E.D.; Lounsbury, J.W.; Gibson, L.W.; Huang, J.L. Personality Traits and Career Satisfaction in Training and Development Occupations: Toward a Distinctive T&D Personality Profile. *Hum. Resour. Dev. Q.* 2016, *27*, 13–40. [Google Scholar] [CrossRef]
73. Abele, A.E.; Spurk, D. The longitudinal impact of self-efficacy and career goals on objective and subjective career success. *J. Vocat. Behav.* 2009, *74*, 53–62. [Google Scholar] [CrossRef]
74. Gelissen, J.; de Graaf, P.M. Personality, social background, and occupational career success. *Soc. Sci. Res.* 2006, *35*, 702–726. [Google Scholar] [CrossRef]
75. Nabi, G.R. The relationship between HRM, social support and subjective career success among men and women. *Int. J. Manpow.* 2001, *22*, 457–474. [Google Scholar] [CrossRef]
76. Kranefeld, I.; Blickle, G. Emotion recognition ability and career success: Assessing the roles of GMA and conscientiousness. *Pers. Individ. Dif.* 2021, *168*, 110370. [Google Scholar] [CrossRef]
77. Blickle, G.; Schütte, N.; Wihler, A. Political will, work values, and objective career success: A novel approach—The Trait-Reputation-Identity Model. *J. Vocat. Behav.* 2018, *107*, 42–56. [Google Scholar] [CrossRef]
78. Psacharopoulos, G.; Patrinos, H.A. Returns to investment in education: A further update. *Educ. Econ.* 2004, *12*, 111–134. [Google Scholar] [CrossRef]
79. Card, D. Estimating the Return to Schooling: Progress on Some Persistent Econometric Problems. *Econometrica* 2001, *69*, 1127–1160. [Google Scholar] [CrossRef]
80. Buddeberg-Fischer, B.; Stamm, M.; Buddeberg, C.; Klaghofer, R. Career-Success Scale—A new instrument to assess young physicians' academic career steps. *BMC Health Serv. Res.* 2008, *8*, 120. [Google Scholar] [CrossRef]
81. Stamm, M.; Buddeberg-Fischer, B. The impact of mentoring during postgraduate training on doctors' career success. *Med. Educ.* 2011, *45*, 488–496. [Google Scholar] [CrossRef]

82. Xu, X.; Payne, S.C. Quantity, Quality, and Satisfaction With Mentoring. *J. Career Dev.* 2014, *41*, 507–525. [Google Scholar] [CrossRef]
83. Savickas, M.L.; Porfeli, E.J. Career Adapt-Abilities Scale: Construction, reliability, and measurement equivalence across 13 countries. *J. Vocat. Behav.* 2012, *80*, 661–673. [Google Scholar] [CrossRef]
84. Sturges, J.; Conway, N.; Guest, D.; Liefoghe, A. Managing the career deal: The psychological contract as a framework for understanding career management, organizational commitment and work behavior. *J. Organ. Behav.* 2005, *26*, 821–838. [Google Scholar] [CrossRef]
85. Peluchette, J.V.E. Subjective Career Success: The Influence of Individual Difference, Family, and Organizational Variables. *J. Vocat. Behav.* 1993, *43*, 198–208. [Google Scholar] [CrossRef]
86. Briscoe, J.P.; Kaše, R.; Dries, N.; Dysvik, A.; Unite, J.A.; Adeleye, I.; Andresen, M.; Apospori, E.; Babalola, O.; Bagdadli, S.; et al. Here, there, & everywhere: Development and validation of a cross-culturally representative measure of subjective career success. *J. Vocat. Behav.* 2021, 103612. [Google Scholar] [CrossRef]
87. Harvey, T.A. *Professional Vitality and the Principalship: A Construct Validity Study*; University of Maine: Orono, ME, USA, 2002. [Google Scholar]
88. Lindholm, J.A. Perceived Organizational Fit: Nurturing the Minds, Hearts, and Personal Ambitions of University Faculty. *Rev. High. Educ.* 2003, *27*, 125–149. [Google Scholar] [CrossRef]
89. Russell, J.E.A. Promoting Subjective Well-Being at Work. *J. Career Assess.* 2008, *16*, 117–131. [Google Scholar] [CrossRef]
90. Baruch, Y.; Grimland, S.; Vigoda-Gadot, E. Professional vitality and career success: Mediation, age and outcomes. *Eur. Manag. J.* 2014, *32*, 518–527. [Google Scholar] [CrossRef]
91. Parker, B.; Chusmir, L.H. Development and Validation of a Life-Success Measures Scale. *Psychol. Rep.* 1992, *70*, 627–637. [Google Scholar] [CrossRef]
92. Hupkens, L.; Akkermans, J.; Solinger, O.; Khapova, S. The Dynamics of Subjective Career Success: A Qualitative Inquiry. *Sustainability* 2021, *13*, 7638. [Google Scholar] [CrossRef]
93. Rossenkhan, Z.; Au, W.C.; Ahmed, P.K. Unbundling subjective career success: A sequential mediation analysis. *Eur. Bus. Rev.* 2021, *33*. [Google Scholar] [CrossRef]
94. Spurk, D.; Keller, A.C.; Hirschi, A. Competition in career tournaments: Investigating the joint impact of trait competitiveness and competitive psychological climate on objective and subjective career success. *J. Occup. Organ. Psychol.* 2019, *92*, 74–97. [Google Scholar] [CrossRef]
95. Gerli, F.; Bonesso, S.; Pizzi, C. Boundaryless career and career success: The impact of emotional and social competencies. *Front. Psychol.* 2015, *6*. [Google Scholar] [CrossRef]

96. Romanelli, F.; Cain, J.; Smith, K.M. Emotional Intelligence as a Predictor of Academic and/or Professional Success. *Am. J. Pharm. Educ.* 2006, *70*, 69. [Google Scholar] [CrossRef]
97. Schomburg, H. The Professional Success of Higher Education Graduates. *Eur. J. Educ.* 2007, *42*, 35–57. [Google Scholar] [CrossRef]
98. Savolainen, T. Towards a new workplace culture: Development strategies for employer-employee relations. *J. Work. Learn.* 2000, *12*, 318–326. [Google Scholar] [CrossRef]
99. Moguerza, J.M.; Fernández-Muñoz, J.J.; Redchuk, A.; Cardone-Riportella, C.; Navarro-Pardo, E. Factor structure and stability of a quality questionnaire within a postgraduate program. *An. Psicol.* 2017, *33*, 351. [Google Scholar] [CrossRef]
100. McKeachie, W.J. Student ratings: The validity of use. *Am. Psychol.* 1997, *52*, 1218–1225. [Google Scholar] [CrossRef]
101. Moreno, A.; Rios-Insúa, D. Issues in Service Quality Modelling. In *Bayesian statistics*; Oxford University Press: Madrid, Spain, 1999; pp. 441–457. [Google Scholar]
102. Simpson, P.M.; Siguaw, J.A. Student Evaluations of Teaching: An Exploratory Study of the Faculty Response. *J. Mark. Educ.* 2000, *22*, 199–213. [Google Scholar] [CrossRef]
103. Gabriella Kuráth, N.S. The graduate tracking and attainment model at the University of Pécs. *J. Educ. Cult. Soc.* 2013, *4*, 247–261. [Google Scholar]
104. Sarstedt, M.; Bengart, P.; Shaltoni, A.M.; Lehmann, S. The use of sampling methods in advertising research: A gap between theory and practice. *Int. J. Advert.* 2018, *37*, 650–663. [Google Scholar] [CrossRef]
105. Singh, S.K. Advantages and Disadvantages of Probability Sampling Methods in Social Research. In Proceedings of the National Conference on Innovative Research in Chemical, Physical, Mathematical Sciences, Applied Statistics and Environmental Dynamics (CPMSD-2015), Saharsa, India, 28 November 2015; pp. 14–18. [Google Scholar]
106. Sharma, G. Pros and cons of different sampling techniques. *Int. J. Appl. Res.* 2017, *3*, 749–752. [Google Scholar]
107. Acharya, A.S.; Prakash, A.; Saxena, P.; Nigam, A. Sampling: Why and how of it? *Indian J. Med. Spec.* 2013, *4*, 330–333. [Google Scholar] [CrossRef]
108. Etikan, I. Sampling and Sampling Methods. *Biom. Biostat. Int. J.* 2017, *5*, 1–3. [Google Scholar] [CrossRef]
109. Judge, T.A.; Klinger, R.L.; Simon, L.S. Time is on my side: Time, general mental ability, human capital, and extrinsic career success. *J. Appl. Psychol.* 2010, *95*, 92–107. [Google Scholar] [CrossRef]
110. Rafferty, A.E.; Griffin, M.A. Perceptions of organizational change: A stress and coping perspective. *J. Appl. Psychol.* 2006, *91*, 1154–1162. [Google Scholar] [CrossRef]

111. Volmer, J.; Spurk, D. Protean and boundaryless career attitudes: Relationships with subjective and objective career success. *Z. Für Arbeitsmarktforsch.* 2011, 43, 207–218. [Google Scholar] [CrossRef]
112. Hirschi, A.; Nagy, N.; Baumeler, F.; Johnston, C.S.; Spurk, D. Assessing Key Predictors of Career Success. *J. Career Assess.* 2018, 26, 338–358. [Google Scholar] [CrossRef]
113. Rigotti, T.; Schyns, B.; Mohr, G. A Short Version of the Occupational Self-Efficacy Scale: Structural and Construct Validity Across Five Countries. *J. Career Assess.* 2008, 16, 238–255. [Google Scholar] [CrossRef]
114. Hirschi, A. The career resources model: An integrative framework for career counsellors. *Br. J. Guid. Counc.* 2012, 40, 369–383. [Google Scholar] [CrossRef]
115. Koh, H.C.; Boo, E.H.Y. The link between organizational ethics and job satisfaction: A study of managers in Singapore. *J. Bus. Ethics* 2001, 29, 309–324. [Google Scholar] [CrossRef]
116. Day, R.; Allen, T.D. The relationship between career motivation and self-efficacy with protégé career success. *J. Vocat. Behav.* 2004, 64, 72–91. [Google Scholar] [CrossRef]
117. Rottinghaus, P.J.; Buelow, K.L.; Matyja, A.; Schneider, M.R. The Career Futures Inventory–Revised. *J. Career Assess.* 2012, 20, 123–139. [Google Scholar] [CrossRef]
118. Arnold, J.; Cohen, L. *International Review of Industrial and Organizational Psychology 2008*; Hodgkinson, G.P., Ford, J.K., Eds.; John Wiley & Sons: Chichester, UK, 2008; ISBN 9780470773277. [Google Scholar]
119. Lee, C.I.S.G.; Felps, W.; Baruch, Y. Toward a taxonomy of career studies through bibliometric visualization. *J. Vocat. Behav.* 2014, 85, 339–351. [Google Scholar] [CrossRef]
120. Mehta, P. “Objective and Subjective Factors in Employees” Satisfaction in Life and Work. *Indian J. Ind. Relat.* 1978, 13, 443–444. [Google Scholar]
121. Poon, J.M.L.; Briscoe, J.P.; Abdul-Ghani, R.; Jones, E.A. Meaning and determinants of career success: A Malaysian perspective. *Rev. Psicol. Del Trab. Y Las Organ.* 2015, 31, 21–29. [Google Scholar] [CrossRef]
122. Saifuddin, S.M.; Dyke, L.S.; Rasouli, M. Gender and careers: A study of persistence in engineering education in Bangladesh. *Gend. Manag. An. Int. J.* 2013, 28, 188–209. [Google Scholar] [CrossRef]
123. Kram, K.E.; Wasserman, I.C.; Yip, J. Metaphors of Identity and Professional Practice. *J. Appl. Behav. Sci.* 2012, 48, 304–341. [Google Scholar] [CrossRef]
124. Vallerand, R.J.; Houliort, N. Passion at Work: Toward a New Conceptualization. In *Emerging Perspectives on Values in Organizations*; Information Age Publishing (IAP): San Francisco, CA, USA, 2003; pp. 175–204. [Google Scholar]

125. Sevinc, L. *The Effect of Emotional Intelligence on Career Success: Research on the 1990 Graduates of Business Administration Faculty of Istanbul University*; Istanbul University: İstanbul, Turkey, 2001. [Google Scholar]
126. Redchuk, A. *Service Quality Measurement: A New Methodology*; Rey Juan Carlos University: Madrid, Spain, 2010. [Google Scholar]
127. Mihelis, G.; Grigoroudis, E.; Siskos, Y.; Politis, Y.; Malandrakis, Y. Customer satisfaction measurement in the private bank sector. *Eur. J. Oper. Res.* 2001, 130, 347–360. [Google Scholar] [CrossRef]
128. Hill, N.; Alexander, J. Handbook of Customer Satisfaction and Loyalty Measurement. *Int. J. Retail. Distrib. Manag.* 2001, 29, 347. [Google Scholar] [CrossRef]
129. Pal Pandi, A.; Rajendra Sethupathi, P.V.; Jeyathilagar, D. The IEQMS model for augmenting quality in engineering institutions—An interpretive structural modelling approach. *Total Qual. Manag. Bus. Excell.* 2016, 27, 292–308. [Google Scholar] [CrossRef]
130. Colbert, A.; Levary, R.R.; Shaner, M.C. Determining the relative efficiency of MBA programs using DEA. *Eur. J. Oper. Res.* 2000, 125, 656–669. [Google Scholar] [CrossRef]
131. Dubas, K.M.; Ghani, W.I.; Davis, S.; Strong, J.T. Evaluating Market Orientation of an Executive MBA Program. *J. Mark. High. Educ.* 1998, 8, 49–59. [Google Scholar] [CrossRef]
132. Blose, J.E.; Tankersley, W.B. Linking dimensions of service quality to organizational outcomes. *Manag. Serv. Qual. An. Int. J.* 2004, 14, 75–89. [Google Scholar] [CrossRef]
133. Cardone-Riportella, C.; Lado-Cousté, N.; Rivera-Torres, P. Measurement and Effects of Teaching Quality: An Empirical Model Applied to Masters Programs. *J. Acad. Bus. Educ.* 2003, 4, 28–40. [Google Scholar]
134. Tan, K.C.; Kek, S.W. Service quality in Higher Education using an enhanced SERVQUAL approach. *Qual. High. Educ.* 2004, 10, 17–24. [Google Scholar] [CrossRef]
135. Sahney, S.; Banwet, D.K.; Karunes, S. Customer requirement constructs: The premise for TQM in education. *Int. J. Product. Perform. Manag.* 2004, 53, 499–520. [Google Scholar] [CrossRef]
136. Morgan, C.; Murgatroyd, S. *Total Quality in the Public Sector*, Buckingham; Open University Press: Buckingham, UK, 1994; ISBN 0335191029. [Google Scholar]
137. Peña, D. La Mejora de la Calidad en la Educación: Reflexiones y Experiencias. 1997. Available online: <https://e-archivo.uc3m.es/bitstream/handle/10016/3645/ds970902.pdf?sequence=1&isAllowed=y> (accessed on 5 August 2021).
138. Tam, M. Measuring Quality and Performance in Higher Education. *Qual. High. Educ.* 2001, 7, 47–54. [Google Scholar] [CrossRef]

139. Ritzer, G. McUniversity in the Postmodern Consumer Society. *Qual. High. Educ.* 1996, 2, 185–199. [Google Scholar] [CrossRef]
140. Dill, D.D. Through Deming's Eyes: A cross-national analysis of quality assurance policies in higher education. *Qual. High. Educ.* 1995, 1, 95–110. [Google Scholar] [CrossRef]
141. EFQM European Foundation for Quality Management. Self-Assessment Guidelines for Public Sector: Education. Available online: <http://www.efqm.org> (accessed on 7 May 2021).
142. Shanahan, P.; Gerber, R. Quality in university student administration: Stakeholder conceptions. *Qual. Assur. Educ.* 2004, 12, 166–174. [Google Scholar] [CrossRef]
143. Asunda, P.A.; Hill, R.B. Critical Features of Engineering Design in Technology Education. *J. Ind. Teach. Educ.* 2007, 44, 25–48. [Google Scholar]
144. Fenstermacher, G.D.; Richardson, V. On Making Determinations of Quality in Teaching. *Teach. Coll. Rec.* 2005, 107, 186–213. [Google Scholar] [CrossRef]
145. Anderson, C.H.; Summey, J.H.; Summey, E.S. Promoting the Marketing Major and Marketing Careers to College Students: A Framework. *J. Educ. Bus.* 1991, 66, 260–266. [Google Scholar] [CrossRef]
146. Witten, I.H.; Frank, E.; Trigg, L.; Hall, M.; Holmes, G.; Cunningham, S.J. Weka: Practical Machine Learning Tools and Techniques with Java Implementations. 1999. Available online: <https://researchcommons.waikato.ac.nz/bitstream/handle/10289/1040/uow-cs-wp-1999-11.pdf?sequence=1&isAllowed=y> (accessed on 5 August 2021).
147. Renu, R.S.; Mocko, G.; Koneru, A. Use of Big Data and Knowledge Discovery to Create Data Backbones for Decision Support Systems. *Procedia Comput. Sci.* 2013, 20, 446–453. [Google Scholar] [CrossRef]
148. Altalhi, A.H.; Luna, J.M.; Vallejo, M.A.; Ventura, S. Evaluation and comparison of open source software suites for data mining and knowledge discovery. *Wiley Interdiscip. Rev. Data Min. Knowl. Discov.* 2017, 7, e1204. [Google Scholar] [CrossRef]
149. Arasu, B.S.; Seelan, B.J.B.; Thamaraiselvan, N. A machine learning-based approach to enhancing social media marketing. *Comput. Electr. Eng.* 2020, 86, 106723. [Google Scholar] [CrossRef]
150. Patil, P.M. An analysis of non-cultivable bacteria using WEKA. *Bioinformatics* 2020, 16, 620–624. [Google Scholar] [CrossRef]
151. Sandhip Laldjee, S.; Ajufo, C.A.M.; Bekaroo, G. Optimizing Recruitment Process within Businesses: Predicting Interview Attendance Using C4.5 Algorithm. In *Advances in Intelligent Systems and Computing*; Panigrahi,

- C.R., Pati, B., Pattanayak, B.K., Amic, S.L.K., Eds.; Springer: Singapore, 2021; pp. 831–838. ISBN 978-981-33-4298-9. [Google Scholar]
152. Gupta, D.L.; Malviya, A.K.; Satyendra, S. Performance Analysis of Classification Tree Learning Algorithms. *Int. J. Comput. Appl.* 2012, 55, 39–44. [Google Scholar]
 153. Thiripura-Sundari, S.; Padmapriya, A. Data Mining Application-Usage of Visualizing Association Rules in CRM System. *Int. J. Eng. Res. Appl.* 2012, 2, 317–320. [Google Scholar]
 154. Wirojcharoenwong, W.; Luangnaruedom, N.; Rattanasiriwongwut, M.; Tiantong, M. Decision Tree Classifier for Computer Self-Efficacy with Best First Feature Selection. *Int. J. Comput. Internet Manag.* 2014, 22, 62–67. [Google Scholar]
 155. Shi, H. *Best-First Decision Tree Learning*; The University of Waikato: Hamilton, New Zealand, 2007. [Google Scholar]
 156. Dette, D.E.; Abele, A.E.; Renner, O. Zur Definition und Messung von Berufserfolg. *Zeitschrift Für Pers.* 2004, 3, 170–183. [Google Scholar] [CrossRef]
 157. Deshmukh, B.; Patil, A.; Pawar, B.V. Comparisoin of Classification Algorithms using WEKA on various Datasets. *Int. J. Comput. Sci. Inf. Technol.* 2011, 4, 85–90. [Google Scholar]
 158. Bhavsar, H.; Ganatra, A. An Empirical Evaluation of Data Mining Classification Algorithms. *Int. J. Comput. Sci. Inf. Secur.* 2016, 14, 142–150. [Google Scholar]
 159. Korting, T.S. *C4.5 Algorithm and Multivariate Decision Trees. Image Processing Division*; National Institute for Space Research–INPE Sao Jose dos Campos–SP: São Paulo, Brazil, 2006. [Google Scholar]
 160. Quinlan, J. *C4.5: Programs for Machine Learning*; Morgan, M., Sery, D., Eds.; Morgan Kaufmann Publishers, Inc.: San Mateo, CA, USA, 2014; ISBN 1-55860-238-0. [Google Scholar]
 161. Dangare, C.; Apte, S. Improved study of heart disease prediction system using data mining classification techniques. *Int. J. Comput. Appl.* 2012, 47, 8–44. [Google Scholar]
 162. Mohapatra, P.; Tripathi, N.K.; Pal, I.; Shrestha, S. C4.5: Programs for machine learning. *Res. Sq.* 2020, 1–50. [Google Scholar] [CrossRef]
 163. Breiman, L. Random Forests. *Mach. Learn. Appl.* 2001, 45, 5–32. [Google Scholar] [CrossRef]
 164. Belgiu, M.; Drăguț, L. Random forest in remote sensing: A review of applications and future directions. *ISPRS J. Photogramm. Remote Sens.* 2016, 114, 24–31. [Google Scholar] [CrossRef]
 165. Jankovic, R. Classifying cultural heritage images by using decision tree classifiers in WEKA. In Proceedings of the 1st International Workshop on Visual Pattern Extraction and Recognition for Cultural Heritage

- Understanding (VIPERC 2019), Pisa, Italy, 30 January 2019; Volume 2320, pp. 119–127. [Google Scholar]
166. Aria, M.; Cuccurullo, C.; Gnasso, A. A comparison among interpretative proposals for Random Forests. *Mach. Learn. Appl.* 2021, 6, 100094. [Google Scholar] [CrossRef]
 167. Zhao, Y.; Zhang, Y. Comparison of decision tree methods for finding active objects. *Adv. Sp. Res.* 2008, 41, 1955–1959. [Google Scholar] [CrossRef]
 168. Görgülü, B.; Baydoğan, M.G. Randomized trees for time series representation and similarity. *Pattern Recognit.* 2021, 120, 108097. [Google Scholar] [CrossRef]
 169. Dries, N.; Pepermans, R.; De Kerpel, E. Exploring four generations' beliefs about career. *J. Manag. Psychol.* 2008, 23, 907–928. [Google Scholar] [CrossRef]
 170. Greenhaus, J.H. Career Dynamics. In *Handbook of Psychology*; John Wiley & Sons: Hoboken, NJ, USA, 2003. [Google Scholar]
 171. Litzky, B.; Greenhaus, J. The relationship between gender and aspirations to senior management. *Career Dev. Int.* 2007, 12, 637–659. [Google Scholar] [CrossRef]
 172. Wilson, J.S.; Stocking, V.B.; Goldstein, D. Gender differences in motivations for course selection: Academically talented students in an intensive summer program. *Sex Roles* 1994, 31, 349–367. [Google Scholar] [CrossRef]
 173. Gianakos, I.; Subich, L.M. Student Sex and Sex Role in Relation to College Major Choice. *Career Dev. Q.* 1988, 36, 259–268. [Google Scholar] [CrossRef]
 174. Judge, T.A.; Piccolo, R.F.; Podsakoff, N.P.; Shaw, J.C.; Rich, B.L. The relationship between pay and job satisfaction: A meta-analysis of the literature. *J. Vocat. Behav.* 2010, 77, 157–167. [Google Scholar] [CrossRef]
 175. Wentland, E.J. *Survey Responses: An Evaluation of Their Validity*; Academic Press: San Diego, CA, USA, 1993. [Google Scholar]
 176. Abele, A.E.; Spurk, D.; Volmer, J. The construct of career success: Measurement issues and an empirical example. *Zeitschrift Für Arbeitsmarktforsch.* 2011, 43, 195–206. [Google Scholar] [CrossRef]
 177. Gunz, H.P.; Heslin, P.A. Reconceptualizing Career Success. *J. Organ. Behav.* 2005, 26, 105–111. [Google Scholar] [CrossRef]
 178. Nicholson, N.; de Waal-Andrews, W. Playing to win: Biological imperatives, self-regulation, and trade-offs in the game of career success. *J. Organ. Behav.* 2005, 26, 137–154. [Google Scholar] [CrossRef]
 179. Cha, J.; Kim, S.; Beck, J.; Knutson, B.J. Predictors of Career Success among Lodging Revenue Managers: Investigating Roles of Proactive Work Behaviors. *Int. J. Hosp. Tour. Adm.* 2017, 18, 474–490. [Google Scholar] [CrossRef]

180. Gilar, R.; de Haro, J.M.; Castejon, J.L. Individual differences in predicting occupational success: The effect of population heterogeneity. *Rev. Psicol. Del Trab. Y Las Organ.* 2015, *31*, 101–107. [Google Scholar] [CrossRef]
181. O'Neil, D.A.; Bilimoria, D.; Saatcioglu, A. Women's career types: Attributions of satisfaction with career success. *Career Dev. Int.* 2004, *9*, 478–500. [Google Scholar] [CrossRef]
182. Princess, H.; Agwu, E.; Ohaegbu, A.V.; Agumadu, M. Strategic Implications of Glass Ceiling on the Professional Leadership of Career Women Development in the West African Sub-Region. *SSRN Electron. J.* 2015, *6*, 260–271. [Google Scholar] [CrossRef]
183. Ballout, H.I. Career commitment and career success: Moderating role of self-efficacy. *Career Dev. Int.* 2009, *14*, 655–670. [Google Scholar] [CrossRef]

**Capítulo III:
Incidencia del programa
Alumni en la predicción del
éxito profesional en una
universidad pública
ecuatoriana**

Capítulo III: Incidencia del programa Alumni en la predicción del éxito profesional en una universidad pública ecuatoriana

Artículo 3: Incidence of Alumni program in the prediction of career success in an Ecuadorian public university



Article

Incidence of Alumni program in the prediction of career success in an Ecuadorian public university

Roberto Pico-Saltos^{1,2}, Javier Garzás¹, Andrés Redchuk¹, Paulo Escandón-Panchana⁵ and Fernando Morante-Carballo^{3,4,5}

¹ Computer Science, ETSII, University Rey Juan Carlos, 28933 Madrid, Spain; javier.garzas@urjc.es (J.G.); andres.redchuk@urjc.es (A.R.)

² Faculty of Engineering Sciences, Quevedo State Technical University, Quevedo 120304, Ecuador; (R.P-S)

³ Centro de Investigación y Proyectos Aplicados a las Ciencias de la Tierra (CIPAT), Campus Gustavo Galindo, ESPOL Polytechnic University, Km. 30.5 Vía Perimetral, Guayaquil P.O. Box 09-01-5863, Ecuador; fmorante@espol.edu.ec (F.M-C)

⁴ Facultad de Ciencias Naturales y Matemáticas (FCNM), Campus Gustavo Galindo, ESPOL Polytechnic University, Km. 30.5 Vía Perimetral, Guayaquil P.O. Box 09-01-5863, Ecuador

⁵ Geo-Recursos y Aplicaciones GIGA, Campus Gustavo Galindo, ESPOL Polytechnic University, Km. 30.5 Vía Perimetral, Guayaquil P.O. Box 09-01-5863, Ecuador; pcescand@espol.edu.ec (P.E-P)

* Correspondence: pcescand@espol.edu.ec;

Abstract: Alumni tracking studies at the local, regional and global levels provide quality and efficiency measurement parameters in higher education institutions and project improvements in the quality of professionals. However, there is a gap between the Alumni tracking and the measurement of career success, influencing the academic offer of careers relevant to labour demands. This article aims to propose a model for predicting career success through the analysis, extraction and evolutionary optimization of objective and subjective variables to determine the incidence of the Alumni tracking in a higher education institution. The methodology establishes i) Analysis of information on the Alumni program and career success. ii) Prediction models of career success using genetic algorithms. iii) Validation of prediction models and iv) Relationship between Alumni tracking and career success. The results show models for predicting career success using a genetic algorithm with high certainty percentages, where the objective variables' weight significantly influences the predictive model. However, subjective variables show importance depending on individual characteristics and their value schemes or goals of graduates. As a recommendation, universities could include a monitoring system for their graduates, which is crucial in adapting to the curriculum, especially in strategic technical and human ethical issues.

Keywords: objective career success, subjective career success, Alumni tracking, prediction, genetic algorithm.

1. Introduction

Universities are transforming agents in the process of student training. They prepare future professionals who understand global challenges and are active players in a prosperous society (Carrión-Mero et al., 2021; Žalėnienė & Pereira, 2021). The current university proposes a higher education based on training and skills development. It incorporates new learning methods, research on current and global issues, adaptation to existing technologies, and intelligent and sustainable infrastructure (Bautista-Puig & Sanz-Casado, 2021; Herrera-Franco, Montalván-Burbano, et al., 2021; Miranda et al., 2021). In addition, it links sustainability projects that drive higher education in the 21st century (Gricelda et al., 2018; Herrera-Franco, Alvarado, et al., 2021; Herrera-Franco, Erazo, et al., 2021; Morante-Carballo et al., 2022).

One of the quality indicators of higher education relates to its graduates' satisfaction and professional performance (Altuntaş & Baykal, 2017). Higher education institutions manage these quality standards by evaluating the academic performance of teachers, curricular relevance, and

infrastructure through graduate monitoring programs (Alumni) (Wiranto & Slameto, 2021). Sometimes, the implementation of these programs requires graduate surveys (Kismul et al., 2020; Salazar & Schelbe, 2021), qualitative interviews (H. Shen & Sha, 2020), questionnaires (Lavi et al., 2021), professional performance self-assessment forms and alumni networks (Campbell & Baxter, 2019). These programs determine the graduate's general situation and measure the graduate's successful performance in his professional life (Geiger et al., 2018; N. Rattanamethawong et al., 2018).

Career success is the achievement of desired results from a person's work experiences over time (McDonald & Hite, 2008). Career success can be both objective and subjective. Objective career success (OCS) are tangible professional achievements related to variables or indicators such as salary, job position, promotions (Bagdadli & Gianecchini, 2019; Golden & Eddleston, 2020), occupational prestige (Hirschi et al., 2021), political will (Blickle et al., 2018), labour mobility (Stumpf & Tymon, 2012), hierarchy, gender, age and working hours (Janssen et al., 2021). In contrast, subjective career success (SCS) refers to the individual's judgment regarding his career, professional satisfaction, self-perceived evaluation of professional well-being (Gordon & Shi, 2021; Hall et al., 2012), professional orientation (Haenggli et al., 2021), vocation and work commitment (Xie et al., 2016).

The OCS is the cause of the SCS; they are positively related and are interdependent. For example, people who have a higher salary feel subjectively more successful (Spurk & Abele, 2014). In addition, increased job satisfaction does not necessarily raise an SCS when factors are involved, such as health, family relationships and other personal values (Heslev, 2005).

There are different studies by authors who propose the measurement of professional success through the analysis of objective and subjective variables. That is the case of (Guo et al., 2012), who correlated human resources and the career success of knowledge workers, using a professional success measurement tool that measures human resources with a high reliability and validity scale. The results showed that the variables education, work experience, learning ability, internal and external competitiveness, and job satisfaction predict career success.

(Blokker et al., 2019) analyzed professional crises in the relationship between professional skills, employability and professional success, using data from 704 young Dutch professionals aged 21 to 35. They reported that people with high levels of professional competence have a high degree of perceived employability. They concluded that professional crises, professional competencies and career success are essential factors in professional development.

Another study of 654 Chinese employees examined the effects of perceived organizational career management and career adaptability on indicators of career success (e.g., salary and job satisfaction). They demonstrated a robust positive relationship between perceived corporate career management and professional fulfilment, reflected in employees with higher professional adaptability (Guan et al., 2015).

On the other hand, educational trajectories, the labour market, age and social classes defined the degree of professional success of British graduates. This study showed that graduates from low social strata have variability and instability in their educational trajectories, which causes a low probability of access to high-level jobs and a greater probability that graduates remain in low social strata (Duta et al., 2021).

(Chang & Chen, 2020), reflected the professional success perceived by entrepreneurs through the analysis of five indicators of business success, such as professional achievements, social reputation, personal capabilities, business happiness and financial satisfaction. The results determined that entrepreneurial creativity and opportunity recognition positively relate to entrepreneurial career success.

On the other hand, they analyzed the impact and significance of attitudes such as trust and work behaviour in the OCS and SCS, and their impact on Chinese workers' physical and mental health, through the analysis of a mediation model- moderation using multilevel linear regression. The results illustrate important relationships between work and life attitudes at an organizational level (Russo et al., 2014).

The research by (Zacher, 2014) analyzed the validity of the Career Adaptation Abilities Scale (CAAS) through the effect of variables of SCS (satisfaction and professional performance). They reported that professional adaptability predicted professional satisfaction and performance. In addition, the variables worry and trust predicted the two indicators of SCS.

(Lei et al., 2021) related the development of competencies, leadership, psychological flexibility and career success through a survey of hotel industry

employees. The results showed that leadership significantly affects the development of competencies. The relationship between the employee and the organization significantly improves the professional success of the workers.

(Healy et al., 2020) analyzed the variables that promote or limit the career success of graduates, employability and professional development through the analysis of psychosocial processes that drive career success. They highlighted their research on the socioeconomic context, the institution, and the curricular strategies that determine graduates' employability and professional development.

Machine learning techniques use computational intelligence to analyze correlations between input and output variables through mathematical and statistical models in different applications (Hamdia et al., 2021). The analysis and selection of variables are essential in constructing prediction models (Kordos et al., 2022). For example, the genetic algorithm (GA), simple linear regression, multiple regression and logistic regression are techniques that select representative and optimal variables to build a prediction model (Ji et al., 2022). For example, the genetic algorithm (GA), simple linear regression, multiple regression and logistic regression are techniques that select representative and optimal variables to build a prediction model (Pham & Hong, 2022).

The genetic algorithm represents an exact or approximate stochastic solution based on the population (Liashchynskiy & Liashchynskiy, 2019). It simulates the survival of the fittest individuals and their genes, where a key and a parameter represent a chromosome and a gene, respectively. It evaluates the aptitude of an individual through the fitness function or objective function (Mirjalili, 2019). It maintains the best solutions in each generation to improve other solutions. The recombination of two leading solutions generates a crossover (Liang et al., 2020; Mathew, 2012). In addition, the mutation changes the genes on the chromosomes, causing the diversity of individuals in the population, which increases the exploratory behaviour of the GA and leads to more optimal solutions (Lambora et al., 2019).

GA is effective in finding optimal solutions to various types of problems, which originates their application in different areas: operations management, route planning of mobile robots in unstructured environments in real-time, convolutional neural networks, processing of images, fields of multimedia, medicine, learning environments, transport optimization and energy management of electric vehicles, real-time systems, production management, precision agriculture and resolution of programming problems real world (Baker & Ayechev, 2003; Dwivedi et al., 2018; Ghaheri et al., 2015; Kumar et al., 2010; Lü et al., 2020; Sun et al., 2020). Furthermore, it uses in real-life applications; that is, chromosome representation is related to real-life issues, demonstrating robustness, efficiency, quality, and accuracy of the solution (Katoch et al., 2021).

This paper presents a study carried out at the State Technical University of Quevedo (UTEQ) to monitor its graduates through a survey aimed at professional graduates. The construction of a career success prediction model used a genetic algorithm based on graduate tracking parameters and significant

variables of career success. However, it emphasizes the importance of a graduate monitoring system aligned with current technological profiles in such a way that it allows to obtain helpful information to predict the career success of its graduates. That contributes significantly to decision-making and compliance with quality indicators for higher education institutions in the country.

The most relevant parameter to measure graduates' career success is the job performance of the graduate in the face of a limited job demand, which implies continuous monitoring of the professional graduates from higher education institutions (Jackson & Tomlinson, 2020; Pico-Saltos, Bravo-Montero, et al., 2021; Pico-Saltos, Carrión-Mero, et al., 2021b). Therefore, to carry out this study, the authors have asked ourselves the following research question: Is it possible that, through the application of a genetic algorithm prediction model and mathematical tools, an optimal model of the career success of graduates in the UTEQ?

This study proposes a model for predicting career success through the analysis and optimization of objective and subjective variables to determine the incidence of the Alumni program at UTEQ. The information on parameters or indicators of the Alumni program and variables on career success allowed an analysis of the significance of variables for the design of GA in predicting career success. The 500 UTEQ graduates and their follow-up characteristics represented the population and genes in this natural selection. The fitness function and genetic operators (e.g., elitist selection, crossover and mutation) found models of career success of GA. This approach determined the relationship between career success and the Alumni program. The statistics found a goodness of fit of 87.61% for the prediction model. The results of this study present models that estimate the career success of UTEQ graduates through the interaction of variables, generating a significant retrospective in decision-making in the Alumni program.

2. Materials and Methods

The methodology of this study consists of the following phases: 1) Analysis of information regarding the Alumni tracking and career success, 2) Prediction models of career success based on a genetic algorithm, 3) Statistical analysis for validation of the prediction models, and 4) Relationship between career success and the Alumni tracking (Figure 1).

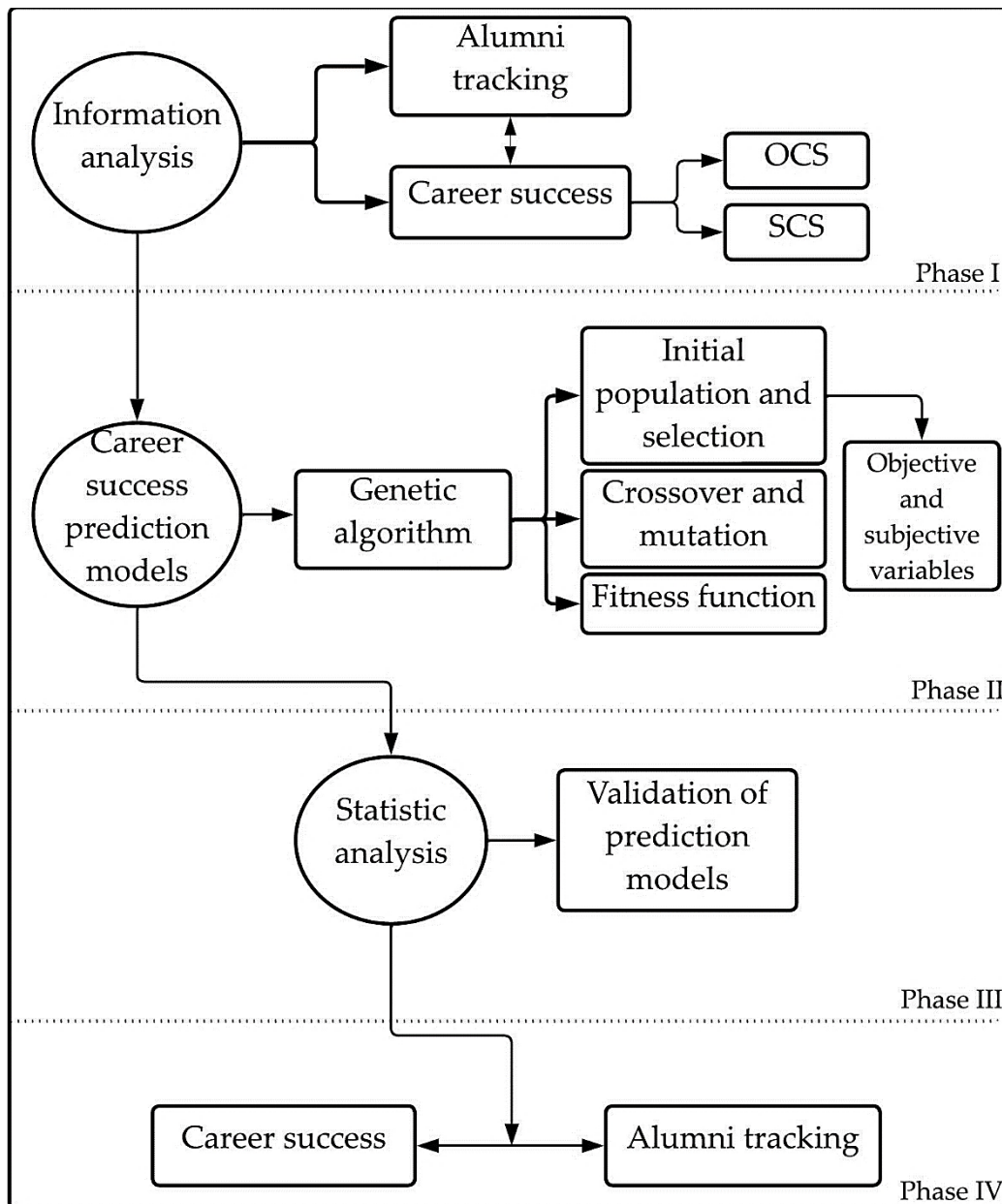


Figure 1. Research methodological design.

2.1. Information analysis of the Alumni tracking and career success

The information analysis proposed two review scenarios. The first scenario established variables within the framework of the external evaluation model of universities and polytechnic schools of Ecuador (Consejo de Aseguramiento de la Calidad de la Educación Superior, 2019; Orozco et al., 2020) and manuals of instruments and recommendations on the follow-up of graduates of studies carried out in higher education institutions of Ecuador, Latin America and Europe (Red Gradua2 & Asociación Columbus, 2006; Schomburg, 2004). That allowed the interpretation of quality indicators related to Alumni tracking (AT) (Table 1) (Saltos et al., 2016; Tirado Morueta et al., 2015). The second scenario determined predominant variables in the scientific context associated with the career success of graduates from higher education institutions (Tables 2 and 3). Both methods

provided a relevant database for constructing the GA for predicting career success, analyzed from the objective (O) and subjective (S) points of view.

Table 1. Parameters of the Alumni tracking.

N°	General features	Variables	Reference citation
AT1	Sociodemographic	Age, marital status, gender, place of birth and place of residence	(Geiger et al., 2018; N. Rattanamethawong et al., 2018)
AT2	Formation	Obtained title	(Salazar & Schelbe, 2021; Tirado Morueta et al., 2015)
AT3		Graduation Average	(Tirado Morueta et al., 2015)
AT4	First job	Job	(Red Gradua2 & Asociación
AT5		Time elapsed to obtain the first job.	Columbus, 2006;
AT6		Relationship with career	Tirado Morueta et al., 2015)
AT7		Employment level	(Salazar & Schelbe, 2021; Tirado Morueta et al., 2015)
AT8		Relationship of employment to career	(Kismul et al., 2020; Tirado Morueta et al., 2015)
AT9	Relationship with the post-formation labour market	Job and Salary	(N. Rattanamethawong et al., 2018; Tirado Morueta et al., 2015)
AT10		Contract period	(Salazar & Schelbe, 2021; Tirado Morueta et al., 2015)
AT11		Job satisfaction	(Red Gradua2 & Asociación Columbus, 2006; Tirado Morueta et al., 2015)

AT12		Organization type	(Geiger et al., 2018; Tirado Morueta et al., 2015)
AT13		Domain skills (learning, critical thinking, communication and leadership)	(Altuntaş & Baykal, 2017; Hutapea et al., 2021; Lavi et al., 2021; Palmer et al., 2017)
AT14	General skills	Competencies of knowledge acquired in the career	(Deros et al., 2012; Hutapea et al., 2021; Kismul et al., 2020; Palmer et al., 2017; Tirado Morueta et al., 2015)
AT15		Knowledge competencies required on the job	(Altuntaş & Baykal, 2017; Deros et al., 2012; Palmer et al., 2017; Tirado Morueta et al., 2015)
AT16		Satisfaction with the training received	(V. Rattanamethawong et al., 2015; Tirado Morueta et al., 2015)
AT17	Relationship with the institution	Career utility	(V. Rattanamethawong et al., 2015; Tirado Morueta et al., 2015)
AT18		Teaching professionalism and curricular relevance	(V. Rattanamethawong et al., 2015; Tirado Morueta et al., 2015; Wiranto & Slameto, 2021)

Table 2. OCS Variables.

N°	Variables	Reference citation
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O1	Profession	(Nabi, 1999;
O2	Graduation note	Psacharopoulos
O3	Graduation Year	& Patrinos,
	Year of	2004;
O4	employment	Schomburg,
		2004)
	Salary	(Abele &
		Spurk, 2009;
		Domínguez &
		Gutiérrez, 2020;
		Golden &
		Eddleston,
O5		2020; Heslev,
		2005; Hirschi et
		al., 2021; Ng &
		Feldman, 2014;
		Spurk et al.,
		2019; Valcour
		& Ladge, 2008)
	Promotion	(Golden &
		Eddleston,
		2020; Heslev,
		2005; Ng &
O6		Feldman, 2014;
		Tlaiss &
		Kauser, 2011;
		Valcour &
		Ladge, 2008)
	Job	(Abele &
		Spurk, 2009;
		Dyke &
O7		Murphy, 2006;
		Gelissen & de
		Graaf, 2006)
	Age	(Domínguez &
		Gutiérrez, 2020;
		Janssen et al.,
O8		2021; Pachulicz
		et al., 2008;
		Zhao et al.,
		2021)

O9	The educational level of the parents	(Stamm & Buddeberg-Fischer, 2011; Xu & Payne, 2014)
O10	Monthly family income	(Abele & Spurk, 2009; Danziger & Valency, 2006; Dyke & Murphy, 2006)
O11	Professional prestige	(Hirschi et al., 2021; Spangler, 1992; Spurk et al., 2019)
O12	Job in a prestigious institution	(Hennequin, 2007; Kim & Beehr, 2018; van den Born & van Witteloostuijn, 2013)
O13	Leadership	(Kim & Beehr, 2018; Lei et al., 2021)
O14	Hierarchical level	(Abele & Spurk, 2009; Heslev, 2005; Kirchmeyer, 2006)
O15	Years of career	(Kirchmeyer, 2006; Nabi, 1999)

Table 3. SCS Variables.

N°	Variables	Reference citation
S1	Professional or job satisfaction	(Briscoe et al., 2021; Cope, 1928; de Vos & Soens, 2008;

		Goh, 1991; Heslev, 2005; Spurk et al., 2019)
	Identification with job	(Heslev, 2005; Schworm et al., 2017b; Valcour & Ladge, 2008)
S2		
	Emotional intelligence	(Goh, 1991; Verbruggen, 2012; Wiese et al., 2002)
S3		
	Fulfilment of goals and professional achievements	(Cesinger, 2011; de Haro et al., 2013; Heslev, 2005; Ng et al., 2005b)
S4		
	Satisfaction with the knowledge and skills acquired in the higher education institution	(Savolainen, 2000; Schomburg, 2007)
S5		
	Ethical behaviour	(Koh & Boo, 2001)
S6		
	Personality	(Denissen et al., 2018)
S7		
	Authenticity	(Briscoe et al., 2021; Spurk et al., 2019)
S8		
	Development of basic skills and competencies	(Briscoe et al., 2021; Colakoglu, 2011; de Vos & Soens, 2008; Wang et al., 2011)
S9		
	Self-efficacy	(Pachulicz et al., 2008)
S10		

2.2. Career success prediction model

This study considered the surveys of the graduate monitoring program of the State Technical University of Quevedo (UTEQ) in Ecuador. The graduate records generated a database, converted to a text or flat file with comma-separated values (CSV) (Munk et al., 2021; Serinelli et al., 2021). The file import allowed the selection of the significantly correlated variables through a correlation matrix (correlation coefficient greater than or equal to 0.7) (Berger & Wessel, 2016; Miller et al., 2019); tables 1-3 show some of these variables. In addition, the CSV allowed the connection with the genetic algorithm.

The custom development of the genetic algorithm used the open-source programming language Python. This language allowed the coding of the genetic, computational model based on four genetic operators (i.e., selection, evaluation, genetic crossover and mutation) through libraries such as Numpy and Matplotlib (Rosso et al., 2020; Salata et al., 2020).

2.2.1. Representation of chromosome

The GA starts with a population, which is a set of individuals (Gustafson & Wilmer, 2019; Moya et al., 2022). Each individual is a possible solution; in this case, an individual represents a graduate. Each individual in the population is a chromosome made up of a set of genes (objective and subjective variables of career success). Figure 2 shows the structure of the chromosome, with its respective genes and possible values. Compared to human genetics, the genotype or DNA is the GA encoding, and an individual's phenotype or physical characteristics are the GA's solution (Gustafson & Wilmer, 2019; Karakatič, 2021).

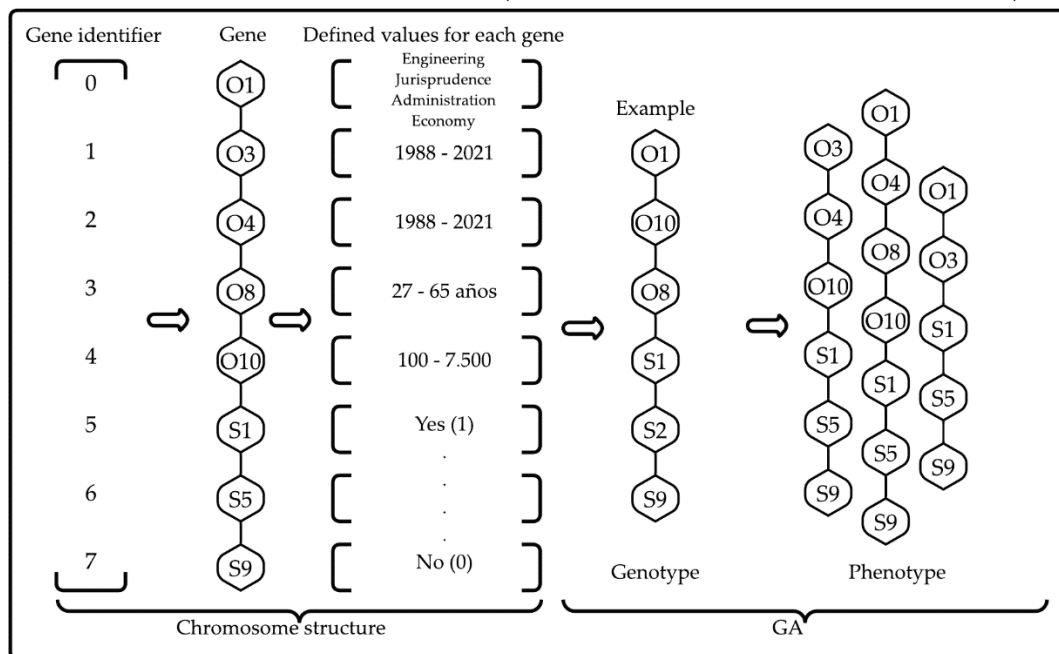


Figure 2. Representation of individuals (chromosome).

2.2.2. Genetic Algorithm Parameter Settings

The exploration and stabilization of the results of the proposed algorithm required an adjustment of the appropriate parameters, shown in Table 4 (Akcan, 2018; Mayer et al., 2020; Moya et al., 2022). The generation chromosomes (graduates) end when the genetic algorithm reaches its maximum iteration (Ali et

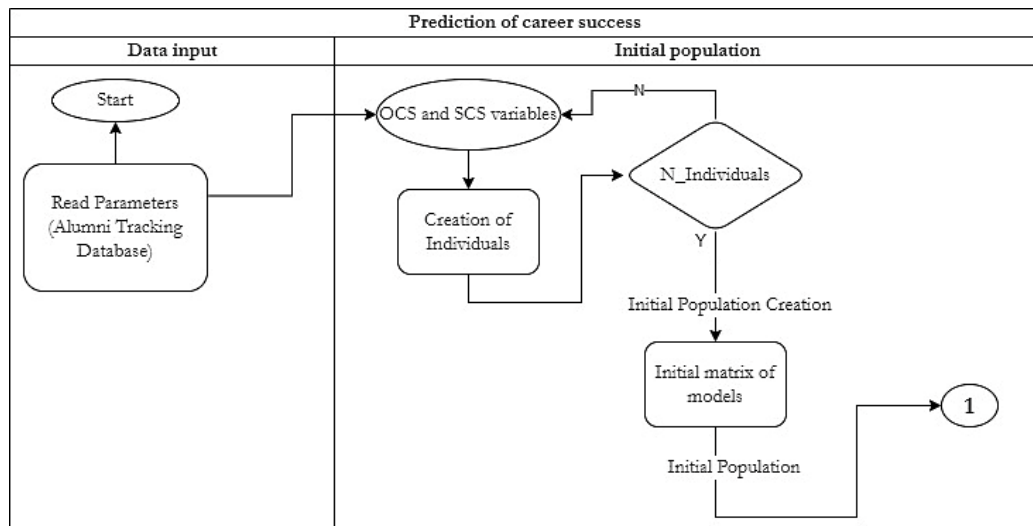
al., 2018; Gustafson & Wilmer, 2019; Haq et al., 2019). For optimal results, the population size ranges from 50 to a maximum of 500 graduates. This study used ten samples of 50 individuals. The elitist selection method selected the chromosomes with the best fitness values. The search probability (crossover) in a new solution is 0.8, and the mutation probability that establishes the diversity of the population is 0.05; assigning lower values to the mutation rate allows an early convergence of GA (R. Chen et al., 2020; Liu et al., 2018; Pourrajabian et al., 2021; Reddy et al., 2020).

Table 4. Initial parameters of the genetic algorithm.

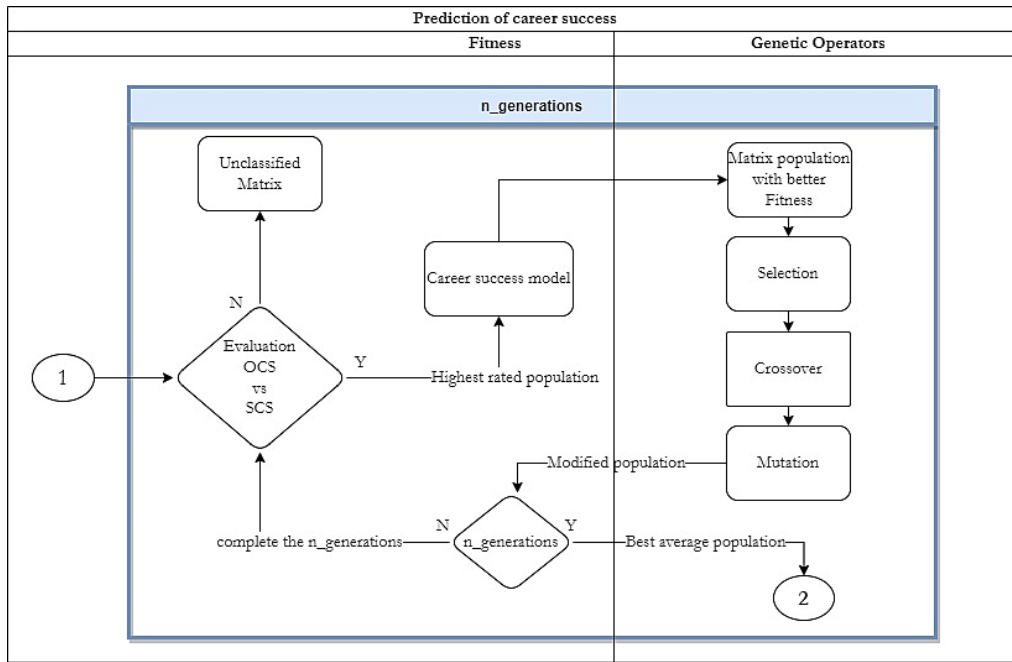
Parameters	Assignment
Population size	500
Maximum generation	100
Crossover probability	0.8
Mutation probability	0.05

2.2.3. Genetic Algorithm Design

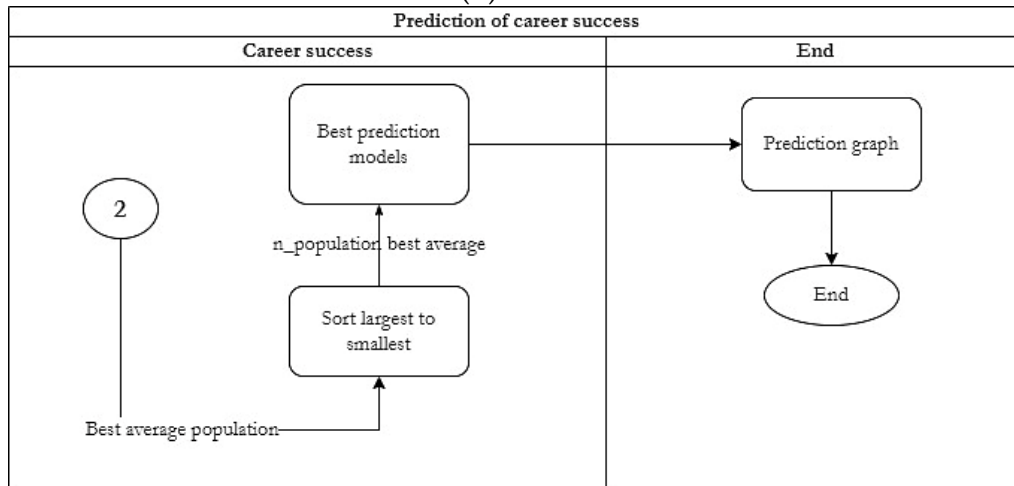
The GA was built based on the basic functional structures that characterize it, relating to methodologies proposed by (D'Angelo & Palmieri, 2021; Luo et al., 2020; Protopopova & Kulik, 2020). The design of the algorithm proposed the following processes: 1) Data reading, according to the parameters of the Alumni tracking database. 2) Creation of the initial population defines the number of individuals. 3) Fitness process. 4) Use genetic operators (e.g., selection, crossover and mutation). 5) Career success prediction models (Figure 3).



(a)



(b)



(c)

Figure 3. Design of the proposed algorithm.

The creation of the initial population used the parameters: of individuals (graduates) and genes (objective and subjective variables of professional success). That generated an initial array of prediction models (Figure 3a). First, the fitness function assigns a value to all chromosomes in the population (Katoch et al., 2021). This process comprises multiple variables optimized by the GA; both chromosomes and genes adjust to minimize or maximize the fitness value (Y.-H. Chen et al., 2019). Next, the fitness evaluation process defined the fitness function, which identified the degree of goodness of fit for each individual. This function generated two matrices, a matrix of unclassified (i.e., individuals with low scores) and a matrix of the population with better fitness (i.e., individuals with high scores) (Figure 3b). Table 5 presents the fitness functions of the genes involved in the prediction models of professional success. That allowed the choice of better individuals before performing the crossover and mutation operations.

Table 5. GA fitness functions.

Genes	Description	GA fitness functions
<i>OCS Variables</i>		
O1	Frequent professions of UTEQ graduates.	Frequency percentage.
O3 and O4	The difference between these variables determined the transition time to employment.	The longer the transition time, the lower the aptitude assessment. And the shorter the transition time, the higher the aptitude assessment.
O8	Age of graduates.	Three weights: <ul style="list-style-type: none"> - 1: ≥ 51 years. - 0.5: $31 \leq \text{age} \leq 50$ years. - 0: $24 \leq \text{age} \leq 30$ years.
O10	Variation of family income.	The higher the family income, the higher the aptitude assessment.
<i>SCS Variables</i>		
S1, S5 y S9	SCS variables, professional satisfaction and satisfaction with the knowledge and skills acquired at the University.	Value of 1 for satisfaction and 0 for dissatisfaction.

Table 6 presents the pseudocode of fitness function evaluation that weighted the best individuals and the best estimate of professional success. The weighting of the mean of the individuals concerning the genes allowed the assessment of the prediction models. In the case of the time of transition to employment, the resulting weighting is inversely proportional. On the other hand, concerning family income (O10), the resulting weight is directly proportional.

Table 6. Evaluation of the fitness function of the GA.

```
def fitness (self, O4-O3, O10, PromS, O8, Actual-O3, O1,
model):
    #the sum of individuals for genes
    if(model == "1"):
        average_ individuals = ((O4-O3)+O10+PromS)/3
    elif(model == "2"):
        average_ individuals = ((O4-O3)+O8+O10+
PromS)/4
    elif(model=="3"):
        average_ individuals = (O1+(A-O3)+ PromS)/3
    return average_ individuals
```

After this, the GA uses the information generated by the fitness function to choose the individuals that pass the crossover and mutation operations to select the best solution according to the fitness values (Lamini et al., 2018). The GA seeks better solutions through genetic processes such as selection, crossing and mutation (Peng et al., 2019). The selection operation considers selecting elite individuals from the population, the crossover is the recombination of selected individuals, and transformation randomly selects a gene and replaces it with a new one (Haldurai et al., 2016). In this study, the genetic operators classified the best chromosomes through 1) selection: choosing the best individuals based on fitness evaluation, 2) Crossover: exchange of objective and subjective variables of career success, and 3) mutation: random modification of objective and subjective variables of professional success (Figure 3b). At the end of iterations ($n_{\text{generations}}$), the GA generated the best predictions through reports and graphs (Figure 3c).

2.3. *Statistic analysis*

The statistical analysis studied the relationship and behaviour of genes (i.e. OCS and SCS variables) through the correlation between variables, choosing the most significant variables (Abaci et al., 2016). This correlation and the results of GA allowed the calculation of standard deviation, confidence intervals and confidence level of prediction models at a significance of 95% (Escandón-Panchana et al., 2021, 2022; Gholami et al., 2018).

These statistical indices determine the probability distributions of the GA in ranges defined by the confidence intervals, obtaining prediction results at 300 iterations (Abreu et al., 2020; Panwar et al., 2021).

2.4. *Relationship between career success and Alumni tracking*

Figure 4 shows the conceptual framework of the impact of graduate follow-up on professional success through the relationship of objective and subjective variables.

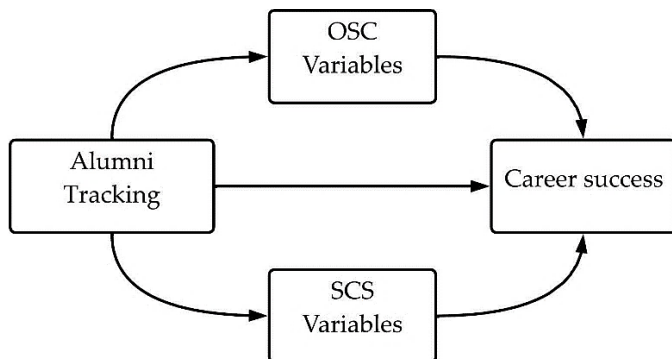


Figure 4. Relationship between Alumni tracking and career success.

The prediction models of the genetic algorithm made it possible to analyze and identify the trends in the relationship between the parameters of professional success and the follow-up of graduates (Ahmad et al., 2019; Tiessen et al., 2019).

3. Results

3.1. Prediction models

Table 7 shows the career success prediction models obtained through the GA with the data of the 500 individuals (UTEQ graduates). The prediction models considered the most significant genes in the database, OCS and SCS variables (Tables 2 and 3). The three models used the same subjective variables to estimate career success.

Table 7. Career success prediction models.

N°	Prediction models	Genes
1	$\sum_{i=1}^{500} [(O4 - O3) + O10 + S1 + S5 + S9]$	O3, O4, O10, S1, S5, S9
2	$\sum_{i=1}^{500} [(O4 - O3) + O8 + O10 + S1 + S5 + S9]$	O3, O4, O8, O10, S1, S5, S9
3	$\sum_{i=1}^{500} [O1 + (A - O3) + S1 + S5 + S9]$; where A represents the current year	O1, O3, S1, S5, S9

The first model estimates graduates' career success through the sum of the mean values of unemployment time, economic income, skills development, professional satisfaction and satisfaction with the knowledge acquired at the university. The mathematical difference between the parameters year of graduation and employment defines the transition to a job or time of unemployment. Furthermore, the subjective variables considered are a crucial

determinant in the prediction since the personal perception of professional satisfaction influences the determination of professional success. On the other hand, the second model estimates career success considering all the genes used in the first model. In addition, it analyzes the age variable as a prediction argument that encourages successful graduates. Finally, the third model estimates professional success under a different approach; it uses the parameter of the current year to establish the time that has elapsed after graduation. In addition, it considers the graduate's profession in estimation significant.

3.2. The elitist weighting of graduates

Table S1 (supplementary material) presents the best career success weightings obtained using the first GA prediction model. The results show the influence of the OCS and SCS variables in predicting the career success of UTEQ graduates. The transition time to employment ranges from 0 to 5 years. 66% of graduates found jobs in a shorter transition time after graduation. However, the personal perception of professional satisfaction establishes a slight decrease in the professional success of elite graduates, caused by 60% of professional dissatisfaction. On the other hand, developing skills and satisfaction with the knowledge acquired increases the career success of select graduates. In addition, there is a notorious influence on the weights determined by family income.

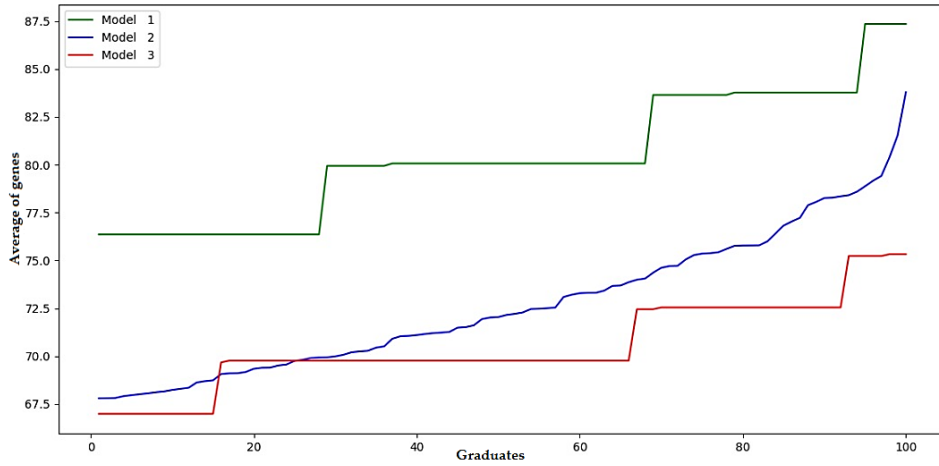
In the second model, 52% of graduates found employment sooner after graduation. The results show a high percentage of incidence (68%) in graduates older than 46 years in the prediction of career success and a low rate (14%) of young graduates (25 to 35 years of age). Regarding the subjective variables, they highlight a high percentage of dissatisfaction regarding the knowledge and skills acquired in the higher education institution (64%) (Table S2).

The third prediction model presents low weights than the previous models. It included the relationship of a career in the prediction of career success. The significant knowledge sciences respond to Engineering (I), Administration (A), Economics (E) and Jurisprudence (J). The results show that 84% of graduates are successful in engineering and management sciences. On the other hand, this model included the current year about the year of graduation to establish the professional's graduation time. 58% of the graduates have a graduation time of fewer than 30 years, which is related to the age of the graduates considered in the second model. The subjective variables found a lower percentage of dissatisfaction regarding the knowledge and skills acquired at the university (Table S3).

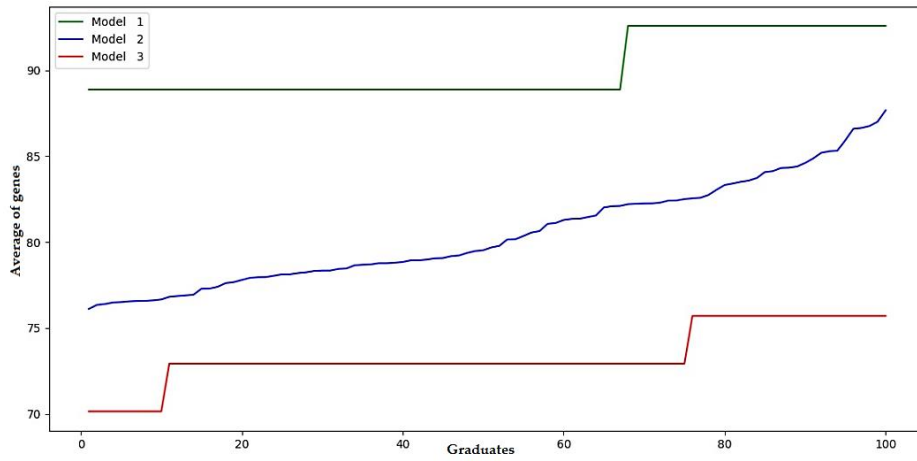
3.3. Dynamics of prediction models

The three prediction models present dynamism in their behaviour according to the genes and the weights of the best-selected individuals. The elite weighting of these models shows an increasing trend according to the variation of the population. The first model with its respective genes presents higher weights than the other models at 100 iterations run in the GA (figure 5a). As the number of iterations increases, the models show greater significance in their behaviour.

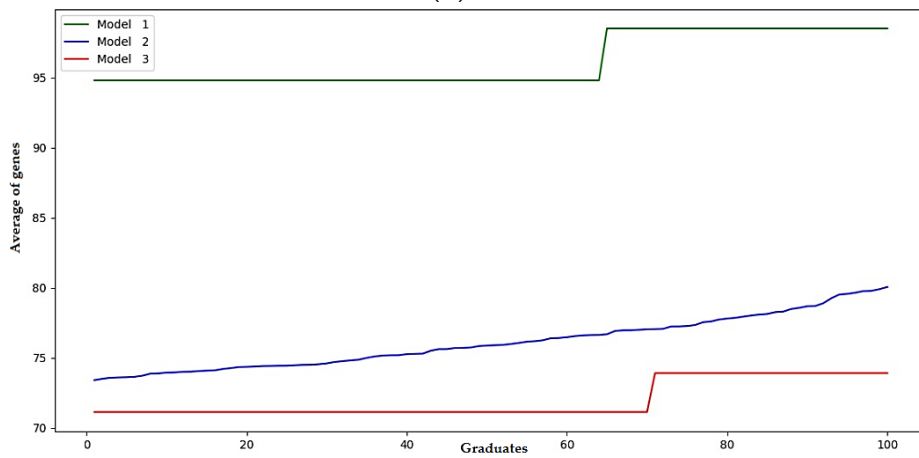
After 200 iterations, the first model is still more significant (figure 5b). Therefore, the greater the number of iterations (300), the greater the precision of the models was obtained (figure 5c). Finally, the trend keeps the first professional success prediction model above the others. The significance and correlation of the predictor variables (OCS and SCS) achieved these results.



(a)



(b)



(c)

Figure 5. Prediction of career success according to the number of generations of the GA. (a) Prediction models with 100 iterations. (b) Prediction models with 200 iterations. (c) Prediction models with 300 iterations.

On the other hand, Figure 6 presents the evolution of the number of chromosomes in each generation. Based on a set of operated genes for each prediction model. In addition, it shows how the fitness values according to the iterations achieve greater precision in the upper quartile (with 0.05 mutation, 0.8 crossover and 50 generations). The convergence of the GA maintains in this quartile, with model one being the one with the highest convergence towards the optimal solution concerning the other prediction models. This prediction model finds the best characteristics of successful graduates (with O3, O4, O10, S1, S5 and S9).

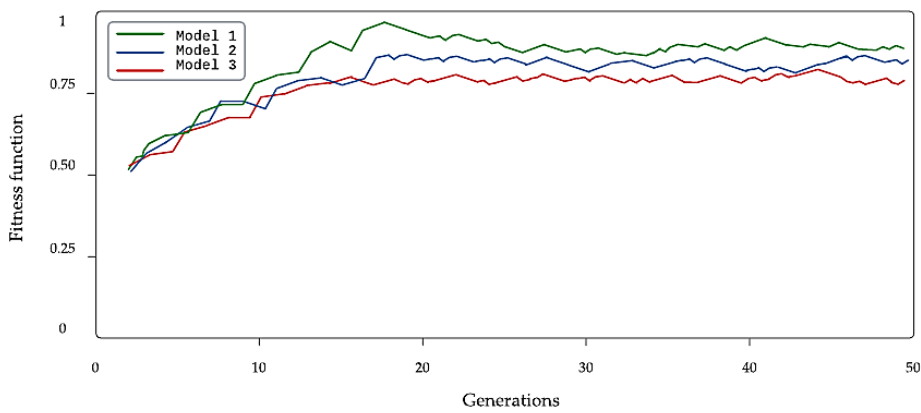


Figure 6. Evolution and convergence of the GA at 50 generations.

3.4. Validation of prediction models

In validating the prediction models, the GA considered the results of the successful predictions of the UTEQ graduates at 300 iterations. There is a strong relationship between genes and elitist weights of graduates, relationships measured by correlation coefficients. The results of the GA show acceptable levels of confidence in the models with a significance of 95%. Table 8 presents the statistical parameters that determine each predictive model's standard deviation, the confidence intervals, and the confidence level (Escandón-Panchana et al., 2021).

Table 8. Confidence estimation of prediction models.

Statistics	Values		
	Model 1	Model 2	Model 3
Significance level	0,95	0,95	0,95
Standard deviation	0,316	0,375	0,569
Confidence interval	0,062	0,074	0,112
Confidence level	87.61%	85.2%	77,40%

All three models are in the upper quartile of acceptable confidence levels. However, the first model represents the best option for predicting professional success with a confidence level of 87.61% and an interrelation of objective genes (time of transition to employment and family income) and subjective genes (skills development, professional satisfaction and satisfaction with the acquired knowledge). On the other hand, the different models represent a valid alternative depending on the behaviour of the variables since they consider other parameters.

3.5. Relationship between career success and Alumni tracking

Table 9 presents the relationship of career success based on the relevance of the Alumni program through the parameters that make up the products and results of the graduate follow-up studies. This relationship found significant variables of the GA (e.g., transition to employment, professional career and satisfaction with the knowledge and skills acquired in the university) for the prediction of professional success (Schomburg, 2004). In addition, some parameters of the follow-up of graduates are indicators of evaluation and accreditation of the quality of higher education.

The relationship between the knowledge acquired, and employment leads to the assessment of the use of knowledge acquired by graduates during their academic training. Furthermore, career success is dependent on the results of graduate follow-up studies. In other words, there is a probability that career success will measure by the employment of graduates, their transition time to the job and their perception of satisfaction with acquired knowledge, which produces indicators of professional results in universities.

Table 9. Relationship of career success with the Alumni tracking.

Alumni Tracking	Career success (genetic algorithm variables)	Relationship
Product (knowledge, skills, career, motivation)	Career Salary	Career success depends on the knowledge acquired during the training process.
	Age	Age is a significant predictor in estimating professional success and a dynamic parameter contributing to Alumni's decision-making.
	Development of basic skills and competencies	Contributes to the analysis of the professional profile of the graduate.
	Job satisfaction	Subjective metrics for the occupational analysis of graduates.
Results	Satisfaction with the knowledge and skills	Satisfaction with the knowledge acquired and skills development are

(transition to employment, employment, contribution to society)	acquired in the higher education institution	complementary to professional development.
	Employment	Employment measures career success. And it is an indicator of the professional results of universities.
	Transition to employment (the year you got a job and year of graduation)	The lack of a link between the labour market and the university influences the transition to employment.
	Family income	Contributes to the socioeconomic analysis of graduates.

The external evaluation model of universities and polytechnic schools determines the legal orientation of the follow-up of graduates within the framework of the quality of education of the universities of Ecuador. Under this regulation, the UTEQ university assigns career commissions to follow up on professionals, obtaining personal and professional data from its graduates through self-administered surveys (Consejo de Aseguramiento de la Calidad de la Educación Superior, 2019).

4. Discussion

The estimation of the career success of UTEQ graduates used a genetic algorithm prediction. This GA generates optimal prediction solutions through graduate tracking variables or parameters. Achieve operational efficiency through genetic operators (e.g., elite selection of successful graduates). It has a greater capacity to search for graduates in short execution times. Crossover and mutation of graduates allow for a better diversity of graduate population with high chances of success. On the other hand, other studies used GA to diversify searches and solve real-world optimization problems (D'Angelo & Palmieri, 2021), such as dynamic energy-saving optimization (Abaci et al., 2016), volunteer teacher transfer problems (C. H. Chen et al., 2015), and intelligent educational systems (Protopopova & Kulik, 2020).

GA of success prediction is adaptive and modifiable in population number, genes, generations and probabilities of genetic operators. That allowed the calculation of optimal graduates weights at different populations and iterations. Similarly to other studies, the GA of temporal network analysis increases individuals and enables the calculation of denser weights, even by reducing the number of generations (Castelli et al., 2020). Likewise, the GA improves its performance through forwarding rules, where the more significant number of iterations represents better results (Vlašić et al., 2019). In this study, the GA is reproducible and adaptable to the parameters of the UTEQ graduate tracking.

The prediction model with the highest reliability of the GA multidimensionally estimates the career success of graduates (Table 7); that is, it significantly relates objective and subjective variables in the prediction. Where professional satisfaction positively affects the time of transition to work, family

income and development of skills of graduates. Similarly, other studies measure subjective career success in a multidimensional way through learning and development, work/life balance, financial security and entrepreneurship, considering these dimensions as significant predictors in estimating career success (Briscoe et al., 2021). They also relate professional skills and employability (Blokker et al., 2019), the quality of internships and the proactive personality (Pan et al., 2018) in measuring career success. On the contrary, other career success estimates consider a single variable's weight. Such as the dynamics of permanent learning mentality relates to objective and subjective career success (Drewery et al., 2020). Or the age that marks a significant relationship with success (Zhao et al., 2021). The GA of this study allows the use of various variables according to the follow-up of UTEQ graduates and determines the significance between them to predict its graduates' success better.

Some studies estimate professional success through different approaches such as multivariate linear regression, logarithmic, multiple standard and hierarchical regression, analysing objective predictor variables such as compensation, promotion, salary, profession, time dedicated to working, leadership, organisational commitment and gender; and subjective such as perceived success. These studies demonstrated an average influence of 25%, with a maximum of 51%, of predictor variables on objective or subjective career success outcomes (Al-Hussami et al., 2018; Bacon, 2017; Kraimer et al., 2019; Martínez-León et al., 2018; Orser & Leck, 2010b). The study proposed in this article uses a prediction GA that estimates the professional success of 500 UTEQ graduates with 87.61% reliability, so the model's goodness of fit is acceptable with all its significant predictors considering the representative sample in different iterations. Similarly, other GA make their estimates in various applications (e.g. meteorology, economics and health), reaching optimal results justified by the prediction accuracy. For example, rainfall prediction reported an accuracy of 80% in its estimates (Roy & De, 2022). Likewise, a GA applied estimated financial problems in private sanitation companies, which reflected an accuracy of 85.16% (González-Martín et al., 2019). Another study used a GA to optimise route transport for ambulances, where it detected an accuracy of 73.5% (Tili et al., 2022).

Some studies applied different methodologies to the GA, demonstrating the relationship of the achievement of their graduates through the analysis of parameters of the Alumni program. For example, a study from a university in Israel used exploratory factor analysis to relate the development of general and specific skills of 21st-century graduates and students to various teaching and learning methods (Lavi et al., 2021). Other studies applied descriptive statistics and multiple linear regression to determine the satisfaction of university graduates in Indonesia and the United States through the relationship between the variables infrastructure, teacher professionalism, employment opportunities, social classes and curricular relevance (Rahim et al., 2021; Wiranto & Slameto, 2021) On the other hand, universities in Norway and Turkey conducted studies on the performance analysis of graduates, using descriptive statistics to improve

graduates' research skills, study plans, competencies, career development and quality of education (Altuntaş & Baykal, 2017; Kismul et al., 2020). In addition, a graduate relationship management model used logistic regression to analyze the demographics, lifestyles, expectations, and interests of graduates from a university in Thailand to establish marketing strategies for Alumni associations (N. Rattanamethawong et al., 2018). So, the GA of the present study is a proposal for measuring career success that includes the use of objective and subjective variables and their interaction with products and results of the Alumni program. Furthermore, it contributes to the follow-up of their graduates and establishes improvements to education and educational management in higher education institutions.

The main limitation of this research is the low percentage of responses by graduates in possible predictor variables such as the position of the graduate for the estimation of professional success.

5. Conclusions

The prediction model proposed in this study develops in a Python programming language through a GA based on the parameters of the Alumni program. This model estimates the professional success of UTEQ graduates through the interaction of objective and subjective variables, generating a significant retrospective for decision-making in tracking its graduates.

The study used data from 500 graduates and obtained predictive results of the career success of their graduates with an acceptable level of reliability (87.61%). So, it gives guidelines for tracking graduates through the transition to employment, family income, development skills of the graduates, their job satisfaction and the knowledge acquired. These variables represent a high significance when the prediction model reaches its maximum limit of generations.

The GA estimated that the average transition time to employment for successful UTEQ graduates is two years. 70% of these graduates feel professionally satisfied and pleased with the knowledge and skills acquired at the university. A high percentage of graduates (89%) perceive that they developed their basic skills and competencies during their academic training.

Based on the application of a genetic algorithm, this study could be replicated based on the correlated variables. In addition, the reality of other higher education institutions must be considered to complement the analysis, including the increase of the population to a more significant number of generations, to obtain reliable results in predicting professional success. Therefore, the authors recommend that higher education institutions implement a robust monitoring system for their graduates based on the analysis of their realities, their environment and the following policies:

- Continuous training strategies as an opportunity to interact with professionals.
- Follow-up of graduates for the objective and subjective measurement of job satisfaction.

- Improve formal and informal communication policies that promote interaction and benefits with professionals as a digital employment exchange.
- Involve professionals in research projects and link society developed in universities.

Supplementary Materials: Table S1: Results of best individuals of prediction model 1. Table S2: Results of best individuals of prediction model 2. Table S3: Results of best individuals of prediction model 3.

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References

1. Žalėnienė, I.; Pereira, P. Higher Education For Sustainability: A Global Perspective. *Geography and Sustainability* **2021**, *2*, 99–106, doi:10.1016/j.geosus.2021.05.001.
2. Carrión-Mero, P.; Morante-Carballo, F.; Herrera-Franco, G.; Jaya-Montalvo, M.; Rodríguez, D.; Loo-Flores de Valgas, C.; Berrezueta, E. Community-University Partnership in Water Education and Linkage Process. Study Case: Manglaralto, Santa Elena, Ecuador. *Water (Switzerland)* **2021**, *13*, doi:10.3390/w13151998.
3. Miranda, J.; Navarrete, C.; Noguez, J.; Molina-Espinosa, J.M.; Ramírez-Montoya, M.S.; Navarro-Tuch, S.A.; Bustamante-Bello, M.R.; Rosas-Fernández, J.B.; Molina, A. The Core Components of Education 4.0 in Higher Education: Three Case Studies in Engineering Education. *Computers and Electrical Engineering* **2021**, *93*, doi:10.1016/j.compeleceng.2021.107278.
4. Bautista-Puig, N.; Sanz-Casado, E. Sustainability Practices in Spanish Higher Education Institutions: An Overview of Status and Implementation. *J Clean Prod* **2021**, *295*, doi:10.1016/j.jclepro.2021.126320.

5. Herrera-Franco, G.; Montalván-Burbano, N.; Mora-Frank, C.; Bravo-Montero, Lady Scientific Research in Ecuador: A Bibliometric Analysis. *Publications* **2021**, *9*, doi:10.3390/publications9040055.
6. Morante-Carballo, F.; Merchán-Sanmartín, B.; Cárdenas-Cruz, A.; Jaya-Montalvo, M.; Mata-Perelló, J.; Herrera-Franco, G.; Carrión-Mero, P. Sites of Geological Interest Assessment for Geoeducation Strategies, ESPOLE University Campus, Guayaquil, Ecuador. *Land (Basel)* **2022**, *11*, 771, doi:10.3390/land11060771.
7. Herrera-Franco, G.; Alvarado, J.; Gordillo, P.; Veintimilla, L.; Merchán, B.; Carrión-Mero, P.; Berrezueta, E. Communication Methods on Water Care during the Covid-19 Pandemic and Its Impact on the Resilience of the Rural Community of “Libertador Bolívar”, Ecuador. In Proceedings of the WIT Transactions on Ecology and the Environment; WITPress, July 27 2021; Vol. 250, pp. 109–118.
8. Gricelda, H.F.; Paúl, C.M.; Niurka, A.M. Participatory Process for Local Development: Sustainability of Water Resources in Rural Communities: Case Manglaralto-Santa Elena, Ecuador. In *Handbook of Sustainability Science and Research*; Leal Filho, W., Ed.; Springer International Publishing: Cham, 2018; pp. 663–676 ISBN 978-3-319-63007-6.
9. Herrera-Franco, G.; Erazo, K.; Mora-Frank, C.; Carrión-Mero, P.; Berrezueta, E. Evaluation of a Paleontological Museum as Geosite and Base for Geotourism. A Case Study. *Heritage* **2021**, *4*, 1208–1227, doi:10.3390/heritage4030067.
10. Altuntaş, S.; Baykal, Ü. An Analysis of Alumni Performance: A Study of the Quality of Nursing Education. *Nurse Educ Today* **2017**, *49*, 135–139, doi:10.1016/j.nedt.2016.11.022.
11. Wiranto, R.; Slameto, S. Alumni Satisfaction in Terms of Classroom Infrastructure, Lecturer Professionalism, and Curriculum. *Heliyon* **2021**, *7*, doi:10.1016/j.heliyon.2021.e06679.
12. Kismul, H.; Hasha, W.; Hinderaker, S.G.; Moen, B.E. An Alumni Study of a Master’s in International Health. *Public Health* **2020**, *181*, 168–170, doi:10.1016/j.puhe.2019.12.015.
13. Salazar, A.M.; Schelbe, L. Factors Associated with Post-College Success for Foster Care Alumni College Graduates. *Child Youth Serv Rev* **2021**, *126*, doi:10.1016/j.childyouth.2021.106031.
14. Shen, H.; Sha, B.L. Conceptualizing and Operationalizing Alumni Engagement: When Conversational Voice Matters More than Openness and Assurances of Legitimacy. *Public Relat Rev* **2020**, *46*, doi:10.1016/j.pubrev.2020.101974.
15. Lavi, R.; Tal, M.; Dori, Y.J. Perceptions of STEM Alumni and Students on Developing 21st Century Skills through Methods of Teaching and Learning. *Studies in Educational Evaluation* **2021**, *70*, doi:10.1016/j.stueduc.2021.101002.
16. Campbell, A.C.; Baxter, A.R. Exploring the Attributes and Practices of Alumni Associations That Advance Social Change. *Int J Educ Dev* **2019**, *66*, 164–172, doi:10.1016/j.ijedudev.2018.10.003.

17. Geiger, J.M.; Piel, M.H.; Day, A.; Schelbe, L. A Descriptive Analysis of Programs Serving Foster Care Alumni in Higher Education: Challenges and Opportunities. *Child Youth Serv Rev* **2018**, *85*, 287–294, doi:10.1016/j.chilyouth.2018.01.001.
18. Rattanamethawong, N.; Sinthupinyo, S.; Chandrachai, A. An Innovation Model of Alumni Relationship Management: Alumni Segmentation Analysis. *Kasetsart Journal of Social Sciences* **2018**, *39*, 150–160, doi:10.1016/j.kjss.2017.02.002.
19. McDonald, K.S.; Hite, L.M. The Next Generation of Career Success: Implications for HRD. *Adv Dev Hum Resour* **2008**, *10*, 86–103, doi:10.1177/1523422307310116.
20. Bagdadli, S.; Gianecchini, M. Organizational Career Management Practices and Objective Career Success: A Systematic Review and Framework. *Human Resource Management Review* **2019**, *29*, 353–370, doi:10.1016/j.hrmr.2018.08.001.
21. Golden, T.D.; Eddleston, K.A. Is There a Price Telecommuters Pay? Examining the Relationship between Telecommuting and Objective Career Success. *J Vocat Behav* **2020**, *116*, doi:10.1016/j.jvb.2019.103348.
22. Hirschi, A.; Johnston, C.S.; de Fruyt, F.; Ghetta, A.; Orth, U. Does Success Change People? Examining Objective Career Success as a Precursor for Personality Development. *J Vocat Behav* **2021**, *127*, doi:10.1016/j.jvb.2021.103582.
23. Blickle, G.; Schütte, N.; Wihler, A. Political Will, Work Values, and Objective Career Success: A Novel Approach – The Trait-Reputation-Identity Model. *J Vocat Behav* **2018**, *107*, 42–56, doi:10.1016/j.jvb.2018.03.002.
24. Stumpf, S.A.; Tymon, W.G. The Effects of Objective Career Success on Subsequent Subjective Career Success. *J Vocat Behav* **2012**, *81*, 345–353, doi:10.1016/j.jvb.2012.09.001.
25. Janssen, E.; van der Heijden, B.I.J.M.; Akkermans, J.; Audenaert, M. Unraveling the Complex Relationship between Career Success and Career Crafting: Exploring Nonlinearity and the Moderating Role of Learning Value of the Job. *J Vocat Behav* **2021**, *130*, doi:10.1016/j.jvb.2021.103620.
26. Hall, D.T.; Lee, M.D.; Kossek, E.E.; las Heras, M. *Pursuing Career Success While Sustaining Personal and Family Well-Being: A Study of Reduced-Load Professionals over Time*; 2012; Vol. 68;.
27. Gordon, S.E.; Shi, X. (Crystal) The Well-Being and Subjective Career Success of Workaholics: An Examination of Hospitality Managers' Recovery Experience. *Int J Hosp Manag* **2021**, *93*, doi:10.1016/j.ijhm.2020.102804.
28. Haenggli, M.; Hirschi, A.; Rudolph, C.W.; Peiró, J.M. Exploring the Dynamics of Protean Career Orientation, Career Management Behaviors, and Subjective Career Success: An Action Regulation Theory Approach. *J Vocat Behav* **2021**, *131*, doi:10.1016/j.jvb.2021.103650.
29. Xie, B.; Xia, M.; Xin, X.; Zhou, W. Linking Calling to Work Engagement and Subjective Career Success: The Perspective of Career Construction Theory. *J Vocat Behav* **2016**, *94*, 70–78, doi:10.1016/j.jvb.2016.02.011.
30. Spurk, D.; Abele, A.E. Synchronous and Time-Lagged Effects between Occupational Self-Efficacy and Objective and Subjective Career Success: Findings

- from a Four-Wave and 9-Year Longitudinal Study. *J Vocat Behav* **2014**, *84*, 119–132, doi:10.1016/j.jvb.2013.12.002.
31. Heslev, P.A. Conceptualizing and Evaluating Career Success. *J Organ Behav* **2005**, *26*, 113–136.
 32. Guo, W.; Xiao, H.; Yang, X. An Empirical Research on the Correlation between Human Capital and Career Success of Knowledge Workers in Enterprise. *Phys Procedia* **2012**, *25*, 715–725, doi:10.1016/j.phpro.2012.03.148.
 33. Blokker, R.; Akkermans, J.; Tims, M.; Jansen, P.; Khapova, S. Building a Sustainable Start: The Role of Career Competencies, Career Success, and Career Shocks in Young Professionals' Employability. *J Vocat Behav* **2019**, *112*, 172–184, doi:10.1016/j.jvb.2019.02.013.
 34. Guan, Y.; Zhou, W.; Ye, L.; Jiang, P.; Zhou, Y. Perceived Organizational Career Management and Career Adaptability as Predictors of Success and Turnover Intention among Chinese Employees. *J Vocat Behav* **2015**, *88*, 230–237, doi:10.1016/j.jvb.2015.04.002.
 35. Duta, A.; Wielgoszewska, B.; Iannelli, C. Different Degrees of Career Success: Social Origin and Graduates' Education and Labour Market Trajectories. *Adv Life Course Res* **2021**, *47*, doi:10.1016/j.alcr.2020.100376.
 36. Chang, Y.Y.; Chen, M.H. Creative Entrepreneurs' Creativity, Opportunity Recognition, and Career Success: Is Resource Availability a Double-Edged Sword? *European Management Journal* **2020**, *38*, 750–762, doi:10.1016/j.emj.2020.03.004.
 37. Russo, M.; Guo, L.; Baruch, Y. Work Attitudes, Career Success and Health: Evidence from China. *J Vocat Behav* **2014**, *84*, 248–258, doi:10.1016/j.jvb.2014.01.009.
 38. Zacher, H. Career Adaptability Predicts Subjective Career Success above and beyond Personality Traits and Core Self-Evaluations. *J Vocat Behav* **2014**, *84*, 21–30, doi:10.1016/j.jvb.2013.10.002.
 39. Lei, C.; Hossain, M.S.; Mostafiz, M.I.; Khalifa, G.S.A. Factors Determining Employee Career Success in the Chinese Hotel Industry: A Perspective of Job-Demand Resources Theory. *Journal of Hospitality and Tourism Management* **2021**, *48*, 301–311, doi:10.1016/j.jhtm.2021.07.001.
 40. Healy, M.; Hammer, S.; McIlveen, P. Mapping Graduate Employability and Career Development in Higher Education Research: A Citation Network Analysis. *Studies in Higher Education* **2020**, doi:10.1080/03075079.2020.1804851.
 41. Hamdia, K.M.; Zhuang, X.; Rabczuk, T. An Efficient Optimization Approach for Designing Machine Learning Models Based on Genetic Algorithm. *Neural Comput Appl* **2021**, *33*, 1923–1933, doi:10.1007/s00521-020-05035-x.
 42. Kordos, M.; Blachnik, M.; Scherer, R. Fuzzy Clustering Decomposition of Genetic Algorithm-Based Instance Selection for Regression Problems. *Inf Sci (N Y)* **2022**, *587*, 23–40, doi:10.1016/J.INS.2021.12.016.
 43. Ji, Y.; Liu, S.; Zhou, M.; Zhao, Z.; Guo, X.; Qi, L. A Machine Learning and Genetic Algorithm-Based Method for Predicting Width Deviation of Hot-Rolled Strip in

- Steel Production Systems. *Inf Sci (N Y)* **2022**, *589*, 360–375, doi:10.1016/J.INS.2021.12.063.
44. Pham, T.D.; Hong, W.K. Genetic Algorithm Using Probabilistic-Based Natural Selections and Dynamic Mutation Ranges in Optimizing Precast Beams. *Comput Struct* **2022**, *258*, 106681, doi:10.1016/J.COMPSTRUC.2021.106681.
 45. Liashchynskiy, P.; Liashchynskiy, P. Grid Search, Random Search, Genetic Algorithm: A Big Comparison for NAS. **2019**.
 46. Mirjalili, S. Genetic Algorithm. In *In: Evolutionary Algorithms and Neural Networks. Studies in Computational Intelligence*; Springer, Ed.; 2019; Vol. 780, pp. 43–55.
 47. Liang, H.; Zou, J.; Zuo, K.; Khan, M.J. An Improved Genetic Algorithm Optimization Fuzzy Controller Applied to the Wellhead Back Pressure Control System. *Mech Syst Signal Process* **2020**, *142*, 106708, doi:10.1016/j.ymsp.2020.106708.
 48. Mathew, T. *Genetic Algorithm*; Mumbai-400076, 2012;
 49. Lambora, A.; Gupta, K.; Chopra, K. Genetic Algorithm- A Literature Review. In Proceedings of the 2019 International Conference on Machine Learning, Big Data, Cloud and Parallel Computing (COMITCon); IEEE, February 2019; pp. 380–384.
 50. Kumar, M.; Husain, M.; Upreti, N.; Gupta, D. Genetic Algorithm: Review and Application. *SSRN Electronic Journal* **2010**, doi:10.2139/ssrn.3529843.
 51. Ghaheri, A.; Shoar, S.; Naderan, M.; Hoseini, S.S. The Applications of Genetic Algorithms in Medicine. *Oman Med J* **2015**, *30*, 406–416, doi:10.5001/omj.2015.82.
 52. Baker, B.M.; Ayechev, M.A. A Genetic Algorithm for the Vehicle Routing Problem. *Comput Oper Res* **2003**, *30*, 787–800, doi:10.1016/S0305-0548(02)00051-5.
 53. Sun, Y.; Xue, B.; Zhang, M.; Yen, G.G.; Lv, J. Automatically Designing CNN Architectures Using the Genetic Algorithm for Image Classification. *IEEE Trans Cybern* **2020**, *50*, 3840–3854, doi:10.1109/TCYB.2020.2983860.
 54. Lü, X.; Wu, Y.; Lian, J.; Zhang, Y.; Chen, C.; Wang, P.; Meng, L. Energy Management of Hybrid Electric Vehicles: A Review of Energy Optimization of Fuel Cell Hybrid Power System Based on Genetic Algorithm. *Energy Convers Manag* **2020**, *205*, 112474, doi:10.1016/j.enconman.2020.112474.
 55. Dwivedi, P.; Kant, V.; Bharadwaj, K.K. Learning Path Recommendation Based on Modified Variable Length Genetic Algorithm. *Educ Inf Technol (Dordr)* **2018**, *23*, 819–836, doi:10.1007/s10639-017-9637-7.
 56. Katoch, S.; Chauhan, S.S.; Kumar, V. A Review on Genetic Algorithm: Past, Present, and Future. *Multimed Tools Appl* **2021**, *80*, 8091–8126, doi:10.1007/s11042-020-10139-6.
 57. Jackson, D.; Tomlinson, M. Investigating the Relationship between Career Planning, Proactivity and Employability Perceptions among Higher Education Students in Uncertain Labour Market Conditions. *High Educ (Dordr)* **2020**, *80*, 435–455, doi:10.1007/s10734-019-00490-5.
 58. Pico-Saltos, R.; Carrión-Mero, P.; Montalván-Burbano, N.; Garzías, J.; Redchuk, A. Research Trends in Career Success: A Bibliometric Review. *Sustainability (Switzerland)* **2021**, *13*, doi:10.3390/su13094625.

59. Pico-Saltos, R.; Bravo-Montero, Lady; Montalván-Burbano, N.; Garzías, J.; Redchuk, A. Career Success in University Graduates: Evidence from an Ecuadorian Study in Los Ríos Province. *Sustainability (Switzerland)* **2021**, *13*, doi:10.3390/su13169337.
60. Consejo de Aseguramiento de la Calidad de la Educación Superior *Modelo de Evaluación Externa de Universidades y Escuelas Politécnicas.*; Quito, Ecuador, 2019;
61. Orozco, E.; Jaya, A.; Ramos, F.; Guerra, R. Retos a La Gestión de La Calidad en las Instituciones de Educación Superior En Ecuador. *Educación Médica Superior* **2020**, *34*.
62. Schomburg, H. *Manual Para Estudios de Seguimiento de Graduados Universitarios*; Kassel-Alemania, 2004;
63. Red Gradua2; Asociación Columbus *Manual de Instrumentos y Recomendaciones Sobre el Seguimiento de Egresados*; Monterrey, Nuevo León , México, 2006;
64. Tirado Morueta, R.; Tejeda, R.; Cedeño, G.; Laica Eloy Alfaro de Manabí, U. Implementación Institucional de un Modelo Cooperativo Para El Seguimiento a Graduados En Ecuador*. *RESU* **2015**, *44*, 125–156.
65. Saltos, M.; Muñoz, E.; Rodríguez, L. Empleabilidad y Seguimiento a Graduados de la Carrera de Administración de Empresas de la Universidad Central del Ecuador, Año 2014, Su Aporte En la Perspectiva para el Proceso de Construcción del Modelo de Formación Universitaria. *Revista Publicando* **2016**, *3*, 116–146.
66. Palmer, S.P.; Lundberg, K.; de la Cruz, K.; Corbett, C.; Heaston, S.; Reed, S.; Williams, M. Long-Term Effects on Nursing Alumni: Assessing a Course in Public and Global Health. *Journal of Professional Nursing* **2017**, *33*, 436–440, doi:10.1016/j.profnurs.2017.03.005.
67. Hutapea, L.M.N.; Balthip, K.; Chunuan, S. Perceptions of Nursing Educators and Alumni of an Effective Preparation Programme for the Indonesian National Nursing Licensure Examination. *Collegian* **2021**, *28*, 565–571, doi:10.1016/j.colegn.2021.02.001.
68. Deros, B.Md.; Mohamed, A.; Mohamed, N.; Ihsan, A.K.A.M. A Study of Alumni Feedback on Outcome Based Education in the Faculty of Engineering & Built Environment, Universiti Kebangsaan Malaysia. *Procedia Soc Behav Sci* **2012**, *60*, 313–317, doi:10.1016/j.sbspro.2012.09.385.
69. Rattanamethawong, V.; Sinthupinyo, S.; Chandrachai, E.A. An Innovation System That Can Quickly Responses to the Needs of Students and Alumni. *Procedia Soc Behav Sci* **2015**, *182*, 645–652, doi:10.1016/j.sbspro.2015.04.801.
70. Nabi, G.R. An Investigation into the Differential Profile of Predictors of Objective and Subjective Career Success. *Career Development International* **1999**, *4*, 212–225, doi:10.1108/13620439910270599.
71. Psacharopoulos, G.; Patrinos, H.A. Returns to Investment in Education: A Further Update. *Educ Econ* **2004**, *12*, 111–134, doi:10.1080/0964529042000239140.
72. Spurk, D.; Hirschi, A.; Dries, N. Antecedents and Outcomes of Objective Versus Subjective Career Success: Competing Perspectives and Future Directions. *J Manage* **2019**, *45*, 35–69.

73. Valcour, M.; Ladge, J.J. Family and Career Path Characteristics as Predictors of Women's Objective and Subjective Career Success: Integrating Traditional and Protean Career Explanations. *J Vocat Behav* **2008**, *73*, 300–309, doi:10.1016/j.jvb.2008.06.002.
74. Abele, A.E.; Spurk, D. The Longitudinal Impact of Self-Efficacy and Career Goals on Objective and Subjective Career Success. *J Vocat Behav* **2009**, *74*, 53–62, doi:10.1016/j.jvb.2008.10.005.
75. Ng, T.W.H.; Feldman, D.C. Subjective Career Success: A Meta-Analytic Review. *J Vocat Behav* **2014**, *85*, 169–179, doi:10.1016/J.JVB.2014.06.001.
76. Domínguez, J.F.C.; Gutiérrez, C.R. A Public University or a Private University: What Effect Does This Choice Have on the Professional Success of Graduates in Spain? *Revista Espanola de Investigaciones Sociologicas* **2020**, *169*, 21–39, doi:10.5477/cis/reis.169.21.
77. Tlaiss, H.; Kauser, S. The Importance of Wasta in the Career Success of Middle Eastern Managers. *Journal of European Industrial Training* **2011**, *35*, 467–486, doi:10.1108/03090591111138026.
78. Gelissen, J.; de Graaf, P.M. Personality, Social Background, and Occupational Career Success. *Soc Sci Res* **2006**, *35*, 702–726, doi:10.1016/j.ssresearch.2005.06.005.
79. Dyke, L.S.; Murphy, S.A. How We Define Success: A Qualitative Study of What Matters Most to Women and Men. *Sex Roles* **2006**, *55*, 357–371.
80. Pachulicz, S.; Schmitt, N.; Kuljanin, G. A Model of Career Success: A Longitudinal Study of Emergency Physicians. *J Vocat Behav* **2008**, *73*, 242–253, doi:10.1016/j.jvb.2008.05.003.
81. Zhao, H.; O'Connor, G.; Wu, J.; Lumpkin, G.T. Age and Entrepreneurial Career Success: A Review and a Meta-Analysis. *J Bus Ventur* **2021**, *36*, doi:10.1016/j.jbusvent.2020.106007.
82. Stamm, M.; Buddeberg-Fischer, B. The Impact of Mentoring during Postgraduate Training on Doctors' Career Success. *Med Educ* **2011**, *45*, 488–496, doi:10.1111/j.1365-2923.2010.03857.x.
83. Xu, X.; Payne, S.C. Quantity, Quality, and Satisfaction with Mentoring: What Matters Most? *J Career Dev* **2014**, *41*, 507–525, doi:10.1177/0894845313515946.
84. Danziger, N.; Valency, R. Career Anchors: Distribution and Impact on Job Satisfaction, the Israeli Case. *Career Development International* **2006**, *11*, 293–303, doi:10.1108/13620430610672513.
85. Spangler, W.D. *Validity of Questionnaire and TAT Measures of Need for Achievement: Two Meta-Analyses*; 1992; Vol. 112.
86. Kim, M.; Beehr, T.A. Can Empowering Leaders Affect Subordinates' Well-Being and Careers Because They Encourage Subordinates' Job Crafting Behaviors? *J Leadersh Organ Stud* **2018**, *25*, 184–196, doi:10.1177/1548051817727702.
87. van den Born, A.; van Witteloostuijn, A. Drivers of Freelance Career Success. *J Organ Behav* **2013**, *34*, 24–46, doi:10.1002/job.1786.
88. Hennequin, E. What "Career Success" Means to Blue-Collar Workers. *Career Development International* **2007**, *12*, 565–581, doi:10.1108/13620430710822029.

89. Kirchmeyer, C. The Different Effects of Family on Objective Career Success across Gender: A Test of Alternative Explanations. *J Vocat Behav* **2006**, *68*, 323–346, doi:10.1016/j.jvb.2005.05.002.
90. Briscoe, J.P.; Kaše, R.; Dries, N.; Dysvik, A.; Unite, J.A.; Adeleye, I.; Andresen, M.; Apospori, E.; Babalola, O.; Bagdadli, S.; et al. Here, There, & Everywhere: Development and Validation of a Cross-Culturally Representative Measure of Subjective Career Success. *J Vocat Behav* **2021**, *130*, doi:10.1016/j.jvb.2021.103612.
91. Goh, S.C. *Sex Differences in Perceptions of Interpersonal Work Style, Career Emphasis, Supervisory Mentoring Behavior, and Job Satisfaction I*; 1991; Vol. 24;.
92. de Vos, A.; Soens, N. Protean Attitude and Career Success: The Mediating Role of Self-Management. *J Vocat Behav* **2008**, *73*, 449–456, doi:10.1016/j.jvb.2008.08.007.
93. Cope, P.M. The Women of “Who’s Who”: A Statistical Study. *Social Forces* **1928**, *7*, 212–223, doi:10.2307/2570142.
94. Schworm, S.K.; Cadin, L.; Carbone, V.; Festing, M.; Leon, E.; Muratbekova-Touron, M. The Impact of International Business Education on Career Success—Evidence from Europe. *European Management Journal* **2017**, *35*, 493–504, doi:10.1016/j.emj.2017.02.009.
95. Verbruggen, M. Psychological Mobility and Career Success in the “New” Career Climate. *J Vocat Behav* **2012**, *81*, 289–297, doi:10.1016/j.jvb.2011.10.010.
96. Wiese, B.S.; Freund, A.M.; Baltes, P.B. Subjective Career Success and Emotional Well-Being: Longitudinal Predictive Power of Selection, Optimization, and Compensation. *J Vocat Behav* **2002**, *60*, 321–335, doi:10.1006/jvbe.2001.1835.
97. de Haro, J.M.; Castejón, J.L.; Gilar, R. General Mental Ability as Moderator of Personality Traits as Predictors of Early Career Success. *J Vocat Behav* **2013**, *83*, 171–180, doi:10.1016/j.jvb.2013.04.001.
98. Cesinger, B. *Measurement of Objective and Subjective Career Success*; 2011;
99. Ng, T.W.H.; Eby, L.T.; Sorensen, K.L.; Feldman, D.C. *Predictors of Objective and Subjective Career Success: A Meta-Analysis*; Georgia, Athens, 2005; Vol. 58;.
100. Schomburg, H. *AustraliaEJEDEuropean Journal of Education0141-8211© 2007 The Author*; Blackwell Publishing Ltd, 2007; Vol. 42;.
101. Savolainen, T. Towards a New Workplace Culture: Development Strategies for Employer-Employee Relations. *Journal of Workplace Learning* **2000**, *12*, 318–326, doi:10.1108/13665620010355566.
102. Koh, H.; Boo, E. The Link between Organizational Ethics and Job Satisfaction: A Study of Managers in Singapore. *Journal of Business Ethics* **2001**, *29*, 309–324.
103. Denissen, J.J.A.; Bleidorn, W.; Hennecke, M.; Luhmann, M.; Orth, U.; Specht, J.; Zimmermann, J. Uncovering the Power of Personality to Shape Income. *Psychol Sci* **2018**, *29*, 3–13, doi:10.1177/0956797617724435.
104. Wang, Y.F.; Horng, J.S.; Cheng, S.Y.S.; Killman, L. Factors Influencing Food and Beverage Employees’ Career Success: A Contextual Perspective. *Int J Hosp Manag* **2011**, *30*, 997–1007, doi:10.1016/j.ijhm.2011.03.005.

105. Colakoglu, S.N. The Impact of Career Boundarylessness on Subjective Career Success: The Role of Career Competencies, Career Autonomy, and Career Insecurity. *J Vocat Behav* **2011**, *79*, 47–59, doi:10.1016/j.jvb.2010.09.011.
106. Serinelli, B.M.; Collen, A.; Nijdam, N.A. On the Analysis of Open Source Datasets: Validating IDS Implementation for Well-Known and Zero Day Attack Detection. In Proceedings of the Procedia Computer Science; Elsevier B.V., 2021; Vol. 191, pp. 192–199.
107. Munk, M.; Pilkova, A.; Benko, L.; Blazekova, P.; Svec, P. Pilar 3-Preprocessed Web Server Log File Dataset of the Banking Institution. *Data Brief* **2021**, *39*, 1–7, doi:10.17632/5bvkm76sdc.1.
108. Miller, J.J.; Benner, K.; Donohue-Dioh, J.; Segress, M. Supporting Collegiate Foster Youth and Alumni: A Mixed-Method Planning Approach for Higher Education. *Eval Program Plann* **2019**, *72*, 67–76, doi:10.1016/j.evalprogplan.2018.10.005.
109. Berger, D.; Wessel, R. The Relationship between Academic Program Delivery Method, Alumni Demographics, and Graduate Alumni Engagement: A Correlation Study, Muncie, Indiana, 2016.
110. Rosso, F.; Ciancio, V.; Dell’Olmo, J.; Salata, F. Multi-Objective Optimization of Building Retrofit in the Mediterranean Climate by Means of Genetic Algorithm Application. *Energy Build* **2020**, *216*, doi:10.1016/j.enbuild.2020.109945.
111. Salata, F.; Ciancio, V.; Dell’Olmo, J.; Golasi, I.; Palusci, O.; Coppi, M. Effects of Local Conditions on the Multi-Variable and Multi-Objective Energy Optimization of Residential Buildings Using Genetic Algorithms. *Appl Energy* **2020**, *260*, doi:10.1016/j.apenergy.2019.114289.
112. Moya, A.; Navarro, E.; Jaén, J.; López-Jaquero, V.; Capilla, R. Exploiting Variability in the Design of Genetic Algorithms to Generate Telerehabilitation Activities[Formula Presented]. *Appl Soft Comput* **2022**, *117*, doi:10.1016/j.asoc.2022.108441.
113. Gustafson, J.A.; Wilmer, C.E. Intelligent Selection of Metal–Organic Framework Arrays for Methane Sensing via Genetic Algorithms. *ACS Sens* **2019**, *4*, 1586–1593, doi:10.1021/acssensors.9b00268.
114. Karakatič, S. Optimizing Nonlinear Charging Times of Electric Vehicle Routing with Genetic Algorithm. *Expert Syst Appl* **2021**, *164*, 114039, doi:10.1016/j.eswa.2020.114039.
115. Akcan, H. A Genetic Algorithm Based Solution to the Minimum-Cost Bounded-Error Calibration Tree Problem. *Applied Soft Computing Journal* **2018**, *73*, 83–95, doi:10.1016/j.asoc.2018.08.013.
116. Mayer, M.J.; Szilágyi, A.; Gróf, G. Environmental and Economic Multi-Objective Optimization of a Household Level Hybrid Renewable Energy System by Genetic Algorithm. *Appl Energy* **2020**, *269*, 115058, doi:10.1016/j.apenergy.2020.115058.
117. Ali, M.Z.; Awad, N.H.; Suganthan, P.N.; Shatnawi, A.M.; Reynolds, R.G. An Improved Class of Real-Coded Genetic Algorithms for Numerical

Optimization☆. *Neurocomputing* **2018**, 275, 155–166, doi:10.1016/j.neucom.2017.05.054.

118. Haq, E.; Ahmad, I.; Hussain, A.; Almanjahie, I.M. A Novel Selection Approach for Genetic Algorithms for Global Optimization of Multimodal Continuous Functions. *Comput Intell Neurosci* **2019**, 2019, 1–14, doi:10.1155/2019/8640218.
119. Reddy, G.T.; Reddy, M.P.K.; Lakshmana, K.; Rajput, D.S.; Kaluri, R.; Srivastava, G. Hybrid Genetic Algorithm and a Fuzzy Logic Classifier for Heart Disease Diagnosis. *Evol Intell* **2020**, 13, 185–196, doi:10.1007/s12065-019-00327-1.
120. Chen, R.; Yang, B.; Li, S.; Wang, S. A Self-Learning Genetic Algorithm Based on Reinforcement Learning for Flexible Job-Shop Scheduling Problem. *Comput Ind Eng* **2020**, 149, 106778, doi:10.1016/j.cie.2020.106778.
121. Liu, H.; Shi, S.; Yang, P.; Yang, J. An Improved Genetic Algorithm Approach on Mechanism Kinematic Structure Enumeration with Intelligent Manufacturing. *J Intell Robot Syst* **2018**, 89, 343–350, doi:10.1007/s10846-017-0564-z.
122. Pourrajabian, A.; Dehghan, M.; Rahgozar, S. Genetic Algorithms for the Design and Optimization of Horizontal Axis Wind Turbine (HAWT) Blades: A Continuous Approach or a Binary One? *Sustainable Energy Technologies and Assessments* **2021**, 44, 101022, doi:10.1016/j.seta.2021.101022.
123. Luo, X.; Qian, Q.; Fu, Y.F. Improved Genetic Algorithm for Solving Flexible Job Shop Scheduling Problem. In Proceedings of the Procedia Computer Science; Elsevier B.V., 2020; Vol. 166, pp. 480–485.
124. Protopopova, J.; Kulik, S. Educational Intelligent System Using Genetic Algorithm. In Proceedings of the Procedia Computer Science; Elsevier B.V., 2020; Vol. 169, pp. 168–172.
125. D'Angelo, G.; Palmieri, F. GGA: A Modified Genetic Algorithm with Gradient-Based Local Search for Solving Constrained Optimization Problems. *Inf Sci (N Y)* **2021**, 547, 136–162, doi:10.1016/j.ins.2020.08.040.
126. Chen, Y.-H.; Huang, H.-C.; Cai, H.-Y.; Chen, P.-F. A Genetic Algorithm Approach for the Multiple Length Cutting Stock Problem. In Proceedings of the 2019 IEEE 1st Global Conference on Life Sciences and Technologies (LifeTech); IEEE, March 2019; pp. 162–165.
127. Lamini, C.; Benhlima, S.; Elbekri, A. Genetic Algorithm Based Approach for Autonomous Mobile Robot Path Planning. *Procedia Comput Sci* **2018**, 127, 180–189, doi:10.1016/j.procs.2018.01.113.
128. Peng, K.; Du, J.; Lu, F.; Sun, Q.; Dong, Y.; Zhou, P.; Hu, M. A Hybrid Genetic Algorithm on Routing and Scheduling for Vehicle-Assisted Multi-Drone Parcel Delivery. *IEEE Access* **2019**, 7, 49191–49200, doi:10.1109/ACCESS.2019.2910134.
129. Haldurai, L.; Madhubala, T.; Rajalakshmi, R. A Study on Genetic Algorithm and Its Applications. *International Journal of Computer Sciences and Engineering* **2016**, 4, 139–143.
130. Abaci, H.; Parr, G.; McClean, S.; Moore, A.; Krug, L. Using Genetic Algorithms to Optimise Dynamic Power Saving in Communication Links Subject to Quality of

- Service Requirements. *Sustainable Computing: Informatics and Systems* **2016**, *10*, 1–19, doi:10.1016/j.suscom.2016.01.002.
131. Escandón-Panchana, P.; Morante-Carballo, F.; Herrera-Franco, G.; Pineda, E.; Yagual, J. Computer Application to Estimate PVT Conditions in Oil Wells in the Ecuadorian Amazon. *Mathematical Modelling of Engineering Problems* **2021**, *8*, 727–738, doi:10.18280/mmep.080507.
 132. Gholami, A.; Bonakdari, H.; Ebtehaj, I.; Mohammadian, M.; Gharabaghi, B.; Khodashenas, S.R. Uncertainty Analysis of Intelligent Model of Hybrid Genetic Algorithm and Particle Swarm Optimization with ANFIS to Predict Threshold Bank Profile Shape Based on Digital Laser Approach Sensing. *Measurement* **2018**, *121*, 294–303, doi:10.1016/j.measurement.2018.02.070.
 133. Escandón-Panchana, P.; Morante-Carballo, F.; Herrera-Franco, G.; Rodríguez, H.; Carvajal, F. Fluid Level Measurement System in Oil Storage. Python, Lab-Based Scale. *Mathematical Modelling of Engineering Problems* **2022**, *9*, 787–795, doi:10.18280/mmep.090327.
 134. Abreu, L.R.; Cunha, J.O.; Prata, B.A.; Framinan, J.M. A Genetic Algorithm for Scheduling Open Shops with Sequence-Dependent Setup Times. *Comput Oper Res* **2020**, *113*, 104793, doi:10.1016/j.cor.2019.104793.
 135. Panwar, V.; Kumar Sharma, D.; Pradeep Kumar, K.V.; Jain, A.; Thakar, C. Experimental Investigations and Optimization of Surface Roughness in Turning of En 36 Alloy Steel Using Response Surface Methodology and Genetic Algorithm. *Mater Today Proc* **2021**, *46*, 6474–6481, doi:10.1016/j.matpr.2021.03.642.
 136. Tiessen, R.; Grantham, K.; Cameron, J. The Relationship Between Experiential Learning and Career Outcomes for Alumni of International Development Studies Programs in Canada. *Canadian Journal of Higher Education* **2019**, *48*, 23–42, doi:10.7202/1057127ar.
 137. Ahmad, B.; Latif, S.; Bilal, A.R.; Hai, M. The Mediating Role of Career Resilience on the Relationship between Career Competency and Career Success. *Asia-Pacific Journal of Business Administration* **2019**, *11*, 209–231, doi:10.1108/APJBA-04-2019-0079.
 138. Chen, C.H.; Liu, T.K.; Chou, J.H.; Tasi, C.H.; Wang, H. Optimization of Teacher Volunteer Transferring Problems Using Greedy Genetic Algorithms. *Expert Syst Appl* **2015**, *42*, 668–678, doi:10.1016/j.eswa.2014.08.020.
 139. Castelli, M.; Dondi, R.; Hosseinzadeh, M.M. Genetic Algorithms for Finding Episodes in Temporal Networks. In *Proceedings of the Procedia Computer Science*; Elsevier B.V., 2020; Vol. 176, pp. 215–224.
 140. Vlašić, I.; Đurasević, M.; Jakobović, D. Improving Genetic Algorithm Performance by Population Initialisation with Dispatching Rules. *Comput Ind Eng* **2019**, *137*, doi:10.1016/j.cie.2019.106030.
 141. Pan, J.; Guan, Y.; Wu, J.; Han, L.; Zhu, F.; Fu, X.; Yu, J. The Interplay of Proactive Personality and Internship Quality in Chinese University Graduates' Job Search Success: The Role of Career Adaptability. *J Vocat Behav* **2018**, *109*, 14–26, doi:10.1016/j.jvb.2018.09.003.

142. Drewery, D.W.; Sproule, R.; Pretti, T.J. Lifelong Learning Mindset and Career Success: Evidence from the Field of Accounting and Finance. *Higher Education, Skills and Work-based Learning* **2020**, *10*, 567–580, doi:10.1108/HESWBL-03-2019-0041.
143. Orser, B.; Leck, J. Gender Influences on Career Success Outcomes. *Gender in Management: An International Journal* **2010**, *25*, 386–407, doi:10.1108/17542411011056877.
144. Bacon, D.R. Revisiting the Relationship Between Marketing Education and Marketing Career Success. *Journal of Marketing Education* **2017**, *39*, 109–123, doi:10.1177/0273475317710061.
145. Al-Hussami, M.; Hammad, S.; Alsoleihat, F. The Influence of Leadership Behavior, Organizational Commitment, Organizational Support, Subjective Career Success on Organizational Readiness for Change in Healthcare Organizations. *Leadership in Health Services* **2018**, *31*, 354–370, doi:10.1108/LHS-06-2017-0031.
146. Martínez-León, I.M.; Olmedo-Cifuentes, I.; Ramón-Llorens, M.C. Work, Personal and Cultural Factors in Engineers' Management of Their Career Satisfaction. *Journal of Engineering and Technology Management* **2018**, *47*, 22–36, doi:10.1016/j.jengtecman.2017.12.002.
147. Kraimer, M.L.; Greco, L.; Seibert, S.E.; Sargent, L.D. An Investigation of Academic Career Success: The New Tempo of Academic Life. *Academy of Management Learning & Education* **2019**, *18*, 128–152, doi:10.5465/amle.2017.0391.
148. Roy, S.K.; De, D. Genetic Algorithm Based Internet of Precision Agricultural Things (IopaT) for Agriculture 4.0. *Internet of Things (Netherlands)* **2022**, doi:10.1016/j.iot.2020.100201.
149. González-Martín, J.M.; Sánchez-Medina, A.J.; Alonso, J.B. Optimization of the Prediction of Financial Problems in Spanish Private Health Companies Using Genetic Algorithms. *Gac Sanit* **2019**, *33*, 462–467, doi:10.1016/j.gaceta.2018.01.001.
150. Tlili, T.; Masri, H.; Krichen, S. Towards an Efficient Collection and Transport of COVID-19 Diagnostic Specimens Using Genetic-Based Algorithms. *Appl Soft Comput* **2022**, *116*, doi:10.1016/j.asoc.2021.108264.
151. Rahim, S.; Gendron, T.; Slattum, P.W.; Donohoe, K.L. Alumni Survey of a Combined Doctor of Pharmacy/Graduate Certificate in Aging Studies Program. *Curr Pharm Teach Learn* **2021**, *13*, 964–967, doi:10.1016/j.cptl.2021.06.003.

Capítulo IV: Discusión de resultados y Conclusiones

Discusiones, conclusiones e implicaciones de la investigación

4.1. Discusión de los resultados

En este capítulo se realiza una discusión de los principales resultados obtenidos en los capítulos anteriores, permitiendo la explicación de diversos enfoques del éxito profesional objetivo y éxito profesional subjetivo, junto con el análisis de la estructura intelectual propuesta.

Éxito Profesional en el Mundo Académico

El éxito profesional ha despertado interés por parte del mundo académico en los últimos treinta años y ha sido discutido con diversas áreas de conocimiento como la gestión de negocios, educación, industria, y medicina (Ummatqul, 2020). Estos campos académicos consideran al éxito profesional en función de sus propios intereses, permitiéndoles obtener diversos enfoques. En este marco de referencias se realizó un análisis bibliométrico que presenta toda la estructura intelectual del éxito profesional y considera su diversidad en diferentes campos (Pacakova & Jindrová, 2011).

La estructura bibliométrica considera el análisis de 1369 documentos pertenecientes a la base de datos Scopus en el periodo 1991-2020, considerándose el año 90 como inicio formal de esta área de conocimiento, que conlleva al estudio de su evolución hasta el 2020.

En los 90 se abordaron estudios sobre grandes rasgos de personalidad, como predictores del éxito profesional y la influencia que ejerce el comportamiento político en esta teoría (Aryee et al., 1994). Para el año 2000, se analiza la empresa y el individuo, mediante características de empleabilidad, efectos de la personalidad, y enfoques objetivo y subjetivo (Juez et al., 1999; Van, 2016; Rothwell & Arnold 2007). A partir del 2010, aparecen diversos enfoques relacionados con factores que determinan el éxito profesional, la mentoría y sus

beneficios, así como el género del individuo (Crompton & Lyonette, 2011; Jolly et al., 2014).

La estructura intelectual del éxito profesional comprende ocho grandes temas de investigación y 116 tópicos relacionados. Estos temas de investigación corresponden a: carrera y género, éxito de carrera objetivo y subjetivo, éxito de carrera, inteligencia emocional, satisfacción del trabajo, educación superior, empleabilidad y desarrollo de carrera.

Éxito Profesional en la universidad

El estudiante universitario y el éxito profesional se relacionan desde el entorno formativo proporcionando a los estudiantes motivación por incrementar sus conocimientos y por participar en actividades extracurriculares. El entorno formativo considera las competencias académicas, habilidades de comunicación, trabajo en equipo y autoconcepción, que sirven como indicadores de calidad de la educación universitaria (Bozionelos, 2004; Seibert & Kraimer 2001; Hogan et al., 2013). Bajo este enfoque es necesario que las universidades implementen áreas de formación en temas de liderazgo, interacción entre los estudiantes para la creación de redes, información sobre vacantes de empleo, entre otros.

Las universidades deberían mantener comunicación con sus graduados a través de programas de seguimiento, que exploran los aspectos objetivos y subjetivos del éxito profesional de cada estudiante o graduado (Kurath 2013). Una de las variables subjetivas más relevantes es la satisfacción laboral, debido a que si los graduados están cumpliendo en su campo profesional y su satisfacción laboral se mantiene en niveles positivos, esto contribuye al éxito profesional (Heslin, 2005; Hogan, 2013). Los programas de seguimiento a graduados facilitan la obtención de información referente al nivel de satisfacción de los graduados a través de indicadores cuantitativos y cualitativos, así como también identifican las necesidades de los estudiantes, en el ámbito educativo, extracurricular, y exploran los desafíos que enfrenta el graduado como el empleo a tiempo parcial,

falta de experiencia laboral y las oportunidades de trabajo en el campo específico de estudio (Moguerza et al., 2017; Mckeachie, 1997).

Éxito Profesional en la empresa

Para los profesionales del área de talento humano de una empresa es importante conocer la percepción de los posibles empleados sobre el éxito profesional, debido a que esto mejoraría el proceso de selección y especialmente la búsqueda de los mejores profesionales con potencial para el desarrollo de la organización (Spangler, 1992; Ng & Feldaman, 2014).

La importancia de contratar talentos y mantenerlos por parte de las empresas radica en la competitividad, eficacia y volatilidad del mercado laboral. Por tal razón es necesario conocer las aspiraciones, objetivos, y necesidades de sus empleados, a nivel personal y profesional (Grimland, 2012). Después de reclutar al personal, las empresas deben proporcionar la formación, motivación hacia sus empleados con la finalidad de obtener lealtad y compromiso en las metas y objetivos institucionales, esto genera empleados comprometidos, satisfechos e involucrados con la organización (Boudreau et al., 2001; Grimland, 2012).

Las organizaciones deben evaluar los criterios de éxito profesional o la relación entre el éxito profesional con factores como la personalidad y competencias (Juez, 1995; Boehm & Lyubomirsky, 2008). El propósito de implementar estas gestiones eficaces de los profesionales es diseñar un sistema de gestión de carrera profesional, que busca encontrar el personal capacitado con las habilidades adecuadas y contribuir al desarrollo de la organización, satisfaciendo los valores y aspiraciones de los empleados.

Incidencia del sistema de seguimiento a graduados en la predicción del éxito profesional

Algunos estudios han demostrado la relación del logro de sus graduados bajo el análisis de parámetros del programa Alumni. Por ejemplo, una universidad de

Israel utilizó un análisis factorial exploratorio que relacionó el desarrollo de habilidades generales y específicas de graduados y estudiantes del siglo XXI con diversos métodos de enseñanza y aprendizaje (Lavi et al., 2021). Otros estudios analizaron la satisfacción de graduados de universidades de Indonesia y Estados Unidos a través de la relación que existe entre las variables infraestructura, profesionalismo de docentes, oportunidades de empleo, clases sociales y pertinencia curricular (Rahim et al., 2021; Wiranto & Slameto, 2021). Por otro lado, universidades de Noruega y Turquía estudiaron el desempeño de los graduados para mejorar las habilidades de investigación de los mismos, sus planes de estudio, sus competencias, desarrollo de sus carreras y calidad de educación (Altuntaş & Baykal, 2017; Kismul et al., 2020). Esto incide en que los hallazgos referentes a modelos de predicción a través de un algoritmo genético, sean considerados como propuestas de medición del éxito profesional que incluya el uso de variables objetivas y subjetivas, y su interrelación con productos y resultados del programa Alumni. Esto contribuye al seguimiento de sus graduados y establece mejoras a la educación y gestión educativa en instituciones de educación superior.

4.2. Conclusiones

Tendencias de investigación sobre el éxito profesional

La utilización del análisis bibliométrico y su visualización es una contribución a la literatura académica relacionada con el éxito profesional. En este tipo de análisis se puede observar la estructura intelectual y la evolución de este campo de estudio al considerar diversas unidades de análisis como es el de co-citación de co-ocurrencia.

Para efectuar el análisis bibliométrico se requirió del uso de una base de datos que tenga una amplia cobertura, que sea de fácil acceso y contener documentos sometidos por pares como es el caso de SCOPUS.

El análisis de red de co-ocurrencias por palabras clave de autor presenta ocho áreas de investigación (8 clusters): El cluster 3 es el área de investigación que presenta 13 tópicos entre los que se destacan empleabilidad percibida, satisfacción laboral, personalidad proactiva. El término “Career Success” es el de mayor relevancia con 276 ocurrencias. También se presentan las otras áreas de investigación: Carrera y Género; Éxito Profesional Objetivo y Subjetivo; Inteligencia Emocional; Satisfacción Laboral; Educación Superior; Empleabilidad y Desarrollo de la carrera profesional.

El análisis de red de co-citas de autores de referencia presenta seis áreas que corresponden a la base del conocimiento del éxito profesional. Estas áreas corresponden: “Predictores del éxito profesional” (destacándose autores Judge, T.A.; Barrick, M.R.); “Personalidad proactiva y éxito profesional” (Crant, J.M.; Spurr, D.; Van Der Heijden, B.I.J.M), “Gestión en la carrera” (Greenhaus, J.H.; Bretz, R.D.; Boudreau, J.W.); “Nuevas direcciones en la teoría de la carrera” (Hall, D.T.; Arthur, M.B.; Feldman, D.C.); “Mentoría para el éxito profesional” (Eby, L.T.; Kraimer, M.L.; Seibert S.E.)y “Eficacia del trabajo” (Ferris, G.R.; Perrewé, P.L.; Pfeffer, J.).

En el análisis de red de co-citas de revistas científicas, presenta cinco áreas de investigación relacionadas con el éxito profesional: Sociología y desarrollo profesional (destacándose la revista *American Sociological Review*); Relaciones interdisciplinarias y psicología social (*Journal of Personality and Social Psychology*); Teoría de la gestión y el comportamiento organizacional (*Academy of Management Journal*); Psicología en el campo laboral (*Journal of Applied Psychology*); y Elección de carrera y psicología del trabajo (*Journal of Vocational Behavior*, siendo la más representativa con 3285 citas).

Este estudio bibliométrico se realizó con 1369 artículos, 691 revistas y 3106 autores. La distribución geográfica de esta producción científica fue desarrollada por 76 países en el que destaca Estados Unidos, Reino Unido y Canadá. El autor

más citado en el campo del éxito profesional es Seibert S.E. con 1221 citas, seguido de Judge T.A. con 766 citas. Ambos autores estadounidenses.

El campo académico del éxito profesional presenta tendencias relacionadas a la empleabilidad, efectos de la personalidad, éxito profesional subjetivo y objetivo, relación de género, beneficios de la mentoría, y factores o variables que determinan al éxito profesional.

El éxito profesional es un campo académico que tiene sus orígenes desde hace más de 150 años, pero ha despertado interés en el mundo académico en los últimos 30 años. Se destaca en varias áreas del saber como la psicología, la gestión de recursos humanos, relaciones humanas, medicina, economía, entre otros.

El éxito profesional de los graduados universitarios de UTEQ

De la función lineal del enfoque objetivo, se valoraron 29 variables que fueron sometidas a la importancia relativa o peso de un grupo de 50 expertos profesionales en donde se aplicó el análisis de Pareto, destacándose nueve variables: Trabajar en relación con su formación profesional; Nivel de superación académica: Nivel de participación en I & D + I; Conocimientos de tecnología informática; Escoger bien titulación profesional la primera vez; Ingresos-sueldos; Nivel jerárquico empresa/logros profesionales; Trabajo empresa o institución de prestigio; Relación trabajo-estudios en proceso de formación.

Se realizó otro análisis de Pareto empleando 50 expertos para valorar el enfoque subjetivo con una función lineal, se analizaron 22 variables. Se destacaron siete: Le gusta el trabajo que desempeña; Satisfacción con el éxito logrado en su carrera; Satisfacción al trabajo y contribución a la sociedad; Persistencia en la consecución de objetivos; Alcance de objetivo trazado en su carrera profesional; Esfuerzo por alcanzar estándar de excelencia; Trabajo da significado a su existencia e identidad. Los resultados mostraron que 50 profesionales se consideran exitosos

objetiva y subjetivamente, 318 como medianamente exitosos y 180 como no exitosos.

En relación con el género de los encuestados, se pudo determinar que el 60% de los hombres se consideran éxitosos y la diferencia corresponde a mujeres. Claramente se observa que las mujeres se perciben menos exitosas en comparación con los hombres. Esto puede deberse al conflicto entre la vida laboral y familiar que presenta desbalance para el género femenino, también se refleja en el porcentaje bajo de graduados que se encuentra en estado civil casados (38.9%).

El enfoque del éxito profesional objetivo se destaca frente al subjetivo, 12 de los 50 profesionales poseen un nivel alto en el éxito profesional objetivo y un nivel bajo en el subjetivo. La satisfacción extrínseca no es suficiente para alcanzar el éxito profesional, provocando una sensación de insatisfacción intrínseca de los graduados.

En base a estos resultados se puede considerar la presencia de programas de seguimiento a graduados que puede proporcionar información valiosa para cada unidad académica que oferta una universidad, segmentando a los graduados en base a su éxito profesional y buscando las soluciones óptimas en la calidad del aprendizaje de la educación universitaria. El seguimiento o monitoreo de graduados no solo incluye el proceso investigativo de la educación en todas sus etapas, sino que agrupa las peticiones e intereses educativos o extracurriculares por parte de la comunidad universitaria.

Las aspiraciones objetivas de los graduados están enfocadas en desarrollarse en su campo profesional estudiado, incrementar los conocimientos e involucrarse en el mundo de la investigación. El salario y nivel jerárquico, a pesar de ser las variables representativas de este tipo de éxito, no fueron consideradas

importantes para los encuestados. El éxito profesional subjetivo, acontece en la satisfacción profesional y personal del individuo, su aporte para con la sociedad y la persistencia en la concesión de sus metas trazadas. La satisfacción profesional se asocia a los sentimientos que produce realizar el trabajo y su desempeño. El individuo si le gusta lo que hace incrementará su satisfacción profesional.

Incidencia del programa Alumni en la predicción del éxito profesional en UTEQ

El modelo de predicción propuesto en este estudio, fue desarrollado en un lenguaje de programación Python mediante un algoritmo genético basado en parámetros del programa Alumni. Este modelo estima el éxito profesional de los graduados de la UTEQ, mediante la interacción de variables objetivas y subjetivas, generando una retrospectiva significativa para la toma de decisiones en el seguimiento de sus graduados.

El estudio aplicó datos de 500 graduados y obtuvo resultados de predicción del éxito profesional de sus graduados con un nivel de confiabilidad aceptable (87.61%), dando pautas para el seguimiento de los graduados, mediante el tiempo de transición al empleo, ingreso familiar, desarrollo de habilidades de los graduados, su satisfacción por el trabajo y por los conocimientos adquiridos. Estas variables representan una alta significancia cuando el modelo de predicción alcanza su límite máximo de generaciones.

El GA de predicción estimó que el tiempo promedio de transición al empleo de los graduados exitosos de la UTEQ es de 2 años. El 70% de estos graduados se sienten satisfechos profesionalmente y complacidos por los conocimientos y habilidades adquiridas en la universidad. Un porcentaje elevado de graduados (89%) perciben que desarrollaron sus habilidades y competencias básicas durante su periodo de formación académica.

Este estudio podría replicarse, en base a las variables que se encontraron en este trabajo y debería considerar la realidad de otras instituciones de educación superior para complementar el análisis, incluyendo el aumento de población bajo un mayor número de generaciones para la obtención de resultados confiables en la predicción del éxito profesional. Por lo tanto, se recomienda que las instituciones de educación superior implementen un sistema robusto de monitoreo de sus graduados en base al análisis de sus realidades, su entorno y las siguientes políticas:

- Estrategias de educación continua como una oportunidad para interactuar con los profesionales.
- Seguimiento a graduados para la medición objetiva y subjetiva de la satisfacción laboral.
- Mejorar políticas de comunicación formal e informal, que promueva la interacción y beneficios con los profesionales como bolsa de empleo digital.
- Involucrar a los profesionales en proyectos de investigación y vinculación de la sociedad que se desarrollan en las universidades.

4.3.Limitaciones y futuras líneas de investigación

En cuanto al estudio bibliométrico se presenta ciertas limitaciones como la utilización única de la base de datos SCOPUS, excluyendo otras fuentes prestigiosas en el mundo académico. Además, se revisó artículos en inglés, esto puede excluir trabajos significativos en otros idiomas.

La encuesta fue realizada en una muestra de graduados provenientes de una sola universidad. Estudios posteriores pueden considerar ampliar el número de participantes en función de la región, tipo de universidad, o especialidad (carrera profesional).

El estudio considera variables que son de percepción por parte del encuestado, es decir, autopercepción. Es posible que exista el efecto de autocomplacencia, que es propio de este tipo de estudios.

La investigación se desarrolló en un país en vías de desarrollo en Latinoamérica, se debe tener en cuenta al momento de generalizar los hallazgos obtenidos en el estudio debido a las diferencias culturales y/o sociales que tienen los informantes o participantes en relación con graduados universitarios en países en vías de desarrollo.

Finalmente, puede existir un porcentaje bajo de respuestas por parte de los graduados en posibles variables predictoras como por ejemplo el cargo del graduado para la estimación del éxito profesional.

Referencias Bibliográficas

- Abaci, H., Parr, G., McClean, S., Moore, A., & Krug, L. (2016). Using Genetic Algorithms to optimise dynamic power saving in communication links subject to quality of service requirements. *Sustainable Computing: Informatics and Systems*, 10, 1–19. <https://doi.org/10.1016/j.suscom.2016.01.002>
- Abele, A. E., & Spurk, D. (2009). The longitudinal impact of self-efficacy and career goals on objective and subjective career success. *Journal of Vocational Behavior*, 74(1), 53–62. <https://doi.org/10.1016/j.jvb.2008.10.005>
- Abreu, L. R., Cunha, J. O., Prata, B. A., & Framinan, J. M. (2020). A genetic algorithm for scheduling open shops with sequence-dependent setup times. *Computers & Operations Research*, 113, 104793. <https://doi.org/10.1016/j.cor.2019.104793>
- Ahmad, B., Latif, S., Bilal, A. R., & Hai, M. (2019). The mediating role of career resilience on the relationship between career competency and career success. *Asia-Pacific Journal of Business Administration*, 11(3), 209–231. <https://doi.org/10.1108/APJBA-04-2019-0079>
- Akcan, H. (2018). A genetic algorithm based solution to the Minimum-Cost Bounded-Error Calibration Tree problem. *Applied Soft Computing Journal*, 73, 83–95. <https://doi.org/10.1016/j.asoc.2018.08.013>
- Akkermans, J., & Tims, M. (2017). Crafting your Career: How Career Competencies Relate to Career Success via Job Crafting. *Applied Psychology*, 66(1), 168–195. <https://doi.org/10.1111/apps.12082>
- Al-Hussami, M., Hammad, S., & Alsoleihat, F. (2018). The influence of leadership behavior, organizational commitment, organizational support, subjective career success on organizational readiness for change in healthcare organizations. *Leadership in Health Services*, 31(4), 354–370. <https://doi.org/10.1108/LHS-06-2017-0031>
- Ali, M. Z., Awad, N. H., Suganthan, P. N., Shatnawi, A. M., & Reynolds, R. G. (2018). An improved class of real-coded Genetic Algorithms for numerical optimization☆. *Neurocomputing*, 275, 155–166. <https://doi.org/10.1016/j.neucom.2017.05.054>
- Altuntaş, S., & Baykal, Ü. (2017). An analysis of alumni performance: A study of the quality of nursing education. *Nurse Education Today*, 49, 135–139. <https://doi.org/10.1016/j.nedt.2016.11.022>

- Arthur, M. B., Khapova, S. N., & Wilderom, C. P. M. (2005). Career success in a boundaryless career world. *Journal of Organizational Behavior*, 26(2), 177–202. <https://doi.org/10.1002/job.290>
- Asghari, E., Zamanzadeh, V., Valizadeh, L., Ghahramanian, A., Rassouli, M., & Praskova, A. (2021). Development and psychometric testing of the career success in Nursing Scale. *International Nursing Review*, 68(1), 41–48. <https://doi.org/10.1111/inr.12631>
- Avramkova, I. S., Kamyants, A. V., Kuznetsova, E. O., & Scherbakova, A. I. (2021). Monitoring Studies of University Graduates' Satisfaction with the quality of Education: the main approaches. *Revista on Line de Política e Gestão Educacional*, 638–653.
- Bacon, D. R. (2017). Revisiting the Relationship Between Marketing Education and Marketing Career Success. *Journal of Marketing Education*, 39(2), 109–123. <https://doi.org/10.1177/0273475317710061>
- Bagdadli, S., & Gianecchini, M. (2019). Organizational career management practices and objective career success: A systematic review and framework. *Human Resource Management Review*, 29(3), 353–370. <https://doi.org/10.1016/j.hrmr.2018.08.001>
- Baghestanian, S., & Popov, S. V. (2014). Alma Mat(t)er(s): Determinants of Early Career Success in Economics. *SSRN Electronic Journal*, 1–42. <https://doi.org/10.2139/ssrn.2506817>
- Baker, B. M., & Ayechev, M. A. (2003). A genetic algorithm for the vehicle routing problem. *Computers & Operations Research*, 30(5), 787–800. [https://doi.org/10.1016/S0305-0548\(02\)00051-5](https://doi.org/10.1016/S0305-0548(02)00051-5)
- Ballout, H. I. (2007). Career success: The effects of human capital, person-environment fit and organizational support. In *Journal of Managerial Psychology* (Vol. 22, Issue 8, pp. 741–765). <https://doi.org/10.1108/02683940710837705>
- Bautista-Puig, N., & Sanz-Casado, E. (2021). Sustainability practices in Spanish higher education institutions: An overview of status and implementation. *Journal of Cleaner Production*, 295. <https://doi.org/10.1016/j.jclepro.2021.126320>
- Beigi, M., Shirmohammadi, M., & Arthur, M. (2018). Intelligent career success: The case of distinguished academics. *Journal of Vocational Behavior*, 107(2017), 261–275. <https://doi.org/10.1016/j.jvb.2018.05.007>

- Beigi, M., Wang, J., & Arthur, M. B. (2017). Work-family interface in the context of career success: A qualitative inquiry. *Human Relations, 70*, 1091–1114. <https://doi.org/10.1177/0018726717691339>
- Berger, D., & Wessel, R. (2016). *The relationship between academic program delivery method, Alumni demographics, and graduate Alumni engagement: a correlation study.*
- Binh, Q. M. Q., & Nguyen, C. N. T. (2020). Factors affecting career success: The case of graduate students. *Management Science Letters, 10*(13), 3151–3158. <https://doi.org/10.5267/j.msl.2020.5.007>
- Blickle, G., Schütte, N., & Wihler, A. (2018). Political will, work values, and objective career success: A novel approach – The Trait-Reputation-Identity Model. *Journal of Vocational Behavior, 107*, 42–56. <https://doi.org/10.1016/j.jvb.2018.03.002>
- Blokker, R., Akkermans, J., Tims, M., Jansen, P., & Khapova, S. (2019). Building a sustainable start: The role of career competencies, career success, and career shocks in young professionals' employability. *Journal of Vocational Behavior, 112*, 172–184. <https://doi.org/10.1016/j.jvb.2019.02.013>
- Briscoe, J. P., Kaše, R., Dries, N., Dysvik, A., Unite, J. A., Adeleye, I., Andresen, M., Apospori, E., Babalola, O., Bagdadli, S., Çakmak-Otluoglu, K. Ö., Casado, T., Cerdin, J. L., Cha, J. S., Chudzikowski, K., dello Russo, S., Eggenhofer-Rehart, P., Fei, Z., Gianecchini, M., ... Zikic, J. (2021). Here, there, & everywhere: Development and validation of a cross-culturally representative measure of subjective career success. *Journal of Vocational Behavior, 130*. <https://doi.org/10.1016/j.jvb.2021.103612>
- Buckley, L. M., Sanders, K., Shih, M., & Hampton, C. L. (2000). Attitudes of clinical faculty about career progress, career success and recognition, and commitment to academic medicine. *Archives of Internal Medicine, 160*(17), 2625–2629. <https://doi.org/10.1001/archinte.160.17.2625>
- Campbell, A. C., & Baxter, A. R. (2019). Exploring the attributes and practices of alumni associations that advance social change. *International Journal of Educational Development, 66*, 164–172. <https://doi.org/10.1016/j.ijedudev.2018.10.003>
- Carrión-Mero, P., Morante-Carballo, F., Herrera-Franco, G., Jaya-Montalvo, M., Rodríguez, D., Loor-Flores de Valgas, C., & Berrezueta, E. (2021). Community-university partnership in water education and linkage process. Study case: Manglaralto, Santa Elena, Ecuador. *Water (Switzerland), 13*(15). <https://doi.org/10.3390/w13151998>

- Castelli, M., Dondi, R., & Hosseinzadeh, M. M. (2020). Genetic algorithms for finding episodes in temporal networks. *Procedia Computer Science*, 176, 215–224. <https://doi.org/10.1016/j.procs.2020.08.023>
- Cesinger, B. (2011). *Measurement of Objective and Subjective Career Success*.
- Chang, Y. Y., & Chen, M. H. (2020). Creative entrepreneurs' creativity, opportunity recognition, and career success: Is resource availability a double-edged sword? *European Management Journal*, 38(5), 750–762. <https://doi.org/10.1016/j.emj.2020.03.004>
- Chen, C. H., Liu, T. K., Chou, J. H., Tasi, C. H., & Wang, H. (2015). Optimization of teacher volunteer transferring problems using greedy genetic algorithms. *Expert Systems with Applications*, 42(1), 668–678. <https://doi.org/10.1016/j.eswa.2014.08.020>
- Chen, R., Yang, B., Li, S., & Wang, S. (2020). A self-learning genetic algorithm based on reinforcement learning for flexible job-shop scheduling problem. *Computers & Industrial Engineering*, 149, 106778. <https://doi.org/10.1016/j.cie.2020.106778>
- Chen, Y.-H., Huang, H.-C., Cai, H.-Y., & Chen, P.-F. (2019). A Genetic Algorithm Approach for the Multiple Length Cutting Stock Problem. *2019 IEEE 1st Global Conference on Life Sciences and Technologies (LifeTech)*, 162–165. <https://doi.org/10.1109/LifeTech.2019.8884020>
- Colakoglu, S. N. (2011). The impact of career boundarylessness on subjective career success: The role of career competencies, career autonomy, and career insecurity. *Journal of Vocational Behavior*, 79(1), 47–59. <https://doi.org/10.1016/j.jvb.2010.09.011>
- Consejo de Aseguramiento de la Calidad de la Educación Superior. (2019). *Modelo de evaluación externa de universidades y escuelas politécnicas*.
- Cope, P. M. (1928). The Women of "Who's Who": A Statistical Study. *Social Forces*, 7(2), 212–223. <https://doi.org/10.2307/2570142>
- Costa, P. T. Jr., & McCrae, R. R. (2008). Revised Neo Personality Inventory and NEO Five-Factor Inventory (NEO-FFI). *Psychological Assessment Resources*.
- Dan, X., Xu, S., Liu, J., Hou, R., Liu, Y., & Ma, H. (2018). Relationships among structural empowerment, innovative behaviour, self-efficacy, and career success in nursing field in mainland China. *International Journal of Nursing Practice*, 24(5), 1–9. <https://doi.org/10.1111/ijn.12674>

- D'Angelo, G., & Palmieri, F. (2021). GGA: A modified genetic algorithm with gradient-based local search for solving constrained optimization problems. *Information Sciences*, 547, 136–162. <https://doi.org/10.1016/j.ins.2020.08.040>
- Danziger, N., & Valency, R. (2006). Career anchors: Distribution and impact on job satisfaction, the Israeli case. *Career Development International*, 11(4), 293–303. <https://doi.org/10.1108/13620430610672513>
- de Haro, J. M., Castejón, J. L., & Gilar, R. (2013). General mental ability as moderator of personality traits as predictors of early career success. *Journal of Vocational Behavior*, 83(2), 171–180. <https://doi.org/10.1016/j.jvb.2013.04.001>
- de Vos, A., & Soens, N. (2008). Protean attitude and career success: The mediating role of self-management. *Journal of Vocational Behavior*, 73(3), 449–456. <https://doi.org/10.1016/j.jvb.2008.08.007>
- Denissen, J. J. A., Bleidorn, W., Hennecke, M., Luhmann, M., Orth, U., Specht, J., & Zimmermann, J. (2018). Uncovering the Power of Personality to Shape Income. *Psychological Science*, 29(1), 3–13. <https://doi.org/10.1177/0956797617724435>
- Deros, B. Md., Mohamed, A., Mohamed, N., & Ihsan, A. K. A. M. (2012). A Study of Alumni Feedback on Outcome based Education in the Faculty of Engineering & Built Environment, Universiti Kebangsaan Malaysia. *Procedia - Social and Behavioral Sciences*, 60, 313–317. <https://doi.org/10.1016/j.sbspro.2012.09.385>
- Domínguez, J. F. C., & Gutiérrez, C. R. (2020). A public university or a private university: What Effect does this Choice have on the Professional Success of Graduates in Spain? *Revista Espanola de Investigaciones Sociologicas*, 169, 21–39. <https://doi.org/10.5477/cis/reis.169.21>
- Drewery, D. W., Sproule, R., & Pretti, T. J. (2020). Lifelong learning mindset and career success: evidence from the field of accounting and finance. *Higher Education, Skills and Work-Based Learning*, 10(3), 567–580. <https://doi.org/10.1108/HESWBL-03-2019-0041>
- Dries, N., Pepermans, R., & Carlier, O. (2008). Career success: Constructing a multidimensional model. *Journal of Vocational Behavior*, 73(2), 254–267. <https://doi.org/10.1016/j.jvb.2008.05.005>
- Duta, A., Wielgoszewska, B., & Iannelli, C. (2021). Different degrees of career success: social origin and graduates' education and labour market trajectories. *Advances in Life Course Research*, 47. <https://doi.org/10.1016/j.alcr.2020.100376>

- Dwivedi, P., Kant, V., & Bharadwaj, K. K. (2018). Learning path recommendation based on modified variable length genetic algorithm. *Education and Information Technologies*, 23(2), 819–836. <https://doi.org/10.1007/s10639-017-9637-7>
- Dyke, L. S., & Murphy, S. A. (2006). How we define success: A qualitative study of what matters most to women and men. In *Sex Roles* (Vol. 55, Issues 5–6, pp. 357–371). <https://doi.org/10.1007/s11199-006-9091-2>
- Escandón-Panchana, P., Morante-Carballo, F., Herrera-Franco, G., Pineda, E., & Yagual, J. (2021). Computer Application to Estimate PVT Conditions in Oil Wells in the Ecuadorian Amazon. *Mathematical Modelling of Engineering Problems*, 8(5), 727–738. <https://doi.org/10.18280/mmep.080507>
- Escandón-Panchana, P., Morante-Carballo, F., Herrera-Franco, G., Rodríguez, H., & Carvajal, F. (2022). Fluid Level Measurement System in Oil Storage. Python, Lab-Based Scale. *Mathematical Modelling of Engineering Problems*, 9(3), 787–795. <https://doi.org/10.18280/mmep.090327>
- Fouad, N., & Byars-Winston, A. M. (2005). Cultural Context of Career Choice : Meta-Analysis of Race/Ethnicity Differences. *The Career Development Quarterly*, 53(March), 223–233.
- Gaebel, M., Hauschildt, K., Mühleck, K., & Smidt, H. (2012). *Tracking Learners' and Graduates' Progression Paths TRACKIT* (E. U. Association, Ed.).
- Geiger, J. M., Piel, M. H., Day, A., & Schelbe, L. (2018). A descriptive analysis of programs serving foster care alumni in higher education: Challenges and opportunities. *Children and Youth Services Review*, 85, 287–294. <https://doi.org/10.1016/j.childyouth.2018.01.001>
- Gelissen, J., & de Graaf, P. M. (2006). Personality, social background, and occupational career success. *Social Science Research*, 35(3), 702–726. <https://doi.org/10.1016/j.ssresearch.2005.06.005>
- Ghaheri, A., Shoar, S., Naderan, M., & Hoseini, S. S. (2015). The Applications of Genetic Algorithms in Medicine. *Oman Medical Journal*, 30(6), 406–416. <https://doi.org/10.5001/omj.2015.82>
- Gholami, A., Bonakdari, H., Ebtehaj, I., Mohammadian, M., Gharabaghi, B., & Khodashenas, S. R. (2018). Uncertainty analysis of intelligent model of hybrid genetic algorithm and particle swarm optimization with ANFIS to predict threshold bank profile shape based on digital laser approach sensing. *Measurement*, 121, 294–303. <https://doi.org/10.1016/j.measurement.2018.02.070>

- Giraud, L., Bernard, A., & Trinchera, L. (2019). Early career values and individual factors of objective career success. The case of the French business graduates. *Career Development International*. <https://doi.org/10.1108/CDI-06-2017-0093>
- Goh, S. C. (1991). Sex Differences in Perceptions of Interpersonal Work Style, Career Emphasis, Supervisory Mentoring Behavior, and Job Satisfaction I. In *Sex Roles* (Vol. 24, Issue 11).
- Golden, T. D., & Eddleston, K. A. (2020). Is there a price telecommuters pay? Examining the relationship between telecommuting and objective career success. *Journal of Vocational Behavior*, 116. <https://doi.org/10.1016/j.jvb.2019.103348>
- González-Martín, J. M., Sánchez-Medina, A. J., & Alonso, J. B. (2019). Optimization of the prediction of financial problems in Spanish private health companies using genetic algorithms. *Gaceta Sanitaria*, 33(5), 462–467. <https://doi.org/10.1016/j.gaceta.2018.01.001>
- Gordon, S. E., & Shi, X. (Crystal). (2021). The well-being and subjective career success of workaholics: An examination of hospitality managers' recovery experience. *International Journal of Hospitality Management*, 93. <https://doi.org/10.1016/j.ijhm.2020.102804>
- Gricelda, H. F., Paúl, C. M., & Niurka, A. M. (2018). Participatory Process for Local Development: Sustainability of Water Resources in Rural Communities: Case Manglaralto-Santa Elena, Ecuador. In W. Leal Filho (Ed.), *Handbook of Sustainability Science and Research* (pp. 663–676). Springer International Publishing. https://doi.org/10.1007/978-3-319-63007-6_41
- Guan, Y., Zhou, W., Ye, L., Jiang, P., & Zhou, Y. (2015). Perceived organizational career management and career adaptability as predictors of success and turnover intention among Chinese employees. *Journal of Vocational Behavior*, 88, 230–237. <https://doi.org/10.1016/j.jvb.2015.04.002>
- Gunz, H., Mayrhofer, W., & Tolbert, P. (2011). Career as a social and political phenomenon in the globalized economy. *Organization Studies*, 32(12), 1613–1620. <https://doi.org/10.1177/0170840611421239>
- Gunz, H. P., & Heslin, P. A. (2014). *Reconceptualizing career success*. 26(2), 105–111. <https://doi.org/10.1002/job.300>
- Guo, W., Xiao, H., & Yang, X. (2012). An Empirical Research on the Correlation between Human Capital and Career Success of Knowledge Workers in Enterprise. *Physics Procedia*, 25, 715–725. <https://doi.org/10.1016/j.phpro.2012.03.148>

- Gustafson, J. A., & Wilmer, C. E. (2019). Intelligent Selection of Metal–Organic Framework Arrays for Methane Sensing via Genetic Algorithms. *ACS Sensors*, 4(6), 1586–1593. <https://doi.org/10.1021/acssensors.9b00268>
- Haenggli, M., Hirschi, A., Rudolph, C. W., & Peiró, J. M. (2021). Exploring the dynamics of protean career orientation, career management behaviors, and subjective career success: An action regulation theory approach. *Journal of Vocational Behavior*, 131. <https://doi.org/10.1016/j.jvb.2021.103650>
- Haldurai, L., Madhubala, T., & Rajalakshmi, R. (2016). A Study on Genetic Algorithm and its Applications. *International Journal of Computer Sciences and Engineering*, 4(10), 139–143. www.ijcseonline.org
- Hall, D. T., Lee, M. D., Kossek, E. E., & las Heras, M. (2012). Pursuing Career Success while Sustaining Personal and Family Well-Being: A Study of Reduced-Load Professionals over Time. In *Journal of Social Issues* (Vol. 68, Issue 4).
- Hamdia, K. M., Zhuang, X., & Rabczuk, T. (2021). An efficient optimization approach for designing machine learning models based on genetic algorithm. *Neural Computing and Applications*, 33(6), 1923–1933. <https://doi.org/10.1007/s00521-020-05035-x>
- Haq, E., Ahmad, I., Hussain, A., & Almanjahie, I. M. (2019). A Novel Selection Approach for Genetic Algorithms for Global Optimization of Multimodal Continuous Functions. *Computational Intelligence and Neuroscience*, 2019, 1–14. <https://doi.org/10.1155/2019/8640218>
- Hay, A., & Hodgkinson, M. (2006). Exploring MBA career success. *Career Development International*, 11(2), 108–124. <https://doi.org/10.1108/13620430610651877>
- Healy, M., Hammer, S., & McIlveen, P. (2020). Mapping graduate employability and career development in higher education research: a citation network analysis. *Studies in Higher Education*. <https://doi.org/10.1080/03075079.2020.1804851>
- Hennequin, E. (2007). What “career success” means to blue-collar workers. *Career Development International*, 12(6), 565–581. <https://doi.org/10.1108/13620430710822029>
- Herrera-Franco, G., Alvarado, J., Gordillo, P., Veintimilla, L., Merchán, B., Carrión-Mero, P., & Berrezueta, E. (2021). Communication methods on water care during the Covid-19 pandemic and its impact on the resilience of the rural community of “Libertador Bolívar”, Ecuador. *WIT Transactions on*

Ecology and the Environment, 250, 109–118.
<https://doi.org/10.2495/WRM210101>

Herrera-Franco, G., Erazo, K., Mora-Frank, C., Carrión-Mero, P., & Berrezueta, E. (2021). Evaluation of a paleontological museum as geosite and base for geotourism. A case study. *Heritage*, 4(3), 1208–1227.
<https://doi.org/10.3390/heritage4030067>

Herrera-Franco, G., Montalván-Burbano, N., Mora-Frank, C., & Bravo-Montero, Lady. (2021). Scientific research in Ecuador: A bibliometric analysis. *Publications*, 9(4). <https://doi.org/10.3390/publications9040055>

Heslev, P. A. (2005). Conceptualizing and evaluating career success. In *Journal of Organizational Behavior* (Vol. 26, Issue 2, pp. 113–136). John Wiley and Sons Ltd. <https://doi.org/10.1002/job.270>

Heslin, P. A. (2005). Conceptualizing and evaluating career success. *Journal of Organizational Behavior*, 26(2), 113–136. <https://doi.org/10.1002/job.270>

Higgins, M. C., Dobrow, S. R., & Chandler, D. (2008). Never quite good enough: The paradox of sticky developmental relationships for elite university graduates. *Journal of Vocational Behavior*, 72(2), 207–224.
<https://doi.org/10.1016/j.jvb.2007.11.011>

Hirschi, A., Johnston, C. S., de Fruyt, F., Ghetta, A., & Orth, U. (2021). Does success change people? Examining objective career success as a precursor for personality development. *Journal of Vocational Behavior*, 127.
<https://doi.org/10.1016/j.jvb.2021.103582>

Hutapea, L. M. N., Balthip, K., & Chunuan, S. (2021). Perceptions of nursing educators and alumni of an effective preparation programme for the Indonesian national nursing licensure examination. *Collegian*, 28(5), 565–571.
<https://doi.org/10.1016/j.colegn.2021.02.001>

Jackson, D., & Tomlinson, M. (2020). Investigating the relationship between career planning, proactivity and employability perceptions among higher education students in uncertain labour market conditions. *Higher Education*, 80(3), 435–455. <https://doi.org/10.1007/s10734-019-00490-5>

Janssen, E., van der Heijden, B. I. J. M., Akkermans, J., & Audenaert, M. (2021). Unraveling the complex relationship between career success and career crafting: Exploring nonlinearity and the moderating role of learning value of the job. *Journal of Vocational Behavior*, 130.
<https://doi.org/10.1016/j.jvb.2021.103620>

- Jeffreys, M. R. (2007). Tracking students through program entry, progression, graduation, and licensure: Assessing undergraduate nursing student retention and success. *Nurse Education Today*, 27(5), 406–419. <https://doi.org/10.1016/j.nedt.2006.07.003>
- Ji, Y., Liu, S., Zhou, M., Zhao, Z., Guo, X., & Qi, L. (2022). A machine learning and genetic algorithm-based method for predicting width deviation of hot-rolled strip in steel production systems. *Information Sciences*, 589, 360–375. <https://doi.org/10.1016/J.INS.2021.12.063>
- Judge, T. A. (1995). *AN EMPIRICAL INVESTIGATION OF THE PREDICTORS OF EXECUTIVE CAREER SUCCESS*.
- Judge, T. A., Hurst, C., & Simon, L. S. (2009). Does It Pay to Be Smart , Attractive , or Confident (or All Three)? Relationships Among General Mental Ability , Physical Attractiveness , Core Self-Evaluations, and Income. *Journal of Applied Psychology*, 94(3), 742–755. <https://doi.org/10.1037/a0015497>
- Judge, T. A., Klinger, R. L., & Simon, L. S. (2010). Time Is on My Side: Time, General Mental Ability, Human Capital, and Extrinsic Career Success. *Journal of Applied Psychology*, 95(1), 92–107. <https://doi.org/10.1037/a0017594>
- Karakatič, S. (2021). Optimizing nonlinear charging times of electric vehicle routing with genetic algorithm. *Expert Systems with Applications*, 164, 114039. <https://doi.org/10.1016/j.eswa.2020.114039>
- Katoch, S., Chauhan, S. S., & Kumar, V. (2021). A review on genetic algorithm: past, present, and future. *Multimedia Tools and Applications*, 80(5), 8091–8126. <https://doi.org/10.1007/s11042-020-10139-6>
- Kim, M., & Beehr, T. A. (2018). Can Empowering Leaders Affect Subordinates' Well-Being and Careers Because They Encourage Subordinates' Job Crafting Behaviors? *Journal of Leadership and Organizational Studies*, 25(2), 184–196. <https://doi.org/10.1177/1548051817727702>
- Kirchmeyer, C. (2006). The different effects of family on objective career success across gender: A test of alternative explanations. *Journal of Vocational Behavior*, 68(2), 323–346. <https://doi.org/10.1016/j.jvb.2005.05.002>
- Kismul, H., Hasha, W., Hinderaker, S. G., & Moen, B. E. (2020). An alumni study of a Master's in international health. *Public Health*, 181, 168–170. <https://doi.org/10.1016/j.puhe.2019.12.015>
- Koekemoer, E., Olckers, C., & Nel, C. (2020). Work-family enrichment , job satisfaction , and work engagement : The mediating role of subjective career

- success. *Australian Journal of Psychology*, 72(August 2019), 347–358. <https://doi.org/10.1111/ajpy.12290>
- Koh, H., & Boo, E. (2001). The link between organizational ethics and job satisfaction: A study of managers in Singapore. *Journal of Business Ethics*, 29, 309–324.
- Kordos, M., Blachnik, M., & Scherer, R. (2022). Fuzzy clustering decomposition of genetic algorithm-based instance selection for regression problems. *Information Sciences*, 587, 23–40. <https://doi.org/10.1016/J.INS.2021.12.016>
- Kraimer, M. L., Greco, L., Seibert, S. E., & Sargent, L. D. (2019). An Investigation of Academic Career Success: The New Tempo of Academic Life. *Academy of Management Learning & Education*, 18(2), 128–152. <https://doi.org/10.5465/amle.2017.0391>
- Kumar, M., Husain, M., Upreti, N., & Gupta, D. (2010). Genetic Algorithm: Review and Application. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3529843>
- Lambora, A., Gupta, K., & Chopra, K. (2019). Genetic Algorithm- A Literature Review. *2019 International Conference on Machine Learning, Big Data, Cloud and Parallel Computing (COMITCon)*, 380–384. <https://doi.org/10.1109/COMITCon.2019.8862255>
- Lamini, C., Benhlima, S., & Elbekri, A. (2018). Genetic Algorithm Based Approach for Autonomous Mobile Robot Path Planning. *Procedia Computer Science*, 127, 180–189. <https://doi.org/10.1016/j.procs.2018.01.113>
- Lau, V. P., & Shaffer, M. A. (1999). Career success: The effects of personality. *Career Development International*, 4(4), 225–231. <https://doi.org/10.1108/13620439910270607>
- Lavi, R., Tal, M., & Dori, Y. J. (2021). Perceptions of STEM alumni and students on developing 21st century skills through methods of teaching and learning. *Studies in Educational Evaluation*, 70. <https://doi.org/10.1016/j.stueduc.2021.101002>
- Lei, C., Hossain, M. S., Mostafiz, M. I., & Khalifa, G. S. A. (2021). Factors determining employee career success in the Chinese hotel industry: A perspective of Job-Demand Resources theory. *Journal of Hospitality and Tourism Management*, 48, 301–311. <https://doi.org/10.1016/j.jhtm.2021.07.001>
- Li, Z. kai, You, L. ming, Lin, H. sheng, & Chan, S. W. ai chi. (2014). The career success scale in nursing: psychometric evidence to support the Chinese

- version. *Journal of Advanced Nursing*, 70(5), 1194–1203.
<https://doi.org/10.1111/jan.12285>
- Liang, H., Zou, J., Zuo, K., & Khan, M. J. (2020). An improved genetic algorithm optimization fuzzy controller applied to the wellhead back pressure control system. *Mechanical Systems and Signal Processing*, 142, 106708.
<https://doi.org/10.1016/j.ymssp.2020.106708>
- Liashchynskiy, P., & Liashchynskiy, P. (2019). *Grid Search, Random Search, Genetic Algorithm: A Big Comparison for NAS*. <http://arxiv.org/abs/1912.06059>
- Liu, H., Shi, S., Yang, P., & Yang, J. (2018). An Improved Genetic Algorithm Approach on Mechanism Kinematic Structure Enumeration with Intelligent Manufacturing. *Journal of Intelligent & Robotic Systems*, 89(3–4), 343–350.
<https://doi.org/10.1007/s10846-017-0564-z>
- Lü, X., Wu, Y., Lian, J., Zhang, Y., Chen, C., Wang, P., & Meng, L. (2020). Energy management of hybrid electric vehicles: A review of energy optimization of fuel cell hybrid power system based on genetic algorithm. *Energy Conversion and Management*, 205, 112474.
<https://doi.org/10.1016/j.enconman.2020.112474>
- Luo, X., Qian, Q., & Fu, Y. F. (2020). Improved genetic algorithm for solving flexible job shop scheduling problem. *Procedia Computer Science*, 166, 480–485. <https://doi.org/10.1016/j.procs.2020.02.061>
- Martínez-León, I. M., Olmedo-Cifuentes, I., & Ramón-Llorens, M. C. (2018). Work, personal and cultural factors in engineers' management of their career satisfaction. *Journal of Engineering and Technology Management*, 47, 22–36.
<https://doi.org/10.1016/j.jengtecman.2017.12.002>
- Mathew, T. (2012). *Genetic Algorithm*.
- Mayer, M. J., Szilágyi, A., & Gróf, G. (2020). Environmental and economic multi-objective optimization of a household level hybrid renewable energy system by genetic algorithm. *Applied Energy*, 269, 115058.
<https://doi.org/10.1016/j.apenergy.2020.115058>
- Mayrhofer, W., Meyer, M., Schiffinger, M., & Schmidt, A. (2008). The influence of family responsibilities, career fields and gender on career success An empirical study. *Journal of Managerial Psychology*, 23(3), 292–323.
<https://doi.org/10.1108/02683940810861392>

- McDonald, K. S., & Hite, L. M. (2008). The Next Generation of Career Success: Implications for HRD. *Advances in Developing Human Resources*, 10(1), 86–103. <https://doi.org/10.1177/1523422307310116>
- Miller, J. J., Benner, K., Donohue-Dioh, J., & Segress, M. (2019). Supporting collegiate foster youth and alumni: A mixed-method planning approach for higher education. *Evaluation and Program Planning*, 72, 67–76. <https://doi.org/10.1016/j.evalprogplan.2018.10.005>
- Miranda, J., Navarrete, C., Noguez, J., Molina-Espinosa, J. M., Ramírez-Montoya, M. S., Navarro-Tuch, S. A., Bustamante-Bello, M. R., Rosas-Fernández, J. B., & Molina, A. (2021). The core components of education 4.0 in higher education: Three case studies in engineering education. *Computers and Electrical Engineering*, 93. <https://doi.org/10.1016/j.compeleceng.2021.107278>
- Mirjalili, S. (2019). Genetic Algorithm. In Springer (Ed.), *In: Evolutionary Algorithms and Neural Networks. Studies in Computational Intelligence* (Vol. 780, pp. 43–55). https://doi.org/https://doi.org/10.1007/978-3-319-93025-1_4
- Morante-Carballo, F., Merchán-Sanmartín, B., Cárdenas-Cruz, A., Jaya-Montalvo, M., Mata-Perelló, J., Herrera-Franco, G., & Carrión-Mero, P. (2022). Sites of Geological Interest Assessment for Geoeducation Strategies, ESPOL University Campus, Guayaquil, Ecuador. *Land*, 11(6), 771. <https://doi.org/10.3390/land11060771>
- Moya, A., Navarro, E., Jaén, J., López-Jaquero, V., & Capilla, R. (2022). Exploiting variability in the design of genetic algorithms to generate telerehabilitation activities[Formula presented]. *Applied Soft Computing*, 117. <https://doi.org/10.1016/j.asoc.2022.108441>
- Munk, M., Pilkova, A., Benko, L., Blazekova, P., & Svec, P. (2021). Pilar 3-Preprocessed web server log file dataset of the banking institution. *Data in Brief*, 39, 1–7. <https://doi.org/10.17632/5bvkm76sdc.1>
- Nabi, G. R. (1999). An investigation into the differential profile of predictors of objective and subjective career success. *Career Development International*, 4(4), 212–225. <https://doi.org/10.1108/13620439910270599>
- Ng, T. W. H., Eby, L. T., Sorensen, K. L., & Feldman, D. C. (2005a). Predictors of Objective and Subjective Career Success: a Meta-Analysis. *Personnel Psychology*, 58(2), 367.
- Ng, T. W. H., Eby, L. T., Sorensen, K. L., & Feldman, D. C. (2005b). Predictors of objective and subjective career success: a meta-analysis. In *PERSONNEL PSYCHOLOGY* (Vol. 58).

- Ng, T. W. H., & Feldman, D. C. (2014). Subjective career success: A meta-analytic review. *Journal of Vocational Behavior*, 85(2), 169–179. <https://doi.org/10.1016/J.JVB.2014.06.001>
- Orozco, E., Jaya, A., Ramos, F., & Guerra, R. (2020). Retos a la gestión de la calidad en las instituciones de educación superior en Ecuador. *Educación Médica Superior*, 34(2). <https://orcid.org/0000-0003-1748-7866><https://orcid.org/0000-0002-0561-6678>
- Orser, B., & Leck, J. (2010a). Gender influences on career success outcomes. *Gender in Management*, 25(5), 386–407. <https://doi.org/10.1108/17542411011056877>
- Orser, B., & Leck, J. (2010b). Gender influences on career success outcomes. *Gender in Management: An International Journal*, 25(5), 386–407. <https://doi.org/10.1108/17542411011056877>
- Pachulicz, S., Schmitt, N., & Kuljanin, G. (2008). A model of career success: A longitudinal study of emergency physicians. *Journal of Vocational Behavior*, 73(2), 242–253. <https://doi.org/10.1016/j.jvb.2008.05.003>
- Palmer, S. P., Lundberg, K., de la Cruz, K., Corbett, C., Heaston, S., Reed, S., & Williams, M. (2017). Long-term effects on nursing alumni: Assessing a course in public and global health. *Journal of Professional Nursing*, 33(6), 436–440. <https://doi.org/10.1016/j.profnurs.2017.03.005>
- Pan, J., Guan, Y., Wu, J., Han, L., Zhu, F., Fu, X., & Yu, J. (2018). The interplay of proactive personality and internship quality in Chinese university graduates' job search success: The role of career adaptability. *Journal of Vocational Behavior*, 109, 14–26. <https://doi.org/10.1016/j.jvb.2018.09.003>
- Panwar, V., Kumar Sharma, D., Pradeep Kumar, K. V., Jain, A., & Thakar, C. (2021). Experimental investigations and optimization of surface roughness in turning of en 36 alloy steel using response surface methodology and genetic algorithm. *Materials Today: Proceedings*, 46, 6474–6481. <https://doi.org/10.1016/j.matpr.2021.03.642>
- Peng, K., Du, J., Lu, F., Sun, Q., Dong, Y., Zhou, P., & Hu, M. (2019). A Hybrid Genetic Algorithm on Routing and Scheduling for Vehicle-Assisted Multi-Drone Parcel Delivery. *IEEE Access*, 7, 49191–49200. <https://doi.org/10.1109/ACCESS.2019.2910134>
- Pham, T. D., & Hong, W. K. (2022). Genetic algorithm using probabilistic-based natural selections and dynamic mutation ranges in optimizing precast

beams. *Computers & Structures*, 258, 106681.
<https://doi.org/10.1016/J.COMPSTRUC.2021.106681>

Pico-Saltos, R., Bravo-Montero, Lady, Montalván-Burbano, N., Garzías, J., & Redchuk, A. (2021). Career success in university graduates: Evidence from an Ecuadorian study in los ríos province. *Sustainability (Switzerland)*, 13(16).
<https://doi.org/10.3390/su13169337>

Pico-Saltos, R., Carrión-Mero, P., Montalván-Burbano, N., Garzías, J., & Redchuk, A. (2021a). Research trends in Career Success: A bibliometric Review. *Sustainability (Switzerland)*, 13(9), 1–24. <https://doi.org/10.3390/su13094625>

Pico-Saltos, R., Carrión-Mero, P., Montalván-Burbano, N., Garzías, J., & Redchuk, A. (2021b). Research trends in career success: A bibliometric review. *Sustainability (Switzerland)*, 13(9). <https://doi.org/10.3390/su13094625>

Pourrajabian, A., Dehghan, M., & Rahgozar, S. (2021). Genetic algorithms for the design and optimization of horizontal axis wind turbine (HAWT) blades: A continuous approach or a binary one? *Sustainable Energy Technologies and Assessments*, 44, 101022. <https://doi.org/10.1016/j.seta.2021.101022>

Presti, A. Lo, Capone, V., Aversano, A., & Akkermans, J. (2021). Career Competencies and Career Success: On the Roles of Employability Activities and Academic Satisfaction During the School-to-Work Transition. *Journal of Career Development*, 1–19. <https://doi.org/10.1177/0894845321992536>

Protopopova, J., & Kulik, S. (2020). Educational Intelligent System Using Genetic Algorithm. *Procedia Computer Science*, 169, 168–172.
<https://doi.org/10.1016/j.procs.2020.02.130>

Psacharopoulos, G., & Patrinos, H. A. (2004). Returns to investment in education: A further update. *Education Economics*, 12(2), 111–134.
<https://doi.org/10.1080/0964529042000239140>

Punnet, B. J., Duffy, J. A., Fox, S., Gregory, A., Lituchy, T., Miller, J., Monserrat, S. I., Olivas-Luján, M. R., & Santos, N. M. B. F. (2007). Career success and satisfaction: A comparative study in nine countries. *Women in Management Review*, 22(5), 371–390. <https://doi.org/10.1108/09649420710761446>

Rahim, S., Gendron, T., Slattum, P. W., & Donohoe, K. L. (2021). Alumni survey of a combined doctor of pharmacy/graduate certificate in aging studies program. *Currents in Pharmacy Teaching and Learning*, 13(8), 964–967.
<https://doi.org/10.1016/j.cptl.2021.06.003>

- Ramaswami, A., Dreher, G. F., Bretz, R., & Wiethoff, C. (2010). Gender, mentoring, and career success: The importance of organizational context. *Personnel Psychology, 63*(2), 385–405. <https://doi.org/10.1111/j.1744-6570.2010.01174.x>
- Rattanamethawong, N., Sinthupinyo, S., & Chandrachai, A. (2018). An innovation model of alumni relationship management: Alumni segmentation analysis. *Kasetsart Journal of Social Sciences, 39*(1), 150–160. <https://doi.org/10.1016/j.kjss.2017.02.002>
- Rattanamethawong, V., Sinthupinyo, S., & Chandrachai, E. A. (2015). An Innovation System that can Quickly Responses to the Needs of Students and Alumni. *Procedia - Social and Behavioral Sciences, 182*, 645–652. <https://doi.org/10.1016/j.sbspro.2015.04.801>
- Red Gradua2, & Asociación Columbus. (2006). *Manual de instrumentos y recomendaciones sobre el seguimiento de egresados*.
- Reddy, G. T., Reddy, M. P. K., Lakshmana, K., Rajput, D. S., Kaluri, R., & Srivastava, G. (2020). Hybrid genetic algorithm and a fuzzy logic classifier for heart disease diagnosis. *Evolutionary Intelligence, 13*(2), 185–196. <https://doi.org/10.1007/s12065-019-00327-1>
- Robinson, R. (2004). Pathways to completion: Patterns of progression through a university degree. *Higher Education, 47*(1), 1–20. <https://doi.org/10.1023/B:HIGH.0000009803.70418.9c>
- Rode, J. C., Arthaud-Day, M. L., Mooney, C. H., Near, J. P., & Baldwin, T. T. (2008). Ability and personality predictors of salary, perceived job success, and perceived career success in the initial career stage. *International Journal of Selection and Assessment, 16*(3), 292–299. <https://doi.org/10.1111/j.1468-2389.2008.00435.x>
- Rosso, F., Ciancio, V., Dell’Olmo, J., & Salata, F. (2020). Multi-objective optimization of building retrofit in the Mediterranean climate by means of genetic algorithm application. *Energy and Buildings, 216*. <https://doi.org/10.1016/j.enbuild.2020.109945>
- Rowley, C., Kang, H. R., & Lim, H. J. (2016). Female manager career success: The importance of individual and organizational factors in South Korea. *Asia Pacific Journal of Human Resources, 54*(1), 98–122. <https://doi.org/10.1111/1744-7941.12071>

- Roy, S. K., & De, D. (2022). Genetic Algorithm based Internet of Precision Agricultural Things (IopaT) for Agriculture 4.0. *Internet of Things (Netherlands)*. <https://doi.org/10.1016/j.iot.2020.100201>
- Russo, M., Guo, L., & Baruch, Y. (2014). Work attitudes, career success and health: Evidence from China. *Journal of Vocational Behavior, 84*(3), 248–258. <https://doi.org/10.1016/j.jvb.2014.01.009>
- Salata, F., Ciancio, V., Dell’Olmo, J., Golasi, I., Palusci, O., & Coppi, M. (2020). Effects of local conditions on the multi-variable and multi-objective energy optimization of residential buildings using genetic algorithms. *Applied Energy, 260*. <https://doi.org/10.1016/j.apenergy.2019.114289>
- Salazar, A. M., & Schelbe, L. (2021). Factors associated with post-college success for foster care alumni college graduates. *Children and Youth Services Review, 126*. <https://doi.org/10.1016/j.childyouth.2021.106031>
- Salto, M., Muñoz, E., & Rodríguez, L. (2016). Empleabilidad y Seguimiento a graduados de la Carrera de Administración de Empresas de la Universidad Central del Ecuador, año 2014, su aporte en la perspectiva para el proceso de construcción del modelo de formación universitaria. *Revista Publicando, 3*(8), 116–146.
- Savolainen, T. (2000). Towards a new workplace culture: development strategies for employer-employee relations. *Journal of Workplace Learning, 12*(8), 318–326. <https://doi.org/10.1108/13665620010355566>
- Schomburg, H. (2004). *Manual para Estudios de Seguimiento de Graduados Universitarios*.
- Schomburg, H. (2007). AustraliaEJEEuropean Journal of Education0141-8211© 2007 The Author. In *European Journal of Education* (Vol. 42, Issue 1). Blackwell Publishing Ltd.
- Schworm, S. K., Cadin, L., Carbone, V., Festing, M., Leon, E., & Muratbekova-Touron, M. (2017a). The impact of international business education on career success—Evidence from Europe. *European Management Journal, 35*(4), 493–504. <https://doi.org/10.1016/j.emj.2017.02.009>
- Schworm, S. K., Cadin, L., Carbone, V., Festing, M., Leon, E., & Muratbekova-Touron, M. (2017b). The impact of international business education on career success—Evidence from Europe. *European Management Journal, 35*(4), 493–504. <https://doi.org/10.1016/j.emj.2017.02.009>

- Seibert, S. E., Crant, J. M., & Kraimer, M. L. (1999). Proactive Personality and Career Success. *Journal of Applied Psychology, 84*(3), 416–427.
- Seibert, S. E., Kraimer, M., & Crant, J. M. (2001). What Do Proactive People Do? A Longitudinal Model Linking Proactive Personality and Career Success. *Personnel Psychology, 54*(4), 845–874.
- Serinelli, B. M., Collen, A., & Nijdam, N. A. (2021). On the analysis of open source datasets: Validating IDS implementation for well-known and zero day attack detection. *Procedia Computer Science, 191*, 192–199. <https://doi.org/10.1016/j.procs.2021.07.024>
- Shen, H., & Sha, B. L. (2020). Conceptualizing and operationalizing alumni engagement: When conversational voice matters more than openness and assurances of legitimacy. *Public Relations Review, 46*(5). <https://doi.org/10.1016/j.pubrev.2020.101974>
- Shen, Y., Demel, B., Unite, J., Briscoe, J. P., Hall, D. T., Chudzikowski, K., Mayrhofer, W., Abdul-Ghani, R., Bogicevic Milikic, B., Colorado, O., Fei, Z., Las Heras, M., Ogliastri, E., Pazy, A., Poon, J. M. L., Shefer, D., Taniguchi, M., & Zikic, J. (2015). Career success across 11 countries: implications for international human resource management. *International Journal of Human Resource Management, 26*(13), 1753–1778. <https://doi.org/10.1080/09585192.2014.962562>
- Sönmez, B., Gül, D., İspir Demir, Ö., Emiralioglu, R., Erkmen, T., & Yıldırım, A. (2021). Antecedents and Outcomes of Nurses' Subjective Career Success: A Path Analysis. *Journal of Nursing Scholarship, 53*(5), 604–614. <https://doi.org/10.1111/jnu.12660>
- Spangler, W. D. (1992). Validity of Questionnaire and TAT Measures of Need for Achievement: Two Meta-Analyses. In *Psychological Bulletin* (Vol. 112, Issue 1).
- Spurk, D., & Abele, A. E. (2014). Synchronous and time-lagged effects between occupational self-efficacy and objective and subjective career success: Findings from a four-wave and 9-year longitudinal study. *Journal of Vocational Behavior, 84*(2), 119–132. <https://doi.org/10.1016/j.jvb.2013.12.002>
- Spurk, D., Hirschi, A., & Dries, N. (2019). Antecedents and Outcomes of Objective Versus Subjective Career Success: Competing Perspectives and Future Directions. In *Journal of Management* (Vol. 45, Issue 1, pp. 35–69). SAGE Publications Inc. <https://doi.org/10.1177/0149206318786563>

- Stamm, M., & Buddeberg-Fischer, B. (2011). The impact of mentoring during postgraduate training on doctors' career success. *Medical Education*, 45(5), 488–496. <https://doi.org/10.1111/j.1365-2923.2010.03857.x>
- Stumpf, S. A., & Tymon, W. G. (2012). The effects of objective career success on subsequent subjective career success. *Journal of Vocational Behavior*, 81(3), 345–353. <https://doi.org/10.1016/j.jvb.2012.09.001>
- Sun, Y., Xue, B., Zhang, M., Yen, G. G., & Lv, J. (2020). Automatically Designing CNN Architectures Using the Genetic Algorithm for Image Classification. *IEEE Transactions on Cybernetics*, 50(9), 3840–3854. <https://doi.org/10.1109/TCYB.2020.2983860>
- Tiessen, R., Grantham, K., & Cameron, J. (2019). The Relationship Between Experiential Learning and Career Outcomes for Alumni of International Development Studies Programs in Canada. *Canadian Journal of Higher Education*, 48(3), 23–42. <https://doi.org/10.7202/1057127ar>
- Tirado Morueta, R., Tejada, R., Cedeño, G., & Laica Eloy Alfaro de Manabí, U. (2015). Implementación institucional de un modelo cooperativo para el seguimiento a graduados en Ecuador*. *RESU*, 44(1), 125–156.
- Tlaiss, H., & Kauser, S. (2011). The importance of wasta in the career success of Middle Eastern managers. *Journal of European Industrial Training*, 35(5), 467–486. <https://doi.org/10.1108/030905911111138026>
- Tlili, T., Masri, H., & Krichen, S. (2022). Towards an efficient collection and transport of COVID-19 diagnostic specimens using genetic-based algorithms. *Applied Soft Computing*, 116. <https://doi.org/10.1016/j.asoc.2021.108264>
- Tremblay, M., Dahan, J., Gianecchini, M., & Tremblay, M. (2014). The mediating influence of career success in relationship between career mobility criteria , career anchors and satisfaction with organization. *Personnel Review*, 43(6), 818–844. <https://doi.org/10.1108/PR-08-2012-0138>
- Tuononen, T. (2019). Employability of university graduates. In *Helsinki Studies in Education*, number 46 (Issue 46).
- Tuononen, T., Parpala, A., & Lindblom-Ylänne, S. (2019). Graduates' evaluations of usefulness of university education, and early career success—a longitudinal study of the transition to working life. *Assessment and Evaluation in Higher Education*, 44(4), 581–595. <https://doi.org/10.1080/02602938.2018.1524000>

- Ummatqul Qizi, K. N. (2020). Soft Skills Development in Higher Education. *Universal Journal of Educational Research*, 8(5), 1916–1925. <https://doi.org/10.13189/ujer.2020.080528>
- Valcour, M., & Ladge, J. J. (2008). Family and career path characteristics as predictors of women's objective and subjective career success: Integrating traditional and protean career explanations. *Journal of Vocational Behavior*, 73(2), 300–309. <https://doi.org/10.1016/j.jvb.2008.06.002>
- van den Born, A., & van Witteloostuijn, A. (2013). Drivers of freelance career success. *Journal of Organizational Behavior*, 34(1), 24–46. <https://doi.org/10.1002/job.1786>
- Vera, A., & Hucke, D. (2009). Managerial orientation and career success of physicians in hospitals. *Journal of Health, Organisation and Management*, 23(1), 70–84. <https://doi.org/10.1108/14777260910942560>
- Verbruggen, M. (2012). Psychological mobility and career success in the “New” career climate. *Journal of Vocational Behavior*, 81(2), 289–297. <https://doi.org/10.1016/j.jvb.2011.10.010>
- Vermeulen, L., & Schmidt, H. G. (2008). Learning environment, learning process, academic outcomes and career success of university graduates. *Studies in Higher Education*, 33(4), 431–451. <https://doi.org/10.1080/03075070802211810>
- Vlašić, I., Đurasević, M., & Jakobović, D. (2019). Improving genetic algorithm performance by population initialisation with dispatching rules. *Computers and Industrial Engineering*, 137. <https://doi.org/10.1016/j.cie.2019.106030>
- Wang, Y. F., Horng, J. S., Cheng, S. Y. S., & Killman, L. (2011). Factors influencing food and beverage employees' career success: A contextual perspective. *International Journal of Hospitality Management*, 30(4), 997–1007. <https://doi.org/10.1016/j.ijhm.2011.03.005>
- Wiese, B. S., Freund, A. M., & Baltes, P. B. (2002). Subjective career success and emotional well-being: Longitudinal predictive power of selection, optimization, and compensation. *Journal of Vocational Behavior*, 60(3), 321–335. <https://doi.org/10.1006/jvbe.2001.1835>
- Wiranto, R., & Slameto, S. (2021). Alumni satisfaction in terms of classroom infrastructure, lecturer professionalism, and curriculum. *Heliyon*, 7(6). <https://doi.org/10.1016/j.heliyon.2021.e06679>
- Xie, B., Xia, M., Xin, X., & Zhou, W. (2016). Linking calling to work engagement and subjective career success: The perspective of career construction theory.

Journal of Vocational Behavior, 94, 70–78.
<https://doi.org/10.1016/j.jvb.2016.02.011>

Xu, X., & Payne, S. C. (2014). Quantity, quality, and satisfaction with mentoring: What matters most? *Journal of Career Development*, 41(6), 507–525.
<https://doi.org/10.1177/0894845313515946>

Zacher, H. (2014). Career adaptability predicts subjective career success above and beyond personality traits and core self-evaluations. *Journal of Vocational Behavior*, 84(1), 21–30. <https://doi.org/10.1016/j.jvb.2013.10.002>

Žalėnienė, I., & Pereira, P. (2021). Higher Education For Sustainability: A Global Perspective. *Geography and Sustainability*, 2(2), 99–106.
<https://doi.org/10.1016/j.geosus.2021.05.001>

Zhao, H., O'Connor, G., Wu, J., & Lumpkin, G. T. (2021). Age and entrepreneurial career success: A review and a meta-analysis. *Journal of Business Venturing*, 36(1). <https://doi.org/10.1016/j.jbusvent.2020.106007>