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MORALITY BEFORE KNOWLEDGE

Strategic analysis of innovation processes in higher education institutions: A mixed-method approach to environmental

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ABSTRACT

Background: Innovation is a crucial driver for higher education institutions to enhance competitiveness and academic excellence. Universitas Indonesia (UI) has implemented various innovation strategies, but the effectiveness and challenges of these processes require further investigation. This study aims to analyze the driving and inhibiting factors in UI's innovation processes and formulate strategic recommendations to optimize institutional innovation. **Methods:** This study employs a mixed-method approach, combining quantitative and qualitative analyses. The quantitative analysis uses descriptive statistics with Statistical Product and Service Solution (SPSS) to examine data distribution and categorize responses into high, moderate, and low classifications. Meanwhile, the qualitative analysis is based on in-depth interviews, where data is processed using coding techniques (open coding, axial coding, and selective coding) to identify key themes. The analysis follows the structured methodology proposed by Daymon & Holloway (2010), consisting of data reduction, organization, coding, interpretation, and evaluation. **Findings:** The conclusion of this study shows that innovation at the Universitas Indonesia is influenced by the strategies implemented and various supporting and inhibiting factors. Quantitative analysis reveals that institutional support, academic collaboration, and technology utilization significantly contribute to the success of innovation at UI. The majority of respondents have a positive perception of the innovation strategies implemented, as indicated in the categorization of the average value. Meanwhile, qualitative analysis through in-depth interviews identified major obstacles to innovation, including bureaucratic complexity, limited funding, and resistance to change. **Conclusion:** Innovation at the University of Indonesia is influenced by institutional and technological support, but faces challenges of bureaucracy, funding, and resistance to change. **Novelty/Originality of this article:** This study analyzes the innovation process in higher education through mixed methods, revealing the strategic factors that play a role in UI. The results provide new insights and policy recommendations to improve ecosystem innovation.

KEYWORDS: innovation strategy; higher education; Universitas Indonesia; strategic decision-making.

1. Introduction

Innovation serves as a key driver for the advancement and development of businesses, organizations, and nations. Faced with continuously evolving environmental conditions and rapid technological advancements, it is crucial to adapt and respond appropriately to these changes. Research indicates that innovation is vital for business sustainability and success in a competitive environment (Betaraya et al., 2018; Hanaysha et al., 2022). Additionally,

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innovation has a positive impact on long-term business and organizational performance (Exposito & Sanchis-Llopis, 2018; Lichtenthaler, 2016). Beyond the organizational and business levels, innovation also plays a significant role in national economic growth and global trade (Desai, 2016). Furthermore, innovation contributes to addressing global challenges such as climate change, global health, and food security. For instance, advancements in renewable energy can help reduce greenhouse gas emissions, while medical technologies can enhance life expectancy and improve healthcare quality. Therefore, discussions surrounding innovation are increasingly relevant and essential.

According to the Director General of Higher Education, Nizam, higher education institutions are the primary sources of innovation, with approximately 4,600 universities in Indonesia (Herlina, 2021). Consequently, universities are not only expected to achieve academic excellence but also to foster a culture of innovation within their academic communities. Modern universities must transition from their traditional missions of teaching and research to include a "Third Mission," which focuses on "contributions to society" (Compagnucci & Spigarelli, 2020). This mission seeks to define how universities contribute to economic and social development as well as engagement with society. UNESCO's Head of Higher Education, Peter J. Wells, emphasized this shift by stating, "Perhaps never before in recent history has the role of higher education been so closely linked to the economic, social, and environmental networks of the modern world" (Cai et al., 2020). Universities act as "innovation engines" that generate long-term economic impacts through social engagement, such as improving local workforce quality, transferring technology to industries, and enhancing regional attractiveness for entrepreneurs. This emerging role positions universities as catalysts for sustainable development within innovation ecosystems (Cai et al., 2020; Hoffecker, 2019).

Despite these expectations, universities still face significant challenges, particularly in product innovation. One of the key issues in academic innovation is the downstream commercialization of research products. This refers to how ideas and creativity, manifested through academic research and innovation, can be effectively implemented into products or services that are useful and marketable to the public, government, and industries. According to the Science and Technology Index Portal, from 2017 to 2023, Indonesian university faculty members produced 399,838 research and innovation outputs. However, only 49% of these were successfully implemented in community projects or programs. Moreover, among the 12 state universities ranked in the QS World University Rankings, 70,541 research outputs were recorded, yet only 36% reached industrial application (Farisi, 2023). Although not all research and innovation outputs must necessarily be commercialized, the low percentage indicates that many potential innovations remain unused or are limited to specific academic circles. Often, innovations fail to align with market or industry needs, ultimately preventing their commercialization (Tassone et al., 2022). Additionally, while universities may possess the capability to develop innovative products, they often lack sufficient funding to see these projects through to completion. Given that universities represent a significant force for national innovation, identifying the factors influencing university innovation is a crucial topic that warrants further exploration.

As Indonesia's leading university, Universitas Indonesia bears the responsibility of actively contributing to national problem-solving. According to the 2023 Scimago Institution Rankings, UI ranks as the top Indonesian university based on research performance, innovation output, and societal impact. It holds the first position nationally and ranks 1,531st globally, followed by Universitas Gadjah Mada and Universitas Syiah Kuala. However, as highlighted by Professor Nachrowi, Chairman of the UI Academic Senate, one of the major challenges the university faces is downstream commercialization. Many research projects that receive funding ultimately fail to reach the market (Faculty of Economics and Business, Universitas Indonesia, 2020). The rapid evolution of technology and information also poses challenges, such as the rise of online learning and distance education during the COVID-19 pandemic, which has influenced the innovative behavior of the academic community. A.G., Director of UI Innovation and Science Techno Park, emphasized that to enhance innovation output, strategies must encompass the entire

innovation process, from inception to commercialization, ensuring that innovations benefit society (Ernis, 2023).

Higher education institutions are particularly vulnerable to government policy changes, social conditions, and technological advancements, all of which significantly impact their operations (Rehman et al., 2024; Zhang et al., 2023). Therefore, equipping academics with the knowledge, skills, attitudes, and values necessary to enhance innovation requires specific benchmarks. One such benchmark involves identifying the factors that influence innovation. While extensive research has been conducted on the drivers and barriers of innovation in the corporate sector, there is limited literature defining what specifically drives or hinders innovation in Indonesian universities.

Based on the aforementioned background, this study aims to explore in greater depth the factors that both facilitate and hinder the innovation process at Universitas Indonesia, particularly in product innovation. As a contribution to addressing national challenges, the findings of this study are expected to provide valuable insights and recommendations for UI and other universities in fulfilling their role as agents of culture, research, and technology in Indonesia. Additionally, this research seeks to propose strategic recommendations for enhancing the innovation process at Universitas Indonesia.

2. Methods

In this study, the researcher employed an embedded mixed-methods design with an emphasis on the quantitative strand. Mixed-methods research constitutes a design in which quantitative and qualitative techniques, methods, approaches, or concepts are integrated within a single investigation to generate comprehensive and in-depth understanding (Creswell & Clark, 2017). The embedded design, as one variant of mixed-methods research, involves the incorporation of quantitative and qualitative data collection and analysis within a broader, dominant methodological framework. The collection and analysis of secondary datasets may occur prior to, during, and/or following the implementation of data collection and analytical procedures traditionally associated with the dominant design (Creswell & Clark, 2017). The approach employed to analyze the issues in this study is a quantitative method. Quantitative research is an approach that emphasizes data analysis using numerical values and serves as a method for testing specific theories by examining relationships among variables (Creswell & Creswell, 2017). The findings of this study are presented descriptively through numerical data and statistical analysis. By utilizing a systematic and measurable approach, quantitative research aims to provide a deeper understanding of the phenomena under investigation.

This study can be categorized into four types based on research benefits, objectives, time dimensions, and data collection techniques. Based on its benefits, research can be classified into two categories: pure research (academically oriented) and applied research (oriented towards change) (Crescentini, 2014). This study is categorized as pure research since it is primarily intended to contribute to scientific knowledge development. It serves as a source of ideas and insights regarding innovation at Universitas Indonesia and focuses on the logic and research design formulated by the researcher, without any external sponsorship. Research based on objectives can be categorized into three types: exploratory, descriptive, and explanatory research (Neuman, 2019). Exploratory research seeks to investigate new topics, descriptive research aims to depict social phenomena, while explanatory research explains how a social phenomenon occurs. This study is classified as descriptive research as it aims to provide a general overview of a phenomenon that can serve as a foundation for further research or decision-making. In this case, the researcher intends to identify variables involved in the phenomenon of innovation at Universitas Indonesia. According to Neuman (2019), research can be categorized into two types based on time dimensions: cross-sectional and longitudinal studies. Cross-sectional research captures a phenomenon at a specific point in time, while longitudinal research is conducted at multiple points in time. Since this study examines information at a specific moment without follow-up studies over different periods, it is classified as cross-sectional research.

Data collection techniques for qualitative research are divided into field research and historical-comparative research (Neuman, 2019). Field research involves case studies on small groups over a certain period, whereas historical-comparative research gathers data to explain past life aspects or different cultures. This study employs field research by conducting in-depth interviews. To obtain data, this study employs a mixed-methods approach, combining quantitative and qualitative data collection techniques to achieve research objectives. The quantitative technique is conducted by distributing questionnaires to samples, while the qualitative technique involves interviews with respondents to identify factors driving and hindering innovation. Secondary data is obtained through literature reviews.

A survey is a technique for collecting information by compiling a set of structured questions for respondents (Neuman, 2019). Survey research is used to address large-scale contemporary issues involving a substantial population, necessitating a large sample size. One of the methods for conducting surveys is through questionnaire distribution. Questionnaires may consist of open-ended or closed-ended questions, administered directly or online. This study collects information from respondents through online questionnaires. The research instrument used is Google Forms, distributed to respondents, including lecturers, students, and administrative staff at Universitas Indonesia. The questionnaire consists of closed and open-ended questions using a Likert scale to measure respondents' agreement levels (strongly disagree to strongly agree) with a value range of 1–4 to eliminate neutral responses.

One of the data collection methods utilized in this study is interviews. Interviews involve direct interactions between two or more individuals to obtain information (Neuman, 2019). Interviews are conducted with selected respondents who have direct relevance to the research topic. Neuman categorizes interview questions into three types: descriptive, structural, and contrast questions. Descriptive questions explore settings and individuals within them, structural questions are built upon existing concepts or theories, and contrast questions are designed to analyze similarities and differences mentioned by respondents. The interview guidelines in this study are based on previously formulated conceptual operationalization. According to Creswell & Creswell (2017), a literature review is the process of searching, organizing, and analyzing scholarly sources related to the research problem. This involves reviewing journals, books, or other documents explaining past and current theories and information. In this study, the researcher gathers information from previous studies, books, and relevant documents related to innovation at Universitas Indonesia.

Population refers to the entire group from which the researcher selects a sample for the study (Neuman, 2019). The population is defined as a group of individuals residing in a specific region with generalizable characteristics relevant to the study. The population for this research includes all individuals involved in the innovation process at Universitas Indonesia, including lecturers, students, and administrative staff across all faculties and units. Based on statistics from the Human Resources Directorate of Universitas Indonesia, the university currently employs 2,482 academic staff, 2,452 lecturers, and approximately 36,000 students, totaling 40,934 individuals. According to Neuman (2019), a sample is a subset of the larger population selected for study. Roscoe (1975) suggests that a sample size between 30 and 500 is appropriate for most studies, whereas a sample exceeding 500 may lead to Type II errors. Sample size may also be influenced by constraints such as time, cost, and scope of observations (Arikunto, 2006).

This study employs non-probability sampling with a purposive sampling technique due to the absence of a complete sampling frame and specific research criteria. The criteria for sample selection are as follows: active lecturers, students, and administrative staff at Universitas Indonesia, and individuals who have engaged in the innovation process within the university environment. To determine the minimum sample size, Slovin's formula is applied with a 10% margin of error, resulting in a minimum sample size of 100 respondents. Prior to distributing the questionnaire, a pre-test was conducted with 30 respondents to improve the validity and reliability of the instrument. Interviews are conducted with key

informants who possess relevant knowledge and experience in the research area. Informants are selected using purposive and snowball sampling techniques to ensure access to credible and relevant information. The key informants include university administrators, lecturers, and students involved in innovation processes at Universitas Indonesia.

Table 1. Research informants

No	Informant	Role	Purpose
1	S.S, Head of the Sub-Directorate of Innovation Development, Division of Innovation, Science, Technology, and Partnership UI	Manages the implementation and commercialization stages of innovation ideas at the university	To identify the driving and inhibiting factors in the innovation process from the perspective of educational staff managing innovation
2	F.F, Staff of the Entrepreneurship and Innovation Unit, Faculty of Engineering UI	Manages the implementation and commercialization stages of innovation ideas at the faculty level	To identify the driving and inhibiting factors in the innovation process from the perspective of faculty-level educational staff managing innovation
3	S.N.N.H., Student of Faculty of Public Health UI	Engages in innovation from ideation to implementation through faculty innovation programs	To identify the driving and inhibiting factors in the innovation process from the perspective of students in the health sciences cluster
4	N.I, Lecturer and Head of the Department of Business Administration	Supervises innovation from the ideation to implementation stage at the faculty and university levels	To identify the driving and inhibiting factors in the innovation process from the perspective of a lecturer who failed to commercialize their innovation
5	T.A, Lecturer of Electrical Engineering	Engages in innovation at the ideation, implementation, and commercialization stages at the university level	To identify the driving and inhibiting factors in the innovation process from the perspective of an educational staff member who successfully implemented their innovation
6	K.P, Civil Engineering Student	Engages in innovation at the ideation stage at the faculty level	To identify the driving and inhibiting factors in the innovation process from the perspective of students in the science and technology cluster

Data analysis is a systematic process of integrating and examining data through the identification of patterns, relationships, and scientific concepts to generalize issues more broadly (Neuman, 2019). Quantitative data analysis is the process of interpreting collected data in numerical formats, such as numbers, graphs, or diagrams, to gain a better understanding of the data numerically (Neuman, 2019). In this study, data analysis is conducted using the univariate method, which aims to understand the distribution of values for each variable. This study employs descriptive analysis using the Statistical Product and Service Solution software to determine which driving and inhibiting factors are the most dominant. Descriptive statistical analysis is a method of collecting, processing, and analyzing data to provide a clearer overview. Descriptive statistical analysis provides information and insights about the distribution and behavior of data in the research sample by examining the maximum value, minimum value, mean, and standard deviation of each variable, both independent and dependent variables.

The researcher uses the mean value to determine the tendency of respondents' answers toward the research variables. This study collected data through in-depth

interviews. From these data, the researcher conducts coding and concept formation as a means of generalization. The purpose of coding analysis is to classify and conceptualize field data into a theory or concept. Furthermore, the researcher applies an illustrative method to apply theories using empirical evidence to describe situations and conditions. This analytical method is used to organize data based on theory and compare social settings through concrete situations (Neuman, 2019).

This study follows the data analysis stages outlined by Daymon & Holloway (2010), beginning with data reduction, which involves listening to recorded audio or video from in-depth interviews conducted with respondents and transcribing the collected data by writing down every spoken word precisely without paraphrasing or summarizing. The next stage is data organization, which aims to verify whether the research data has been systematically recorded and labeled so the researcher can keep the data intact, complete, and well-organized. This is followed by coding and categorization, a process of deciding which words to use as labels or themes that appear repeatedly in the research data, with Neuman (2019) classifying coding operations into three stages: open coding, axial coding, and selective coding. The subsequent stage is data interpretation, which involves analyzing and explaining the meaning of the data, describing it to others, and determining whether the research data provides meaningful insights into field findings. Finally, the evaluation of data interpretation ensures that the qualitative analysis conducted is meaningful, useful, and credible.

3. Results and Discussion

3.1 General overview

The general overview outlines the theme and locus of the research. This section presents information related to Universitas Indonesia and the product innovation practices carried out within the institution. The general overview discussed in this chapter is presented as follows.

3.1.1 Universitas Indonesia

Universitas Indonesia is one of the oldest universities in Indonesia and a globally recognized academic institution that continuously strives for excellence in the discovery, development, and diffusion of knowledge on both a regional and international scale. Originally founded in 1849 under the name Nood-universiteit, the institution was renamed “Universiteit van Indonesië” in 1947, with its central campus located in Jakarta (ui.ac.id, n.d.). In 1950, “Universiteit van Indonesië” was reorganized into “Universiteit Indonesia,” comprising multiple faculties spread across several cities including Jakarta, Bandung, Bogor, and Makassar. Subsequently, in 1987 UI established a new campus on a 320-hectare tract in Depok. Entering the 2000s, UI became one of the few universities granted the status of State-Owned Legal Entity, providing it greater autonomy in academic development and financial management. Currently, UI consists of 14 faculties, 1 Vocational Program, and 2 Schools (School of Strategic and Global Studies and School of Environmental Science). The 14 faculties are: Faculty of Medicine; Faculty of Dentistry; Faculty of Nursing; Faculty of Pharmacy; Faculty of Mathematics and Natural Sciences; Faculty of Engineering; Faculty of Psychology; Faculty of Social and Political Sciences; Faculty of Law; Faculty of Economics and Business; Faculty of Administrative Sciences; Faculty of Public Health; Faculty of Cultural Sciences; and Faculty of Computer Science.

In accordance with Law of the Republic of Indonesia No. 12 of 2012, Universitas Indonesia is mandated to administer higher education based on the Tridharma Perguruan Tinggi, which encompasses education, research, and community service. As stated in its Statute, UI articulates its vision as “becoming a leading and competitive center of knowledge, technology, and culture through efforts to enlighten the nation and improve societal welfare, thereby contributing to the development of Indonesian and global communities.” To realize

this vision, UI carries out its mission, which includes providing broad, equitable, and high-quality access to education; implementing high-quality and relevant Tridharma activities that address national and global challenges; producing graduates who are intellectually capable, ethically upright, and globally competitive; and fostering an academic environment conducive to the realization of the university's vision.

3.1.1.1 Organizational structure

The organizational structure of Universitas Indonesia reflects the patterns of relationships and responsibilities among its constituent units, designed to support various work programs aligned with the university's vision, mission, and objectives. These work programs are grounded in the General Guidelines for the Implementation of Education, which serves as the primary guideline for the administration of education. Each component within the organizational structure carries roles and responsibilities directly tied to achieving these institutional goals. The structure also functions as a foundational element that ensures the quality of policies, fosters modern financial management practices, and upholds performance standards necessary for global competitiveness. Achieving these aims requires the development of a strong and consistent intellectual culture and atmosphere, supported by close collaboration among various bodies—from the Board of Trustees and the Rectorate Cabinet to Faculty Deans and administrative teams. UI's management operates on the principles of transparency and accountability, with the expectation that the university will continue to position itself as a globally competitive institution.

According to Government Regulation No. 75 of 2021, Article 19, concerning the Statute of UI, the university's governing bodies consist of the Board of Trustees, the Rector, the Academic Senate, and the Council of Professors. The relationships among these bodies are grounded in collegiality, with each entity providing mutual oversight and maintaining a system of checks and balances. Decision-making within meetings held by the Board of Trustees, Academic Senate, or Council of Professors is conducted through deliberation to reach consensus. UI offers multiple levels of academic programs, including Undergraduate (S1), Master's (S2), Doctoral (S3), Specialist-1, Subspecialist, Professional, and Vocational programs. These programs are organized under three clusters of academic disciplines (Health Sciences; Social Sciences and Humanities; Science and Technology), 14 Faculties, the Vocational Program, the School of Strategic and Global Studies, and the School of Environmental Science.

3.1.1.2 Innovation at Universitas Indonesia

As a research-based institution, Universitas Indonesia formulated its 2019–2024 strategic plan with a focus on research and innovation, including joint research initiatives, international conferences, innovation downstreaming, and the utilization of research outcomes to address national challenges. UI's innovations span multiple fields, including food, health, engineering, business, information and communication technology, and security (Schiuma & Carlucci, 2018). Over the past five years, UI has transformed into an Entrepreneurial University, marked by increased commercialization of innovations and the registration of 1,155 intellectual property rights in 2022.

UI has also contributed to the G20 Presidency through innovations such as electric buses and actively showcased innovative products at Hannover Messe 2023, including the COVENT-20 ventilator, Dengue Rapid Test, and various other advanced technological products. The development of innovation has been further supported by UI's Directorate of Innovation Development, Division of Innovation, Science, Technology, and Partnership since 2007, which manages business incubation and intellectual property. However, of the 3,890 intellectual properties owned by UI, only a small portion has been successfully commercialized, indicating that downstreaming and product innovation still require significant improvement.

3.2 Pretest results

In this study, a pretest was conducted by analyzing the responses of 30 participants from the research sample, consisting of lecturers and students from Universitas Indonesia (UI), to assess the feasibility of the questionnaire. Subsequently, the collected data were tested for validity and reliability using the measurement tools provided by International Business Machines – Statistical Package for the Social Sciences.

3.2.1 Validity test

The validity test was conducted on the Driving Factors and Inhibiting Factors variables to ensure that each questionnaire item effectively measured the intended research variable. The method employed was the Pearson Product-Moment Correlation, comparing the calculated r-values with the critical r-value (0.361) at a 5% significance level with 30 respondents. The results of the validity test indicated that, for the Driving Factors variable, 15 out of 16 indicators were valid, while one indicator—"I feel that UI has shown improvement in collaboration with other universities"—was invalid and therefore excluded from further analysis. Meanwhile, for the Inhibiting Factors variable, 32 out of 35 indicators were valid, while three indicators were invalid, namely: "current legislation lacks a long-term strategy for innovation," "government procurement processes are rigid and time-consuming," and "lack of student participation in university decision-making." Thus, the majority of indicators for both variables met the criteria for further analysis.

3.2.2 Reability test

The reliability test was conducted to assess the precision, accuracy, and consistency of the statements in the questionnaire using Cronbach's Alpha, which yields a coefficient ranging from 0 to 1. An instrument is considered reliable if $\alpha > 0.6$. The results indicated that the Driving Factors of the Innovation Process variable had $\alpha = 0.912$, while the Inhibiting Factors of the Innovation Process variable had $\alpha = 0.941$, classifying both as reliable. Therefore, all dimensions in this study can be considered dependable as questionnaire instruments.

3.3 Descriptive statistical analysis

3.3.1 Respondent characteristics

In conducting descriptive analysis, the first step is to understand the characteristics of the respondents who are the subjects of this study. Respondents' identity data were obtained in the initial segment of the questionnaire to determine their characteristics using numerical data. In this study, there were 182 respondents categorized based on occupation, gender, age, field of study, faculty of origin, and the success of the innovations they carried out. To provide a deeper understanding, statistical information about the respondents will be presented through graphs.

3.3.1.1 Respondent gender

The gender-based characteristics of respondents help to understand the comparison between male and female respondents who participated in filling out the research questionnaire. Based on the questionnaire distributed to 102 respondents, it was found that the percentage of male respondents was 54% or 55 people. Conversely, the percentage of female respondents was smaller, at 46% or 47 people. The graph above indicates that the majority of respondents participating in this study were male. Several studies have examined the impact of gender diversity on innovation (Sastre, 2015 in Xie et al., 2020). The "value-in-diversity" perspective suggests that gender diversity can enhance innovation

performance, particularly in intensive work environments, by offering diverse ideas and perspectives (Sastre, 2015).

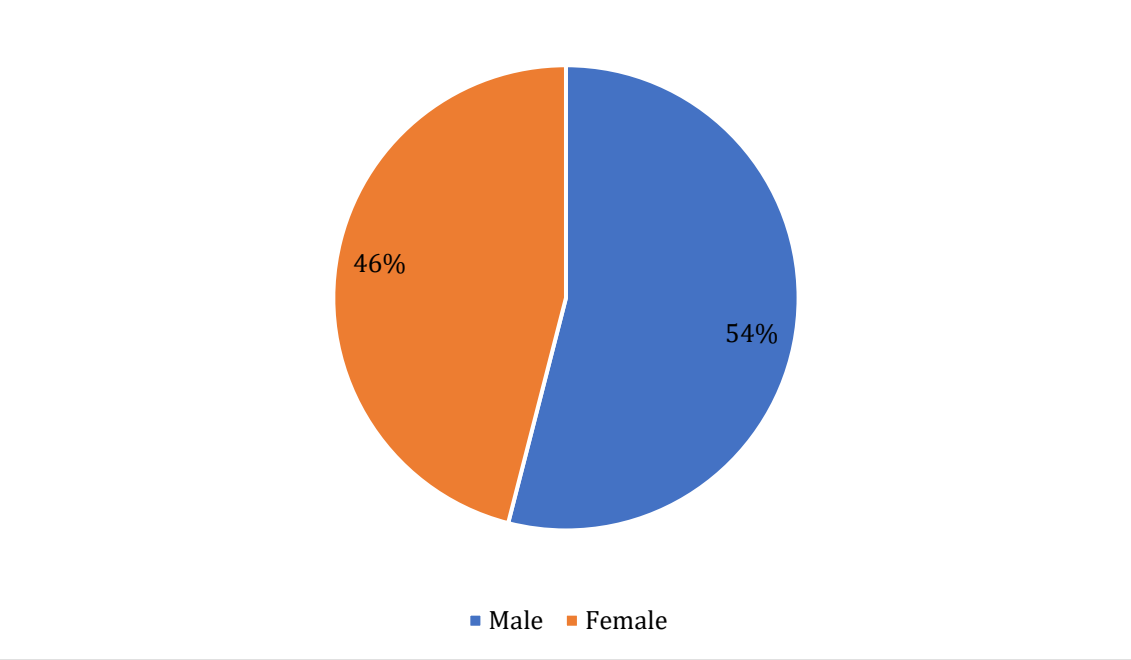

Fig. 1. Respondent characteristics by gender

3.3.1.2 Respondent age

Respondent characteristics based on age are categorized into the following groups: ≤20 years, 21–30 years, 31–40 years, 41–50 years, and more than 50 years. The distribution of respondents engaged in innovation activities at UI based on age is as follows:

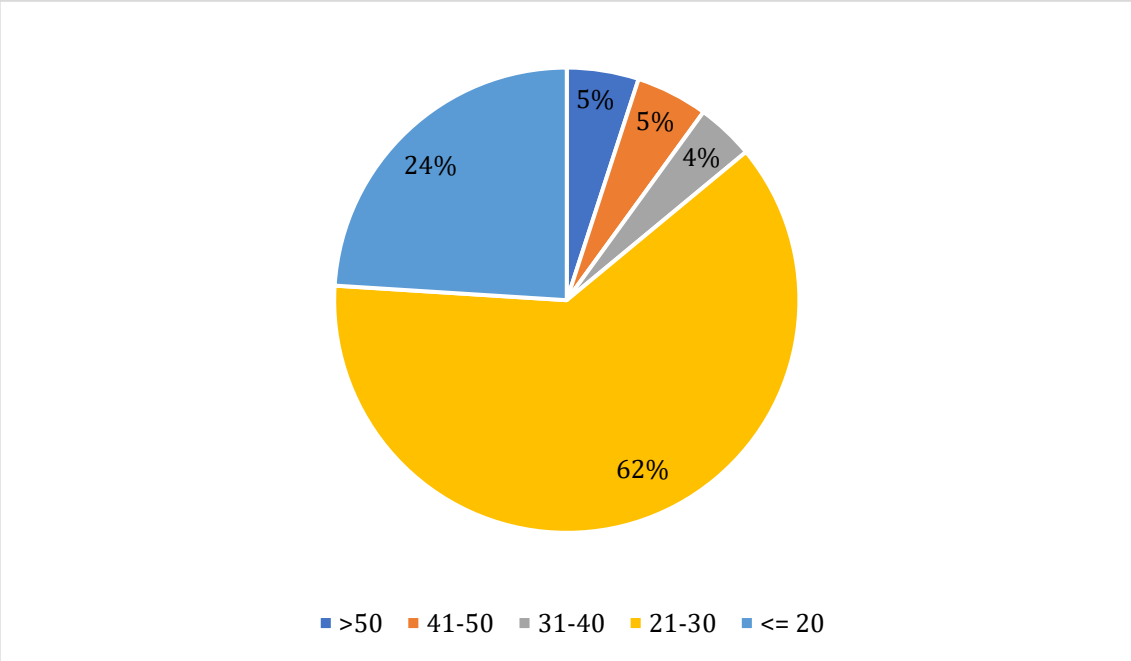

Fig. 2. Respondent characteristics by age

Based on Fig 2, it is evident that the majority of respondents belong to the 21–30 years age group, with 63 respondents or 62% of the total. Meanwhile, the smallest group consists of respondents aged 31–40 years, with only 4 respondents or 4% of the total. This suggests

that the study's respondents are predominantly from the productive age category. A person's age can influence their level of innovation. Previous research found that older individuals are less innovative than younger ones (Lee et al., 2010). This is related to how older individuals find it more difficult to keep up with technological advancements and tend to be more conservative. Additionally, age serves as an important independent variable, with negative elements associated with the costs and benefits individuals receive from their innovation efforts. For example, older individuals may be in a career maintenance stage, focusing on stability and job security, whereas younger individuals are in a phase of growth and exploration, allowing them to have a longer focus and greater flexibility for change. However, contradicting this notion, Ng & Fieldman (2013) found that age is not negatively related to innovation-related behavior. A person's ability to successfully implement innovations increases with age. They gain more knowledge about organizational procedures, build stronger networks, and develop better communication and organizational skills, all of which help them succeed. Thus, age can have a positive impact on the likelihood of innovation success (Parsons, 2015).

3.3.1.3 Respondent occupation

Respondent characteristics based on occupation consist of three categories: lecturers, students, and administrative staff, covering the entire academic community. The distribution of respondents by occupation is illustrated in the following graph:

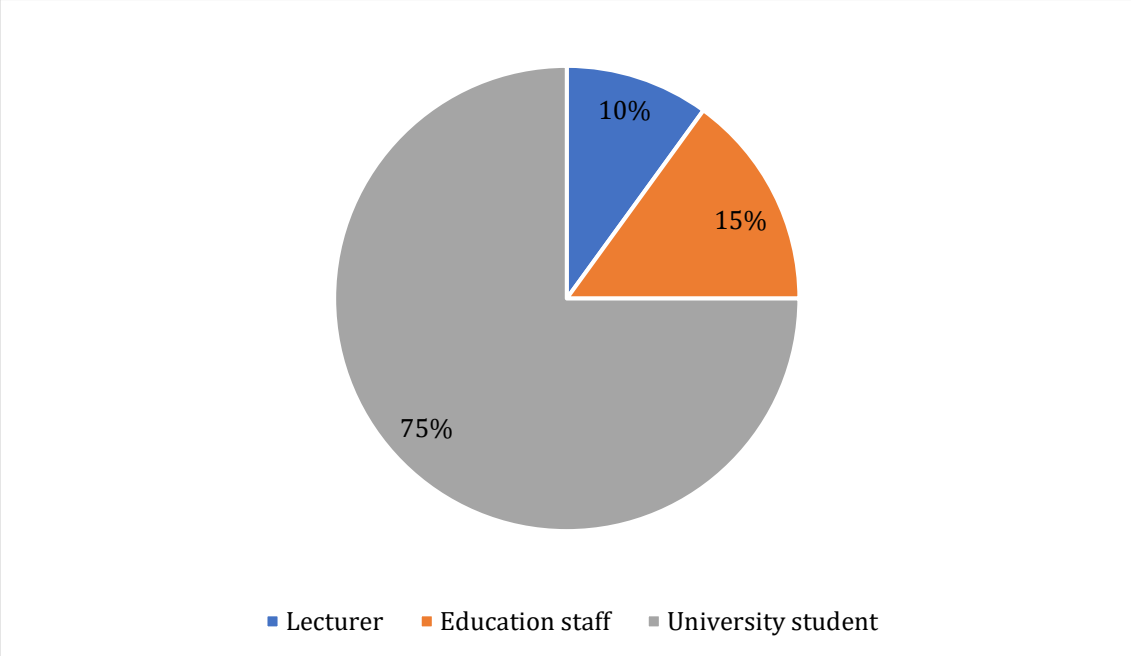

Fig. 3. Respondent characteristics by occupation

Based on Fig 3 it is evident that the majority of respondents are students, with 77 people or 75% of the total. Meanwhile, lecturers form the smallest group, with only 10 respondents or 10% of the total, and administrative staff account for 15 respondents or 15% of the total. These results suggest that the study's findings will be more representative of students' perspectives rather than those of lecturers and administrative staff. However, this is proportionate when considering that UI has approximately 36,000 students, while lecturers and administrative staff number only around 2,000. Students have access to the latest technology and knowledge, along with high levels of creativity and innovation, making them key catalysts in the era of globalization (Alrizqi, 2024). Therefore, students play a crucial role in driving innovation at UI.

3.3.1.4 Field of study

Respondents were categorized into UI's three main fields of study: Social Sciences and Humanities, Science and Technology, and Health Sciences. The researcher sampled each field to obtain a representative distribution across disciplines. The distribution of respondents based on their field of study is shown in the following graph:

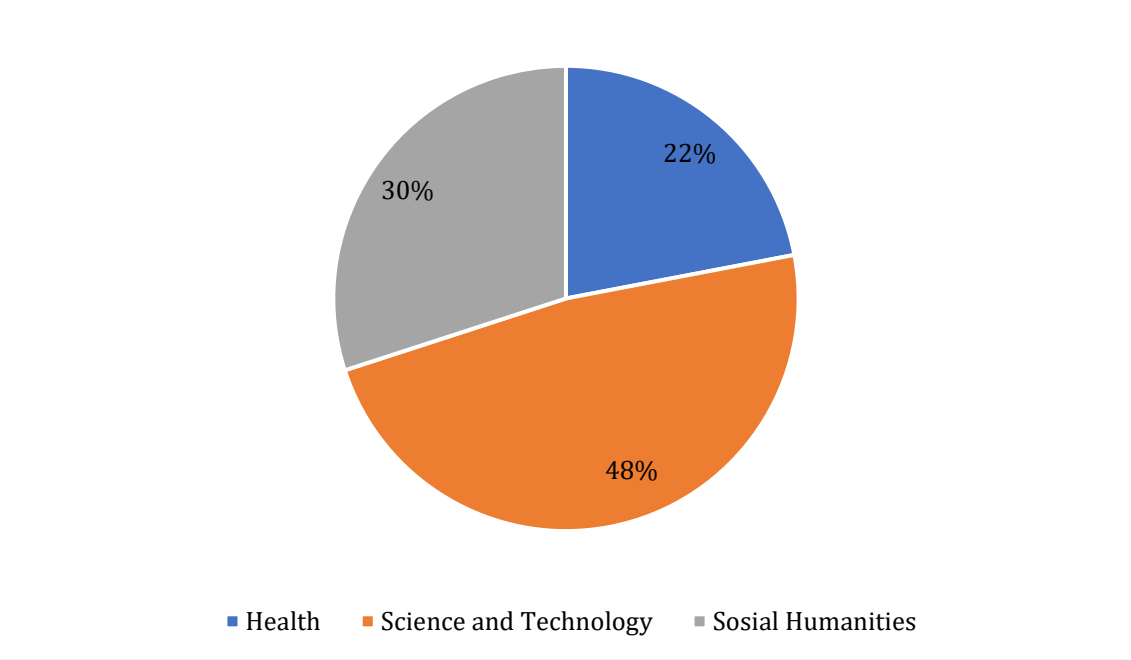

Fig. 4. Respondent characteristics by field of study

Based on Fig 4, it is evident that respondents are predominantly from the Science and Technology field, with 49 respondents or 48% of the total. Meanwhile, the Health Sciences field has the lowest frequency, with only 22 respondents or 22% of the total. The Social Sciences and Humanities field has 31 respondents or 30% of the total, placing it between the other two categories.

3.3.1.5 Faculty of origin

The respondents in this study came from 11 faculties out of the 14 faculties at Universitas Indonesia. The distribution of respondents by faculty is shown in the following table:

Table 2. Distribution of respondents by faculty

Faculty	Frequency	Percentage
Faculty of Engineering	44	43%
Faculty of Administrative Sciences	23	22.5%
Faculty of Pharmacy	9	8.08%
Faculty of Medicine	9	8.08%
Faculty of Computer Science	4	3.09%
Faculty of Economics and Business	4	3.09%
Faculty of Humanities	4	3.09%
Faculty of Public Health	2	2%
Faculty of Law	1	1%
Faculty of Nursing	1	1%
Faculty of Mathematics and Natural Sciences	1	1%
Total	102	100%

Based on Table 4.5, the Faculty of Engineering has the highest number of respondents, with 44 people or 43% of the total, followed by the Faculty of Administrative Sciences with 23 respondents. The faculties with the lowest number of respondents (1 person or 1% each) are the Faculty of Law, Faculty of Nursing, and Faculty of Mathematics and Natural Sciences. Three faculties—Faculty of Dentistry, Faculty of Psychology, and Faculty of Social and Political Sciences—were not represented in this study.

3.3.1.6 Innovation products

The researcher collected data on the types of innovation products developed by respondents (excluding administrative staff). The following table presents the types of innovations they have worked on:

Table 3. Types of innovation conducted by respondents

Type of innovation	Frequency	Percentage
Application	22	25%
Machine	8	9%
Medical device	4	5%
Aquawater	1	1%
Agricultural assistive tool	1	1%
Soft-shell crab apartment	1	1%
Application, transportation system, construction method, digital hazard identification system	1	1%
Daily necessity items utilizing organic waste through eco enzyme processes	1	1%
Bioprinter, water quality monitoring	1	1%
Book	1	1%
Electric bus	1	1%
Convent 20	1	1%
Building/infrastructure design	1	1%
Emergency shelter	2	2%
Energy	1	1%
Drug formulation	5	6%
Written idea	1	1%
Fuel innovation	1	1%
Sexual education media and methods for individuals with disabilities	1	1%
Livestock feed innovation	1	1%
Service innovation	1	1%
Journal	1	1%
Product campaign	1	1%
AI-based service	1	1%
Healthcare service	1	1%
Food	2	2%
Recommendation for drilling fluid formulation for well drilling in East Java	1	1%
Machine (sustainable energy based on kinetic energy)	1	1%
Beverage	3	3%
Obesity	1	1%
Biodegradable hydrogel-based sanitary pads (eco-friendly pads)	1	1%
Addition of microalgae for filtration in MBRs and utilization of bacteria for POME purification	1	1%
Marketing and psychological research	1	1%
Scientific application	1	1%
Use of AR, VR, and IoT in hardware development for Alzheimer's patient treatment	1	1%
Digital product	4	5%
Paper products made from waste	1	1%
Health products	3	3%
Health reproduction education program through youth empowerment	1	1%

Chemical process	1	1%
Clothing recycling	1	1%
Soap	1	1%
Fast-dissolving tablet	1	1%
Total	87	100%

3.1.1.7 Innovation success

The researcher also gathered data on the success of respondents' innovations by asking, “Was your innovation successfully implemented/marketed?” The results are illustrated in the following graph:

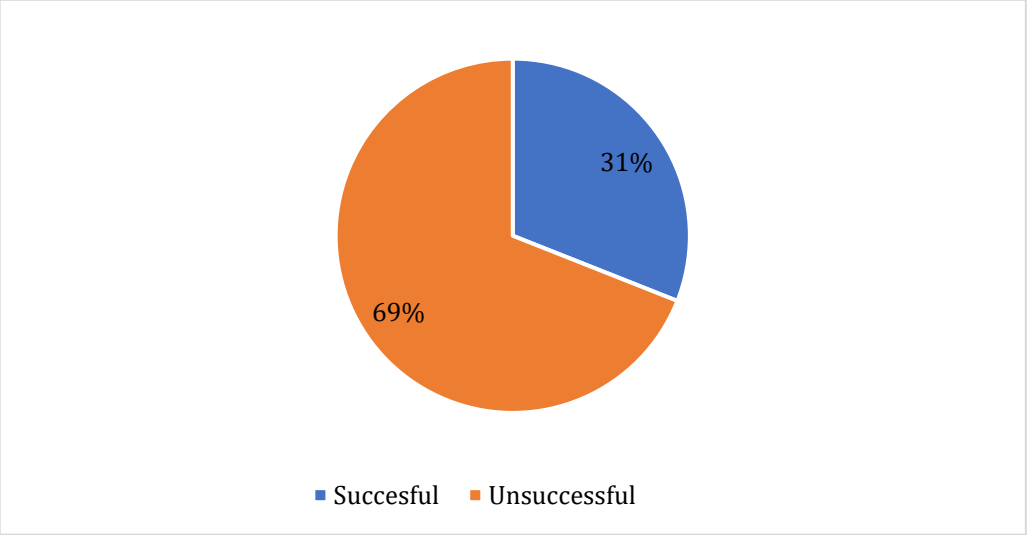

Fig. 5. Respondent innovation success

Based on Fig 5, most respondents (69% or 60 people) were unable to implement or market their innovations, meaning their ideas remained at the ideation or prototype stage. Only 27 respondents (31%) successfully implemented or marketed their products. This indicates that innovation commercialization at UI needs improvement, as many potential innovations fail to be realized.

3.4 Results of Open-ended question on strategies to enhance innovation at UI

In this study, respondents were given an open-ended question in the questionnaire: "What strategies do you think should be implemented to enhance innovation at Universitas Indonesia?" The responses were processed through a coding analysis, and the results are summarized in the following table:

Table 4. Results of open-ended question on strategies to enhance innovation at UI

Category	Innovation-driving factors	Frequency	Percentage
Collaboration among Innovation Actors	Enhancing collaboration	5	6.25%
	Benchmarking with successful institutions	1	1.25%
	Talent pool for matchmaking between faculty, students, and departments	1	1.25%
	Guidance in innovation creation	2	2.50%
Innovation Management	Increasing faculty and student engagement with industry	1	1.25%

	Simplifying and clarifying innovation processes at UI	4	5.00%
	Open leadership and governance	4	5.00%
	Improving innovation assessment criteria	2	2.50%
	Enhancing promotion of UI innovation programs	5	6.25%
	Clear institutional responsibilities within UI	1	1.25%
	Better grassroots outreach through simple approaches	1	1.25%
Enhancing Innovation Actors' Capabilities	Cultivating problem-solving mindsets	1	1.25%
	Increasing awareness of research with innovation potential	1	1.25%
Human Resource Management	Establishing innovation programs (competitions and grants)	11	13.75%
	Expanding skills training programs	5	6.25%
	Mentorship programs	1	1.25%
	Introducing innovation-related courses	4	5.00%
	Improving HR effectiveness	1	1.25%
	Reducing faculty workload	2	2.50%
Facilities and Infrastructure	Providing support through facilities and infrastructure	6	7.50%
Financial Support	Increasing financial support	4	5.00%
	Multi-year grant funding	1	1.25%
Legislation and Regulation	More flexible policies	4	5.00%
	Bureaucratic efficiency	5	6.25%
Researcher Remuneration	Enhancing incentives and appreciation for innovators	7	8.75%
Total		80	100.00%

Based on the table above, the majority of respondents recommended that UI establish more innovation-focused programs, such as competitions and grants. Additionally, increasing incentives and recognition for innovators was identified as a crucial factor in fostering a more dynamic innovation ecosystem. Several respondents provided qualitative insights into these recommendations. One respondent emphasized the need for a space outside the Student Creativity Program that allows students to explore and create freely without coercion. The respondent noted that the more opportunities students have to explore, the more innovative ideas will emerge, particularly when supported by financial assistance (Respondent 23).

Another respondent highlighted the importance of assigning clear responsibilities to specific UI institutions, such as Directorate of Innovation Development, Division of Innovation, Science, Technology, and Partnership, in collaboration with Dirmawa and the SDGs Center Hub UI. This collaboration could facilitate broader access to innovation funding opportunities, including journal publication and patent applications. The respondent also suggested the creation of a dedicated social media platform to disseminate information about innovation grants and recommended that these funding programs be conducted in partnership with research institutions to expand UI students' exposure to the professional and industrial sectors (Respondent 13).

Additionally, one respondent proposed that innovation be introduced more effectively to new students to spark their interest while also providing mentorship for aspiring innovators (Respondent 36). Another emphasized the need for increased training programs,

particularly software-related training, as software tools can aid in product design and simulation. Such tools can enhance creativity, reduce failure risks, and optimize both time and research expenses, ultimately fostering a more productive innovation environment at UI (Respondent 45).

A more comprehensive response addressed multiple key aspects necessary for improving UI's innovation ecosystem. The respondent suggested reducing faculty teaching and administrative workloads while ensuring stable salaries and structured career progression without financial or functional disadvantages. Moreover, they emphasized the importance of integrating students into faculty-led scientific activities and aligning student organizations with faculty innovation initiatives. In terms of infrastructure, the respondent advocated for modern laboratories with open-access information technology systems, extended lab hours beyond standard working hours, and the enhancement of fabrication and hardware facilities. The respondent also highlighted the need for stable information technology infrastructure and electricity to support innovation activities. Regarding funding, the respondent recommended sustained multi-year grants with simplified administrative requirements, as well as philanthropic contributions through endowment funds from affluent Indonesian entrepreneurs and alumni. According to the respondent, with UI's high-quality faculty and students, effective human resource management could establish a strong innovation climate, ultimately yielding economic benefits through commercialized innovations (Respondent 64). These findings suggest that enhancing innovation at UI requires a multifaceted approach that includes improving institutional support structures, providing targeted financial assistance, fostering a culture of collaboration, and reducing administrative burdens on faculty and researchers. By addressing these factors, UI can further strengthen its position as a leading institution in research and innovation in Indonesia.

4. Conclusions

As a world-class university, Universitas Indonesia has undertaken various initiatives to promote the development and creation of innovations. Accordingly, this study aims to analyze the driving and inhibiting factors of the innovation process at UI. Based on the research findings, the driving factors influencing the innovation process at UI consist of two dimensions: Culture of Openness and Freedom and Conscious Innovation Management. Within the Culture of Openness and Freedom dimension, the most influential factors in promoting innovation are strong collaboration with the business sector and the freedom for innovators to determine the innovations or methods they wish to pursue. In the Conscious Innovation Management dimension, the highest-ranking driving factors are the establishment of dedicated positions or units directly related to innovation development and the support provided to lecturers and students for innovation through training and skill development programs.

Regarding the analysis of inhibiting factors, the barriers to the innovation process at UI are categorized into three dimensions: External Relations, Internal Operations, and People-Related Barriers. Within the External Relations dimension, the primary inhibitors of innovation at UI are government bureaucracy, insufficient financial investment in the innovation sector, and stringent and time-consuming product innovation certification. For the Internal Operations dimension, the main inhibiting factors are inconsistent innovation management practices, an overly bureaucratic organizational culture at UI, inefficient financial allocation, and slow decision-making processes. However, two factors—insufficient financial investment in the innovation sector and varying innovation management practices across faculties—contradict the interview findings, indicating the need for further analysis of these factors.

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References
Alrizqi, M. R. (2024, July 5). *Mahasiswa sebagai katalisator digitalisasi, memperkuat UMKM melalui inovasi*. Kompasiana. https://www.kompasiana.com/rrana02/6686e14bed641513093eeec3/mahasiswa-sebagai-katalisator-digitalisasi-memperkuat-umkm-melalui-inovasi

Arikunto, S. (2006). *Prosedur penelitian: Suatu pendekatan praktik (Edisi Revisi VI)*. Rineka Cipta.

Betaraya, D. M., Nasim, S., & Mukhopadhyay, J. (2018). Subsidiary innovation in a developing economy: Towards a comprehensive model and directions for future research. *FIIB Business Review, 7*(2), 109–125. https://doi.org/10.1177/2319714518788387

Cai, Y., Ma, J., & Chen, Q. (2020). Higher education in innovation ecosystem. *Sustainability, 12*(11), 4376. https://doi.org/10.3390/su12114376

Compagnucci, L., & Spigarelli, F. (2020). The third mission of the university: A systematic literature review on potentials and constraints. *Technological Forecasting and Social Change, 161*, 120284. https://doi.org/10.1016/j.techfore.2020.120284

Crescentini, A. (2014). Mixed Methods for Research in Education: Studying an Innovation. *Procedia – Social and Behavioral Sciences, 112*, 749–758.

https://doi.org/10.1016/j.sbspro.2014.01.123
Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.
Creswell, J. W., & Clark, V. L. P. (2017). *Designing and conducting mixed methods research*. Sage publications.
Daymon, C., & Holloway, I. (2010). *Qualitative research methods in public relations and marketing communications* (2nd ed.). Routledge.
Desai, A. (2016, April 20). *Innovation and the World Bank*. World Bank Blogs. https://blogs.worldbank.org/voices/innovation-and-world-bank
Ernis, D. (2023, November 13). *UI ungkap 3 strategi untuk pacu lahirkan banyak inovasi*. Tempo.co. https://tekno.tempo.co/read/1796249/ui-ungkap-3-strategi-untuk-pacu-lahirkan-banyak-inovasi
Exposito, A., & Sanchis-Llopis, J. A. (2018). Innovation and business performance for Spanish SMEs: New evidence from a multi-dimensional approach. *International Small Business Journal: Researching Entrepreneurship, 36*(8), 911–931. https://doi.org/10.1177/0266242618782596
Farisi, M. I. (2023, April 29). *Minimnya hilirisasi hasil riset dan inovasi perguruan tinggi*. Kompas.com. https://www.kompas.com/edu/read/2023/04/29/112534671/minimnya-hilirisasi-hasil-riset-dan-inovasi-perguruan-tinggi?page=2
Faculty of Economics and Business, Universitas Indonesia. (2020, October 31). *Tantangan perguruan tinggi di 2021 yang penuh dengan ketidakpastian*. Fakultas Ekonomi dan Bisnis Universitas Indonesia. https://feb.ui.ac.id/2020/10/31/tantangan-perguruan-tinggi-di-2021-yang-penuh-dengan-ketidakpastian/
Hanaysha, J. R., Al-Shaikh, M. E., Joghee, S., & Alzoubi, H. M. (2022). Impact of innovation capabilities on business sustainability in small and medium enterprises. *FIIB Business Review, 11*(1), 67–78. https://doi.org/10.1177/23197145211042232
Herlina, N. (2021, March 10). *Inovasi perguruan tinggi kunci kemajuan bangsa*. Direktorat Jenderal Pendidikan Tinggi, Riset, dan Teknologi. https://www.dikti.kemdikbud.go.id/kabar-dikti/kabar/inovasi-perguruan-tinggi-kunci-kemajuan-bangsa/
Hoffecker, E. (2019). *Understanding Innovation Ecosystems: A Framework for Joint Analysis and Action*. MIT Practical Impact Aliance.
Lee, H. J., Jeong Cho, H., Xu, W., & Fairhurst, A. (2010). The influence of consumer traits and demographics on intention to use retail self-service checkouts. *Marketing Intelligence & Planning, 28*(1), 46–66. https://doi.org/10.1108/02634501011014606
Lichtenthaler, U. (2016). Toward an innovation-based perspective on company performance. *Management Decision, 54*(1), 66–87. https://doi.org/10.1108/MD-05-2015-0161
Neuman, W. L. (2019). *Social research methods: Qualitative and quantitative approaches*. Pearson.
Ng, T. W., & Feldman, D. C. (2013). A meta-analysis of the relationships of age and tenure with innovation-related behaviour. *Journal of Occupational and Organizational Psychology, 86*(4), 585–616. https://doi.org/10.1111/joop.12031
Parsons, R. A. (2015). The impact of age on innovation. *Management Research Review, 38*(4), 404–420. https://doi.org/10.1108/MRR-10-2013-0241
Rehman, W. U., Jalil, F., Saltik, O. Degrimen, S., & Bekmezci, M. (2024). Leveraging strategic innovation and process capabilities for intellectual capital initiative performance of higher education institutes (HEIs): A knowledge-based perspective. *Journal of the Knowledge Economy, 15*, 4161–4202. https://doi.org/10.1007/s13132-023-01336-3
Roscoe, J. T. (1975). *Fundamental research statistics for the behavioral sciences*. Holt, Rinehart, and Winston.
Sastre, J. F. (2015). The impact of R&D teams' gender diversity on innovation outputs. *International Journal of Entrepreneurship and Small Business, 24*(1), 142–162. https://doi.org/10.1504/IJESB.2015.066154

Schiuma, G., & Carlucci, D. (2018). Managing strategic partnerships with universities in innovation ecosystems: A research agenda. *Journal of Open Innovation: Technology, Market and Complexity, 4*(3). https://doi.org/10.3390/joitmc4030025

Tassone, V. C., Biemans, H. J. A., den Brok, P., & Runhaar, P. (2022). Mapping course innovation in higher education: a multi-faceted analytical framework. *Higher Education Research & Development*, *41*(7), 2458–2472. https://doi.org/10.1080/07294360.2021.1985089

Xie, L., Zhang, Y., Zhang, X., & Qi, G. (2020). Gender diversity in R&D teams and innovation efficiency: Role of the innovation context. *Research Policy, 49*(1), 103885. https://doi.org/10.1016/j.respol.2019.103885

Zhang, T., Ma, Z., & Shang, Y. (2023). Higher Education, Technological Innovation, and Green Development—Analysis Based on China's Provincial Panel Data. *Sustainability*, *15*(5), 4311. https://doi.org/10.3390/su15054311

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